THE PUBLIC HEALTH CONFERENCE ON RECORDS AND STATISTICS

The People's Health: Facts, Figures, and the Future

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE • Public Health Service • Office of Health Research, Statistics, and Technology

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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
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FOREWORD

Sponsorship of the Public Health Conference on Records and Statistics is one of the ways the National Center for Health Statistics fosters improved health information systems in the United States. A most important accomplishment of the biennial conferences is providing a national forum where organizations and individuals concerned with health data can exchange ideas and discuss current issues.

The value of the conferences is indicated by the growth in attendance over the years and by the broader sponsorship which the recent meetings have attracted. With the 17th national meeting of the Conference, for which our co-sponsors were the Bureau of Health Manpower, and the Bureau of Health Planning and Resources Development, Health Resources Administration, registration exceeded 1,000 persons for the first time.

Given that sponsorship, the 17th national meeting focused on the relationships between health planning, manpower, and statistical information systems. A particular goal was that the conference be useful to health planners at the State and local levels.

The agenda was planned to facilitate consideration of many different aspects of the development and utilization of health data. Topics for individual sessions included the technical—the State or Local Area Health Interview Survey, and Status and Effects of the Uniform Reporting and Classification System—and the conceptual—Data Needs for Health Resources Policy, and Environmental Factors and Measures of Health.

We live in an era of ever-increasing needs for comprehensive, high quality data that can aid decisionmaking about health in our country. Many of the needs and issues discussed at this meeting have been explored in earlier conferences as well, and some of them remain unfilled or unresolved. But the conferences have also devised and led the way in implementing strategies to fill some needs for data in a manner least costly and burdensome to all concerned.

It is our hope that the communication and understanding fostered by the 17th national meeting of the Public Health Conference on Records and Statistics will continue in the future. Publication of these proceedings is a step in that direction and hopefully will contribute to more rapid implementation of the comprehensive statistical systems and programs needed today. Our thanks to all of those who by their participation, whether in planning the sessions, preparing papers, or contributing to discussions, helped to make this meeting an informative, well-structured, and beneficial interchange.

DOROTHY P. RICE
Director
National Center for Health Statistics

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Note: All speakers at the 17th National Meeting of the Public Health Conference on Records and Statistics were requested to submit the text of their remarks to be included in the published Proceedings of the Conference. Any papers which are not included in the Proceedings were received after the publication deadline or were omitted at the request of the author. In addition, chairperson remarks and rapporteur summaries for some of the sessions are included. For a complete list of speakers and chairpersons see the index of program participants on page 461.

THE PUBLIC HEALTH CONFERENCE ON RECORDS AND STATISTICS

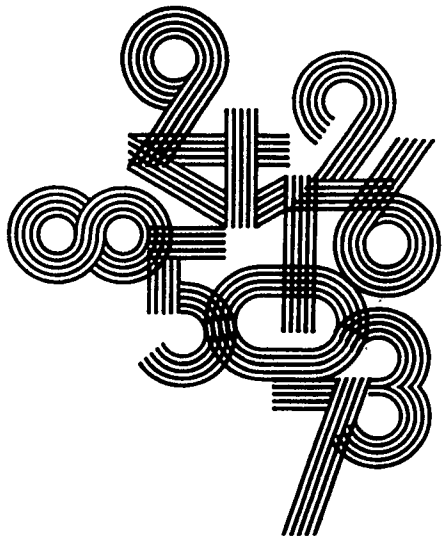
What it is—What it is for

The Public Health Conference on Records and Statistics (PHCRS) has been sponsored by the National Center for Health Statistics as a Biennial Meeting since 1958. This year, 1978, the Bureau of Health Manpower and the Bureau of Health Planning and Resources Development are co-sponsors of the PHCRS. The PHCRS brings together workers in the field of Public Health from State agencies, local health departments, Federal agencies and a variety of private organizations. The Conference enables the participants to discuss current and future problems of a major concern to them and to consider recommendations for practical solutions with a view to improved services to health programs, to the public in general, and to the nation.

The theme of the 17th National Meeting of the PHCRS is "The People's Health: Facts, Figures, and the Future." In keeping with this theme, subject matter for this Conference will include health status indicators, data on utilization of health services, health expenditures data, health resource data, health interview survey, utilization of ambulatory care data and environmental and occupational health data.

As has been customary, the American Association for Vital Records and Public Health Statistics (AAVRPHS) will hold its national meeting in conjunction with the PHCRS and has scheduled its independent sessions on June 8 and 9. These sessions, with the exception of the business meeting on Friday morning, are open to all Conference participants who wish to attend. Agenda items for this meeting will be available at the Registration Desk.

In essence, the PHCRS provides a valuable forum for the delineation and discussion of problems in maintaining a coordinated and uniform health information system to guide decisionmaking regarding health care in the United States.



FIRST PLENARY SESSION

CALL TO ORDER

Robert A. Israel, *Deputy Director, National Center for Health Statistics, Hyattsville, Maryland*

I would like to call the 17th National Meeting of the Public Health Conference on Records and Statistics to order. First of all, let me point out that I am Bob Israel, the Deputy Director of the National Center for Health Statistics. There is a slight change in your program. Dr. Robey is not here this morning.

The first meeting of this Conference actually was held in 1942 in St. Louis, Missouri. It was a meeting of registration executives who were discussing problems and solutions to better the registration of vital statistics in the United States and in Canada. The first meeting under the Public Health Conference on Records and Statistics title was in 1958 when the old National Office of Vital Statistics, one of the forerunners of the National Center for Health Statistics, sponsored the meeting.

We began co-sponsorship with interested sister agencies in 1974. The first in 1974 was with the National Institute of Mental Health. They held their annual national conference on mental health statistics in conjunction with the Public Health Conference on Records and Statistics. In 1976, the meeting was co-sponsored with the Bureau of Health Planning and Resources Development, in recognition of the close interrelationships between health statistics and planning. You will be hearing a lot more about that during the course of this meeting.

This meeting continues that emerging tradition of co-sponsorship with again the Bureau of Health Planning and Resources Development and the Bureau of Health Manpower joining with the National Center for Health Statistics for a three way co-sponsorship of this meeting.

The theme, as you can tell from your program, is "The People's Health: Facts, Figures and the Future." Since all of our labors are, in the final analysis, for improving the health of the people, we will be talking about a wide range of facts and figures dealing, for example, with vital events, measures of health status, utilization of health services, health expenditures, health manpower and facilities, environmental and occupational health measures, and so forth, in ways which will hopefully impact on the future, the future plans, programs and related activities, as they in turn relate to the people's health.

In the past, this conference has provided an opportunity for the attendees to exchange ideas about current and anticipated problems and to consider recommendations for practical solutions. So, the Bureau of Health Planning and Resources Development, the Bureau of Health Manpower and the National Center for Health Statistics hope that this 17th Conference will do the same.

As you can see, many people have come to attend this first plenary session and the sessions to come. What you cannot see so easily is that they represent a broad range of backgrounds and professions which we think is all to the good. Some come from afar while some are local, perhaps even natives of Washington, D.C. The registration is at an alltime high. We have somewhat in excess of 1,100 persons registered at this time. The previous high for a Public Health Conference has been in the neighborhood of 850. So, you can see that we continue to grow.

Without trying to be exhaustive, because there is always the problem of omitting somebody and feeling very bad about it, nevertheless I do want to mention some of those distinguished guests who have come from far away places.

We have in attendance today Mr. K. Uemura, the Director of the Division of Health Statistics from the World Health Organization in Geneva. We have Mr. Francis Beecham, the Deputy Registrar of Births and Deaths from Ghana, West Africa; Mrs. Vera Carstairs, Assistant Director of Information Services Division of the Scottish Health Services from Edinburgh. We have Mr. Rokucho F. Billy, Public Health Statistics, United States Trust Territory, Saipan, Mariana Islands in the Pacific; Mr. Keith Callwood, the Director of Health Planning and Resource Development of the Department of Health, St. Thomas, United States Virgin Islands; Mrs. Ruth Gonzalez, Director of the Office of Statistics from the Puerto Rico Department of Health; Mrs. Edith Leerdam, the Acting Director of Research and Statistics of the Virgin Islands Department of Health; Miss Nilsa Perez, a demographer and coordinator of Vital Statistics Component of the Puerto Rico Department of Health; Dr. Edgar Reid, Director of the Division of Public Health from Pago Pago, American Samoa; Mr. Tony Saliceti, Director of the Cooperative Health Statistics Program from Puerto Rico; Mrs. Julita Santos, the Territorial Registrar from Guam; and a large group of neighbors who have come not quite so far from our neighbor to the north, Canada.

We have Mr. John Silins from Statistics Canada; Mr. Douglas Angus from Statistics Canada; Mr. Don Brothers, also from Statistics Canada; and a number of persons from the various provinces: Mr. W.D. Burrowes, Director of Vital Statistics for British Columbia, Canada; Mr. Val Cloarec, Director of Vital Statistics from Saskatchewan; Mr. Harvey Hersom, Director of Vital Statistics, Alberta; Mr. H.I. MacKillop, Director of Data Development and Evaluation Branch, Ministry of Health, Ontario; Mr. Dean Mundee, who is an information system coordinator from New Brunswick,

Canada; and, Dr. Frank White, Director of Communicable Disease Control, Social Services and Community Health in Edmonton, Alberta, Canada.

For any other visitors from afar or from any of our close neighboring countries that I have omitted, my apologies, but you are all more than welcome.

Now, I will turn the microphone to Mrs. Ruth Hanft, who will give us greetings and a few opening remarks. You know, at the last Public Health Conference on Records and Statistics, some of you may recall that the National Center for Health Statistics was in a different organization or location than it is now. It was part of the Health Resources Administration. Since that time, there has been a change and we have been moved to the Office of the Assistant Secretary for Health, and, more specifically, under the direct supervision of Mrs. Hanft, who is the Deputy Assistant Secretary for Health Policy, Research and Statistics in Dr. Julius Richmond's office.

Mrs. Hanft has attended school in a number of places. I am not going to recite all of her background, but I do want to give you some idea of the experience that she does bring to her job. Ruth, I will not go through the whole list, of course, but let me pick a few of the more recent things that you have done.

She has served as a Special Assistant for Health Care Financing in the Office of the Assistant Secretary for Health. She has been a senior research associate and study director at the Institute of Medicine/National Academy of Sciences. She was the director of two Congressionally mandated studies, the Medicare/Medicaid Reimbursement Policies and Cost of Education in the Health Professions. She has been and still is a visiting professor at Dartmouth Medical School, Dartmouth College. She has done freelance consulting in health care management, financing and manpower. As I have said already, she carries the title of Deputy Assistant Secretary for Health Policy, Research and Statistics.

OPENING REMARKS

Ruth S. Hanft, *Deputy Assistant Secretary for Health Policy, Research and Statistics, Washington, D.C.*

It gives me great pleasure to welcome you on behalf of the Assistant Secretary for Health and myself. Dr. Richmond regrets very much that he was not able to be with you, but he is on an official government mission to Egypt at the moment. I think that Mr. Israel and Mrs. Rice would tell you, as would others in this audience, that he is an appreciative user of health data and a strong supporter of statistical and research programs in the health field.

Over the years, these conferences have produced some thoughtful and stimulating ideas for the gathering and utilization of health data. I am sure that this one, with the theme of the "The People's Health: Facts, Figures and the Future" will be no exception.

Recently, we in the Public Health Service completed our own look at health in the United States and developed priorities for the next few years. I would like to take a few minutes to summarize these priorities for you.

The three program areas represented in the sponsorship of this conference, statistics, planning and manpower, are an integral part of those objectives. The immediate context of our examination is the President's commitment to national health insurance and to cost containment and his broader policy of assuring not only a financing mechanism, but comprehensive, high quality health coverage for all Americans.

Public health policies of system reform and disease prevention clearly affect public health policies. Too often in the past, each set of policies has been developed without regard to the other, independently on different tracks. In consonance with national goals, we propose the following priorities. This time, we have tried to bring together the financing priorities in the planning process with the public health goals in the planning process.

The priorities are as follows:

The first is to develop additional service delivery capability to meet the nation's health care needs, particularly those of children, adolescents and the medically underserved, who live beyond the reach of existing services, usually in the innermost part of our cities and in the rural areas. We will rely heavily on data, on prevalence and incidence of certain illnesses, indicators of medical underservice to target on the highest needs. I am sure you will hear later about how we have developed, for example, the index that we use to target, for example, community health center grants to areas of highest need. We are going to be doing a lot more focusing not only on the kinds of indicators that we should be using to determine need, but to target our programs much more directly in relation to indicators of need.

Secondly, we need to improve the distribution and encourage cost effective delivery of health services by redirecting health manpower policies to improve geographical and specialty distribution and increasingly to use other health professionals in medicine and dentistry.

We are also seeking to expand community health centers and other systems' reform efforts, particularly HMO's and State and local planning authorities. We are seeking to reshape our mental health programs to integrate more fully with general medical services. In the last few weeks, we gave 57 grants to community health centers to integrate mental health services with the general physical health services in those centers. They are called linkage grants and we are going to do far more of that in the next several years.

We also want to increase the flexibility in meeting local needs and in the special needs of children, adolescents, women, the elderly and minorities.

Third, we want to make substantial advances in preventive health and in preventive medicine by implementing known and effective prevention and promotion practices. Along these lines, but going even further, we expect to have a new charge to expand our environmental knowledge and our ability to determine which environmental factors affect the health of Americans. The National Center for Health Statistics will be given a very large environmental charge in the renewal of the legislation that is up before the Congress at the moment.

Fourth, we seek to develop a process for establishing research priorities to better address perceived needs for research and to capture research opportunities that will improve health status.

Fifth, we have a new program and a new office in the Office of the Assistant Secretary for Health, the Office of Health Technology. This office will be managing a systematic assessment and transfer of health care technology.

I think you can see the reasoning and the need behind these priorities. A financing program alone will not insure service capability where it does not exist, nor will it automatically increase resources where they are inadequate, and certainly it will not change health status unless we know more about how to change health status and we target the financing program to help us in problems of health status.

By supplementing the building of health services resources with targeted programs for delivery of service for the young, the poor and the medically underserved, we can achieve great advances in health status and at the same time help to reduce long term reliance on aid from the public sector. By assuring adequate controls on the expansion of health care facilities and service through systematic integrated planning at

State and local levels, we can contribute to containment of health care costs and improve the quality of our services. Through prevention and health education, we can foster in our people a new sense of responsibility for their own health and an understanding of the inherent limitations of organized medical care. We can further dampen demand for unnecessary health services.

This is not to say that either the Assistant Secretary for Health or the Administration plans to rely only on changes in personal behavior and will withdraw its programs. That is not the intent at all. The intent is to bring the awareness of the American people that they can do much for themselves outside of traditional health care programs either to improve their own health or to delay the onset of illness.

These are very challenging agendas. I believe these agendas have particular importance for this meeting. A comprehensive and usable data base will increasingly be a resource in our decision making. You cannot target unless you have adequate data. We will need better small area data and this is one of the things that we are working to expand in the National Center for Health Statistics, the capability to produce small area data. We need this data to indicate need and also to indicate health status.

We will need environmental data and better data on the incidence and prevalence of environmentally caused or environmentally contributed-to illness. We will need measures of the effectiveness of individual programs conducted under these priorities and measures which show us the directions in which we need revision and reform or expansion. Data will be needed on trends in health status and the incidence and prevalences of disease, disability, the accessibility of use, the costs of services and resources, and on the sources of funding and on the quality and acceptability of care. These data are needed by the policy offices of PHS and HEW, by State and local area planning agencies as well, and by various private organizations who wish to use data to improve or redirect their own program.

The agencies established under the National Health Planning and Resources Development Act and the nationwide network that is now established cannot carry out their mandate for planning at the local level without data for their areas. We will be asking more of these areas in terms of planning for specific services, for specific population groups. For example, we are working on child health strategy at the moment. An integral part of that strategy is a role for the HSA's to assess the need for maternal and child health services in every area and to seek to act as the catalyst to get those services in place.

Over the past year, I have had the opportunity to work closely with the National Center for Health Statistics and the National Center for Health Services Research. As you know, these Centers were transferred to the Office of the Assistant Secretary for Health in the last reorganization. The move has given us in the Office of the Assistant Secretary for Health a direct link to timely research data, to health statistics, and to the analytic capability by which health issues and their social and economic considerations are understood, addressed and resolved. We intend to support the functions of these organizations to the fullest extent possible. A great deal of health data, planning and hard work are required if we in PHS, in HEW and in the government are to carry out our priorities for health and to support you in the States and local areas, as we wish to support you.

I am pleased to see so many of you here for this meeting where we can all exchange ideas on how best to achieve our national goals.

Thank you, Mrs. Hanft. I know that you cannot stay. I know you want to. Mrs. Hanft will be attending as much of the Conference as the demands of her time will allow her. We certainly do appreciate her coming this morning.

Next, we have what we would consider to be the keynote presentation, to be given by Dr. Kerr White. Dr. White, formerly the Director of the Institute for Health Care Studies of the United Hospital Fund, is the Chairman of the United States National Committee on Vital and Health Statistics, which is the principal public advisory committee to the Secretary and to the Assistant Secretary on matters of health statistics and related subjects.

Dr. White was born in Canada, but he is an American citizen now. So, I am sure that he is as pleased as the rest of us are that we have so many Canadians attending the meeting. Dr. White has had a long and distinguished career. Again, I will not embarrass him by trying to recite long pieces of it. But you should know, for example, that he has been an Associate Professor of Preventive Medicine at the University of North Carolina. He has had a Commonwealth Fund Advance Fellowship at the University of London. He has been Chairman and Professor of the Department of Epidemiology and Community Medicine at the University of Vermont College of Medicine. For many years, he was Departmental Chairman and Professor of Medical Care in Hospitals at the Johns Hopkins University School of Hygiene and Public Health. He is a member of many professional organizations. He holds memberhip on a long series of committees. If I told you how many publications are attached to his curriculum vitae, you would be surprised. It is a very long list.

But, enough of the background, because Dr. White's topic is "The People's Health: Progress, Problems and Prospects." Many of you have heard Dr. White before, so I think you know what is coming. There is another "P" in that alliteration of "Problems, Progress and Prospects," or at least I would be very surprised if there was not at least one more, and that is "provocative." Dr. White.

THE PEOPLE'S HEALTH: PROGRESS, PROBLEMS AND PROSPECTS

Kerr L. White, M.D., *Division of Health Sciences, Rockefeller Foundation, New York, New York*

It is asking rather a lot of this conclave to suggest that many of you sit through yet another keynote address from me. Since 1966, I seem to have assumed this role every six years, but I can assure you that it was only under considerable duress that I agreed to inflict my views on you one more time.

My two previous talks were entitled "Improved Medical Care Statistics and the Health Services System" given 1966,[1] and "Priorities for Health Services Information" given in 1972.[2] On the subjects discussed on those occasions, I have little new to say, although I will make a couple of references to one or two items as we move on. However, I believe there may be some virtue in taking stock of some of the many factors that have influenced and currently characterize the present status of our nation's health information and statistical systems. First, I will review briefly the substantial progress that has been made during the past decade. Second, I will comment on some of the formidable problems that face the nation's health statisticians. Third, I want to consider how information generated by our statistical systems can be expressed in ways that will assist policy-makers and managers to grasp its full implications more readily. Finally, I will dwell on some fanciful prospects that are probably in store for the future evolution of health information systems—at least as I see them. Hence, I have taken as the title for this oration, The People's Health: Progress, Problems and Prospects.

At the outset, let me declare my biases. The only reason that any society creates and supports a health care system is in the faith and belief that somehow, sooner or later, it will help to contain, ameliorate or even prevent the health problems that beset individuals and populations. The health care enterprise, consisting as it does, of doctors, nurses and other health care personnel, administrators, and managers and other worthy participants in the health-industrial complex, including health statisticians, is not established to provide for our employment and welfare. It is created, and should be designed solely, in the words of Chairman Mao, "to serve the people." If this assumption is correct, we should be concerned, as we guide the evolution of our health statistical systems, primarily with people and their problems, as individuals and as groups: people both singly and collectively. This clear focus on people's problems should always remain a highly personal concern meriting as much trust, on the part of the public, in health statisticians as in other health care personnel who provide individual services on a one-to-one basis. As the "quantitative ombudsmen" of the people's health, our concerns should be directed at relating measures of events, services, activities and expenditures to the resolution of the public's health problems as they perceive them individually and collectively. At least, that is where I start, when I think about health statistics.

Now what progress have we made in the furtherance of this mission? First, we have had two editions of an annual volume entitled *Health: United States* and a third is in active preparation.[3] Each includes selected presentations of data on health status and its determinants, on health care and its use, and on health expenditures. These, together with selected topics for special treatment each year are characterized by an increasing emphasis on counts of people, rather than on abstract tabulations reporting the volumes of events, activities and services. Again, it is the people and their health problems, and the impact of contemporary health measures on the resolution of these problems that counts, not how much activity or even, commotion, there is on the part of the health care system and its components.

Starting in January 1979 we will have one, and only one, Clinical Modification of the Ninth Revision of the International Classification of Diseases,[4] rather than the previous four or more. We now have a national capability for rational comparisons of mortality and morbidity statistics and of procedures across geographic areas, among institutions and over time. The ICD-9CM to be used in the United States permits comparisons with the slightly more restricted, but entirely compatible, ICD-9 published by the World Health Organization. In addition, plans are well under way for the Tenth Revision of the ICD which, it is hoped, will be entitled the International Classification of Health Problems. My hope is that it will consist of a family of classification modules, ranging from those terms used by lay persons for their health problems to those used at the level of primary care, including reasons for visiting health professionals, terms used at the level of hospital care, and classifications involving increased refinements by biomedical scientists and superspecialists at the physiological and molecular levels. All of the classification modules would be linked by a common three-digit core classification which probably may involve some modest evolution or change from the current set of 17 disease categories. If we are indeed to focus on the problems of people, we should be guided by their concerns, that is, their complaints, and by the incidence and prevalence of those problems in the populations, and not solely by the

interest of nosologists, statisticians or specialized investigators. In other words, we need more detail for the common problems and less for the rare. We know too little about the common problems of the living, otherwise they would not be common. On the other hand, we may have placed undue emphasis on the rare problems of the dead, which, in any event, usually require *ad hoc* studies for thorough investigation.

We also have almost completed the critical review and conceptual coordination of five Uniform Minimum Data Sets. These include the much discussed and widely used Uniform Hospital Discharge Data Set, and also the Uniform Minimum Data Sets for Ambulatory Medical Care, Long-Term Care, Manpower and Facilities. Work has been initiated also on a Minimum Mental Health Data Set. These are all in addition to their prototypes, the data sets promulgated for the recording of vital events: births, deaths, marriages and divorces.

There is further good news to report. In contrast to the state of affairs in 1966, statutory authority now exists for a Cooperative Health Statistics System (CHSS) linking local, State and Federal statistical entities in ways that should reduce respondent burden and increase comparability, timeliness and utility in the aggregation and use of statistics at each appropriate level. This development is especially important at the Health Systems Agency and other small area levels. Although many of the data elements in the Cooperative Health Statistics System are now being collected adequately, there is, unfortunately, little in the way of progress to report with respect to the creation of organizational entities or analytical capacities at local and State levels. However, to further this goal we now have a Model Health Statistics Act that the staff of the National Center for Health Statistics has developed and which is being distributed widely. State legislators as well as statisticians and others concerned with health matters will have clear guidance about the legal conditions that are most likely to promote the one-time collection of essential data and ensure its confidentiality. The creation of State statistical organizations should simplify the tabulation, analysis and presentation of parsimonious displays for multiple users at local and State levels and for all officials and organizations who have a need and right to the information. What matters is not the collection of uniform data sets, but the capacity the collection of uniform data provides for comparative analyses and transformation into usable information to effect important decisions. Data sets are a necessary means to worthwhile ends that influence people's health care favorably. They are not ends in themselves any more than a birth certificate is.

To summarize our progress, we have an annual report on the health of the people, we have national legislation and model State legislation to construct a Federal-State local statistical system; and we have a single Clinical Modification of the ICD-9 for use throughout the United States. We will soon have a full series of Uniform Minimum Data Sets, not only for vital events, but also for Ambulatory, Hospital and Long Term Care and also for Manpower and Facilities—all developed as a result of wide consultation with the public and private sectors. This represents considerable progress, it seems to me.

Now for problems! The fact is that substantial discord exists among professional groups and associations, Congressional Committees, and administrative enclaves in the Department of Health, Education, and Welfare, about who should control and have access to what data and how it should flow from the point of acquisition to the Federal level especially, but also to users at local and State levels. What I discern from all this, is that health statistics and information are seen as important, perhaps even essential, concomitants of influence, control, and even power. Otherwise, why all the fuss! These strident conflicts and the resultant confusion have political, conceptual, organizational and technical aspects. Two examples will suffice to illustrate all this.

First, as of 1977 there were 282 separate data systems operated by DHEW as well as 12 maintained by the Veterans Administration and the Department of Defense. All of these, including the poorly conceived and misdirected Medicaid Management Information System must cost at least $400 million annually. There is, therefore, no shortage of Federal money available for the development of an overall national health statistical system. Some redundancy might be justified by special circumstances, but great variability has been found in the terms, definitions and classifications, as well as for age-intervals and other groupings used among these 282 data systems. The same is true of even the major DHEW data systems and there are many unwarranted departures from census definitions and conventions. These idiosyncratic practices seriously limit the analytical capability of DHEW data systems, individually and collectively, in addition to adding enormously to respondent burden, waste of paper and data processing facilities, and of course, collectively, they constitute profligate squandering of public funds.

While fears about the abuse of data are not without foundation, there are technological, operational, legal and ethical safeguards that can be invoked to allay justifiable concerns. More importantly, however, if pluralism and diversity are to flourish in the United States, it is imperative that individuals and politicians be able to make informed comparisons as a basis for choice. Statistical comparisons are only possible when aggregated data and their expression follow well-established procedures for the use of comparable terms, definitions, classifications and conventions as the minimum basis for major tabulations. Special surveys and analyses can always be conducted as circumstances require. When we confuse statistical diversity with political and administrative diversity, we are confusing the logic and rigor of a quantitative science with the precious opportunities accruing to individuals and

politicians for selecting and experimenting with different ways of using and improving our own and the nation's health resources and health services. Uniform statistical systems, therefore, are a necessary but not sufficient condition for the useful maintenance of a diverse and pluralistic health care system.

A second example of the problems that confront our statistical system is to be found in the continuing bureaucratic hassle surrounding the promulgation by DHEW of the Uniform Hospital Discharge Data Set (UHDDS). At the heart of the matter is the basic cleavage that has existed for many years between the major health components of DHEW—the Public Health Service, the Social Security Administration and the former Social and Rehabilitation Service. This has probably been widened rather than narrowed by creation, in the summer of 1977, of a fourth unit, the Health Care Financing Administration (HCFA). HCFA is composed of elements from each of three existing health divisions of DHEW and has been given new authorities under PL 95-142 to manage Medicare, Medicaid and other Federally financed health insurance programs, including their quality assurance aspects. Central to the present debate is the Cooperative Health Statistics System and the principles it embodies of voluntary cooperation among private and public users of statistics and decentralization of many statistical activities. The CHSS, to which the Public Health Service is committed, was established, as I noted above, by Congress in PL 93-353. It is designed to reflect the concerns and needs of State and local planning agencies, cost and rate review commissions and other State agencies, voluntary associations and possibly also PSRO's, as well as those of the Federal Government. It has been evolving slowly, in part because of conflicting Federal policies and limited Federal funding. HCFA, and perhaps even the Administration, has yet to be convinced, it would appear, that the decentralized approach will work and that CHSS will be able to supply the data HCFA clearly needs to carry out its responsibilities. A very real danger exists that the unilateral imposition of new reporting requirements, especially those involving the UHDDS, by HCFA on the providers of care will undermine the entire CHSS movement, and deprive State and local jurisdictions of the essential information they both supply and need.

Equally serious in the long run, assuming that some form of national health insurance will emerge, is the prospect that much of the data on health services manpower and facilities, use of services and costs and expenditures will be unduly dependent upon and biased by the current payment mechanisms; that it will be effectively divorced from population-based measures that are both the starting point for planning health services and the end point for evaluating them; and that it will not be readily available to State and local planners and others in the private and public sectors. These are the issues that surround the longstanding debates about the promulgation of the Uniform Hospital Discharge Data Set. The manner in which the issue is eventually resolved will have enormous impacts on our entire health statistical system. If anyone doubts that information is power, they should study carefully the history of efforts initiated by Florence Nightingale 125 years ago to obtain Uniform Hospital Discharge Data from all hospitals for all patients, and especially its history in the United States!

I conclude this discussion of the problems that still face us with a quote from my paper before this gathering in 1972: "A Bureau of Health Statistics headed by a Presidentially appointed Commissioner of Health Statistics akin to the Commissioner of Labor Statistics or the Director of the Bureau of the Census is needed." Only by having an overall Commissioner reporting directly to the Secretary of HEW, it seems to me, is it going to be possible to bring any coherence, to say nothing of order, out of DHEW's discordant statistical policies and practices. The present organizational arrangements are simply not equal to the task and no cosmetic organizational changes or benign hopes for bureaucratic cooperation can alter this ten-year historical record. It is essential to give some one person and an accompanying office, bureau or agency, overall responsibility for these activities across the Department. I personally believe that we need an expanded National Institute for Health Statistics and Epidemiology, with a Director who is also appointed Commissioner of Health Statistics and who directly advises the Secretary of Health, Education, and Welfare.

By the same token, the States and local health agencies also need to get their acts together. The reluctance of most State vital records and statistics units to expand their activities, to embrace health care statistics, especially hospital discharge data, has resulted in many of these entities losing much of their status and influence. In my 1966 paper to this meeting I said, "If the State and local health departments cannot live up to their mandates, it seems clear...that other agencies will be established to gather statistics on personal health services...I propose that the terms "Vital Statistics" and "Public Health Statistics" be abandoned, and that every health department establish a new unit, bureau, division, department or center for health statistics with a mandate much broader than that connoted by the traditional titles. Such a unit would be responsible for collection and analysis of all statistics related to health, health problems and health services of the community it serves."

Unfortunately, or perhaps fortunately, depending upon your point of view, all of this has not come to pass. While change has occurred in a few States, even greater progress has been made by the evolution of health data "consortia" or data "brokers," involving both producers and users of health statistics from the private and public sectors. These new entities are committed to the acquisition, aggregation and analysis of a variety of statistics bearing on personal and environmental health and health services. The traditional vital statisticians could, it has been suggested by some, if they do not move rapidly, be relegated to the keep-

ing of records of vital events. Although this is an essential public function, it is a limited one, akin to that of keeping track of motor vehicle licences. Such a restricted mandate would provide them with little impact on the organization and provision of services and resources to resolve the public's health problems.

So much for the progress and problems that characterize our national health statistical enterprise. What about the prospects for the future? First, it is essential that we reach some overall agreement on the essential differences between data, information, and intelligence, a matter which I also addressed at length in my 1972 paper. I will not repeat what I said then save to emphasize that I have found no grounds for changing these views but rather have been pleased to encounter widespread acceptance and adoption of them. However, it is now increasingly important that a general consensus be developed among health statisticians with respect to conceptual and analytical frameworks for organizing our statistical system, and for presenting our findings, so that the public, politicians, and other professionals can grasp and understand fundamental relationships on which to base choices and decisions. Our task is to illuminate, not to obfuscate, to serve the public interest of all the people, not the special concerns of statisticians, epidemiologists, nosologists, researchers and record keepers. Our task is to transform raw data into information and then into intelligence. The latter is the essential product that should stem from any conceptual approaches that guide the development of a health information system directed at helping in the resolution of the people's health problems.

Accordingly, as examples, I want to present four conceptual models which have evolved from a large-scale international study in which 90 professional colleagues supported by 300 technical personnel participated during a ten year period. These models reflect many contributions to our collective thinking, but I should mention particularly the ideas of Professor Donald Anderson of Canada and Professor Tapani Purola of Finland. Figure 1 depicts a simple model which relates the "natural" or psychobiological system that can be regarded as influencing individual perceptions of ill-health, choices and decisions, and the "social" system or constellation of forces that impinge on the perceptions and decisions of both individuals and populations.[5] The interactions of these two major systems on the perceptions of morbidity and on the use of personal health resources and services are the basis for this cybernetic or feed-back model which serves to relate the parts to the whole.

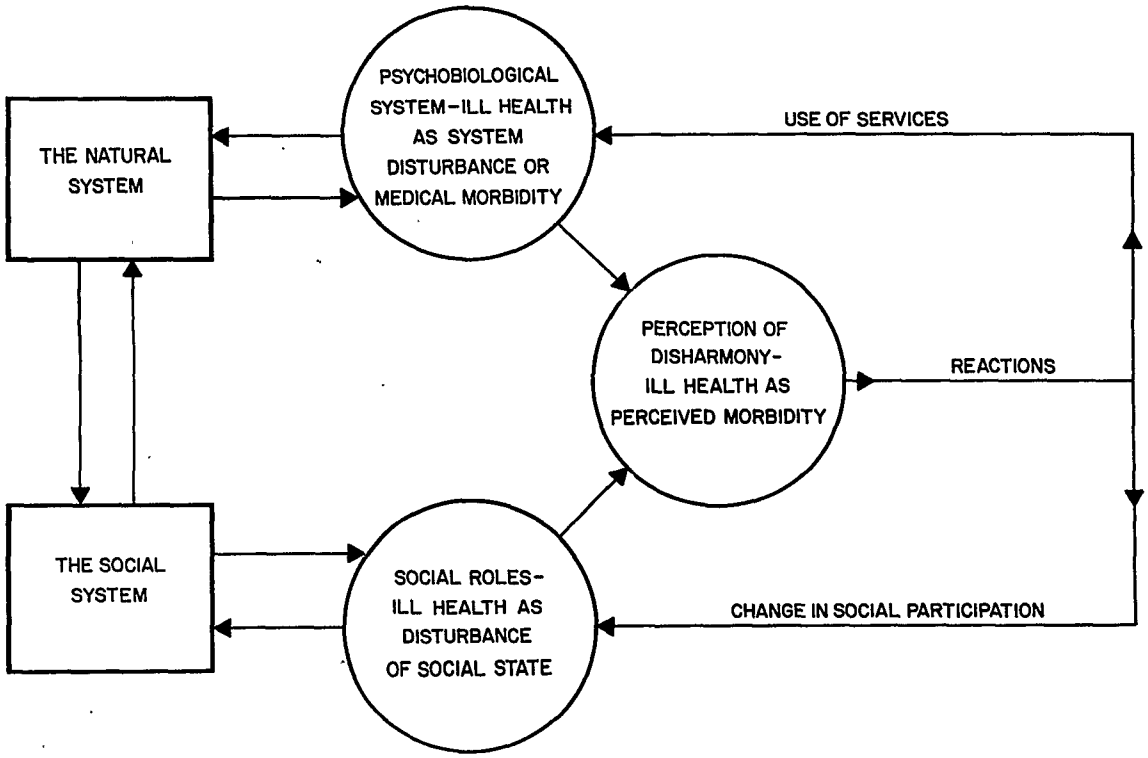
Two more figures suggest ways in which components of a health services system can be related to morbidity as experienced by the population. Figure 2 suggests how the factors that characterize different health services systems modified by predisposing factors such as age, sex, education and socio-economic level, and enabling factors such as family size, financial resources, availability and accessibility of health services, and the extent of health insurance coverage, can be compared with respect to their influences on the interactions between perceived morbidity and the use of resources. Such a model permits comparisons of the impact of different health care systems or arrangements on perceived morbidity or the health status of the populations served. The different systems may, for example, include variations in the mix and amount of resources, variations in the ownership, control and management of facilities and resources and differences in the way services are used and paid for. When predisposing and enabling factors are controlled, the influences of the systems can be compared. Such comparisons could be made across HSA's, PSRO's, counties, States or regions.

Figure 3 depicts the use of perceived morbidity as a controlling variable and examines the influences of systems factors and of predisposing and enabling factors on the use and outcome of services. The central features of these last two models is the recognition that almost any statistical analysis of personal health services involves relating five sets of measures: needs (including both expressed and latent); resources (including personnel, knowledge, acilities and equipment); use (or expressed demand and its distribution over time and place); outcomes or benefits of services; and their costs. It is almost impossible to say much about the meaning of one set of these variables alone without relating it to at least two of the other four, if the information is to be useful for setting priorities, allocation resources or evaluating impacts.

Here again, another cybernetic or feed-back model for the use of information may be helpful. Figure 4 is that developed by our international group to show the interrelationships between health services information, research and evaluation on health policy formation, and decision-making. It is based on contemporary information theory. Maintenance of records and collection of data, untouched by human thought, is a useless and wasteful exercise. Once more it is usable and useful information for decisions that affect large numbers of people and their problems that is needed, if not wanted.

Now let me illustrate how actual information, developed in accordance with these models, can be used to illuminate several fundamental relationships. Instead of thinking about the twelve study areas in our seven country international study, think of small areas such as HSA's, counties, Standard Metropolitan Statistical Areas, or even States in the United States. The details of our study have been recounted in detail elsewhere.[6,7] Let me only emphasize here that standardized methods and terms were used throughout, that the data were all gathered simultaneously but independently, that the overall response rates for an aggregated sample of 48,000 persons representing 15 million people averaged 96%, with a range from 90 to 99%, and that the results are expressed in standardized forms. Figure 5 shows several of the traditional standardized vital statistics: morality, and infant mor-

Figure 1. Model of Relationship Between the Individual and the Natural and Social System.[a]



[a]Adapted from: Purola, T., A Systems Approach to Health and Health Policy. *Medical Care*, 10:373-379, 1972.

Figure 2. Model Used by the WHO International Collaborative Study in Analysis of the Impact of Perceived Morbidity on the Use of Health Services.

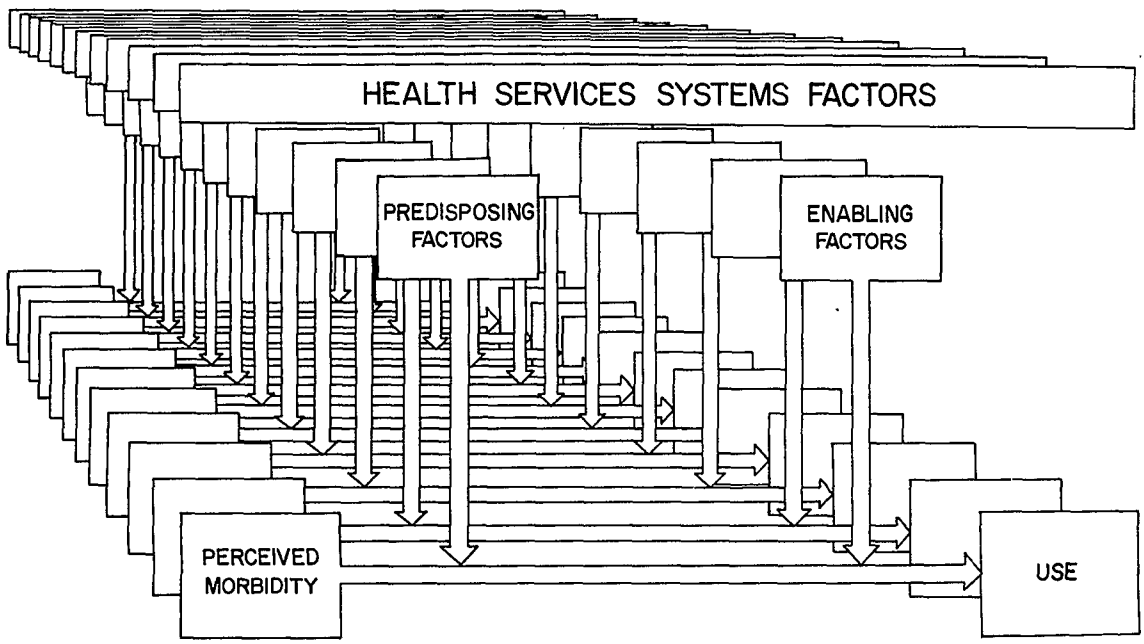


Figure 3. Model Used by the WHO International Collaborative Study in Analysis of the Use of Health Services Controlling for the Impact of Perceived Morbidity.

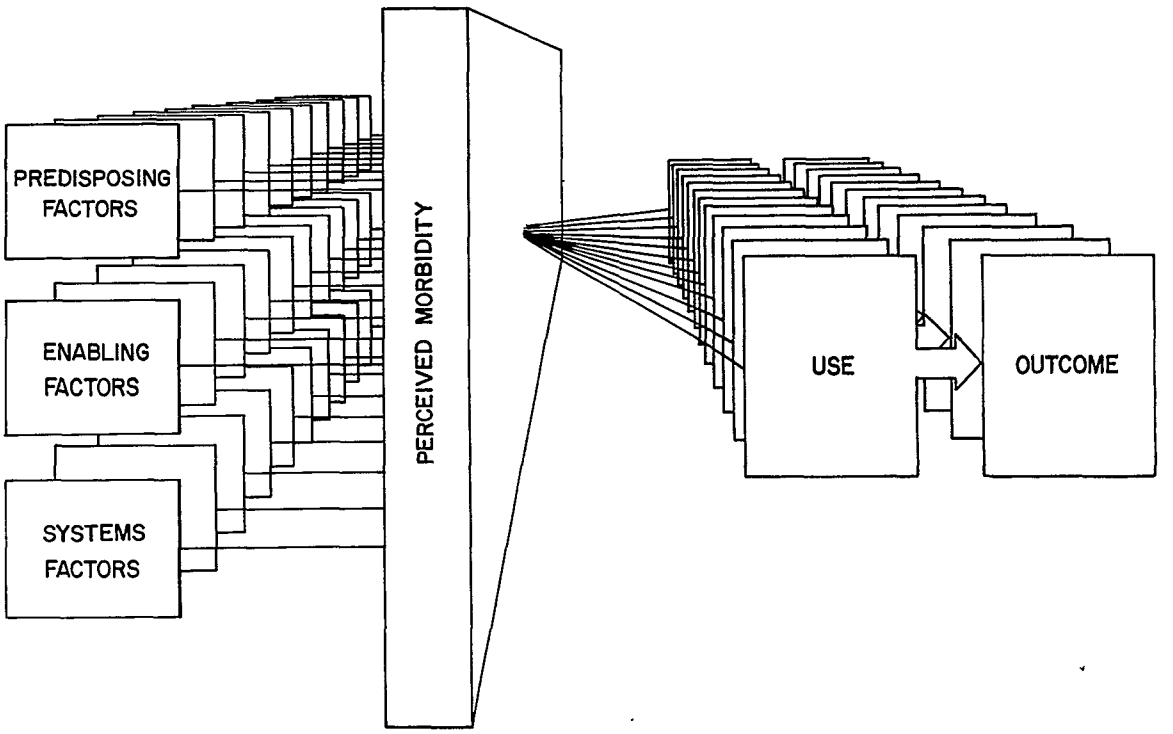
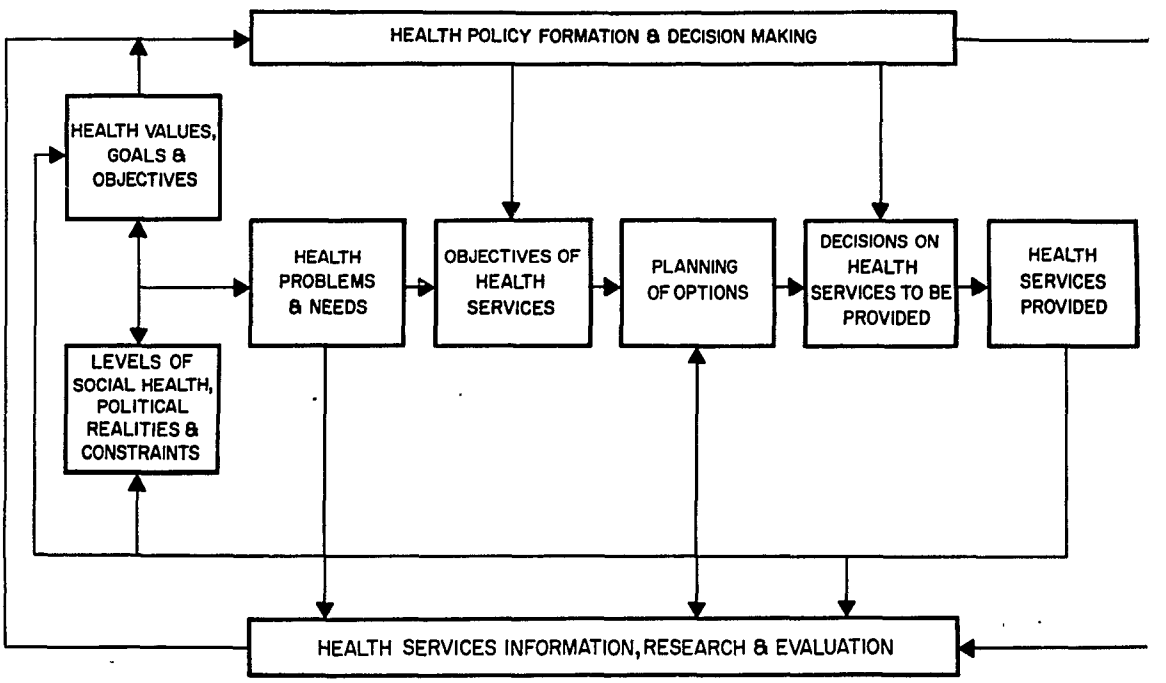


Figure 4. Model of Health Policy Formation: The Functions of Information, Research and Evolution.[a]



[a]Adapted from: Purola, T., et al., National Health Insurance in Finland: Its Impact and Evolution. *International Journal of Health Sciences.* 3:69-80, 1973.

tality rates and proportional mortality for the twelve study areas. The Standardized Mortality Rates have a narrow range about the median of 8.4 deaths per 1000 population. The same is true for Proportional Mortality (i.e. the proportion of total deaths accounted for by persons aged 50 years and over); here the median is 82.0 percent. Only Infant Mortality Rates (i.e. deaths of children under one year per 1000 live births) show a wider range about the median of 24.5 per 1000 live births. Three study areas, Buenos Aires, Lodz and Banat have substantially higher rates than the other nine. Based on these three measures of health status, the twelve study areas are more alike than different, with the exception of the three higher rates for infant mortality. Whatever the differing impact of health services across the study areas, they are not immediately apparent from examination of these figures. In other words, vital statistics, apart from perhaps infant mortality, do not help much to distinguish among these twelve study areas.

Here are some other ways in which our data can be analyzed and presented. Perhaps the most interesting finding of the study is the relative lack of responsiveness in the volume of physician contacts to a rather discriminating measure of unmet perceived need or pressure on the health care system as depicted in the next figure. Figure 6 shows the percent of persons with perceived morbidity of high severity who, within two weeks, wanted but did not obtain a physician contact. There is no discernible effect on the volume of physician services used in spite of an almost fourfold variation in the ratios of physicians per 10,000 population, i.e. from 6.9 to 27.7, about a median of 15.1. On the other hand, as figure 7 shows, there is a substantial impact on the consumption of hospital nights associated with this measure of unmet need or pressure. Indeed, the greater the unmet need at the ambulatory or primary care level of services, the greater the use of hospital care. More importantly, this relationship is observed even with the exclusion of Buenos Aires, which has by far the lowest bed to population ratio (4.6 beds per 1000 population), and in the face of a threefold variation in the bed to population ratios, about the median of 10 per 1000 population.

It is also of interest that for those countries with two or more study areas, similar patterns are exhibited. Banat and Rijeka in Yugoslavia are close together, as are Northwestern Vermont and Baltimore in the United States, while in Canada, a country with universal hospital insurance coverage but without universal medical care coverage at the time of the fieldwork (1968-69), the four study areas (Grande Prairie, the Saskatchewan study area, Fraser and Jersey) cluster closely.

These observations suggest that the balance between physicians, (and even types of physicians) and hospital beds, (and types of hospital beds), may be much more important determinants of hospital use, the most expensive component of care, than the mere availability of beds. Study areas with comparatively high total bed supply ratios (Jersey, Baltimore, Liverpool and Grande Prairie) do not seem to be the most responsive to this measure of pressure on their respective systems. This may mean that so-called "excess" bed capacity, although a necessary condition, may not be the major determinant of "excessive" hospital use. More important factors may be the types, availability and accessibility of physicians or distortions among these factors resulting in unmet need for appropriate physician care, probably primary or general care.

It is instructive also to examine overall profiles for the twelve study areas and to note the extent to which the several groups of indicators that reflect Need, Resources and Use are in balance, as measured by variations above the medians. These are shown in figure 8. Without belaboring the wide variations in the observed patterns, it is perhaps of more than passing interest that the two study areas (Saskatchewan and Liverpool) with the longest histories of efforts to balance resource allocations through regionalization do, in fact, seem to have relatively balanced arrays.

The importance of balance also may be illustrated by dichotomizing the twelve study areas into those above and those below the median for the measures of Need and Resources, and then examining the impacts on volume of Use, as shown in figure 9. Where high levels of Need and high levels of Resources are balanced, or low levels of both are balanced, there tends to be a gradient in the measures of Use (or little difference, as in the case of hospital rates) as might be expected logically. Aberrant patterns of Use for all three of these measures are found where the measures of Need and Resources are discordant.

These fundamental relationships may be expressed in the matrix shown in figure 10; this is a set of relationships derived from the actual findings of the study. Again measures of Need, Resources and Use are dichotomized and eight cells can be created. Only two of these can be regarded as "balanced": Types A and H. One cell, Type B, can be regarded as "compensatory" in nature because high productivity in the face of high levels of Need and Use makes up for the low level of Resource allocation. On the other hand, over-investment in Resources can be said to characterize Type G, where both Need and Use are low but a high level of Resources is provided.

Lest all this be regarded as completely hypothetical in the sense that it has no implications for health care organization, it is worth comparing the extremes of the rates and ratios per 1,000 population, for selected measures of Need, Resources and Use as shown in figure 11. By choosing just two examples, physicians and hospital beds, it is possible to illustrate the nature of the huge investments involved. The 2080 physicians who, based on the figures for the two extreme study areas, constitute the difference between the maximum and minimum supply ratios available to theoretical populations of one million persons, would represent the annual output of one medical school, allowing for attrition, emigration, retirement and death. For a State

Figure 5. Study Areas: Selected Demographic and Mortality Characteristics (1968-79).

Country	Study Area	Total Population[a] (1)	Surface Area (2)	Percent Urban (3)	Standardized Mortality (4)	Infant Mortality (5)	Proportional Mortality (6)
		no.	*km²*	*%*	*rate/1000*	*rate/1000*	*%*
Canada	Grande Prairie, Alberta	23,000	5,570	51	6.9	25.0	78.0[b]
	Saskatchewan	158,750	15,026	86	6.9	25.8[b]	80.5[b]
	Fraser, British Columbia	11,100	259	30	9.1	24.0	79.0
	Jersey, British Columbia	19,800	334	15	8.5	25.4	85.0
United States	Northwestern Vermont	160,300	2,727	45	8.4	19.7	83.6
	Baltimore, Maryland	1,992,200	5,818	85	9.2	23.0	79.8
Argentina	Buenos Aires	7,958,300	3,880	100	9.1	39.6	74.2
United Kingdom	Liverpool	2,250,200	1,850	88	8.3	20.8	88.7
Finland	Helsinki	682,000	933	90	8.2	15.8	82.6
Poland	Lodz	747,700	476	70	7.9	44.7	81.3
Yugoslavia	Banat, Serbia	684,700	8,889	34	9.1	47.1	84.1
	Rijeka, Croatia	448,300	7,222	43	7.5	19.2	86.4
	Median	565,130	3,304	60.5	8.4	24.5	82.0
	Range	11,100–7,958,300	259–15,026	15–100	6.9–9.2	15.8–47.1	74.2–88.7

[a] Based on census nearest to 1968-1969.
[b] Based on regional data.

Figure 6. Relationship Between Volume of Physician Use and Unmet Need for Physician Services.

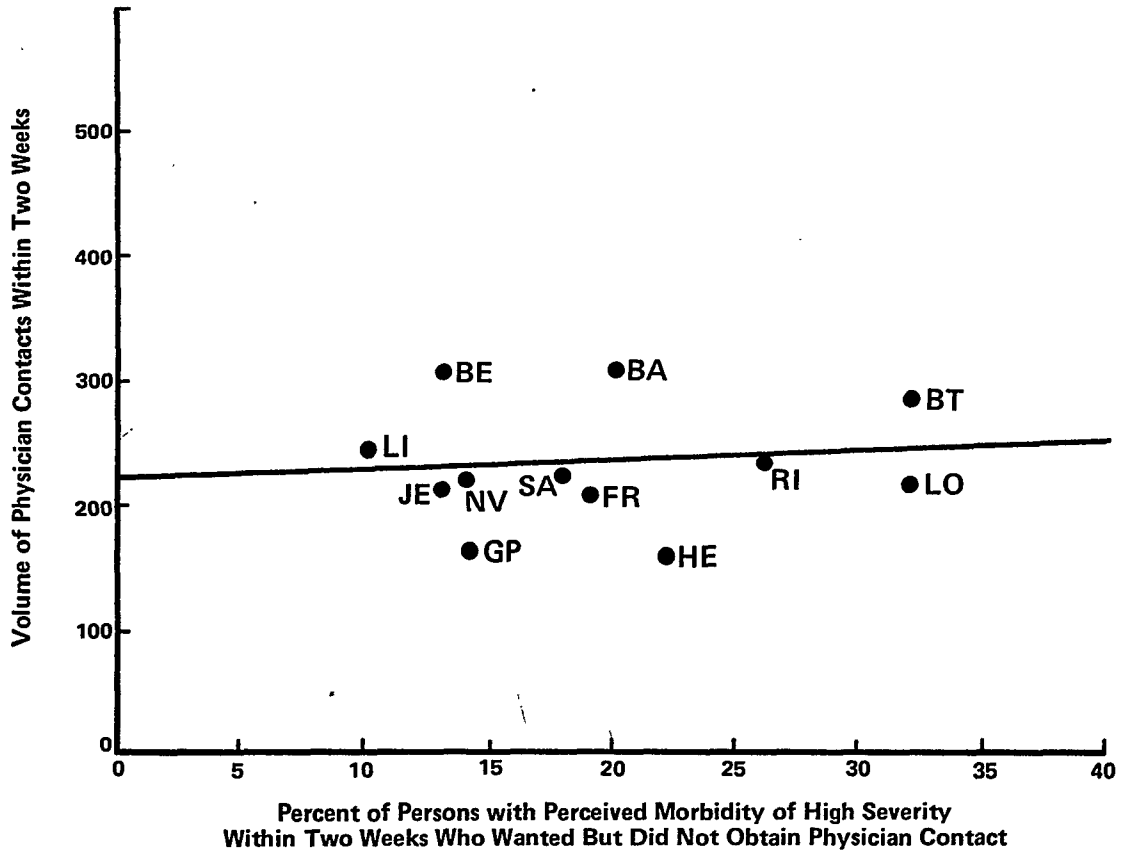


Figure 7. Relationship Between Volume of Hospital Use and Unmet Need for Physician Services.

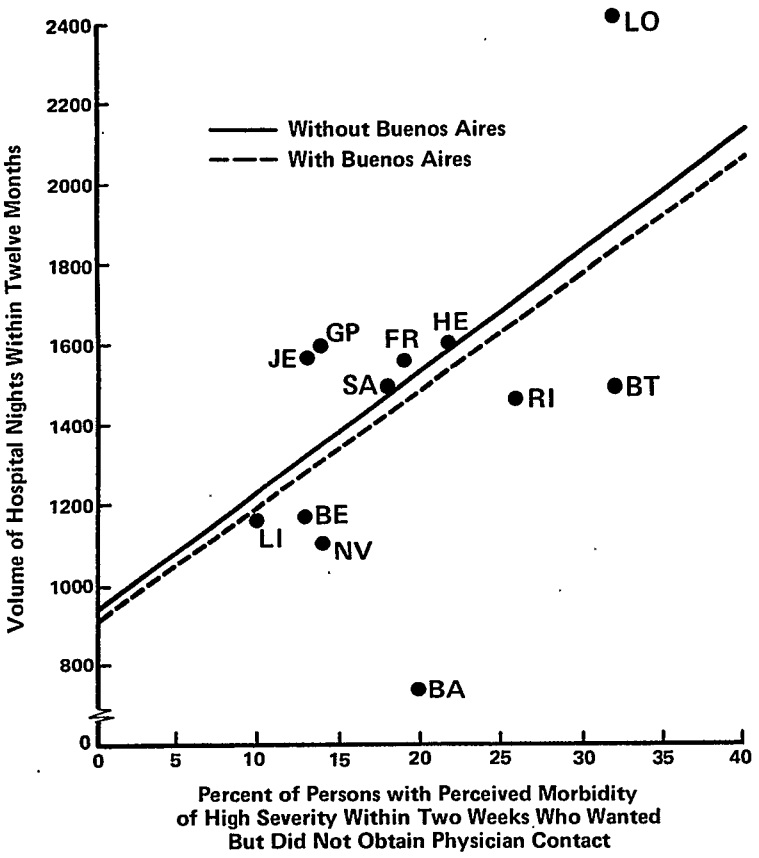


Figure 8. Relative Distribution of Comparative Measures of Perceived Need, Resources and Use as Percentage of Median Rates for Persons (P) Using Services and Volume (V) for Use for Twelve Study Areas.

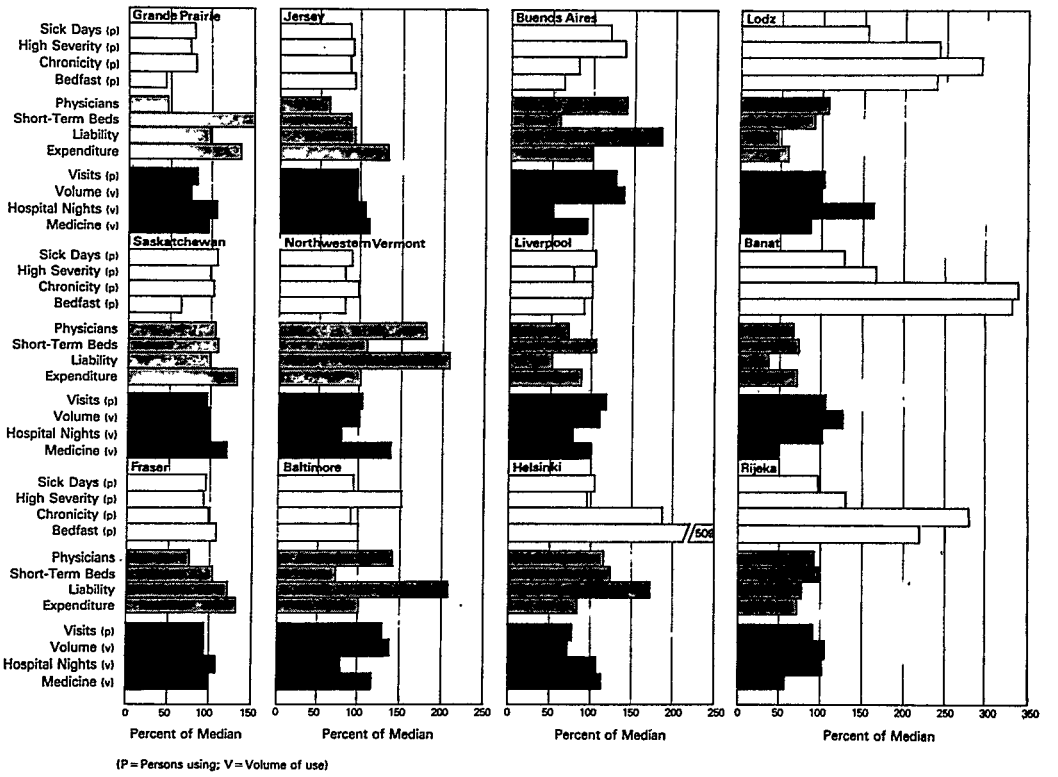


Figure 9. Effects of Relationship Between High and Low Levels of Need and Resources: Impact on Physician Contacts, Short-term Hospital Beds, and Medicines Prescribed.

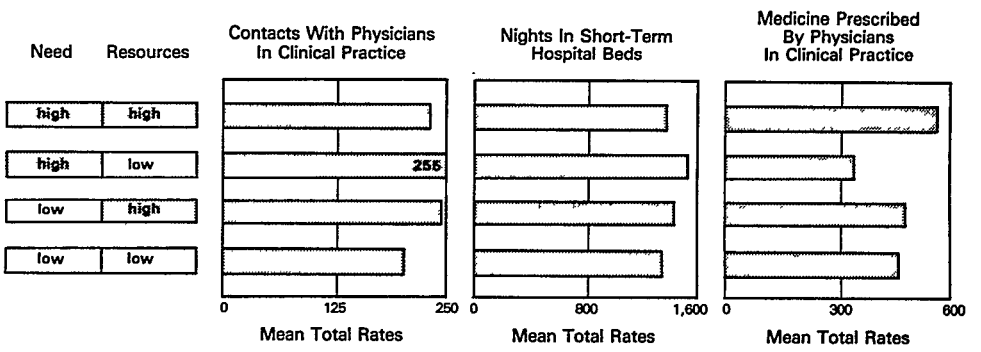
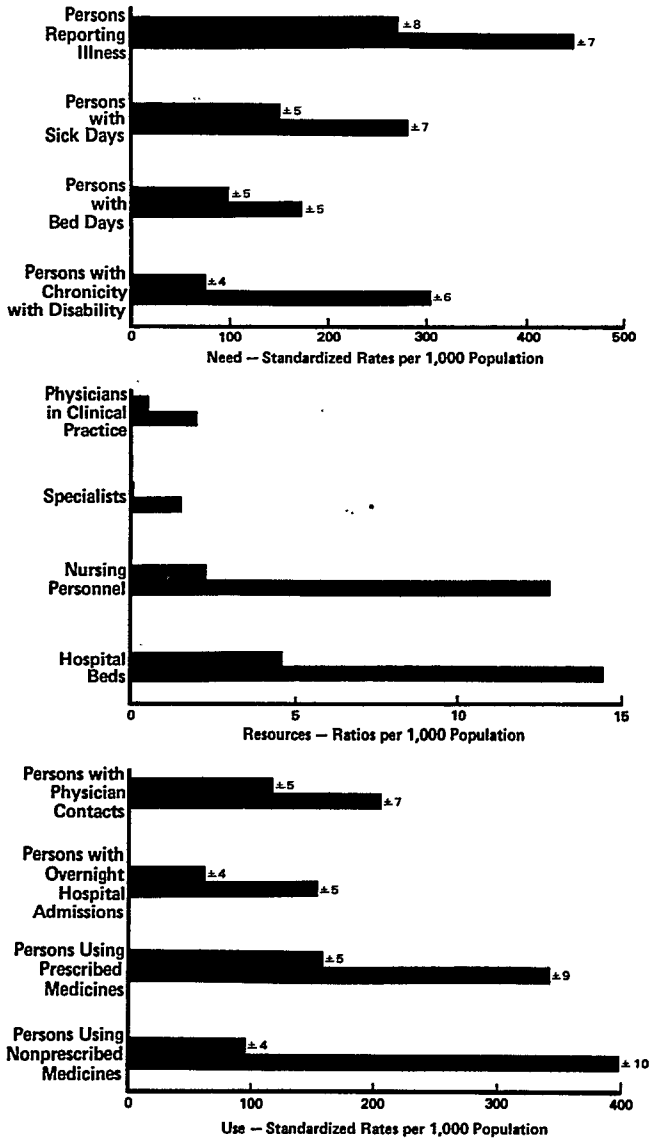


Figure 10. Model of Relationships Between Need, Resources and Use.

Use	High need		Low need	
	High resources	Low resources	High resources	Low resources
High	TYPE A **Balanced** appropriate allocation of resources	TYPE B **Compensatory** high productivity of resources	TYPE E **Unbalanced** overuse of resources	TYPE F **Unbalanced** high productivity of resources
Low	TYPE C **Unbalanced** underuse of resources	TYPE D **Unbalanced** under-investment in resources	TYPE G **Unbalanced** over-investment in resources	TYPE H **Balanced** appropriate allocation of resources

NOTE: Needs, resources, and use may be defined by any appropriate measures as long as they are uniform over all the areas being considered.

Figure 11. Ranges of Need, Resources and Use; Standardized Rates and Ratios Between Extremes for Twelve Study Areas in Seven Countries.



or region of 10 million persons that means 10 medical schools and so forth. The figures for specialists are even more staggering. How many is enough? For hospital beds, the differences between the extremes is 4400 beds per million population or 6 or 7 district hospitals of 600-700 beds each and twice as many 300-bed hospitals. The figures are 10 times as large for 10 million persons.

These are huge social investments and the question is how much difference do they make to the health status of the population served? Again, there are no "right" or "wrong" answers; there are certainly no "solutions." The lessons to be derived from these kinds of displays stem from the power of information to inform choices and decisions by those in positions to assign priorities, not just to what beds are built, or to what equipment is bought, and who is taught, but, perhaps most importantly, to how it is all organized.

These are just a few of the possibilities. There are many others, not the least important of which is the computer mapping which is being most imaginatively developed by Dr. Paul Leaverton and his colleagues at the National Center for Health Statistics. These and related methods will be needed to identify and track the impact of environmental, occupational and social factors on health and disease.

So much for the prospects of expressing information in new arrays, useful to professionals, politicians and the public. What are some of the other prospects that will influence the future of health statistics and health statisticians? Prediction is always hazardous, especially about the future, but I cannot let the opportunity pass. Consider the potentials of cable TV and the wired city; consider the impending revolutions associated with the widespread use of cheap microprocessors and domestic micro-computers with inexpensive cathode ray terminals, and of interactive computer systems linked by satellite reception and transmission from all quarters of the country or the globe. Consider the impact of electronic funds transfer and of the cashless society on the use of insurance claims for auditing the use and quality of care and of the inter-dependence of all populations inhabiting spaceship "earth." For example, consider the easy use of portable CRT's operated with light pencils, introduced by "information technicians," rather than by interviewers, into panels of selected households, or even given to "block" or "village" captains selected on the basis of a probability sample, and the implications for the Health Interview Survey. Such technological advances should enable respondents to answer questions in the complete privacy of their own homes, and allow data to be aggregated in timely fashion for any geopolitical level or jurisdiction and produced in formats instantly available for any legitimate purpose. Epidemics, patterns of drug consumption and of potential adverse reactions, exercise and leisure activities, as well as potential demands for health care, could be displayed promptly and widely on the desks of legislators and administrators as well as on TV screens and in the daily papers, typeset by computer and distributed in facsimile format by satellites. Managers would be able to anticpate on Monday mornings the potential demand for services in clinics, out-patient departments and hospitals. Individual and collective satisfaction with appointment times or with waiting periods could be identified instantly. Occupancy rates of hospitals, bed turnover rates and availability of beds and clinic appointments within and among communities could be known both by public and private agencies and institutions at 7 o'clock each morning. Timeliness would no longer be a limitation. Political decisions that defied or respected the people's needs or wishes for use of the resources available to them would be immediately apparent. Not only would local decision-making be enhanced, but States, nations and even international agencies could deploy their resources with maximum sensitivity to the needs and priorities of the people themselves and with full recognition of the constraints imposed by realistic and usable knowledge as well as by available resources and finances.

Airlines, hotel chains, banks, food processing institutions, supermarkets, TV networks, the stock exchange and many other service systems use these ideas and are working on many others. If you doubt my word for it, look into Prestel, being developed by the General Post Office in the United Kingdom.[8] But what distinguishes the efforts of these entities from the activities of a health care system? To my mind, there are two. In the first place, the primary task of these other systems is to be effective, not just efficient. They have to satisfy clear targets or objectives and they are guided by policies designed to accomplish this. Second, the notions of effectiveness and efficiency are guided by some underlying conceptual model of how the "market" (i.e. the needs of the people) and the resources (i.e. the capital, facilities, equipment, knowledge and personnel) and the production costs (i.e. costs of services) are to be related to customer satisfaction (i.e. outcomes or benefits of services). It all seems fairly straightforward, but we continue to fumble and stumble as our health statistical system evolves on the basis of outmoded concepts of data acquisition rather than on modern developments in information theory.

The real kicker will come with the advent of a national policy for health and health services in the United States. When that day arrives will our health statisticians be ready? With a concerted effort to get our conceptual thinking straight and a recognition of the enormous technical advances that are imminently available to us, the prospects are exciting indeed.

If you do not like the conceptual frameworks I have described, I urge you to develop others. In the meantime, let us strengthen and coordinate our collective resources at local, State and Federal levels and agree on definitions, classifications and conventions. Let us work together to inform the people and their representatives fully about what can be usefully done to ameliorate their health problems and about what they have to do for themselves. It is all possible.

Mr. Chairman, I have discussed some of the progress that has been made and some of the problems that impede the evolution of health statistics in the United States. I have suggested ways of expressing our findings more imaginatively and parsimoniously, and I have conjured up selected glimpses of the future. I hope the deliberations at this biennial conclave will be fruitful and that I will not be asked to return and try your indulgence for a fourth talk six years from now! Thank you.

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[8] The Economist Newspaper. London, March 25, 1978, pp. 70–71.

Thank you very much, Kerr. We certainly appreciate your coming back and back and back.

As I indicated to you this morning, we have a 3-way sponsorship of this 17th Public Health Conference on Records and Statistics being shared with the Bureau of Health Manpower, the Bureau of Health Planning and Resources Development and the National Center for Health Statistics. This portion of our morning's session, the first plenary session, is devoted to brief presentations from each of those co-sponsoring organizations.

I would like to start with the National Center for Health Statistics. I would like to call on our Director, Mrs. Dorothy Rice. Mrs. Rice has been serving as the Director since January 1976. Prior to that, she was the Deputy Assistant Commissioner for Research and Statistics with the Social Security Administration, and a number of other jobs that go back nearly 37 years, although, Dorothy, you had some time for raising a family in there.

Nevertheless, this is the point in time when I would call on Dorothy Rice. But, as most of you have heard, she unfortunately, about two weeks ago, had an accident and she is in George Washington University Hospital at the present time and unable to be with us here on the platform. I found out about it in Geneva, Switzerland, where I was on temporary assignment doing some work with the World Health Organization. I got back to my hotel late one evening and found a message to call the office. Well, it was a little too late to call the office at that hour and so I waited until the next day. With the time differential, I had to wait until about 2 o'clock in the afternoon of the following day, all the while wondering what had happened back in Hyattsville for them to have to call me in Geneva. I called the office and my secretary said, "I don't want to alarm you, but your children called the office and they want to know what to do about the refrigerator that is not working." Well, we discussed that for a little while. Then my secretary said, "Furthermore, Mrs. Rice has had a nasty spill and she has broken her hip and she is in the hospital—but don't worry about a thing."

Well, I can assure you that I worried. I was worried about Dorothy. I was worried about a refrigerator that did not seem to be operating with a house full of kids that we had left home. So, I had a lot of worries. But, the message came loud and clear from Dorothy. Whatever I did, I was not to hurry back. I was not to come back; so I didn't. As a matter of fact, I am just back. I just got back on Saturday. One of the first things I did was to rush over to George Washington Hospital and see Dorothy. She looks fine and she seems to be in good spirits. We have arranged to let her talk to you by the miracle of Ma Bell and the telephone system.

But, first, let me make sure that she can hear us here and we can hear her clearly. Dorothy, hello.

DIRECTOR'S REMARKS—NATIONAL CENTER FOR HEALTH STATISTICS

Dorothy P. Rice, *Director, National Center For Health Statistics, Hyattsville, Maryland*

Hello, Bob. Welcome back!

And Hello to all the conference participants. As you all know, I, a statistician, became a health statistic when I tripped and fractured my hip. Believe me, I would much rather be with you at the Hyatt Regency Hotel than here in the hospital.

I officially welcome all of you to the 17th Biennial Public Health Conference on Records and Statistics.

I wanted to have at least a very small part in this meeting, for such a long time. I am pleased that we could arrange this serviceable means of communication.

First, I want to say welcome. We have never had such an overwhelming response to the announcement of the conference. More than 1,100 people registered in advance, I am told, and we apologize, if there are people standing without seats, because we have exceeded the capacity of the meeting room. But we are very pleased to have all of you.

I would like to hear from all of you. At the count of three, a big "Hello, Dorothy." One, two, three.

Thank you, thank you very much. That sounded so great.

Your response to this conference tells you something about the need for health data that exists at each level of government and in every region of the country. All of us here and all of the organizations that we represent have a big job ahead. We must produce data relevant to today's needs, plan to be able to answer tomorrow's questions, and assemble, analyze and present the findings in a way that is meaningful to decision makers and to the public at large.

I want to reaffirm to you that the National Center for Health Statistics and its staff will do everything we can to fulfill our part of that obligation and to help to meet your planning and manpower needs. I believe that NCHS, as an organization, is in a better position now to be responsive to your needs than we were two years ago at the time of the previous Biennial Public Health Conference on Records and Statistics. The Center and our ongoing general purpose statistical systems continue to receive your support, as well as that of the Congress and the DHEW, bolstered further by our transfer to the Office of the Assistant Secretary for Health.

Responsibilities assigned to us as an agency continue to grow. We will be initiating new programs in epidemiology and environmental data in the next few years. We have made some notable advances in the timeliness of data release. For example, in May 1978, we issued a report presenting preliminary data from the 1977 National Nursing Home Survey.

On the other side of the coin, we have not had as rapid progress as we were hoping and planning for two years in the expansion of the Cooperative Health Statistics System. Nevertheless, we expect that the three basic components, vital statistics, manpower and facilities data, will be implemented in all States by fiscal year 1980.

We are making much greater use of our authority to conduct statistical work for other agencies and organizations on a reimbursable basis. It is under this kind of arrangement that we are engaged in collaboration with BHPRD in activities to meet the greater needs of health planning. Under a recently signed agreement, we will be continuing activities which many of you are familiar with, such as the "Statistical Notes for Health Planners." We are also initiating several new activities to assist planners. For example, we are designing research methodology on selected health characteristics for counties and HSA's. As a part of a technical assistance program, we are investigating which data needs of HSA's can be met by survey methods and evaluating the use of personal interviews as a means of obtaining these data. We are also working with the Bureau of Health Manpower similarly.

I feel that we are functioning well in both our basic mission as the Federal statistical agency and in our somewhat newer and certainly enlarged role as statistical advisor to other organizations. I expect that out of this conference we will gain new ideas on how our organizations can continue to assist each other.

I am sure you know that I regret very much not being with you in person. I wish each of you a fruitful, productive, meaningful and fun meeting. Thank you all.

Thank you very much, Dorothy. We will be keeping you in touch on the progress of the conference. I will call you later.

Now, I would like to call on Dr. Colin Rorrie, Jr. Colin is the Acting Director of the Bureau of Health Planning and Resources Development and has served in a variety of earlier positions dealing with comprehensive health planning and with the American Society of Public Administration. He was Director of Continuing Education and an instructor in Hospital Administration at Washington University School of Medicine, and so on.

But Colin is here to talk to us as one of the co-sponsors of the conference. I am very pleased to have him. I am sure you will all welcome Colin Rorrie.

DIRECTOR'S REMARKS—BUREAU OF HEALTH PLANNING AND RESOURCES DEVELOPMENT

Colin C. Rorrie, Jr., Ph. D., *Acting Director, Bureau of Health Planning and Resources Development, Hyattsville, Maryland*

Thank you very much, Bob. It is a pleasure to be here to be able to co-sponsor this important conference with NCHS and my colleague Dan Whiteside from the Bureau of Health Manpower. We did this with NCHS two years ago and we found it to be a very valuable contribution on our part to the field of health planning in terms of the dialog and interchange that we had with many of the people in the field of health statistics and research. That is why we were particularly interested when Dorothy came to us well over a year ago and asked us if we wanted to help co-sponsor this conference again.

I think timing in any issue, particularly in any conference, is an important element. When I was thinking about the timing of this conference and the forces that were being brought together here today, I was particularly struck by a story that I recently heard. I think it demonstrates that timing is certainly important.

It is a story of two individuals, Pat and Bridget. Many of you may have heard the story. Pat and Bridget went to see the parish priest, Father O'Malley, about getting married. Father O'Malley said to Pat, "How old are you, Pat?" He said, "I am 86." He then asked, "How old is Bridget?" He said, "Well, Bridget is 82." He then asked, "How long have you been going together?" Pat said, "Father, we have been going together about 50 years." He said, "Well, at this stage in your life, why do you all want to get married?" He said, "Well, Father, it is like this. Life has been very good to us and we have reaped many benefits from those 50 years we have spent together and we figure that it is time for us to leave an heir to this good earth." Father O'Malley stood back and looked at them and said, "Pat, you may be heir determined, but you sure ain't heir conditioned."

I think that little story really lends the emphasis to the importance and the timing of this particular conference for those of us in the Bureau of Health Planning and Resources Development and particularly for those of us who are out in the field of health planning. The opportunity to come together today and to have a dialog over the next several days with those who are interested in the field of health statistics and health services research is a great one. The expertise that you can bring to bear to the field of health planning is of vital importance to all of us.

So, I am especially pleased that we can be together here in Washington. Unfortunately, the conference session tomorrow afternoon was to be another opportunity for me to speak to you in a smaller session, but I will not be able to participate in it. At the same time that this conference is going on, the group that we support, the Health Planners of the United States, are meeting in a different spot. I will not mention it, but they are in Las Vegas. Unfortunately, I will have to go to Las Vegas tomorrow morning in order to do equal time for the health planners. On the other hand, I am heartened to see that there are so many health planners here today, because, as I have already said, the opportunities are important and the time is vital.

What I would like to do today, very briefly, is to give you a brief status report on the implementation of the health planning program and then talk about a couple of major policy issues where I think you can be of very important help to those of us in the health planning field. Then, I will finally wind up with a couple of major policy questions.

As far as the program status is concerned, I think all of you know that there are now 205 active functioning Health Systems Agencies around the country. The entire country is now covered with some form of local health planning organization. Ninety-eight of those organizations have now achieved full designation from HEW, which means that they now have a capacity to perform all the functions of a Health Systems Agency. More importantly, it emphasizes that they have achieved a milestone in the development of a health systems plan, which is a long range goal oriented plan of five years duration, and a one-year implementation plan, called an Annual Implementation Plan.

They have now created, in the first cycle, these two important documents, which will serve as the basis for a number of other activities that they will be functioning in over the next several years. Those two documents are important in the context of this particular meeting, since the essence of those documents ties in very closely to the availability of data.

We have 57 State Health Planning and Development Agencies, which are now functioning at the State level. They are performing primarily a regulatory function, but also an important planning function in terms of the development of a State Health Plan and a State Medical Facilities Plan. We have 50 Statewide Health Coordinating Councils operating. These are the bodies that advise State government and the State Health Planning and Development Agency on the operation of its particular health planning program. They also advise the Secretary of the functioning of the Health Systems Agencies. So, the apparatus is there and it is moving along in fine fashion.

Secondly, as many of you know, we had a 3-year piece of legislation and we now are actively in the midst of the renewal of that particular piece of legislation. Hearings have been held both in the Senate and in the House. Bills have now been reported out by both the Senate committee and the House committee. This month, we expect that both the Senate and the House will take up the renewal of the health planning program.

In the testimony, except for one major group, all the organizations that came up before the Congress during extensive hearings on the health planning legislation were fully supportive of the concept of the health planning program and were looking for certain refinements, in their own context, so that the program could better satisfy their particular needs. That is the way the Congress has dealt with the renewal of P.L. 93-641; that is, to leave the basic structure there, because there are a number of elements that still have to be implemented, and to move to make certain refinements in the structure, but to let the program go on as it is basically structured.

So, most of the major organizations and interests have received some sort of attention and will get some sort of modification in the context of P.L. 93-641. For example, the governors will play a much larger role in terms of the State Health Plan.

One important new program that will come out, which I think has implications for the whole area of data, will probably be a program of closure and conversion. As many of you know, we have been attempting to deal with the question of an excess of hospital beds and nursing home beds. It looks like the Congress is ready to take that step forward by developing a closure and conversion program, which would provide Federal funds to institutions that want either to delete services or to close down an entire institution. However, in order successfully to fulfill that responsibility and program, you have to have strong sources of data.

So, it looks as if in late summer or early fall there will be a new 3-year extension of the health planning program and it will move on in the fashion that it has been structured in the last three years.

The Bureau of Health Planning has, since its inception, provided as much support as possible, given our limited discretionary resources, to activities which would further the development of a sound empirical base for health planning. We have felt for some time that the planning program will not succeed if the agencies do not have access to the kinds of information and intelligence about the health system which they need to do the job.

These are not just nice ideas which we all support. Rather, it is clear that to succeed, the planning agencies must be careful in their fact finding and make decisions wherever possible on the basis of documented evidence. Further, their decisions, indeed the whole planning process, must be both public and defensible in the courts. These needs will be even more critical as planning agencies begin to make and have to sustain decisions which no one often finds pleasant. Indeed, it is likely that at least one person or group will be dissatisfied by the decisions made by the planning process. Repeatedly, we will undoubtedly see that decisions will only be sustained where as much evidence and information has been assembled as possible and judgments are in the context of being as reasonable as possible in the face of the facts that have been made.

We still do not have the kind of empirical foundation for health planning that is needed. Further, it is not solely that we do not have the data which many people have talked about for years as being needed, such as vital statistics, manpower and facilities. We not only do not have the data that we are fairly certain that we still need, but we also have in recent years developed a whole new set of needs for information. For example, I think many of you are aware of the National Guidelines for Health Planning that were issued late last year that wound up with some 55,000 comments being issued by the general public toward those particular guidelines.

Those national guidelines, which have now been promulgated as final guidelines by the Department, set forth resource standards as well as set health goals, which if handled properly require data at a local and State level, which for the most part are not yet available, certainly not throughout the country on a small area basis.

Secondly, it is clear that the Department has made cost containment a major priority under the Health Planning Act. Thus, it is essential that the planning agencies begin to develop a data base which involves knowledge of health expenditures and charges for various services.

Thirdly, it is obvious that over time the planning agencies will not be able to make or sustain the kinds of tough decisions which they will have to make if the research base or the knowledge base on which those decisions must stand is not more fully developed and more clearly related to efficacy of services and not simply whether or not services are needed as measured by demand statistics.

Finally, we have found over and over, as many of you no doubt have known for years, that the number of people in the country who have knowledge of the acquisition and the use of the interpretation of statistics is comparatively small for the need. Thus, your assistance is needed in both how to intelligently and efficiently collect information and in how to interpret the data for policy, planning, and, increasingly more important, for regulation.

Now, I would like to turn briefly to a few of the major public policy issues which infringe upon our program, partly to give some context to some of our concerns and to remind you of the larger context in which we all operate, but particularly the health planning program. While we are certainly in general optimistic about the potential of this program's doing a number of things, it is clear that the health planning program and the agencies, that is, the Health Systems

Agencies and the State Health Planning and Development Agencies, have in recent years been seen as a local outlook for a wide variety of hopes and dreams by the Federal government and increasingly by State government. While that is very nice in some respects, it is clear that the expectations about what the planning agencies are capable of doing and a real assessment of the expectations that the Congress and HEW have of them are needed if the planning agencies are going to have half a chance for coming out looking as if they have accomplished anything.

Secondly, it must be recognized as mentioned in the previous section that the planning agencies are operating on the cutting edge of medical technology proliferation and health services research. They must make decisions and recommendations in subject areas that are not yet fully agreed upon in the medical and research community. As a consequence, they not only need all the help they can get, but it must be recognized that they can only be as good as the state of the art is and no better.

What we are hoping is that, in terms of technical assistance, we can bring the state of the practice more in line with the state of the art. That in itself is quite a challenge.

Finally, two major forces, cost containment legislation and the national health insurance program, could be national laws or national programs in the coming months. Both of these in one way or another will deal with other major pieces of the kaleidoscope of problems which health planning is in the middle of. Certainly, the Administration is pushing very hard on cost containment and is developing principles and draft proposals on national health insurance. In many respects, such legislation would make the planning program and its tasks much easier. The expectations associated with the planning program would certainly be much easier.

But, in many respects, the addition of these two new programs would also complicate the lives and roles that these planning agencies would be playing in yet a different way. In any event, whatever programs or legislation come down the pike, we hope that we will have relatively stable, well-staffed and somewhat institutionalized agencies by then, which will have gained already, through good work and sound empirical base, credibility and the respect of the community, so that the role that they do play can be an important one. We hope that you will join us in helping to make that happen.

Thank you very much for your time.

Thank you very much, Colin.

And now for the third corner of our triangle, I would like to call on Dr. Dan Whiteside, Assistant Surgeon General and Director of the Bureau of Health Manpower in the Health Resources Administration.

Dan is a dentist. He has an M.P.H. from the University of North Carolina. I think he spent his entire professional career in the Public Health Service, either in the Indian Health Service or in one form or another in what is currently called the Bureau of Health Manpower. It gives me great pleasure to introduce to you Dr. Dan Whiteside, the Director of the Bureau of Health Manpower.

DIRECTOR'S REMARKS—BUREAU OF HEALTH MANPOWER

Daniel F. Whiteside, D.D.S., *Director, Bureau of Health Manpower, Hyattsville, Maryland*

On behalf of the Bureau of Health Manpower, I am pleased to welcome you to this meeting. Although we have participated in these conferences in the past, this is the first time that the Bureau has been a co-sponsor. In view of the broadening scope of the conference and of the importance of data to the Bureau, I trust it will not be the last time that we are asked to be a co-sponsor.

The title of this conference, "The People's Health: Facts, Figures and the Future," aptly describes some of our main concerns. Facts and figures provide the basis for our decisions about health manpower educational policies. We must also look into the future, because the physicians, dentists, nurses and other health workers who are being trained today will not address the health needs of the people for a number of years yet to come.

Like this conference, the Bureau is experiencing a change of role. For many years, we were concerned almost entirely with the awarding of grants and contracts to support health training. From a relatively narrow concern with funding of enrollment increases and curricula improvements, our interests have shifted to manpower utilization, distribution, quality, cost and need. We have become increasingly involved in assessing the adequacy of the nation's current and future health manpower supply. This shift toward targeted development of health manpower resources reflects concerns expressed in recent legislation, such as the National Health Planning Resources Development Act, the Nurse Training Act of 1975 and the Health Professions Educational Assistance Act of 1976. It also reflects growing interest in the quality, cost and distribution of health services.

Although our principal function remains the support of health manpower education, more and more of our resources are being devoted to efforts to understand the interrelationship of health manpower in the health care system. To this end, the Bureau's policy analysis and supply and requirements activities are being consolidated into a new division, the Division of Health Manpower Analysis.

We are attempting to keep abreast of changes resulting from the unprecedented expansion of U.S. health professions education capacity in recent years. During the decade ending in 1976, 41 new health profession schools, including 28 schools of medicine and osteopathy were opened. The annual number of health professions graduates increased 84 percent, with the number of medical and osteopathic graduates rising from slightly over 8,000 in 1967 to 15,000 a decade later. Fears of health manpower shortages are being replaced by concerns about potential surpluses.

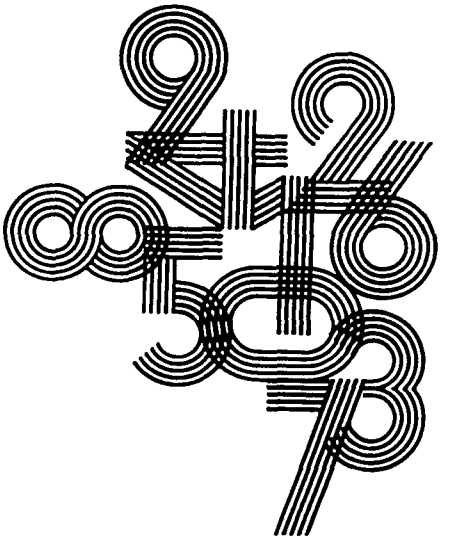
The massive increase in the number of health profession graduates will only begin to be fully felt in the next decade. If current enrollment trends continue, the number of active physicians will increase by more than 60 percent over the next 12 years. This will create a physician ratio of 242 active physicians for every 100,000 people in 1990. This figure compares to about 177 physicians per 100,000 people in 1975. Despite the fact that the number of health profession graduates and practitioners are reaching record levels, we are still faced with such basic problems as how to improve the geographic and specialty distribution of health personnel. Many citizens are still not receiving the health care they need.

The escalation of health care costs is receiving increasing attention and concern. We are only beginning to understand the dynamics of health manpower development. There are still many unanswered questions about the meaning to the Nation of the increasing supply of health personnel. I invite you to join us in trying to clarify some of these issues. Your expertise will assist us in finding better ways of gathering and using data. With your help, we will be able to develop more effective methods of formulating sound health policies.

I wish you 3 days of stimulation and productive discussion.

Thank you very much, Dan.

With that, I would like to adjourn this first plenary session. I look forward to seeing you at the concurrent sessions and at the other sessions during the remainder of the week. Thank you very much.



CONCURRENT SESSION A

Distribution and Maldistribution of Resources

DISTRIBUTION AND MALDISTRIBUTION OF RESOURCES

Welcome to Session A—Distribution and Maldistribution of Resources. My name is Shelly Starr and I will be your session moderator this afternoon. Let me begin this afternoon's session by providing you with a plan for how I hope we will proceed.

As you have noticed we have a full contingent of participants this afternoon. Each speaker will have approximately 15 to 20 minutes for presentation and immediately following each presentation, there is planned a 10-minute discussion period. After the first three papers, Dr. Alan Dever, who will be the discussant this afternoon, will be given 15 minutes for his comments. Following Dr. Dever's comments, there will be a 15-minute coffee break. When we return, the same procedure will be followed for the last two papers, followed once again by Dr. Dever's comments. Please notice that there are microphones in the aisles. Please make note of your questions and give them to the rapporteur at break time or after the session. The rapporteur for this session is Neil Fleming. Would he please stand up?

This afternoon we will hear from a number of people who are deeply involved in the business of uses of data for identifying and evaluating the distribution and maldistribution of health resources in this country. Our purpose in inviting these experts to speak here is to give you an opportunity to hear about some of their ideas and activities in this area.

As probably many of you are aware, the health manpower strategy has undergone a major change since the early 70's when the Federal interest was primarily focused on increasing the supply of physicians and other health workers. Today, the Federal Government is less concerned with the overall supply of health manpower in this country. Rather, it is attempting to find solutions to the problems of geographical distribution of physicians and other practitioners as well as the imbalance or shortage of certain medical specialities and other health personnel. There is a growing belief that the critical manpower issue today is not one of absolute numbers, but rather one of directing growing manpower resources into areas of greatest need, such as rural and inner city areas.

USES OF HEALTH DATA IN HEALTH PLANNING

Alan Gittelsohn, Ph.D., *Professor of Biostatistics, Johns Hopkins University, School of Hygiene, Baltimore, Maryland*

Experience in working with state-wide CHSS hospital data sets in Maine, Vermont and Rhode Island is described. Information on patient origin has been employed to group towns of residence into homogeneous communities and medical market areas. Temporal and geographic patterns have been studied by relating hospitalizations to population denominators. Vital rates techniques have been adapted for the computation of hospital admission and patient day rates standardized by direct and indirect methods. Life table methodology has been employed to estimate populations at risk and cumulative loss probabilities in measuring the incidence of surgical removal of organs and other non-repetitive events. Distribution of resource inputs has been investigated by use of external data sources such as hospital expenditures, facilities and health manpower. This represents one approach to integration of CHSS data components based on linkage through areal units. Pertinent measures include per capita expenditures, hospital bed ratios and physicians per population. The present report is intended as a review of health data uses in relation to health planning.

Data Sets and Data Management

Since 1969, a hospital data set covering virtually all inpatient episodes of Vermont residents has been developed and maintained by the Cooperative Health Information Center (CHIC). Patient discharge abstracts, under the PAS system, include all of the items in the uniform hospital discharge data set plus much additional clinical and procedural information. Patient records from Vermont hospitals not participating in PAS (presently two small facilities) have been abstracted and coded by CHIC staff. Patient information on Vermont residents has been obtained by cooperative arrangements with several out-of-state hospitals in neighboring states in order to insure complete coverage. The estimated completeness is 95% based on alternative data sets including vital records and Medicare files. Reports by Wennberg and Gittelsohn (1973) and Gittelsohn (1974) include details of collection and processing methods. A similar population hospital file based on PAS is maintained for Rhode Island by SEARCH. Beginning in 1973, with technical assistance from CHIC, a state-wide hospital data base was organized for Maine under the aegis of the Maine Hospital Discharge System (MHDS). Thereby, PAS, MHDS and hand-collected discharge records were merged into a single uniform format file which has been the basis for a series of tabulations, reports and publications. (See Wennberg, Soule and Gittelsohn, 1975.)

The following data items are included in all three files:

- Hospital
- Patient characteristics—age, sex, race
- Patient residence—town, census tract (R.I.)
- Admission and discharge dates
- Final diagnosis explaining admission, secondary diagnoses
- Principal and secondary procedures
- Discharge status

Changes in coding and formats over time and the use of several coding systems pose technical problems in file processing and add significantly to the effort in developing uniform files. PAS utilizes an adapted version of the ICDA–8 termed HICDA–1; in 1974, it introduced a further modification HICDA–2. The six possible conversions from one system to the other insure that difficulties will arise. The mappings are not 1 to 1 but 'INTO' at best. The problem is further compounded by the use of Current Procedure Terminology (CPT) and California Relative Value (CRVS) in other health data systems. A veritable coding Tower of Babel currently exists. Code correspondences have been handled on an *ad hoc* basis for high frequency procedures only.

In order to handle the minutiae of procedure and diagnoses codes as well as a multitude of logic, subsetting and grouping applications, generalized software has been developed at CHIC and Johns Hopkins and linked together into the package with the acronym CHOMPS for "comprehensive health organizing and management programming system." The system operates in both a time-sharing and batch mode, the latter utilized for production work and the former for design and testing. The objective is flexibility achieved through control card problem specification and minimization of the time interval between when a question is posed of a file and when an answer is produced. Options include provision for inputting numerator and denominator files in order to produce vital statistics rates, adjusted rates and life tables. CHOMPS has been used to process health data sets of various types obtained from different States and localities including natality, mortality, hospital discharge abstracts, Medicare B claims, physician registries, facilities inventories, etc. The data examples to follow have been processed through the programming system.

Some Methods of Analysis

The definition of geographic units for analysis of population rates of hospital utilization has been based on patient origin studies for each hospital included in the data set. In the three States under study, adjacent towns have been grouped into communities termed "hospital service areas" (HSA's), where the majority of residents are treated in the local facility. The degree to which a community's inpatient services are provided locally is called its "self-sufficiency" index. Table 1 exhibits this index for six Vermont communities in 1975 for selected admissions. For the entire State, 77% of cases are hospitalized locally; over the six communities, the localization percent varies from 67% in Area E to 95% in Area F. The range of services provided in the local hospital determines the community self-sufficiency index for particular reasons for admission. Thus, for the State, 83% of deliveries are local as contrasted with 50% of neurosurgical cases, the latter services primarily being provided in university centers. The importance of defining homogeneous geographic units with reasonably high localization indexes lies in the possibility of associating utilization patterns with the local hospital and the local physician supply.

Methods for estimation of resource inputs such as hospital beds per capita by community are based on proportionate allocation. If all of the patients admitted to one hospital are residents of a single area, all of the hospital's resources are allocated to that area. When the hospital's admissions are residents of more than one area, its resources are allocated in proportion to the number of admissions or patient days by area served. Table 2 illustrates this method for the 2,491 admissions resident in Area A of Vermont in 1975. The majority of the cases were admitted to the local hospital where they constituted 88% of its admissions.

Table 1. COMMUNITY SELF-SUFFICIENCY INDEX
(Percent of Cases Treated in Local Hospital—6 Vermont Communities, 1975)

AREA	Total Cases	Total	Delivery	Neuro-surgery	Ortho-pedics	Cancers
A.	2491	71%	58%	15%	66%	48%
B.	3682	85	94	61	92	62
C.	1788	68	43	9	74	26
D.	2538	83	94	50	93	65
E.	1077	67	85	0	83	29
F.	14304	95	94	99	96	97
Vermont	78057	77%	83%	50%	79%	63%

Table 2. ESTIMATION OF HOSPITAL BED AND HOSPITAL EXPENDITURE RATES
Method of Proportionate Allocation
Area A Randolph, Vermont 1975

HOSPITAL	Hospital Admissions			Hospital Beds		Hospital Expenditures (x1,000)	
	Total	Local	%	#	Local	Total	Local
Local Hospital	1939	1701	88%	66	57.9	$ 1,540	1,352
Referral A	4190	351	8	135	11.3	6,200	519
Community #1	8140	215	3	175	4.6	4,970	131
Referral B	18402	137	1	515	3.8	25,320	189
Community #2	10165	63	1	281	1.7	7,930	49
Community #3	1474	14	1	45	.4	1,040	10
(7 Hospitals)	19904	10	—	546	.3	16,580	8
(5 Hospitals)	13843	0	0	539	—	12,610	—
Total	78057	2491		2170	80.2	$76,190	2,260

Population = 12,914 persons
6.2 BEDS per 1,000 = (80.2) / 12,914
$175 per capita = ($2,260,000) / 12,914
199 Admissions per 1,000 per Year

Table 3. HOSPITAL ADMISSION RATES PER 1,000
6 Vermont Communities, 1975

AREA	Total	Medical Admissions C.V.	Resp	G.I.	G.U.	Neop	Total Surgical
A.	154	28	27	22	20	14	73
B.	125	21	24	21	15	10	65
C.	164	32	30	22	15	11	56
D.	74	17	10	17	12	10	55
E.	73	14	9	17	10	9	51
F.	80	15	11	17	10	10	64
Vermont	98	20	16	19	13	11	62
R.I.	60	18	12	15	11	10	59
Maine	93	21	19	21	16	12	72

Rates adjusted by age and sex by direct method

Table 4. COMPARISON OF THREE COMMUNITIES IN TERMS OF STANDARDIZED INCIDENCE RATIOS (SIR)
Vermont, 1975

	Community 'I'	'J'	'K'
TOTAL ADMISSIONS	1.39	1.36	.78
Total Surgical	1.15	.89	.81
Tonsillectomy	1.38	.25	.79
Appendectomy	1.15	.99	1.33
Hernia	1.20	.84	1.07
Prostatectomy	.48	.91	1.06
Cholecystectomy	1.02	.88	.44
Hysterectomy	.96	1.29	.87
D & C	1.70	1.22	.77
Total Medical	1.58	1.67	.76
Respiratory	1.68	1.86	.74
Circulatory	1.23	1.39	.72
Digestive	1.15	1.17	.91
Genito-urinary	1.51	1.16	.82
Admissions per 1,000	227	220	126
Patient days / 1,000	1524	1874	822
Person years	11438	7527	9583

Incidence ratio by indirect standardization

Consequently, 88% of the local hospital's sixty-six beds and 88% of its total budget are allocated to Area A. A similar allocation was carried out for all other hospitals to which Area A residents were admitted. The sum of these allocations is the total input for the Area. The sum is 80.2 beds for the Area corresponding to a bed rate of 6.2 per 1000, which is 50% in excess of HEW guidelines. The method is an improvement over the usual approach of computing beds per capita by simple division of beds in the area by area population in that it accounts for both patient inflow and outflow. The allocation method permits development of measures of resource inputs for each community in the hospital data system. Comparisons between areas in beds per capita, hospital expenditures per capita and physicians per capita are then available to health planners to incorporate in their plans, ruminations, and decision making.

Variations in Utilization

Hospitalization rates for communities are based on the number of resident admissions irrespective of the hospital. Table 3 exhibits hospital utilization rates for six Vermont communities and the three States for medical and surgical reasons for admission. The utilization rates (SUR's) are standardized by the direct method using the aggregate population by age and sex as standard. For the three States, Maine and Vermont have medical SUR's exceeding Rhode Island by more than 50%: surgical SUR's for the three States are fairly comparable. For the six Vermont communities, medi-

cal SUR's range between 74 and 164 per 1000 per year while total surgical SUR's exhibit more narrow variability. Within-State variability tends to be large; the SUR for an entire State comprising many communities is thus an average which reveals little about utilization in any one area.

A second type of hospital utilization measure used in the New England studies is the indirectly standardized rate which corresponds exactly to the standard mortality ratio of classical vital statistics. Thereby, marginal age-sex specific rates for a given cause of admission are applied to the community's population and an expected number of cases computed. The ratio of observed to expected cases is termed a 'SIR' for "standardized incidence ratio." Examples of SIR's for three Vermont communities are exhibited in Table 4. Total SIR's for Areas I and J are almost double that of Area K. Excepting prostatectomy and hysterectomy, Area I is high for both surgical and medical SIR's. Its D & C SIR is 70% in excess of the State average. By contrast, Area J is 11% lower than the State average for surgical SIR and 67% higher for medical SIR. Excepting appendectomy, medical and surgical SIRs for Area K are considerably below the State average. These measures provide a simple way of comparing communities. Many vital statistics practitioners prefer the SIR to the SUR because of its greater stability and the ease of developing standard errors.

Community profiles based on SUR's, SIR's, allocated resource indexes, demographic characteristics, mortality rates (SMR's) and other measures provide a method for comparing areas, for detecting outliers and for identifying potential problems. The 70% excess D & C SIR for Area I may or may not be a reason for concern. It certainly might be used by PSRO to initiate medical care evaluation studies of gynecological services delivered in the local hospital. Clearly, the data system can be used to target such activities.

Applications

Several applications of the products of the data system are envisioned within the context of the health planning process. The first and most important of these is purely descriptive of how different communities use hospital services, how much and for what reason. It is only through observation and measurement that a beginning can be made to give meaning to such notions as excess surgery, inappropriate use, overutilization and underutilization. Total hospitalization use rates standardized by age (SUR's) range by a factor of nearly 3 from 90 to 260 per 1,000 per year over the communities under study. Surgical SUR's tend to be less variable while medical SUR's exhibit a wide range. Institutional indicators, such as percent occupancy and average length of stay, often tend to be at variance with population measures. Both are relevant to health planning and regulation.

At a recent Certificate of Need hearing, representatives petitioning for the hospital argued that the high occupancy rate and the low length of stay justified the addition of new beds. A counterargument was provided by the fact that the community served by the hospital had the highest total SUR in the State, nearly the highest patient day rate and the highest per capita expenditures for hospitalization. With a stable population, the addition of more beds could only lead to an increase in the community measures of utilization or to a decrease in occupancy unless the hospital could extend its service area into towns currently being served by other hospitals.

In a similar vein, the impact of the recruitment of new physicians into a community has been studied through the examination of changes in SUR's and SIR's over time. For example, the majority of residents of Area G are hospitalized in Hospital G, and the majority of patients admitted to Hospital G are residents of Area G. The community had a localization index of 79% in the period under study. Tables 5a, 5b, and 5c document changes in hospital and community indicators over time. Between 1971 and 1973, the number of admissions, patient days and percent occupancy declined. In Hospital G in 1974, the addition of four new staff members was associated with an increase in occupancy from 53% to 73% and the following year to 84%. Over the entire period, mean length of stay for all admissions remained constant, contributing little as an index to understanding the rapid changes in institutional and population indicators. From the hospitals' standpoint, matters had improved because empty beds were now occupied.

Population SUR's and SIR's for the community primarily served by Hospital G tell a different story. In the baseline year of 1973 total and surgical SIR's were at the State average, i.e. 97% and 98% respectively. By the following year, the total SIR for all reasons for admission had risen to 16% above the State average.

Table 5a. INSTITUTIONAL INDICATORS HOSPITAL "G"

	Number of Admissions	Number Pt. Days	Percent Occupancy	Length of Stay
1971	1553	9246	62%	6.0
1972	1491	8844	59	5.9
1973	1394	7932	53	5.8
1974	1874	10932	73	5.9
1975	1962	12754	84	5.9

Table 5b. MEDICAL STAFF ACTIVITY HOSPITAL "G"

Activity Year	Number of M.D.'s	Patient Days 1973	1974	Change
1973 only	1	315	0	−315
1973 & 1974	6	7281	7218	− 63
1974 only	4	0	3371	+ 3371

Table 5c. HOSPITAL ADMISSIONS PER 10,000 IN COMMUNITY SERVED BY HOSPITAL "G"

	SUR Admission Rates per 10,000		SIR Ratio to State Average	
	1973	1974	1973	1974
Total surgical	675	905	.97	1.31
D & C	75	108	.99	1.42
T & A	34	41	.54	.65
Hysterectomy	68	78	1.15	1.32
Prostatectomy	31	37	1.19	1.42
Hernia	22	34	.88	1.36
Appendectomy	16	26	.94	1.53
Total Admissions	1618	1845	.98	1.16

Table 6. DEMOGRAPHIC AND MEDICAL CARE UTILIZATION STATISTICS FOR VERMONT

MUA 16 BHM-Designated Physician Shortage Areas
MSA 5 Federal Register Critical Medical Shortage Areas
ASA 20 Vermont Physician Non-Shortage Areas

	MUA	MSA	ASA	
Physicians per 10,000—Total	7.1	6.2	18.2	**
Primary	4.9	5.9	8.2	**
Population per Area (x1000)	4.2	3.8	17.2	**
per square mile	25.9	22.7	87.8	**
Percent age 65+ years	10.6	12.6	11.0	ns
Medicare (B) Dollars per capita	$119	$133	$117	ns
Hospitalization rate per 1,000	158	171	166	ns
Neoplasms	7.4	8.1	7.5	ns
Delivery	21.4	21.0	20.8	ns
Injuries	9.0	8.8	9.1	ns
Patient days per 1,000	1179	1275	1258	ns
Mean Length of Hospital Stay (Days)	7.6	7.7	7.7	ns
Mean Hospital Distance in Miles	16.8	16.6	10.8	**
Neoplasms	21.6	23.9	15.4	**
Delivery	14.1	16.6	10.0	**
Prenatal Care—none and 8th+ month	5%	5%	4%	ns
Mothers with less than HS education	28%	29%	25%	ns
Low Birthweight Percent (under 2500gm)	7.0	8.1	7.6	ns
Perinatal Deaths per 1,000	27.1	26.6	26.9	ns
Total Mortality (age-sex adjusted)	10.1	10.4	10.5	ns

Most of this was accounted for by the one-third increase in surgical admissions. Marked increases were noted for D & C (43%), herniorrhaphy (55%) and the emergency procedure appendectomy (63%). Since the SIR's and SUR's are community based, these increases represent changes in surgical utilization patterns in the same population at risk. The issue is moot as to whether community G is better served by the high rather than the average utilization rate. MCE's directed at this point might furnish clarification.

The reasons for variability between communities in hospital utilization rates are complex and cannot be ascribed to particular sources without examination of additional data. Possible explanations include geographic variations in disease incidence and prevalence, differences in access to medical care, and variability in physicians' attitudes towards management. There are no observations suggesting that differences in incidence constitute an important source of variability in the States under study, at least for the common reasons for hospital admission. Population-based morbidity data for the medical and surgical conditions of interest are not available. Prior work in Vermont has shown that access to medical care does not vary. We know little concerning the incidence of hypertrophy of the tonsils, silent gall stones, arteriosclerosis, gastroenteritis or peptic ulcers. With similar population groups living in adjacent communities, the expectation is that such conditions will exhibit like distributions across geographic boundaries in the absence of direct evidence to the contrary. Rather, the variations in hospital use appear to be associated with differing approaches to medical management.

For a number of conditions, the magnitude of practice variations is large. In one area, nearly half of the resident births are induced while only 10% are induced in a neighboring area served by a different group of physicians. Similarly, Cesarean section rates for resident births in two adjacent communities are 5% and 15%. In one hospital, over half of the heart attack patients are anticoagulated, while, in another, fewer than 1% of similar patients receive the therapy. Population hospitalization rates for elective surgery vary widely between communities ostensibly similar in demographic characteristics. This is particularly true for otolaryngology and gynecology. Admission rates for medical conditions are even more highly variable. The importance of a hospital data system is that it provides the capability of deriving and measuring utilization for specific reasons for hospital admission. The pinpointing of extremes permits definition of potential problem areas and the initiation of special *ad hoc* investigation.

Physician Shortage

A related application of CHSS data components to health planning lies in the determination of physician shortage areas. Vermont vital statistics, hospitalization files, census and manpower registers have been utilized to develop profiles for communities designated by the Bureau of Health Manpower as "medically underserved areas" (MUA's) and "critical medical shortage areas" (MSA's). The remaining sections of the State, not so designated by BHM, have been assumed to be amply served (ASA's) or perhaps overserved. Results have been reported by Gittelsohn (1976). Table 6 displays profiles for the aggregate of the MUA's, MSA's and ASA's in Vermont. The amply served areas differ from the underserved and critically short areas in several respects—the ratio of physicians to population is greater, total populations and population densities are higher, and the mean distance traveled for hospitalization is lower, i.e. 11 vs. 17 miles. The MUA's and MSA's are thus small rural areas with relatively few resident doctors, who are located at a distance from hospitals. Hospital utilization measures show no differences between the three types of areas, indicating that distances of the type encountered in Vermont are not barriers to access to hospital care. Similarly, utilization as measured by Medicare (B) reimbursements per capita is essentially the same for amply and underserved areas. The issue of underservice is not clarified by standard vital rates measures of health status. Total mortality rates are 10 per 1000 per year for each of the three area groupings. Perinatal mortality rates and prematurity rates are not significantly different. The same percent of mothers either seek no prenatal care or care after the eighth month of pregnancy.

The general pattern emerges from such profile analysis that MUA and MSA residents use medical services at about the same rate as residents of amply served areas and that outcomes, as measured by mortality, are similar. This being the case, the entire concept of medical underservice and the BHM designation criteria must be seriously questioned.

Conclusion

CHSS population-based data sets for hospitalization are in an early phase of development. The use of statistical measures derived from these data bases in health planning is only beginning. In large measure, their utility will depend on establishing an ongoing dialog between data analysts, data managers, planners and providers. The latter sorely require a basic introduction to health care epidemiology, demography and the meaning of such simple concepts as population rate. For many years, hospital data analyses have focused attention on length of stay, service intensity, unit costs, and occupancy, with minimal attention paid to the population being served. Clearly, a full characterization of service delivery requires that both institutional and community indicators be studied.

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IDENTIFICATION OF HEALTH MANPOWER SHORTAGE AREAS AND DEVELOPMENT OF CRITERIA FOR DESIGNATION

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One of the most important components of Federal programs aimed at alleviating geographic maldistribution is the identification and designation of those specific areas which are in need of health manpower. Lists of such shortage areas were originally developed for two types of programs: (1) cancellation or repayment of the educational loans of health professionals who serve in shortage areas, including physicians, dentists, nurses, optometrists, podiatrists, pharmacists, and veterinarians; and (2) placement of National Health Service Corps personnel in shortage areas. A third major type of program which later used such shortage area lists was the Scholarship programs which call for obligated service by recipients in areas designated by the Secretary as manpower shortage areas. The Health Professions Educational Assistance Act of 1976 (P.L. 94–484) required significant changes in the criteria and procedures for designation of shortage areas for these programs, and new shortage criteria were recently published as Interim-Final regulations (on January 10, 1978). In what follows I will give some historical background on the previous shortage criteria and their shortcomings, describe the changes required by P.L. 94–484 and how we developed new criteria to implement those changes, make some observations about how these changes are affecting shortage area programs, and comment on where we go from here.

1. Historical Development of Shortage Area Designation and Criteria

A. Health Professions Loan Cancellation and Repayment—The earliest health manpower shortage area designations were mandated by 1965 legislation (P.L. 89–290, Health Professions Educational Assistance Act Amendments) creating Section 741(f) of the Public Health Service Act. This legislation provided for forgiveness or cancellation of portions of outstanding Health Professions Student Loans obtained by students in schools of medicine or osteopathy, dentistry, or optometry, in return for their service after graduation in areas found to have shortages of physicians, dentists, or optometrists.

Regulations promulgated to implement the loan cancellation programs provided for shortage area designation on the basis of specific ratios of practitioners to population applied to county data, with special consideration allowed for county or subcounty areas exhibiting inaccessibility of medical services to the residents of the area, age or incapacity of practitioners, or particular local health problems. The practitioner-to-population ratios used were 1:1,500 for physicians (all active MD's and DO's in patient care); 1:3,000 for dentists; and 1:15,000 for optometrists. Although these ratios were set by the Secretary, actual designation of areas was carried out by the State Health Authorities.

Legislation enacted in 1971 provided that an individual must sign an agreement with the Secretary to serve in a shortage area before that individual can receive benefits for such service. It allowed for repayment of educational loans other than those made by the Federal government. The criteria used for this new loan repayment program were essentially the same as those previously used for loan cancellation, but shortage area designation was to be done by the Secretary. The legislation also extended the loan repayment program to include podiatrists, pharmacists, and veterinarians. Simple population-to-practitioner ratios were also used for shortage determinations for these professions: 25,000:1 for podiatrists, 4,500:1 for pharmacists, and 15,000:1 for veterinarians (also a human population).

The shortage ratios chosen for the six disciplines were on the order of 150% of the national mean population-to-active practitioner ratio for each. (Specifically: physicians, 200% of national mean; dentists, 150%; optometrists, 150%; podiatrists, 110%; pharmacists, 250%; and veterinarians, 200%.) The first list of health manpower shortage areas designated under the above criteria was published in February 1974. Most areas designated were whole counties, data being most readily available at the county level. The physician shortage area list accounted for roughly two-thirds of all U.S. counties; the dentist shortage area list, about one-half. The podiatrist list included almost one-half the counties, while optometry shortage areas represented one-fourth, veterinarian shortage areas one-sixth, and pharmacist shortage areas less than 10%.

B. National Health Service Corps—At the same time that shortage area criteria were being developed for loan repayment, other criteria were being developed for use in identifying areas eligible for placement of National Health Service Corps personnel. Because this program was to operate only in "critical" health manpower shortage areas, more stringent criteria were selected. To indicate critical medical shortage

areas, these criteria relied primarily on the use of a primary care physician-to-population ratio of 1:4,000, applied either to county data or to data on sub-county groups of census tracts or minor civil divisions. Also taken into account for subcounty areas where the availability of health centers within certain distances and whether the ratio of primary care physicians to populations in the county as a whole was worse than 1:3,000. Primary care physicians were defined as non-Federal physicians in general or family practice, pediatrics, internal medicine, obstetrics and gynecology, and, in non-metropolitan areas, general surgery. To identify critical dental shortage areas, all dentists were counted and a dentist-to-population ratio of 1:5,000 was used.

In developing the National Health Service Corps designations, the Comprehensive Health Planning agencies were asked to review all areas proposed for designation and provide data that could be evaluated to determine which areas should be designated. The first list of such areas was published in the Federal Register in October 1974, with revisions made in February 1975, and July 1976. The July 1976 publication included an expansion of the criteria to allow consideration of mitigating circumstances that could be taken into account in evaluating requests for designation of areas that might not quite meet specific physician- and dentist-to-population ratio criteria. It also included information relative to definition of appropriate service areas against which to apply the criteria. As of September 30, 1977, both the list of critical medical and the list of critical dental manpower shortage areas contained roughly one-fourth of all U.S. counties, with an additional 400 subcounty medical shortage areas and 100 subcounty dental shortage areas.

C. Nursing Loan Cancellation and Repayment—The nursing student loan cancellation program, established in 1968, provided for cancellation of nursing student loans in return for service in public or nonprofit hospitals determined by the Secretary to have substantial shortages of nurses. A list of such hospitals was developed and issued in October 1969, and subsequently revised in January 1972, and January 1975. These lists included all those hospitals in which the number of registered nursing hours per patient day was lower than the national median for a hospital of the same type (i.e., general, psychiatric, tuberculosis, chronic, convalescent and others). These lists still remain effective for cancellation of Federal Nursing Student Loans obtained before November 18, 1971.

The Nurse Training Act of 1971 replaced the loan cancellation program with a nursing loan repayment program similar to the Health Professions Student Loan Repayment Program, and authorized lists of nursing shortage areas to be developed by the Secretary in consultation with State Health Authorities. (The authority involved is now Section 836(h) of the PHS Act.) After considerable research and statistical analysis, a list of nursing shortage areas was developed in the summer of 1975, based on a comparison of estimated nursing requirements for each county with the supply of nurses in that county. Nursing requirements were estimated for each county's various health care settings (e.g., hospitals, nursing homes, physician's offices, etc.). Each of these requirements was based on a ratio of nurses employed in the setting to an average daily number of patients, residents, or physicians, as appropriate. Each county's aggregate requirement for nurses was then compared with its total supply to determine whether or not a shortage existed. The list developed (published June 24, 1976) contained 541 counties, 18% of all U.S. counties.

D. Medically Underserved Areas—No discussion of shortage area criteria development and designation efforts to date would be complete without mention of the impact of the Health Maintenance Organization Act of 1973, which required that funding priorities be given to HMO's serving "medically underserved populations." The concept of medical underservice is a larger one than that of health manpower shortage, since it relates to populations not receiving adequate health care for whatever reason, while health manpower shortage designation presumably is aimed only at identifying that portion of the underservice which is due to lack of health manpower.

The HMO Act required that the Secretary define criteria for medically underserved areas and set specific deadlines for this effort. In response to that requirement, an interdisciplinary group from the University of Wisconsin was involved in developing a methodology which could take a number of factors thought to relate to the concept of medical underservice into consideration. The approach was to develop an index which would predict the judgment "experts" would make as to the degree of "medical underservice" if they were to make site visits to all possible areas. A variety of panels of experts were therefore used to develop "multi-attribute utility" models using various sets of variables. Each such model would generate a medical underservice score from the values of the variables included, using weights and "utility curves" provided by the experts. The scores generated by these various models were then correlated with scores assigned on a global basis by local experts familiar with the sample areas used, in order to choose the best model.

Ultimately, a four-variable model was selected, using primary care physician-to-population ratio, infant mortality rate, percent of the population below the poverty level, and percent of the population over age 65. The score generated by this model was termed the "Index of Medical Underservice" and was evaluated for all counties of the United States. All counties or subcounty areas with values below the median were designated as Medically Underserved Areas. The first list of such areas was published in the Federal Register in September 1975 together with a description of the methodology used. An update of the list has since been published (October 1976). Subsequently, this Index and the corresponding list of areas were also adopted for use in defining Medically Underserved Areas for

purposes of the Community Health Centers legislation (Section 330 of the PHS Act) and other service programs. In particular, the MUA list is now used, often in combination with the list of critical health manpower shortage areas, for implementation of grant funding under the Urban Health Initiative and Rural Health Initiative/Health Underserved Rural Area programs by the Bureau of Community Health Services.

2. Shortcomings of Historically-Used Approaches

The various approaches to shortage area designation described above had a variety of shortcomings. One was simply that fact that, for both the physician and dental shortage, two separate lists of manpower shortage areas existed, involving two distinct sets of criteria. This created confusion for the public, including potential program participants, as to which list was to be used for which program purposes. Another was the fact that the manpower shortage area designation procedures involved our dealing with two different sets of agencies—the Comprehensive Health Planning "A" and "B" agencies for NHSC-related designations, and the State Health Authorities for loan repayment designations.

A third weakness of the manpower shortage area designation process was its dependence, to a large extent, on county data. This was of course mostly because of the availability of such data and the general unavailability of subcounty data. The use of county data is appropriate in many rural areas where the county may be a rational medical service area; but in Western States rural counties are apt to be entirely too large to represent reasonable service areas, and in Southeastern States rural counties tend to be too small to be considered independently. In the latter cases, the presence or absence of resources in contiguous areas definitely needs to be taken into consideration.

In metropolitan areas, the use of county data is almost always inappropriate, either because the appropriate service area is a group of census tracts in one portion of the city (as may be the case for primary care and perhaps pharmacist's services), or because the metropolitan area as a whole is the appropriate service area rather than one of its counties (as is generally the case for dentistry, optometry or podiatry, where appointments are scheduled far in advance and travel within the metropolitan area does not generally constitute a barrier to care).

In the case of the NHSC-related critical shortage designations, an effort was made to define appropriate subcounty or multicounty service areas, and/or to consider contiguous area resources. However, this was generally not done for the loan repayment designations. Very few urban subcounty service areas were defined, even for the NHSC, prior to passage of P.L. 94–484.

A fourth, and perhaps the major, shortcoming of the MOD/VOPP manpower shortage designations was their excessive dependence on the practitioner-to-population ratio. This tended to obscure differences among areas due to different population makeup, different health needs, or different levels of demand for care, and also tended to ignore productivity differences among practitioners and the presence or absence of health care resources which augment the MOD/VOPP practitioners. In addition, possible access barriers were neglected almost entirely. This dependence on practitioner-to-population ratios led to an almost complete lack of designated urban areas, since these ratios generally appear quite adequate in urban areas, at least at the county level.

The MUA designations avoid some of the pitfalls of this fourth problem by including three indicators other than the (primary care) physician-to-population ratio. The infant mortality rate may be regarded as a measure of health status; the percent of population above age 65 as a measure of probable increased needs and demands for health care; and the percent of population below the poverty level as a measure of economic access problems, often correlated with sociocultural access barriers and higher needs for health care as well. However, the MUA designation procedure does not involve any efforts to define rational non-county service areas or to take into account contiguous area conditions. The procedure used to designate subcounty MUA's suffers from an additional problem; two of the indicators are available nationally for census tracts or civil divisions (the poverty and aged indicators), while the other two are not, so a combination of county data for two indicators and tract or division data for the other two is used to designate tracts and divisions. This could be corrected, but only in those metropolitan areas and/or HSA's where tracts or divisions have been aggregated into rational service areas, for which appropriate physician-to-population ratios and infant mortality data are also available.

3. Changes in Designation Criteria and Procedures Required by P.L. 94–484

In Public Law 94–484 (the Health Professions Educational Assistance Act of 1976), enacted October 12, 1976, Congress moved toward solution of these difficulties. A new section 332 was added to the Public Health Service Act, entitled "Designation of Health Manpower Shortage Areas." This section required that the Secretary establish, by regulation, new criteria for the designation of health manpower shortage areas. The Act also set down specific requirements for the criteria and for the process of designating shortage areas, which represented significant departures from previously established procedures.

As expressed in the House and Senate reports and in the specific wording of the Act, the major Congressional objectives in enacting the new section 332 were the following: 1) To permit designation of urban

areas as well as rural areas; 2) to "broaden the concept of shortage," by defining shortage less stringently and by "going beyond ratios alone"; and 3) to insure that "areas, population groups, and medical facilities with a more severe need for the assignment of Corps personnel be assigned personnel on a priority basis." The statute specifically called attention to the fact that urban as well as rural areas were to be included as shortage areas, and stated that an area need not conform to the geographic boundaries of a political subdivision but should be a rational area for the delivery of health services. It required that the new criteria to be developed should involve not only practitioner-to-population ratios but also indicators of a need for health services, with special consideration to indicators of infant mortality, access to health services, and health status. Section 741(f) was changed to refer to areas designated under section 332, thus eliminating the authority for two sets of lists. Section 332 requires consideration of recommendations of Health Systems Agencies, State Health Planning and Development Agencies and Governors in the process of designating areas, with the emphasis on the Health Systems Agencies. In addition, wording of the new statute permitted designation of population groups and facilities with health manpower shortages as well as geographic areas, thus opening the way for designation of population groups who may have difficulties assessing health manpower within larger areas which, as an area, may appear to have sufficient numbers of practitioners.

Finally, priority listings of areas were to be developed. A new section 333(c) of the Public Health Service Act required that the Secretary give priority to applications for placement of NHSC personnel in areas with the "greatest health manpower shortage," as determined under the criteria established under section 332. This provision required that the criteria identify those areas with the "greatest" health manpower shortage as distinct from other areas.

4. Approach Used in Developing Criteria to Implement Provisions of P.L. 94–484

Reflecting both the Congressional objectives and the specific requirements mentioned within the law itself, new criteria were developed and published (as Interim-Final Regulations) on January 10, 1978. Some of the basic characteristics of the approach used to meet the new legislative requirements are described in what follows.

A. Separate criteria for each type of health manpower are used. The criteria for health manpower shortage areas have been divided into seven groupings, as follows: (1) Primary medical care manpower shortage areas, (i.e., areas with a shortage of primary care manpower, including primary care physicians (physicians in general and family practice, pediatrics, general internal medicine, and obstetrics and gynecology), nurse practitioners, and physicians' assistants); (2) Dental manpower shortage areas (i.e., areas with shortages of dentists and dental auxiliaries); (3) Mental health manpower shortage areas (i.e., areas with shortages of psychiatrists and other practitioners providing mental health and related services, including alcohol and drug abuse); (4) Vision care manpower shortage areas (i.e., areas with shortages of optometrists or ophthalmologists providing vision care services); (5) Foot care manpower shortage areas (i.e., areas with shortages of podiatrists and other practitioners providing foot care services); (6) Pharmacy manpower shortage areas (i.e., areas with shortages of pharmacists); and (7) Veterinary manpower shortage areas (i.e., areas with shortages of veterinarians. Nursing manpower shortage areas remain covered under section 836(h).

B. For each of these manpower types, there are three basic criteria: (1) For designation of a geographic area, the area under consideration must be a rational one for delivery of the type of care involved; (2) Certain ratio and/or other types of criteria must be met by the area itself; and (3) It must be demonstrated that manpower in contiguous areas providing care of the same type are overutilized, excessively distant, or inaccessible to the population of the area under consideration.

(1) Rational Service Areas—For each type of manpower the criteria relate the definition of appropriate service areas, in general, to an appropriate travel time to care. This travel time is set at 30 minutes for primary care, and 40 minutes for dental care, based in each case on existing studies suggesting that utilization of medical and dental services are seriously affected by travel times greater than these. Appropriate travel time and rational service areas for pharmacy services were assumed to be the same as those for medical care because of the need for the availability and quick accessibility of prescription drugs to carry out prescribed medical treatments. Appropriate travel times and rational service areas for psychiatric, optometric, and podiatric care were assumed to be the same as those for dental care, since they normally involve advance appointments and are of a non-emergency nature.

Because use of a 30- or 40-minute travel time in urban areas would result in service areas with enormous populations, with the consequence that appropriate patient-practitioner relationships would be less likely to develop, and because of the observation that patients of particular socioeconomic, ethnic, or racial groups are often unlikely to cross certain neighborhood lines to obtain care, the rational area criteria also provide for definition of established neighborhoods and/or communities within urbanized areas, with a suggested minimum population of 20,000.

(2) Criteria to be Applied Within Areas—A variety of factors are now included in the criteria for manpower shortage within geographic areas. For most types of care, a modified population-to-practitioner ratio is still the basic indicator used. However, for those

manpower types where the available data supports such adjustments, the population may be adjusted as appropriate to reflect the varying care needs and/or utilization of different population components, and the number of practitioners may be adjusted to reflect differential productivity based on such factors as age, type of practice, hours of work, and, where possible, the effect of auxiliaries. This modified population-to-practitioner ratio for a given area is then compared with the shortage level, as set in the criteria.

Data available indicated that population adjustments for needs and utilization of different age/sex cohorts was most appropriate for primary care and podiatric care, while productivity variation based on practitioner age was most significant for dental care and podiatric care.

The criteria for the shortage levels were developed in different ways for the different manpower types. For primary care and dental, examination of the literature and calculations based on average visits per year supplied by full-time practitioners, and visits per year per person where care is available, suggest that levels such as 2,000:1 for primary medical care and 3,500:1 for dental care could represent adequacy levels. However, it was felt that Federal intervention could only be justified in areas where manpower levels were significantly worse than adequate, indicating that the needs of these areas are not being met through free market mechanisms or reimbursement programs. The distribution of population-to-practitioner ratios by county for the U.S. were therefore examined to identify appropriate levels. The designation levels selected, 3,500:1 for primary care and 5,000:1 for dental care, represent roughly 150% of the values for the median U.S. county ratios (as opposed to the mean), and in each case select approximately one-fourth of all U.S. counties at this time.

To take into account other indicators of need which cannot be included by modifying the population-to-practitioner ratio, the shortage level of that ratio is reduced (to 3,000:1 for medical and to 4,000:1 for dental) where indicators of high need are present. In choosing the indicators to be used, our emphasis was on indicators that could be used to identify urban shortage areas, since it appeared that the ratio criteria alone would continue to identify rural shortage areas effectively. For primary care shortage; one indicator used is fertility rate; the level used picks out about one-half the areas in an NCHS sample of poverty areas in 18 selected cities. Another indicator used is the poverty rate itself. The level chosen (30% of population below the poverty line) identifies about one-half the low-income neighborhoods defined by the U.S. Census Bureau in the 50 largest cities. A third indicator used is infant mortality rate, because of its wide availability and its specific mention in the statute. A level of 20 infant deaths per 1,000 live births or worse was chosen for consistency with the standard under consideration for use in the National Guidelines for Health Planning, which was approximately the U.S. county median according to 1966–70 five-year-average data.

In addition to the above, indicators of insufficient capacity have been defined in terms of excessive visits per year per FTE primary care physicians, excessive waiting times, limited acceptance of new patients, etc. The rationale for selection of the criteria used for these, as well as that for the criteria used for the VOPP professions, is contained in a Report (BHM/OPD/MAB #78–03, November 1977) available from our office.

It is worth mentioning here that the criteria for podiatric shortage happen to be best documented, since they are the result of a (as yet unpublished) separate study by Leonard Greenberg which we supported, entitled "A Proposed Demand-Productivity Model for the Designation of Podiatric Manpower Shortage Areas." This model includes the contribution to foot care made by orthopedic surgeons and general family practitioners. The vision care and pharmacy criteria take a slightly different form from that of the medical, dental, and podiatric criteria; for these, the requirements for and supply of services were estimated and compared, with the shortfall (if any) in optometric visits or in number of pharmacists needed, used to determine whether the area involved has a shortage. In the case of veterinarians, separate determinations are made of shortages of food animal veterinarians and of companion animal veterinarians, with the former involving a ratio of livestock equivalents to veterinarians, while the latter essentially uses human population as a proxy for the pet population. For all the VOPP professions, a computed need for at least one professional to get the area below the shortage level is required to declare it a shortage area, since these areas are defined primarily for use by private practitioners wishing to obtain loan repayment.

(3) Contiguous Area Considerations—Three ways have been specified for determining whether manpower in a particular contiguous area should mitigate against designation: (1) If the area's manpower resources are beyond the "excessive" travel time for the manpower type (i.e., 30 minutes for primary care, 40 minutes for dental); (2) if the area has a practitioner-to-population ratio greater than a certain level, and its manpower are considered to be over-utilized so that it has no excess capacity to make available to its neighbors (this level was set at 2,500:1 for primary care and 3,000:1 for dental care); and (3) If specified access barriers prevent the population (of the area being considered for designation) from obtaining care in the contiguous areas.

C. Particular population groups may be designated as "shortage areas." Native Americans and migrants are identified as population groups for which the Federal Government has special responsibilities or which have special health care or access problems. Provisions are also included for identifying other population groups within geographic areas that, because of special access problems due to language, cultural, or eco-

nomic barriers, have a shortage even though the entire geographic area in which they reside does not.

D. Facilities with a shortage of manpower can be designated under certain circumstances. Special criteria are included for shortages of health manpower to serve prisons and other correctional institutions and for shortages of health manpower to serve State mental hospitals. In addition, the criteria include general provisions for designation of other facilities having health manpower shortages where it can be shown that these facilities are providing services to a designated shortage area or to a designated shortage population and have insufficient capacity to meet care needs.

E. The criteria include factors to determine which areas have the greatest degree of health manpower shortage for purposes of determining priorities for placement. In general, the priorities mainly reflect the level of the practitioner-to-population ratio and whether or not unusually high needs, as defined in the criteria, are present.

F. The review and comment procedures used involve HSA's, SHPDA's, Governors and others in the designation process. Annually, the criteria are applied to the best and most recent data available at the national level on the various factors included in the criteria, and the resulting listing is sent to the HSA's for their review, comment, and recommendations. Copies of all individual requests for designation of particular areas are also sent to the HSA's, SHPDA's and the State Governors for comment and recommendations.

5. Status of Current Area Designation Efforts

The new criteria were published as Interim-Final Regulations in the Federal Register on January 10, 1978. Immediately thereafter, copies of the criteria were sent to all Health Systems Agencies, State Health Planning and Development Agencies, and State Governors together with listings showing relevant data now in our files for each county and each previously designated service area within their State. The agencies were asked to review this material and make recommendations as to which areas within their jurisdiction should be designated. By May 1st, responses to this mailing had been received from 81 of 205 HSA's and 18 SHPDA's. In addition, approximately 400 requests for designation of specific areas had been received.

After each such request has been reviewed both here and by the HSA and State Agency and/or Governor, a letter is written to the requestor stating the results of the review. We are now preparing for Federal Register publication the first formal list of designated areas, which will include all areas designated by May 31. Because requests and additional responses to our January mailing are still coming in, and because of the staff time required for review of this material, the first list published will not be by any means complete, and we anticipate publication of an updated list later this year. We expect by the end of the calendar year to have designated at least 1,300 primary care shortage areas, including 250 in urban areas; 950 dental shortage areas; 800 vision care manpower shortage areas; 800 foot care manpower shortage areas; 800 veterinary shortage areas; and 200 pharmacy shortage areas. A mailing to the planning agencies dealing specifically with psychiatric shortage areas is to be made in the near future.

6. Observations from our Designation Experience Under the New Criteria

A couple of observations from our experience to date in applying the criteria seem worth mentioning.

In urban areas, almost all of the designations involve access problems rather than a complete unavailability of primary care physicians. Most of these are economic access problems, although these are often aggravated by racial, cultural, or language differences. These economic access problems may involve an insufficient number of practitioners willing to accept Medicaid eligibles; this may be because of the Medicaid fee schedule, the red tape involved in getting reimbursement, or simply that the practice generated by privately-financed patients is sufficient to make acceptance of publicly-financed patients unattractive. In addition, there may be a significant population of working poor—people without Medicaid eligibility but with insufficient income to meet the costs of adequate medical care.

The result is that we wind up fostering use of the National Health Service Corps, originally conceived as a program to place physicians in areas where there were no (or almost no) physicians, to place physicians within subsections of apparently physician-rich metropolitan areas in order to meet the needs of underserved populations within those areas. It would appear that better reimbursement methods or some form of National Health Insurance would be a more appropriate way of meeting the needs in these areas.

In rural areas, the criteria seem to work fairly well, but we are receiving complaints that they do not identify some legitimate needs in the lowest density areas. In such areas, as one State health director put it, "it is difficult to round up enough people to meet the criteria," but a single physician may be on call day and night to meet the needs of people spread out over a large area. We should probably modify the criteria in some way to deal with this.

7. Needed Improvements in Area Delineation, Data Bases, and Designation Criteria

Techniques for identification of rational health service areas leave much to be desired. Some research has

already been undertaken to find better ways of identifying service areas, using such factors as commuting patterns, natality and mortality data, etc. Comprehensive and cooperative efforts involving the HSA's are needed to develop feasible procedures for defining service areas, using consistent national guidelines and local input and conditions.

The data base for shortage determinations needs to be improved substantially. Currently, data bases are being improved moderately through information from the professional health manpower organizations and the Cooperative Health Statistics System, but these are scattered, inconsistent and generally unavailable or not completely current. There are also a large number of variables important to the identification of shortage areas for which data are not now available, and efforts need to be made to find ways that such data might be collected by HSA's and made available for shortage designation purposes. Perhaps the most critical need is for development of criteria that go beyond adjusted population-to-practitioner ratios, with more rigorous and formal consideration of other factors. It may be desirable to identify surrogate variables (perhaps available from census data or other common data sources) which could be used to represent factors that would better identify health manpower shortage areas. Efforts to identify such surrogate variables and to develop sets of designation criteria using them have been undertaken, but early results are too inconclusive to permit changes in the criteria.

There is a need for major changes in the nursing shortage criteria to improve the methodology now in effect for such designations. The criteria in effect under section 836(h) do not meet the requirements of section 332 for other types of shortage, and Congress is moving toward requiring us to eliminate this inconsistency. Research needs to be done into more appropriate measures of nursing shortage and into more appropriate applications of available data. Methods of designating nursing shortage areas should take into account interactions with the nursing resources and nursing needs of contiguous counties; methods for designating subcounty areas with nursing shortages need to be developed to deal with special cases; designation of facilities with nursing shortages should also be considered.

8. Outstanding Issues

With the changes in the concept of health manpower shortage made by Congress through P.L. 94-484, there is little difference left between the concept of "populations with manpower shortages" and that of "medically underserved populations." This would appear to leave a policy issue open for discussion—i.e., should there really continue to be two shortage area designation systems, one for health manpower-specific programs and another for the more general community health services programs? Or should there be one set of criteria for each type of health service (i.e., primary care, dental care, vision care, etc.), with the areas meeting those criteria eligible for all types of Federal programs relating to that health service? We have made one step toward the latter approach by an interagency agreement that all areas designated as primary care manpower shortage areas will also be considered designated as medically underserved areas (MUA's). Other areas which qualify using the Index of Medical Underservice will continue to be designated as MUA's, however, whether or not they meet the primary care HMSA criteria. To make the two lists identical would require significant changes in one methodology or the other, or both.

A second issue, which has not really been fully engaged in the process of designating shortage areas, is that of the difference between needs and demands for care. The criteria as they stand represent a compromise between the two, since the key population-to-practitioner ratio is basically a need factor, but the population is modified to reflect demands for and utilization of services. In general, our policy is to designate shortage areas based primarily on need, with the demand considerations to be taken into account in the process of considering applications to the NHSC for placement of personnel (or to BCHS for grant funds to be used in MUA's).

A related issue is that of adequacy vs. shortage. As discussed above, we use a designation ratio which is higher than the adequacy level, in order that Federal resources will be used only in those areas where the imbalance of supply and demand seems to result in high levels of unmet need. Adequacy or target population-to-practitioner ratios, lower than the designation ratios, are used by the Corps to determine staffing levels for particular sites. Areas worse than the staffing levels but better than the designation levels are not considered shortage areas, but are in a kind of gray area between shortage and adequacy. It can be argued that all areas which do not meet adequacy levels should be designated as shortage areas. We have not gone this route primarily for the reason already mentioned, but also because adequacy levels vary so much according to different observers. Resolution of this matter thus awaits a definitive study of adequacy levels together with a policy decision on the proper extent of the Federal role in inadequately served areas.

DATA NEEDS IN EVALUATING THE DISTRIBUTION OF REGISTERED NURSES

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Nursing personnel, in particular registered nurses, play a vital role in the Nation's health care delivery system. Data on the nursing profession are essential for effective planning and evaluation of health care services. This paper focuses upon data needed in assessing the distribution of nursing personnel and in particular registered nurses.

However, before engaging in the specifics, it is useful to provide working definitions of some key terms used throughout the report. First, the term "nurse population" refers to the number of nurses holding at least one current license to practice as a registered nurse. It might be noted here that nurses can, and an estimated 21 percent do, hold current registered nurse licenses in more than one State.[1] A "State nurse population" refers to the actual number of nurses working a State, if employed in nursing, plus the actual number of nurses residing in the State of those not employed in nursing. Similarly, the "county" or "SMSA nurse population" is defined as the actual number of nurses working or residing (if not employed in nursing) in the respective geographic area under study. It is of interest to point out that a recent ANA-HEW study showed that an estimated 2.5 percent of the nurses employed in nursing and 14.7 percent of those not engaged in nursing were located in States where they held no license to practice; however, these nurses did hold a current license to practice in at least one other State.[1] The "nurse supply" of an area is comprised of those registered nurses who are employed in nursing on either a full- or part-time basis. Finally, the term "requirements for nurses," quoting a recent article by Dr. Eugene Levine, is defined as the "nursing manpower necessary to provide nursing service to a population." Nurse requirements are measured by "demand, the number of nurses consumers will employ at various rates of compensation or by 'need', the number of nurses judged by professional standards to be necessary to attain a desired goal as, for example, 'safe, efficient, and therapeutically effective care.' "[2]

The perceptions about current supply and requirements are of particular interest when scrutinizing the distribution of nurses and defining the data needs. In viewing the distribution of nurses, it should be born in mind that the measurement of the supply, demand, and requirements may take different forms depending upon the definition used and assumptions made. Different conclusions might be reached even though supposedly objective approaches to measuring the problem were used. For example, one common way persons measure the proportion of nurses working in a particular State is to use as a base, or denominator, the total number of nurses who are both licensed by the State and located within the State. As alluded to earlier, because about 6.2 percent of the State nurse population will not hold an active license in the State, the proportion of nurses employed in nursing will be somewhat overstated if State licensure data alone are used. On the other hand, the use of individual State licensure data alone will undernumerate the entire State nurse population because these counts are devoid of the nurses who are not licensed in the State but are working (or residing) in the State.

Now, how do we assess what data are required on nurses? Let's take a look at the types of data currently collected and then point out the gaps. The collection of data on nursing resources, as currently organized, is undertaken by a variety of individual agencies and organizations, both governmental and private, whose organizational interests and goals govern the types of data collected. Health planning agencies, professional organizations, State and local governments and the Federal Government have all been involved in determining and obtaining needed information on nurses. One group in particular, the Interagency Conference on Nursing Statistics, or ICONS, comprised of Statisticians from the American Nurses' Association, the National League for Nursing, the Division of Nursing, the National Center for Health Statistics, the American Hospital Association, and the Bureau of Health Manpower, has as one of its major focuses to determine the data gaps in nursing and to stimulate the collection of the required data in nursing—at least at the national level. It is through these organizations that the majority of national data on nursing personnel have been collected.

Historically, national data on nursing personnel have been obtained from four direct sources. The first deals with studies of individual nurses; the second, with studies of the employers of nurses; the third, with studies of nursing educational institutions; and the fourth, with nurse licensure or registration data. Each type of study has value as each addresses different questions which are required in assessing the distribution of nurses.

The American Nurses' Association's inventory of registered nurses provides the sole source of information about the characteristics of all registered nurses. The 1977 Inventory of Registered Nurses is being conducted in cooperation with States participating in

the Cooperative Health Statistics System and through partial funding by the National Center for Health Statistics. Included in these Inventories are broadscale statistics on the demographic characteristics, employment status, and educational preparation of nurses. Being the most comprehensive source of national nurse resource data, the Inventory provides for elimination of duplicate State licenses and measures the actual number of nurses and their distribution throughout the country. The Inventory measures the distribution of registered nurses according to State, city, and county of employment (or residence, if not employed in nursing) and, hence, provides the only source of complete information on the State and local nurse population. For many reasons—too numerous for this report—the number of data items and the nature of the data items which can be elicited from the entire nurse population is limited. The ANA, working with the CHSS States, the National Center for Health Statistics and the Division of Nursing, has devised a "minimum occupation-specific data set for registered nurses." This minimum data set, an extension of ones used in previous inventories, is currently being collected in the 1977-78 Registered Nurse Inventory. In assessing the distribution of nurses at the State and local levels, it is important to know in what major types of settings the nurses are employed; what types of nursing positions they hold; what their major clinical teaching or practice areas are; what their basic educational preparation was; what the highest educational degree they now hold is; whether they are working in nursing on a full or part-time basis; and what distribution of demographic characteristics, such as age, sex, marital status and race, exists.

With respect to the raw counts of nurses, it is useful, but not sufficient, to examine the employed nurse-to-population ratios. Although simple population ratios are inadequate measures of need and demand for health manpower, they can serve as gross indicators of changes in nurse supply. It would be wise not only to examine the gross nurse-to-population ratios, but also to convert the part-time complement into full-time equivalents. A high number of part-time nurses in an area will consequently reduce the ratio and tend to be a gross indicator of shortage. Growth in the number of part-time workers may reflect the difficulty for employers to find full-time nurses for employment. The nurse-to-population ratios should also be viewed in terms of the number and types of health facilities in an area. Because the preponderance of nurses are employees, the substantial variations in the availability of employment opportunities across divergent geographical areas cause differential nurse-to-population ratios. Thus, the variation in nurse-to-population ratios for smaller geographic areas, such as counties, is likely to be widespread, merely due to the uneven distribution of health facilities.

Since the Inventories provide basic statistics on the fields of employment and the type of positions nurses hold, data on the distribution of nurses by major employer type can be obtained. Furthermore, it is possible, and essential, to scrutinize the distribution of nurses in an area according to type of position and highest educational preparation. It is projected that in light of society's increasingly complex health care needs and the increasing demand for more specialized care, educational preparation at the baccalaureate and higher degree level for nurses is becoming increasingly important. In fact, in 1965 the ANA took a position that the baccalaureate degree should be the basic credential for professional nursing practice. In this position paper two levels of nursing practice, "professional and technical," were proposed for implementation through legislative action in the various States by 1985.[3] A variety of questions related to the quality of nursing care have been raised; some propose that the qualitative deficiencies in care are a consequence of inadequate educational preparation of registered nurses, particularly for leadership positions. The rapid acceptance of increased responsibilities, technological advancements, and the generally anticipated move toward national health insurance, underscore the need for more nurses prepared for leadership roles and a reduction in the demand for less prepared nursing personnel. Hence, there is a dire need for continued collection of information on the educational preparation of nurses.

Furthermore, there is a need to identify the nurses in an area who have been prepared to function in expanded roles. Using definitions established by the ANA Congress for Nursing Practice, nurse practitioners have advanced skills in assessing the physical and psychosocial health-illness status of individuals, families, or groups in a variety of settings. They receive special training through formal continuing education programs that adhere to ANA approved guidelines, or through baccalaureate nursing programs. Data on the specialty preparation, employment setting, and type of reimbursement received for services are essential in understanding the distribution of nurses. While their numbers are relatively small at present (an estimated 9,120 nurses report "nurse practitioner" as position title),[4] the nurse practitioners with broad responsibilities in the area of primary care have a distinct and important independent role in health care.

Another way of evaluating the distribution of nurses is to review the activity rates of nurses by marital status and age. Comparisons of the activity rates of nurses can be made with the rates for all females and for females in selected occupations. Past studies have shown, for the U.S. as a whole, that the activity rate for all women was about half that for nurses. There is evidence that an expanding economy with readily available jobs will tend to encourage a greater number of women to enter the labor force. Although much of the increase in the nurse supply is a function of the changing age composition of the nurse population, it would seem that other factors, such as wage and general economic conditions, are also operating. A few years ago ANA staff evaluated some licensure statistics

with respect to the number of reinstated licenses in a particular State. It turned out that the general economic conditions in the State were extremely poor and, hence, many nurses were reactivating their licenses and returning to work. Generally speaking, past studies have also shown activity rates for single nurses, regardless of age, to be higher than those for married nurses. In addition, married nurses between 25 and 35 years of age show a general tendency to drop out of the labor force and re-enter after reaching 35 years of age. There is also a tendency for nurses to become inactive in nursing with advancing ages.[5]

Since there are distinct patterns of activity rates for nurses with respect to various characteristics, there is a clear reason to continue to collect these data. This would be particularly true if one were developing supply projection models for a geographical area, such as the one developed by the Research Triangle Institute, as reported in the publication *Trends in Registered Nurse Supply*.[6] Of course, if one were to use this approach, certain modifications would have to be made to the model because of deficient licensure data and the lack of interstate mobility data. The Division of Nursing is currently working on such a projection model for use by the Interagency Conference on Nursing Statistics in making its annual projections.

While only broadscale and limited information can be obtained from individual nurses through the Inventory mechanism, it was possible to develop a national sample of registered nurses under a contract with the Division of Nursing. Through a sample survey, a comprehensive set of information was obtained from over 16,000 registered nurses. National and regional data collected through this survey are presently being analyzed. In regards to State data, data for larger States are somewhat reliable; however, the majority of data for small States are subject to a fairly large sampling error. It may be fruitful in future years to increase the sample size in order to improve the sample estimates for some medium-and small-sized States; however, for certain States, including Alaska and Hawaii, a small improvement in sample size will not help the variance a great deal. From this survey, we are beginning to obtain indications about the mobility of nurses over geographic areas, employment settings, and position types. In addition, detailed income and family characteristic data have been collected in more depth to study the factors associated with the nurse supply. Finally, the sample survey allowed us the opportunity to look at major areas in which nurses spend time as well as frequency of performance of selected activities.

While these estimates are not applicable to small areas, the data from the sample is required to understand the total nurse population and its overall characteristics. The findings will enable persons at the local level to better understand their own data. For example, let's say the sample survey shows that, on the average, a nurse practitioner spends about 75 percent of the time involved in direct patient care activities. Local nursing groups who are trying to assess the number of nurse practitioners needed can use the information to plug into their requirements formulae.

A second example of the utility of this survey is that it substantiates the usefulness of marital status as a proxy variable for family income and family background in measuring nurse supply. It is much easier and more cost-effective to collect the one data item on marital status in an inventory of all nurses in the country rather than to ask a whole host of other questions related to the nurse's family background. Thus, certain national studies, while not producing reliable State and local area data directly, are necessary to understand the distribution of nurses by enhancing the interpretation of the information analyzed at the local level.

A third source of data obtained from individual nurses which is of potential value in assessing the distribution of nurses is the collection by the National League for Nursing of up-to-date descriptive information about the employment and geographic distribution of newly licensed nurses.[7] As the testing service for the Council of State Boards of Nursing of the American Nurses' Association, the National League for Nursing develops and administers the licensing examinations (known as the State Board Test Pool Examination). Hence, the names and addresses of new licensees are temporarily kept on file at NLN. For nurses obtaining a first license in one of 34 States in 1975, the NLN mailed a survey to obtain unemployment data, information on the difficulty experienced by the newly licensed nurse in obtaining a job, the number of job offers received, and other related questions which were designed to establish a mechanism for measuring equilibrium between supply and demand. This approach is quite unique in helping to assess shortage or surplus of nursing personnel by geographic area and level of basic educational preparation.

The second portion of my talk today deals with data obtained from employers of nurses. In order to obtain more detailed and diversified information needed to assess both significant changes in the use of nursing staff in a wide variety of employment settings and certain economic data, studies presenting personnel data in terms of facilities, characteristics, and uses are most valuable. Detailed statistics of this nature can only be generated through special studies of employers of nurses.

Since hospitals continue to employ the greatest number of registered nurses, some of the most valuable studies of nursing personnel are those in which the hospital sector is scrutinized. In the past, much data were consistently available on nursing personnel in hospitals through a joint American Hospital Association-Division of Nursing DHEW biennial survey.[8] Data on the number of full-and part-time registered nurses by type of position within the Department of Nursing Services and throughout other departments enabled us to obtain a better fix on the ratios of

bedside nursing personnel per 100 average daily patients and per beds among the various types of hospitals, on a State-by-State basis.

Data from the NCHS Master Facility Inventory obtained in more recent years were not useful substitutes, however, because of the need to isolate the staffing patterns and levels of nursing personnel in various parts of the hospital, such as intensive care, outpatient units, emergency room, etc. We need to know the trends in staffing levels and patterns in hospitals and the changes occurring to affect staffing patterns of nursing personnel, including registered nurses, licensed practical nurses, aides, orderlies, and attendants, provided in a hospital or nursing unit. The amount of nursing personnel per patient unit is the "staffing level" expressed in a ratio either of nursing hours per patient day or of number of personnel per patient. In an article on "Trends in Staffing of Hospitals: Implications for Nursing Resources Policy," Dr. Myrtle Aydelotte reported that "hospitals have gained more expensive and more sophisticated equipment which, instead of reducing the number of staff required, intensifies the need for more. There is an accompanying increase in the volume of supplies and supporting equipment required by the sophisticated technology. A few selected specialized services in hospitals illustrate the recent program changes which necessitate high levels of staffing and a high proportion of registered nurses. There has been a striking growth in the number of hospitals providing intensive care, abortion services, renal dialysis, burn care, cardiac care, and many other types of specialized units."[9] The analyst of hospital staffing data should be aware that staffing patterns and level are associated with a host of other variables, as Dr. Aydelotte pointed out in her article, such as "scale of operation, occupancy rate, technology and type of facility, services, length of stay, purpose, supply, funding sources, admission rates, and many other complex variables reflecting organizational and community characteristics."[9] In addition, she further pointed out that four major changes are occurring in nursing which have strong implication for manpower policy. These are "1) the increased specialization of the registered nurse group; 2) the introduction of primary nursing care as an organizational mode for staffing; 3) increased educational requirements for entry into practice; and 4) the restructuring of the functional relationships of nurse personnel."[9] There exists a need for specialized data to assist in understanding these changes in the nursing role.

Other data which are collected by ANA from employers, some of which are published in *Facts About Nursing*,[10] are information related to salary level paid to registered nurses in different areas of the country for the various employment settings and types of positions nurses hold. These data are relevant to the study of distribution of nursing resources. Bognanno defines an economic shortage of nurses, for example, as the gap "between the amount of nursing resources society is willing and able to hire at a given wage rate (demand), and the amount of nursing services society is offered at that wage rate (supply), other things constant."[11]

For the hospital and nursing education sector, ANA periodically collects data on budgeted vacancies and turnover.[12 13] Budgeted vacancies are used as an indicator of unmet demand. If we are willing to assume, in an economic sense, that budgeted positions represent the amount of personnel the public is willing to support, unfilled vacancies can be said to reflect current unmet demand or shortage. The decline in the vacancy rate thus indicates either a smaller total number of budgeted positions or a greater proportion of filled positions. In either case, a shrinking vacancy rate may indicate a general tightening of employment opportunities for nurses.

There are problems of distribution among the various employment settings and within employment settings which cannot go unnoticed. For example, while there may appear to be a numerical abundance of registered nurses in an area, it is plausible that one sector, such as nursing homes, could have a shortage. Within a hospital, while there is an ample supply of registered nurses available for the day shift, the night shift may be "short" on qualified nursing staff.

The third major section of this presentation revolves around data on nursing education for use in understanding the distribution of nurses. Each year the National League for Nursing compiles data on the admissions, enrollments and graduations from all nursing educational programs. In addition, the NLN provides an annual publication delineating each school of nursing and its programs, the number of nonnurses entering each type of program, and the dropout rate for each type of nursing program are indicators of a surplus or shortage of nurses.[14] The number of graduations program type are also useful in supply projections.

The final portion of the presentation pertains to the needs for continuous data on licensure to practice. Licensing of health occupations is a function of State government. The requirements for nurse licensure are established by each State's nursing practice act, which is administered by the State Board of Nursing. State boards of nursing are organized either as independent bodies in the State government or within a department of State government. State boards of nursing administer the nursing practice act by establishing minimum standards for approving basic nursing educational programs, determining by examination applicants' competence to practice nursing, and issuing licenses to qualified applicants.

Graduates from initial nursing educational programs must pass the licensing examination administered by the State boards as one of the requirements for licensure. Through its annual survey to the State boards of nursing, the ANA collects information on the number of persons issued a first U.S. license. The preponderance of first licenses are issued by the examination process; however, a small percentage

(less than one percent in 1975) were issued to foreign nurses on the basis of a license or certificate from a foreign country." [15]

Since the boards have established precedures that allow nurses with licenses in other States to obtain a license through endorsement, statistics are provided to the ANA on the number of licenses issued to nurses previously licensed in another State. A word of caution, however—just because a nurse picks up a license or renews it, a State cannot be inferred to provide any information on mobility. Almost one-fifth of the licenses in the country issued to nurses are duplicates. The State boards also provide ANA with counts of reinstated licenses, if such figures are kept, and the renewals for the year.

The data on licensure from the State boards are also used to provide some information on the number of foreign nurse graduates licensed in the U.S. It is probable that foreign nurse graduates migrate into areas where they are more likely to find suitable employment opportunities and areas where foreigners are accepted. The extent to which this is the case is another indication that a numerical shortage of nurses may exist in an area. One area where data is needed is on the numbers and distribution of foreign nurse graduates who have entered the country but who are not licensed. The extent to which the foreign nurse graduate who is not licensed in the U.S. is utilized by hospitals and other health agencies to substitute for the American graduate nurse is unknown; however, this has marked implications for the nursing profession.

In the few minutes I have had the opportunity to speak with you today, I have attempted to provide some insights into the broad areas where data are needed and the types of data needed to assess the distribution of registered nurses. It is the intent of this report to depict that the nursing profession is indeed complex and, hence, "a nurse is not a nurse is not a nurse." This should be kept in mind whenever an assessment of the distribution of nursing personnel is made. Not only is the overall geographic distribution of registered nurses important, but also it is important to have a sufficient number of nurses with adequate educational preparation to function in the various nursing roles. On the other hand, it is important to have information on the numbers, distribution and characteristics of licensed practical nurses and the trends in their distribution.[16] In nursing, this addresses the issue of a qualitative shortage of nursing personnel. Qualitative as well as quantitative aspects of nursing are implicit in all planning for health care. Indicators of both are essential data requirements.

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DISTRIBUTION AND MALDISTRIBUTION OF RESOURCES

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Discussion after Dr. Hadley's Presentation

In creating a production function that relates health as an output from an input of resources (including physician supply), the amount of health that could be marginally produced would be estimated by the same function for any geographic area. The problem of differing sizes of areas is avoided because there would be different production functions that would estimate a group's (e.g., age-sex specific) current level of health as a function of an area's currently existing resources. Moreover, a production function that is group-specific could also be created for various specialties. An area's overall level of estimated health that is currently being produced could be derived from a composite of the estimated produced health for the various characteristic-specific groups. However, it may be more advantageous to view different size areas when estimating services provided by primary practitioners as compared with those provided by specialists. In other words, it may be beneficial to disaggregate physicians' services according to specialty, perhaps considering each specialty's distribution for areas of different population size.

The production function is not linear, but rather, it is a translogarithmic function. This form has been used in a number of previous production function studies.

Discussion after Dr. Gittelsohn's Presentation

In answering the question of why there are few indices of ambulatory care, an important component of a physician's practice, it should be realized that this phase of the research has lagged behind that pertaining to the hospital data.

In reply to a question regarding whether or not some physicians had offices outside their county of residence (which would result in a distortion of the meaning of the supply of physicians for a given county), it was pointed out that there was little overlap between the fairly large area examined in the study.

It is difficult to deal with patient discharge data for small area planning, because a large portion of patients are not local. An example of this phenomenon is given by the fact that only 25 percent of the individuals using hospital services at Johns Hopkins were from the surrounding Census tract.

Discussion after Dr. Rockoff's Presentation

In regard to discrepancies between Medically Underserved Areas (MUAs) and critical shortage area designations, it should be realized that there is no clear answer. The MUAs are used as rough cuts. A solution to the designation problem might be the existence of disaggregated data that could subsequently be used for programmatic intervention in small areas.

In making designations for the Rural Health Initiatives, exceptions are sometimes made for rural areas which, because of a large city in the same county, are part of an SMSA. San Bernadino is a good example of an area that was designated for the Rural Health Initiative, because of its large rural portions, despite being in an SMSA.

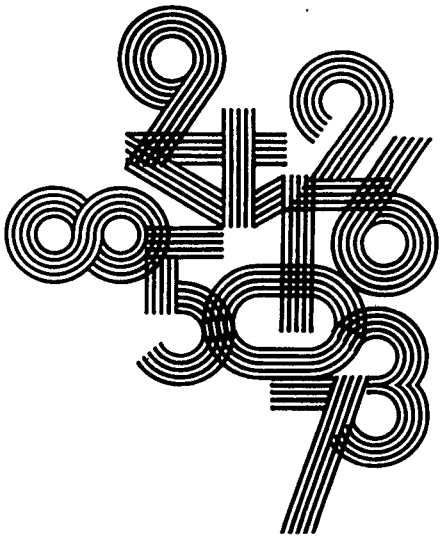
In answering the question of what channels the HSP or HSA can take in order to reach the decision makers, the HSPs and HSAs should contact the appropriate regional office.

The infant mortality designation produced differences that were reliable because they were based on infant mortality for the State Economic Areas (SEAs). The SEAs were aggregated at a large enough level in order to produce robust estimates.

The comparison of counties by characteristics of access (e.g., travel time, cost of care, distance, etc.), needs to be done more. Various aspects unique to the specific geographical areas such as access (that could be, for example, based on a spatial-effect choice model that is used by geography) could be included. However, more research is needed in these areas before such approaches can be used for designation purposes.

Discussion after Mr. Lee's Presentation

The question to be addressed is that of the rationale employed in adding extra criteria for the designation of urban shortage areas. The use of fertility rates is justifiable, insofar as high fertility rates imply a greater demand for services. The use of poverty as a measure can be supported due to its relationship with economic access. In fact, the expressed intent of Congress with the creation of the National Health Service Corps was to address the lack of access to medical care that accompanies poverty.



CONCURRENT SESSION B

The State or Local Area Health Interview Survey

THE ROLE OF HEALTH INTERVIEW DATA IN PLANNING

Roger Kropf, Ph.D. *Center Associate, Alpha Center for Health Planning, Dewitt, New York*

Health interview surveys now serve two primary purposes in this country: First, they provide information on the use of the medical care system that we cannot as yet obtain from the organizations and individuals who provide medical care. Secondly, they provide information about the health, attitudes, and other characteristics of people regardless of whether they use the medical care system at all. I make this distinction because it is clear that health interview surveys will have to change as our ability to capture information from medical care providers improves, yet they will always be needed to provide information on *all* the people whose needs we are trying to plan for. I would like to outline some of the present needs of planners for health interview data and at the same time discuss what changes the future is likely to bring. I should also remind you that few State and local planners have data from interview surveys, so that we are really dealing with the potential uses of health interview data rather than the role such data now plays in most State and local planning agencies.

HEALTH SERVICES UTILIZATION

Despite the growth in third party payment for medical care, planners at the State and local level usually know very little about the use of health services in the areas for which they must plan.

A common task that health planners are asked to perform is to determine the need for acute hospital beds, an especially critical task given the current extraordinary increases in the cost of hospital care. Forgetting for the moment about the need for *projecting* the use of services in the future, how can the planner learn what current utilization is? Since most States have yet to implement a UHDDS or similar discharge data system, the planner can at best learn from hospitals their number of admissions and days of care provided and proceed to calculate occupancy and length of stay.

The data in table 1 from an HSA in New York State is actually more than most health planners have available to them. Because of a special 1-day patient origin study, this agency was able to adjust the number of discharges and patient days to reflect movement across county lines. Without such studies, the volume of services actually being used by people in the individual cities, towns, and counties for which health plans are developed cannot be determined. Especially in large metropolitan areas, where service areas are complex, planners must focus only on the extent to which each hospital's assets and personnel have been efficiently used. What is really needed is information on the hospital days and services being used by distinct population groups, defined either geographicallv or according to social, demographic and economic characteristics known to be related to need and access to care.

Even when hospital discharge data becomes available to most planners, health interview surveys will have a role to play. They will be needed to determine the significance of differences in utilization. There is and will continue to be a critical need to know whether those groups using more or less care are doing so because of differential access to services, their ability to pay for them, health practices or knowledge or the use of care outside of the hospital.

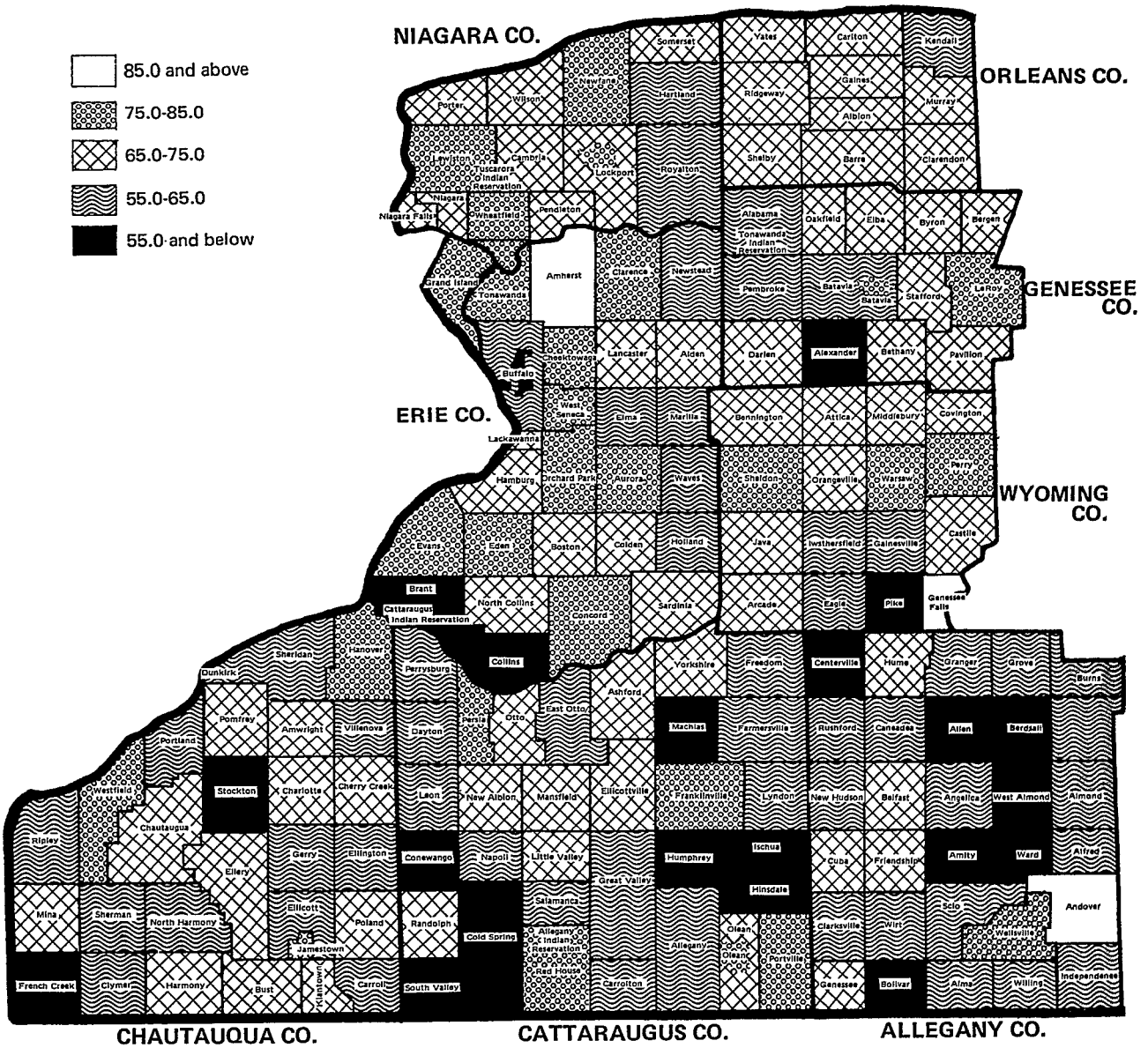
A similar and more serious problem exists in determining the use of services outside of hospitals. The percentage of third party payment for outpatient care is much smaller than for inpatient care. Data generated to substantiate claims for payment for outpatient care covers a smaller part of the population. Regulation has proceeded more slowly so that providers have had fewer inducements to generate profiles of the patients they serve. It is likely to be a much longer time before we will obtain data on, for example, physician visits and home health care services that would document differences in the use of services at the State and local level. National health insurance would help, of course.

Health planners are now forced to rely on indices of the use of services outside of hospitals rather than direct measures of such utilization. Map 1 from the health plan of another Health Systems Agency shows the use of an "Index of Medical Underservice." It combines data on the ratio of primary care physicians to population, the percent of the population over 65 and below the poverty line, and the infant mortality rate. This index was developed for the HMO program under a Federal grant.

The absence of data on the utilization of services might at first seem an unfortunate fact of life for health planners, but something of little consequence for the rest of us. I would like to remind you what the absence of this information means.

Equity.—We now have little understanding of the equity of our current system of developing and paying for health services. A look at Medicare reimbursement data shows dramatic differences in the dollars we spend for health care in different States and regions of this Nation (table 2). While differences in unit prices explain some of the disparities, it is clear that some individuals are receiving more services than others. If

INDEX OF MEDICAL UNDERSERVICE
WESTERN NEW YORK REGION



Source: Health Systems Agency of Western New York, *Health Systems Plan* (April 1977)

Table 1

FROM: Hudson Valley HSA, *Proposed Health Systems Plan* (December 1977).

HUDSON VALLEY HEALTH SYSTEMS AGENCY

TABLE AC.5 Beds, Patient Days and Discharges per 1000 Population, 1975 HSA Region and U.S.

	TOTAL ESTIMATED POPULATION 1975	GENERAL CARE TOTAL DISCHARGES (EXCLUDING NEWBORNS)				GENERAL CARE PATIENT DAYS			
		Total Discharges	Adjusted Total Discharges[1]	Discharges per 1000 Population	Adjusted Discharges per 1000[1] Population	# of Patient Days	Patient Days per1000 Population	Adjusted Patient Days per 1000 Population[1]	Average Length of Stay
DUTCHESS	233107	27245	27417	116.9	117.6	225396	966.9	973.7	8.3
ORANGE	244360	40785	40537	166.9	165.9	312772	1279.9	1267.1	7.8
PUTNAM	67917	7463	7831	109.9	115.3	57454	845.9	891.6	7.6
ROCKLAND	252777	28293	31423	111.9	124.3	214772	849.7	955.1	7.9
SULLIVAN	61553	10623	12759	172.6	207.3	95494	1551.4	2089.7	9.3
ULSTER	156357	19532	23216	124.9	148.5	163879	1048.1	1295.5	8.1
WESTCHESTER	889612	109740	106137	123.4	119.3	1006688	1131.6	1085.2	9.4
REGION	1905683	243681	249962	127.9	131.2	2076455	1089.6	1125.6	8.3
U.S.	213450000			156.1*			1218.0		7.7

[1] Adjusted discharges were arrived at in the following manner:

a. Discharges were reduced by the proportion of out-of-county residents hospitalized in each hospital according to the Blue Cross Blue Shield One Day Inpatient census of 1975.

b. Discharges were increased by the proportion of county residents who were hospitalized elsewhere in New York State according to the Blue Cross Blue Shield.

The adjusted patient day per 1000 population reflects the proportional change between the discharge rate per 1000 population and the adjusted discharge rate per 1000 population.

SOURCE: New York State Economic Development Board, *Population Projections,* March 1, 1976.
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*U.S. Department of Health, Education, and Welfare, *Utilization of Short Stay Hospitals Summary of Nonmedical Statistics United States,* 1973.

Table 2

	1974 Medicare reimbursement per enrollee 65 and over		1974 Short-stay non-federal hospital beds per 1,000 civilian population (excluding psychiatric)
	Part A&B	Part A	
Northeast	$ 544	$ 401	4.56
South	$ 395	$ 287	4.26
New York	$ 623	$ 457	4.77
Arkansas	$ 316	$ 220	4.50

SOURCE: National Center for Health Statistics, *Health, United States, 1976–1977,* Tables X, 127, 145.

planners are unable to detect and explain these differences by examining both consumer and provider characteristics associated with them, they face the danger of approving the development of additional medical care resources in such a manner as to increase the current inequities.

Need.—Need is as important as equity. I will discuss a little later the problems involved in defining need in terms of health status given our current data base. Assuming that need is simplistically defined as the use of services equal to the average for a particular planning area, most Health Systems Agencies would still be

Table 3A. NATIONAL GUIDELINES FOR HEALTH PLANNING

Standards Respecting the appropriate supply, distribution and organization of health resources:

General Hospitals–Bed Supply

"Less than *four* non-Federal short-stay hospital beds for each *1,000* persons in a health service area except under extraordinary circumstances."

Adjustment Factors:

1. Over 65 more than 12% of population
2. Seasonal variations in demand (e.g., migrant workers)
3. Rural areas—access within a reasonable period of time (e.g., 30 minutes)
4. Urban areas—greater ratio in some areas if entire SMSA meets standard
5. Beds used by referred patients who reside outside both the SMSA and HSA

Table 3B

General Hospitals–Occupancy

"An average annual occupancy rate for medically necessary hospital care of at least *80%* for all non-federal short-stay hospital beds considered together in a health service area, except under extraordinary circumstances"

Adjustment Factors:

1. Seasonal population fluctuations
2. Rural Areas—significant number of small (less than 4,000 admissions per year) hospitals, more beds needed to accommodate fluctuations in admissions.

Additional Standards For:

Obstetrical services
Neonatal special care units
Pediatric inpatient services
—Number of beds
—Occupancy rates
Open heart surgery
Cardiac catheterization
Radiation therapy
Computer tomographic scanners

SOURCE: *Federal Register,* March 28, 1978, Part IV.

unable to define what parts of their regions were in need of most health services. Need is generally being defined, as the National Health Planning Guidelines demonstrate (table 3), in terms of the volume of services being provided by hospitals and other health care providers, not in terms of the amount of care that people actually receive.

The designation of health manpower shortage areas by the Federal government is an important example of where our current lack of knowledge is likely to lead us in the allocation of health care resources.

The Health Professions Educational Assistance Act of 1976 required that DHEW designate health manpower shortage areas across the United States. Designation as a shortage area brings a number of benefits, including eligibility to receive National Health Service Corps physicians, and a greater likelihood that some physicians will locate in the area because a portion of their Federal education loans will be forgiven for service in a shortage area. The Senate report on this bill expressed dissatisfaction with criteria used in the past that focused on the physician-population ratio. Faced with a Congressional mandate to designate service areas across the country, DHEW applied a basic ratio of one primary care physician to 3500 people to designate shortage areas. In a letter to the Nation's Health Systems Agencies and State Planning Agencies, DHEW urged that planning agencies examine any data they had that would suggest whether these or other areas in fact faced a shortage of primary care manpower.[1] The criteria that a planning agency can use to substantiate that a geographic area with a ratio of between 3000:1 and 3500:1 is a shortage area are presented in table 4.

[1] January 17, 1978 memorandum from Directors, BHPRD and Bureau of Health Manpower on the Designation of Health Manpower Shortage Areas.

Table 4. CRITERIA FOR PRIMARY MEDICAL CARE MANPOWER SHORTAGE

B. Criteria to be applied to service area:

1. Basic ratio of population to number of primary care physicians to indicate shortage is 3,500:1
2. Shortage ratio can be further reduced to 3,000:1 if either (A) or (B) below is applicable:
   - (A) Unusual high needs for primary care, as measured by one of the following:
     - I. High fertility rates, more than 200 births per 1,000 women aged 15–44, or 40 births per 1,000 women aged 13–17
     - II. Infant mortality is greater than 20 per 1,000
     - III. More than 30 percent of population (or of households) below the poverty level
   - (B) Insufficient capacity of existing primary care providers, as measured by any two of the following:
     - I. More than 8,000 visits per year per physician
     - II. Unusually long appointments waiting times—7 days for established patients and 14 days for new patients
     - III. Excessive average waiting time at providers' office—more than 1 hour if appointment and more than 2 hours if first-come, first-served
     - IV. Excessive use of emergency room facilities for primary care
     - V. 2/3 or more of area physicians do not accept new patients
     - VI. Low utilization—2.0 or less visits per year

SOURCE: BHM/OPD/MAB, November 1977, Report No. 78–13

While the first three criteria involve the use of readily available data, the validity of infant mortality and poverty status as indicators of medical underservice has been questioned by Kleinman and Wilson.[2] Data on four of the six criteria concerning insufficient capacity could be obtained through health interview surveys. These Federal criteria were developed because the supply of physicians is clearly inadequate as an indicator of unmet demand or need. Without improved access to information on *consumers*, planners are forced to rely on information concerning the production and efficiency of the *providers* of health care to make resource allocation decisions. In order to reduce inequities in the availability of health services, planners will need both information from providers and health interview data directly from all of the population to be served.

HEALTH STATUS

Most State and local health planners have little information on the well-being of the people they serve. Estimates of the prevalence of chronic illnesses are usually not available, let alone data on the ability of individuals to function in the roles they would like to hold in society—whether that be as a factory worker, student, or professional. Death records have been the planner's primary source of information, and great strides have been made in the use of such information as indicators of the success of the medical care system in at least assuring individual population groups of the life span that is attained by others. Expected mortality ratios, numbers of preventable deaths and years of life lost are common health status indicators in the health plans in the DHEW region in which I work.

Health interview data could play a role in expanding the analysis of health status used in planning. The prevalence and incidence of specific chronic or acute conditions could be estimated, and some information obtained on the limitations in function they create. Because health interview surveys provide information on the entire population rather than just those who utilize medical services, they will be needed to provide this data even when our access to provider records is improved. Rather than just examining the use of services among similar demographic, social and economic groups, we can add the dimension of level of functional ability and presence/absence of chronic or acute conditions to the study of who uses health services.

I do not want to minimize the problems involved in linking the use of health services to health status, or of defining functional ability. I only want to emphasize that our ability to determine, for example, the number of individuals with interference in functioning due to arthritis or blindness who are not receiving social or medical assistance is now close to zero. Health Systems Agencies are now being asked by the Federal government to review and approve the expenditures of most Federal grant funds other than research. Their ability to determine the need for a range of medical and social services to the non-institutionalized population in their regions requires information that only health interviews can provide. In their health plans, HSA and State planners are being asked by the Federal government to state what the priorities are for the development of health services. Without an understanding of what health problems exist, among what population groups and in what locations, such priorities will merely reflect the extent to which medical care providers, pressure groups and the media have brought attention to a problem.

[2] Joel C. Kleinman and Ronald W. Wilson, "Are 'Medically Underserved Areas' Medically Underserved," *Health Services Research* (Summer 1977), pages 147–162.

NATIONAL POLICY AND STATE/LOCAL DECISION MAKING

I hope we can all begin to take more seriously the problems involved in delegating to the State and local level decisions on the size, type and location of medical services in the absence of information on the use of health services and health status of the populations residing in the areas to be served. Just as the development of national policy requires the determination of what problems exist and for whom in order to draft legislation and determine overall spending levels, the allocation of those resources at the State and local level requires similar knowledge, but about the neighborhoods, towns, cities and counties for which plans must be developed. We definitely must consider less costly means of obtaining information directly from individuals. We also need to improve access to information already held by hospitals and other providers and to encourage them to incorporate information now collected through interviews into their regular data collection systems. But just as the political and business communities have learned the value of the personal interview in marketing a product or winning an election, the Federal government and the health planning agencies it supports will have to recognize the utility of interviews in allocating the billions of dollars we now spend on medical care and the necessity of bearing the expense of carrying them out.

Before dismissing the idea that health interview data can be provided to State and local planners because of high costs, I hope we consider the alternative approaches that will be discussed in more detail later in this program. We can learn a great deal on the telephone in less than a half-hour about the attitudes and other characteristics of the American voter, as many candidates for political office will testify. We can also learn a great deal about where to place a clinic or a hospital, about why health services are used and who uses them in order to reduce inequities in the allocation of our health care resources.

THE VIRGINIA STATE—LOCAL HOUSEHOLD HEALTH INTERVIEW SURVEY AS A DATA SOURCE

Frank H. Mays, *Executive Director, Southwest Virginia Health Systems Agency, Inc., Blacksburg, Virginia*

INTRODUCTION

The National Center for Health Statistics (NCHS), within the U.S. Department of Health, Education, and Welfare, has since its inception been conducting a continuing Health Interview Survey based on a national sample of the population to obtain information that would facilitate development of estimates of prevalence and frequency of health problems with a high level of confidence on a regional and national basis. There is discussion of expanding the national health interview sample to 90,000 households, twice the present national sample size of 45,000 families (or approximately 120,000 individuals). Although this sample is fairly large, it is inadequate for the preparation of State or local estimates of health status and well-being across the broad population of a State or locality. Health systems planners at the State and local level in Virginia have developed a cooperative health interview survey project on a statewide basis. The interested parties drew on the considerable experience and expertise of the National Center for Health Statistics in developing the specifications and survey instruments for the project.

Early in 1976, Virginia Health Systems Agency representatives, the State Health Planning and Development Agency, and the Virginia Center for Health Statistics began meeting as a Data Task Force under the sponsorship of the Virginia Health Statistics Advisory Council. In the process of inventorying and determining availability of various health data items, statistics, and information of use to health systems planners, the Task Force identified certain inadequacies in the health data and statistics systems in Virginia. Primary among these was the absence of any health status information on family units. This kind of data is usually available only through household interviewing. From a defined universe of households, sample surveying will provide a wide variety of information on perceived health problems; chronic diseases; disability due to accidents and illnesses; utilization of health and medical services; and some expression of the accessibility, availability, cost and quality of such services. With the fragmentation of the health and medical care system, central data banks are virtually non-existent within States where comprehensive information can be obtained on the life experiences of individuals or family units in seeking and receiving health and medical care, and information on the range of health problems experienced by family unit or individuals. Health information obtained from households is without doubt essential for those responsible for health systems planning and development at present and in the future, and sample surveying provides a cost-effective means for obtaining accurate data at a fraction of the costs that would accrue in conducting a complete enumeration.

The Virginia Health Systems Agencies (HSA's), the State Health Planning and Development Agency (SHPDA), the Virginia Statewide Health Coordinating Council (SHCC), and the Center for Health Statistics of the Virginia Department of Health (VCHS), are participating jointly in the development and execution of a statewide household health interview survey and have pooled sufficient monies to conduct a survey of approximately 5,000 households in Virginia; to compute and tabulate the results; and to develop an analytical report of findings with regard to the health status of Virginians and also provide information concerning their knowledge and utilization of the health care system in Virginia. This project did not develop overnight; it required a lot of meetings between January 1977 and September 1977 with the immediate outcome being a signed contract with Research Triangle Institute in North Carolina to do all those things necessary to launch and complete the project within the expected time frame we had all agreed upon.

STAGING OF THE PROJECT

A cooperative household health interview project on a statewide basis is not an easy task to undertake, and such a project is expensive. Health system planners in Virginia had some misgivings about whether it could be done as the discussions began in January 1977, and the risks seemed greater than the benefits at times. As Chairman of the Health Data Task Force, my role was to bring the different parties together and decide on ways and means for filling an identified data void if we could develop a pool of money to pay the costs. We were all in agreement that the project costs would be prohibitive if each of the six official planning agencies in Virginia tried to go it alone, and there would probably be no basis for comparative analysis even if we were able to finance an HHI project in each health service area. The key elements in staging the project therefore were as follows:

1. Obtain formal agreement in principle from the HSA's and related State agencies on the conceptual framework and need for the project.

2. Obtain formal resolutions from all parties to contribute to a funding pool to pay costs of the project. (Although actual costs were not known at the time, it was projected that costs for the HHI survey would range between $250,000-$400,000.) The formal resolutions would be to commit unexpended funds at the end of each agency's project year. A "go—no go" decision would have to be made later when actual project costs were known.
3. All of the agencies making a commitment to pool funds would meet under the auspices of the Virginia Center for Health Statistics and develop a survey instrument that would be agreed on. The participating agencies agreed, from the beginning, that the technical assistance and experience of NCHS specialists would be of paramount importance.
4. A mechanism for holding the pooled funds to pay the costs of the project needed to be identified and a determination made by HEW that the mechanism was acceptable, because the largest portion of the funding would be HSA-SHPDA grant money from HEW.
5. Survey research firms most experienced in health interviewing should be identified and requested to submit a proposal once the survey instrument and relative sample size was decided.
6. An agreed upon objective was that at least 5,000 households in Virginia should be surveyed (approximately 1,000 households in each of Virginia's five health service areas) and that data should be compiled and tabulated along the boundaries of the five health service areas to enable some comparison and contrast studies. NCHS specialists felt that this number would be a representative sample and would yield reliable information on key variables with a relative sampling error of no more than 10 percent. In addition to aggregations of data by health service area, there should also be a statewide aggregation in the final report.
7. Establish a Virginia Health Interview Council composed of HSA, SHCC, SHPDA, HEW, NCHS representatives with the following purposes and responsibilities:
   a. to develop a contract to be executed between the Bureau of Vital Records and Health Statistics (VRHS) and the independent survey research group which shall be approved by the VHIC prior to execution,
   b. to develop a work schedule in cooperation with VRHS and the survey research group, with work schedule to become an addendum to the contract upon approval by the VHIC,
   c. to determine the amount of analysis and assessment of health status which shall be done by the survey research group,
   d. to determine what analysis, if any, shall be done by VRHS after the computer tapes have been turned over upon completion on the project, and
   e. to provide, on at least a bi-monthly basis, monitoring and evaluation of progress being made by the survey research group towards satisfactory completion of the contract.

Further, VHIC and VRHS were to be guided by the following precepts:

   a. the survey and sample size shall be such as to enable area distinctions, comparisons, and contrasts to be made within and between the five health service areas, designated by the Governor of Virginia, and
   b. the survey results shall be such as to allow total population baseline estimates of key variables with less than 10 percent relative error in each of the five health service areas.

OUTCOMES

The Virginia Household Health Interview Survey project became a reality approximately nine months after detailed discussions began among the more than half a dozen agencies involved in health planning in Virginia.

All five HSAs and the Virginia SHPDA provided sufficient funds to finance the project through a funding pool administered by the Virginia Center for Health Statistics, Virginia Department of Health, and we did agree on a survey form and sampling design. From the attached time table, one can see that the project began on September 14, 1977, and is due for complete wrap-up by mid December 1978. (Attachment I) The contract cost is $349,481 and Research Triangle Institute in North Carolina is the contractor. (A copy of the contract with RTI is available on request from Deane Huxtable, Director of the Bureau of Vital Records and Health Statistics.) I should point out that the costs of any similar surveys that may be done in other States would vary somewhat, and would be determined by such characteristics as geographic size, sample size, the required survey procedures, and the content of the questionnaire to be used.

The total sample size chosen by RTI was 6,269 households, or responding units, and now that household interviewing is complete, except for some call-

backs, RTI anticipates that the final response rate will be 90–91 percent RTI has described the Virginia HHI response rate as extremely gratifying in view of increasing difficulties in achieving high response rates in recent years.

A key element for monitoring progress and follow-through on the project is the Virginia Health Interview Council (VHIC), comprised of representatives from the various agencies participating in the project (See Organizational Chart, Attachment II). I also serve as Chairman of the Virginia Health Interview Council at this time. As indicated earlier, Council's duties and responsibilities include:

1. Advising VCHS on the terms of the survey contract initially and on an on-going basis.
2. Development of an on-going publicity and public information campaign throughout Virginia. Representative news releases and a logo for the project used widely during the interview phase follows (Attachment III).
3. Final decisions made in sessions with the contractor on tabulation and cross-tabulation of the data from survey.
4. Review, comment, and acceptance of the final report and computer tapes from the contractor.

SUMMARY OF DATA ITEMS IN THE VIRGINIA HEALTH INTERVIEW SURVEY

A summary of the data set is found as *Attachment IV*. The major sections of the survey form will be discussed at this time, as well as discussion of the relevancy of the data obtained to health systems planning in Virginia.

In addition to general information on household members included in the survey and other information required by the interviewers, the following sections on health related matters are included:

1. Dental Care
2. Doctor Visits
3. Limitation of Activity
4. Conditions
5. Hospital/Nursing Home Stays
6. Health Insurance
7. Environmental Stress & Health Service Utilization Patterns
8. Sample Person Interview—Life Styles, Habits and Practices

Dental Care.—The questions in the dental care section are designed to tell us more about availability, accessibility, and acceptability of dental care. Health planners in Virginia are most concerned about family attitudes concerning dental care, as well as spatial distribution of dental care resources. This information would be most valuable in planning for dental health education programs in health service areas, and to apprise dentistry professionals of perceived problems in obtaining dental care.

Doctor Visits.—The primary focus of this section is on primary care by medical doctors and associated health and medical care professionals. The questions are designed to determine intervals in receiving medical care, to determine if there is any trend toward seeing more than one physician for the same problem, and to determine settings in which care was received.

Limitation of Activity.—The questions in this section are designed to give more information on prevalence and incidence of limited activity and functional disability in households, as well as in age groups within households. This kind of information will be most valuable to us in planning for expansion of institutional services, home health services and other non-institutional services.

Conditions.—Designed to obtain information on some 49 medical conditions or functional disabilities, this section will enable us to make more precise prevalence and incidence estimates within the health service area. More detailed information in this section will be helpful in developing more specific planning goals and objectives for services.

Hospital/Nursing Home Stays.—This section is designed primarily to determine patient origin, in-migration and out-migration patterns of household members who have experienced a hospital or nursing home stay during the previous year. Also, information is obtained on source of payment for these stays and the follow-up care patterns prevailing in the health service area. Again, this is most valuable information for reference in planning hospital and nursing home configurations for the future.

Health Insurance.—This section provides for a more detailed investigation and analysis of health insurance coverage held by the health service area's population, and is most helpful for precise estimation of the percentage of population covered by insurance by types. Planners must have more than national or statewide information on populations covered by health insurance. The kind of information obtained by HHI will help the HSAs focus more sharply on certain insurers, and devote more time to working with insurers on benefits, closer monitoring of claims, and development of insurance policy statements on minimum or basic benefits that should be provided by health insurers within the health service area.

Health Service Utilization Patterns and Environmental Stress.—This section of the survey is designed to produce information on stress situations encountered during the past 12 months, i.e. family member death, divorce, relocation, job change, unemployment, legal or financial problems, births or adoptions. Also, questions are asked to determine from whom persons first seek advice about medical or emotional problems. This may be an M.D. or it may be people in the community whose involvement in primary medical care is peripheral or non-existent. All this information will be help-

ful in determining how to structure community health education programs for population clusters within the health service area, and to determine what other kinds of persons to bring into the health systems planning process who may not be participating at the present time.

Sample Person Interview.—Within each household surveyed, an average of one sample person will be identified, and more in-depth questioning will be conducted to offset recall problems when one person is trying to recall experiences of all household members. These questions are designed to obtain individual perceptions on availability, accessibility, and acceptability of routine medical care, and associated problems. Life styles, habits, and practices of that sample person are also scrutinized including things such as smoking, alcohol beverage intake, exercise, use of sleep-inducing medications, health maintenance, and use of preventive health measures.

SUMMARY

State-local health interviewing is feasible and necessary for health systems planning because it provides a unique data base that enables more precise and accurate estimates of prevalence and incidence of health and medical care problems within a State and provides directions for future development of the health and medical care system in a designated health service area.

The costs may be prohibitive for one agency within a State to develop information described in this presentation, but it is anticipated that the approach taken by one State (Virginia) may have application in other States. Tact, diplomacy, and a rather clear understanding of objectives among several agencies within a State can lead to a successful project and an adequate funding pool, as I think we have clearly demonstrated.

We feel sure that there will be a great deal of comparative analysis of data and human experiences with the results of this survey, and comparisons or contrasts will be drawn between several Health Systems Agencies within a State; the State as a whole; and the Nation. The nationwide data base, of course, will be the National Health Interview Survey data, and as much of this tabular analysis as possible in the Virginia HHI survey will parallel those published tabular findings which are available from the Health Interview Survey for the Nation.

ATTACHMENT I

(PROJECT TIMETABLE)

VIRGINIA HEALTH INTERVIEW SURVEY

SCHEDULE OF SURVEY ACTIVITIES
(Data Collection and Analysis)

September 14, 1977—December 13, 1978

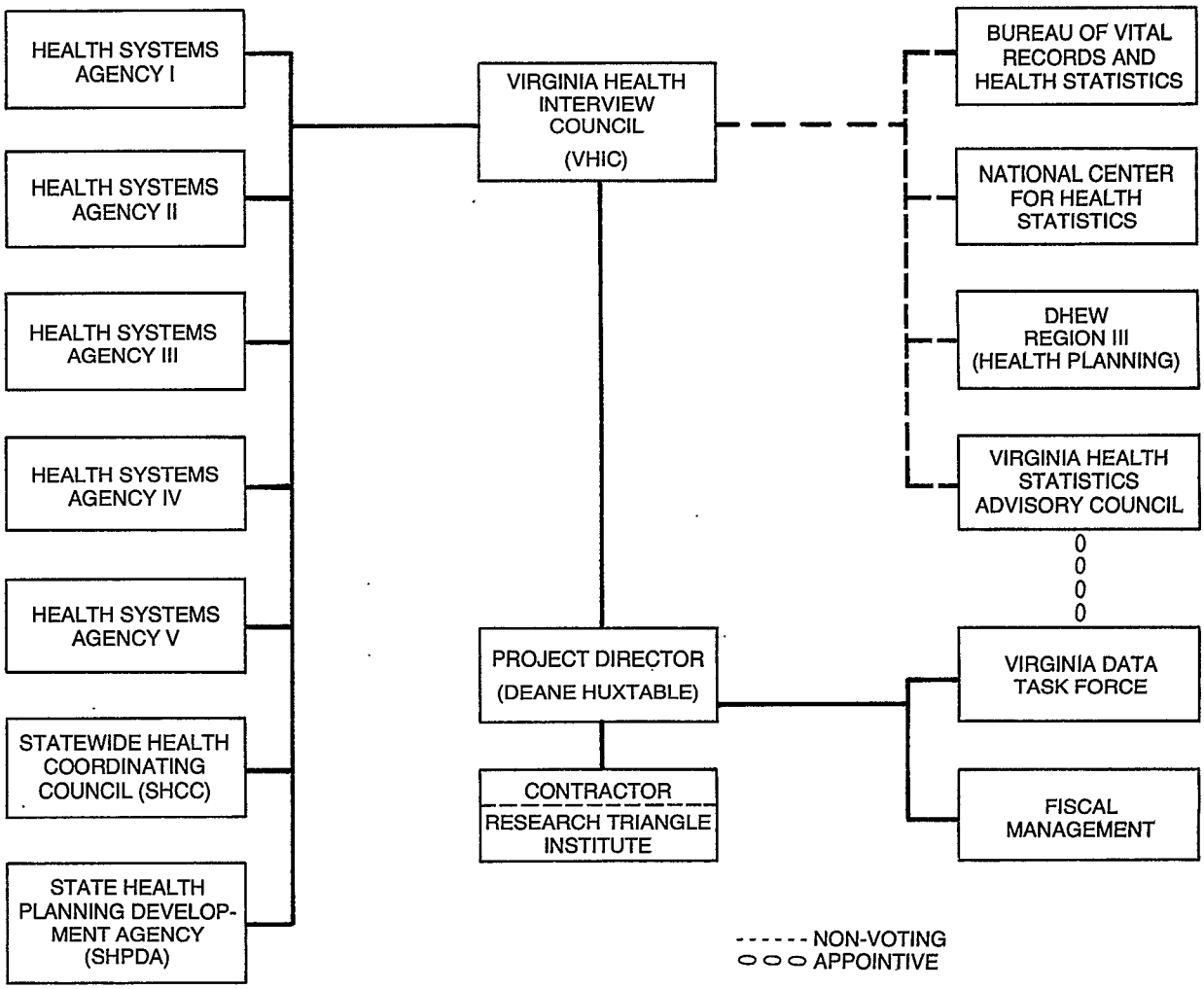
Activity	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Contract Award	X															
Planning, Q. Development, Etc.	XX	XXXX	XX													
Sample Design & Selection		XXXX	XXXX													
Cruising & Listing:																
Retain Staff		XXX														
Train Staff		X	X													
Conduct Cruising & Listing			XXXX	XXXX	XXXX											
Set-Up & Conduct Pretest:																
Prepare Materials for Pretest		XXXX														
Cruise & List Pretest Areas		X														
Retain & Train Interviewers		X														
Conduct Pretest Data Collection		X	X													
Develop Data Processing Programs			X													
Develop Receipt Control Procedures			X													
Train Editors/Coders/Data Entry Personnel			X													
Process Completed Data			XX													
Set-Up & Conduct Statewide Survey:																
Revise & Print Q., Manuals, & Materials				XXXX												
Complete Cruising & Listing for Initial Assignments				XXX												
Recruit Field Interviewer Staff				XXX												
Develop Data Processing Programs				XXX	XX											
Train Field Interviewers					XXX											
Review Initial Work of Interviewers					XXX											
Conduct Data Collection					XXX	XXXX	XXXX									
Finalize Editing/Coding/Data Entry Procedures					XX	X										
Implement Receipt Control Procedures					XX	XXXX	XXXX									
Develop Data Tape Editing/Cleaning Specifications						XXX	XX									
Process Completed Data						XX	XXXX	XXXX	XX							
Machine Edit Completed Data Tape									XX	XXX						
Analyze the Survey Results:																
Prepare Basic Survey Tabulations										XX	XXXX					
Calculate Standard Errors											XX	XX				
Analyze Survey Data in Detail												XXX	XXXX			
Make Comparisons with the National HIS													XXXX	XX		
Prepare and Submit Draft Final Report														XXX	XX	
Prepare and Submit Revised Final Report and Data Tapes															XX	XX

ATTACHMENT II

(HHI ORGANIZATIONAL CHART)

VIRGINIA HEALTH INTERVIEW SURVEY

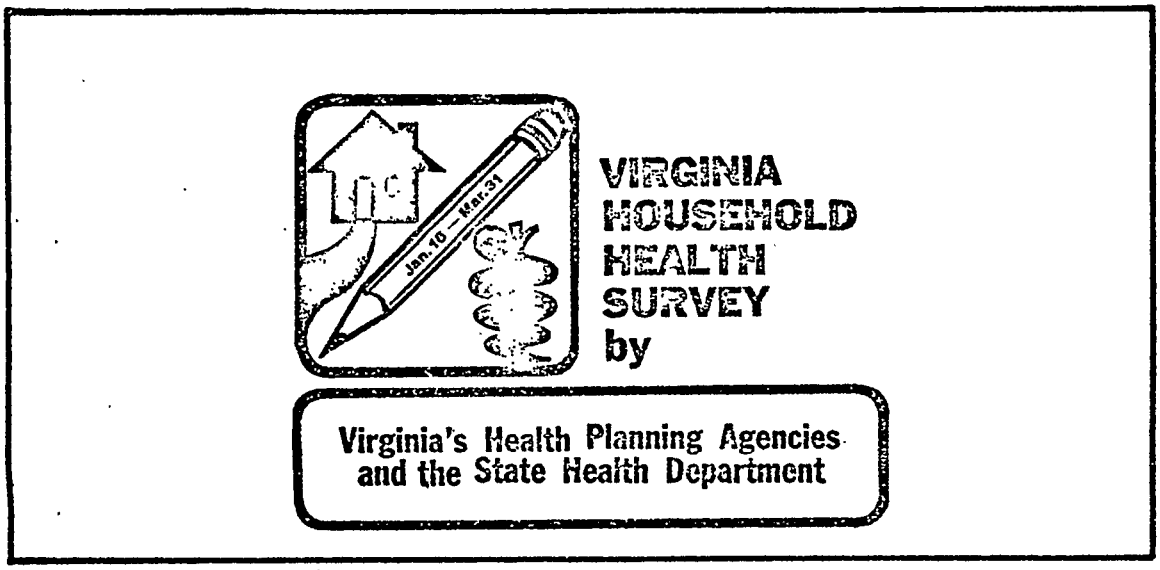
Sponsor: State Department of Health



ATTACHMENT III

(LOGO AND NEWS RELEASES)

TELEVISION PUBLIC SERVICE ANNOUNCEMENT
SUBJECT: Virginia Household Health Survey



Script: (20 seconds)

THE RESEARCH TRIANGLE INSTITUTE IS CONDUCTING A HOUSEHOLD SURVEY FOR YOUR LOCAL HEALTH SYSTEMS AGENCY AND THE STATE HEALTH DEPARTMENT BETWEEN NOW AND MARCH 31. THIS IS YOUR CHANCE TO TELL ABOUT YOUR FAMILY'S EXPERIENCES IN OBTAINING AND PAYING FOR HEALTH CARE. YOUR ANSWERS CAN HELP MAKE IMPROVEMENTS IN THE DELIVERY OF HEALTH SERVICES IN VIRGINIA.

Copies attached for the following television stations in HSA (III):

Already transmitted!

For more information contact—Name:
Phone No.:

STATE'S HEALTH PLANNING
AGENCIES TO CONDUCT SURVEY

Virginia's health systems planning agencies are sponsoring a household health survey to determine the accessibility, availability, cost and quality of health services currently being received by citizens of the Commonwealth. It is the first such survey to be conducted in Virginia and will be conducted over a 10-week period beginning in mid-January 1978. A total of 1,000 households will be surveyed in each of the State's five Health Service Areas designated by Governor Godwin in 1975.

The Central, Eastern, Northern, Northwest and Southwest Virginia Health Systems Agencies have joined in the project with the Statewide Health Coordinating Council, Virginia State Department of Health, and the U.S. Department of Health, Education, and Welfare. The survey is being conducted by the Research Triangle Institute of North Carolina.

The survey resulted from the recommendations made by the Health Information Task Force comprised of representatives from each of Virginia's Health Systems Agencies and the State Department of Health. It was the finding of this Task Force that the State's health planning agencies lacked information on health care problems faced by individual families within Virginia. In addition, existing health information reflects the experience of only those persons who actually use health services, not those who do not seek such services. The household health interview survey has proven to be an effective means of obtaining this type of information.

The health survey interviewers will be seeking information from selected Virginia households concerning such topics as dental and medical care, health insurance coverage, health conditions and hospital stays.

Preliminary results of the survey will be available by August, 1978. These results, along with the final findings, will enable the State's health planning agencies to improve their plans for the promotion of quality health care at reasonable costs for all Virginians.

ATTACHMENT IV

IDENTIFYING INFORMATION

(COMPLETE SECTIONS A-D ON EACH QUESTIONNAIRE USED)

A. PSU ☐☐☐ Seg. ☐ SHU ☐☐☐ RU ☐☐ ID # ☐☐☐☐☐☐

B. Book ☐☐ of ☐☐ books for RU (If 2 or more books, specify reason) _____

C. No. of RUs in this SHU ☐☐

D. FI Name _____ FI No. ☐☐☐☐☐

FOR OFFICE USE ONLY
VERIFICATION CODE
Yes 01
No 02

VIRGINIA HEALTH SURVEY

Field Operations by

RESEARCH TRIANGLE INSTITUTE
P. O. BOX 12194
RESEARCH TRIANGLE PARK, NORTH CAROLINA

For

THE VIRGINIA DEPARTMENT OF HEALTH
THE VIRGINIA HEALTH SYSTEMS AGENCIES

INTRODUCTION

(COMPLETE SECTIONS BELOW ONLY ON BOOK 01 FOR AN RU)

(BEGIN INTERVIEW WITH SECTIONS E, F, AND G)

E. INTRODUCTION

Hello, I'm _____ from the Research Triangle Institute in North Carolina. We are conducting a statewide health care survey in Virginia for the Virginia Department of Health and your Health Systems Agency. Here is a letter from the State Health Commissioner explaining the survey and how important your participation is.

F. First, what is your exact street address? (INCLUDE HOUSE NO., APT. NO., OR OTHER IDENTIFICATION AND ZIP CODE.)

_____

_____
City State ZIP Code

(IF RU 01, GO TO G; OTHERWISE, SKIP TO Q. 1)

G. (ASK FOR RU 01 ONLY)

Are there any occupied or vacant living quarters besides your own
{ in this structure or on this property? (FOR SINGLE-UNIT STRUCTURES)
{ in this unit? (FOR MULTI-UNIT STRUCTURES)

Yes . . . . . 01 (ADD TO LIST OF ADDED HOUSING UNITS IF INDICATED BY MISSED HU RULES)

No 02

(CONTINUE INTERVIEW WITH Q. 1)

H. (RECORD RESPONSE TO Q. 45 HERE)

Phone No. (A/C) _____ No Phone 01
Refused 02

INTERVIEWER FIELD RECORD

(COMPLETE SECTIONS I-P AS APPROPRIATE ON BOOK 01)

(OMIT SECTIONS L, M, AND N BELOW IF GENERAL INTERVIEW NOT OBTAINED)

I. RECORD OF CALLS AT RU TO OBTAIN GENERAL INTERVIEW

Call	FI No.	Day of Week	Date	Time	Result Code (From J)
1				am pm	
2				am pm	
3				am pm	
4				am pm	
5				am pm	
6				am pm	
7				am pm	
8				am pm	

J. RESULT CODES (CIRCLE FINAL CODE FOR GENERAL INTERVIEW)

018 Interview completed.
026 No eligible respondent at home. (Make second call between 6:30-9:00 p.m. or on Saturday; after 4th call, discuss with coordinator.)
034 Temporarily absent. (Record details in P and discuss with coordinator.)
042 Refused. (Record details in P and discuss with coordinator.)
059 Vacant. (Identify neighbor source in K.)
067 Not a housing unit; e.g., merged, demolished HU, moved away, group quarters, used for nonresidential purposes. (Identify neighbor source in K and explain in O.)
075 Temporary or vacation home; usual residence elsewhere. (Identify neighbor source in K and explain in O.)
083 Other. (Explain in O and discuss with coordinator.)

K. NEIGHBOR IDENTIFICATION (COMPLETE FOR FINAL RESULT CODES 059, 067, AND 075)

Name of Source _____ (First) _____ (Last)

Address _____

Phone No. (A/C) _____

Date _____

L. No. of SPs in RU ☐ (IF "0" OMIT M AND N)

M. RECORD OF ADDITIONAL CALLS ON SPs ☐ None

Call	Day of Week	Date	Time	Method (Circle)	RESULT CODE (018, 026, 034, 042 OR 083) SP Col ___	SP Col. ___	SP Col. ___	SP Col. ___
1			am pm	T P				
2			am pm	T P				
3			am pm	T P				
4			am pm	T P				
5			am pm	T P				

N. SP FINAL RESULT CODES (ENTER SP COL. NO(S). AND CIRCLE ONE CODE FOR EACH)

Col. ___	Col. ___	Col. ___	Col. ___
018	018	018	018
026	026	026	026
034	034	034	034
042	042	042	042
083	083	083	083

O. NOTES (INCLUDE HERE EXPLANATIONS OF CODES 067, 075, AND 083)

_____

_____

_____

P. NONINTERVIEW EXPLANATIONS (CODES 034 AND 042)

_____

_____

_____

_____

THE HEALTH INTERVIEW SURVEY COMPONENT OF A COMPREHENSIVE HEALTH INFORMATION SYSTEM

Alan B. Humphrey, Ph.D., *Director,* and Ann H. Walker, M.A., *Deputy Director, Rhode Island Health Services Research Inc., Providence, Rhode Island*

The primary objective of a statewide health information system is to provide that information needed for planning, implementing, managing, and evaluating health programs. A comprehensive health information system then would include population descriptors, health resources inventory, utilization statistics of those resources by the population and fiscal descriptors. The primary data components within the broad categories are the following:

- Population
  - Census
  - Vital Records
  - Health Interview Survey
- Resources
  - Manpower
  - Facilities
- Utilization
  - Ambulatory Care
  - Acute Care
  - Long Term Care
- Fiscal
  - Funds Flow

The Health Interview Survey (HIS) component, while often viewed as a costly luxury item in a statewide health information system, is in fact the most important component, as it provides information on the *entire* non-institutionalized population that cannot be obtained from any other source. In addition, it is the only mechanism that provides data on morbidity, perceived health needs, health habits and attitudes, and out-of-pocket health expenditures. Since these data items as well as those on utilization of services are obtained on a common record, a mechanism is established for interrelating all the components.

In addition, the HIS is self contained. The percentage of the population with a particular characteristic is easily calculated, and independently developed denominator data are not needed unless estimates need to be made of the total number in the population with that characteristic. Even then the numbers can be estimated based on the sampling fraction being used.

When data from a statewide Health Interview Survey are coded to small geographic units within the State (census tracts, minor civil divisions, cities or towns) the utility of the information increases considerably, since the survey information can be used to link data from other data sets on a geographic basis.

The State of Rhode Island is completely census tracted, and the tract is the smallest unit used for coding the data. In addition, each tract has been categorized into one of four SES groups, (Poverty, Low, Middle, High) which allows for small geographic analyses to be conducted. For example, vital statistics provide indicators of health status (i.e., death rates, infant mortality rates, etc.) but yield little information on the determinants of health status (i.e., availability, accessibility, barriers to health care, morbidity, environment, etc.). Health resources statistics provide information on the availability of services and manpower existing in an area, but these services are generally concentrated in specific areas within the State. Using measures of the utilization of ambulatory services from the HIS, it is possible to allocate the number of physicians to smaller geographical units.

Health Interview Surveys were conducted in Rhode Island in February and March 1972, and March and April 1975. Approximately 1 percent of the State's households were sampled in 1972 and .6 percent in 1975, yielding 3,086 families/9,383 individuals in 1972, and 1,952 families/5,655 individuals in 1975. The interviewing methodology varied between the two surveys in that the 1972 survey used a combination of phone, mail and personal interview techniques, while the 1975 survey was all personal interview.

The major topics covered include:

A. Demographic Characteristics
B. Health Conditions and Disability
C. Preventive Care and Health Habits
D. Attitudes toward Health Care
E. Utilization of Health Services and Regular Sources of Care
F. Hospital Payment Coverage and Out-of-pocket Health Expenditures

SEARCH has provided basic descriptive material on each of these topics for distribution to other agencies (Health Interview Survey Profile). Some of the highlights of this report and other more detailed analyses have implications for the way health status, utilization, and availability of medical care resources are interrelated.

For example, in 1975 in Rhode Island there were 3.6 visits per person per year to a physician. However, when compared across FES groups (table 1) the "poverty" and "low" groups see a physician about 1 time per year more than the "middle" and "high" groups. One conclusion may be that individuals in the poorer FES groups are in poorer health; another may be that due

to government programs, they overutilize the services.

When the morbidity measures (table 2) are compared to explore the health issue, we find that individuals in the "poverty" group have about three times the number of bed days as those in the "high" group, and are about three times as likely to experience interference with their usual activities due to some impairment. Not only does about 30 percent of the "poverty" group experience this interference, but also there appears to be a gradient with FES. Therefore they are in poorer health but possibly do not utilize medical services appropriately. In addition, they may not be practicing preventive services to the degree that would lead to better health. This possibility turns out to be somewhat of a mixed bag (table 3). Eye examinations and blood pressure checks are about the same across the groups, while pap tests and breast exams are practiced about half as frequently in the "poverty" group as in the "high" group.

One other item that has been suggested for the poorer health status of the "poverty" group is that accessibility barriers exist for them that do not exist for the "high" group (table 4). This appears to be true only for transportation.

While these statistics are interesting when taken separately, they describe and quantify an overall situation in which individuals in "poverty" and "low" socioeconomic groups are in poorer health, generally do not follow health maintenance practices, and, consequently, once in the medical care system, use more resources. One might speculate that accessibility factors and ignorance may be the primary antecedents to the higher use rates that result from people getting care when the disease has progressed further than it should have if care had been received earlier in the disease cycle. The HIS then allows for the formulation of such questions, and can be used to direct or orient the analyses and data needed.

As an aside, it is interesting to note that people's attitudes (table 5) across FES groups vary only in that a greater proportion of people in the high FES group were dissatisfied with the availability of physicians on weekends and evenings.

One issue that requires information from other CHSS data sets but also requires HIS information is the availability of physicians in small geographic areas to meet the needs of the population. Data collected from physicians provides information on where physicians practice and how many hours they expend on patient care. Usually the physicians' offices tend to cluster in certain urban settings, and Rhode Island is no exception to this trend. Consequently, the calculation of physicians per 1,000 population is a relatively useless statistic when calculated for small or rural areas. A neighborhood may not have any physicians in it, but there may be physicians in adjoining areas or within a reasonable commuting distance. The provider dependency ratio based on where physicians' caseload is drawn from can be used to allocate physicians (or FTE) to other geographic areas. This information, along with the population's assessment as to whether transportation is a problem, can be used to indicate whether a particular area is truly a shortage area with respect to the availability of physicians.

This procedure and others using data from all the CHSS components were used to explore the relationship between health status, availability of resources, accessibility to those resources, and the use of curative and preventive services. To conduct this study the State was first partitioned into 18 primary care service areas based on patient origin trends from the HIS. The variables used included the location of the respondent's home and the office location of his regular physician. Indicators of health status were then calculated from mortality and natality records, availability of resources from the manpower and facilities survey data, accessibility of resources from the Health Interview Survey, and the utilization of resources from the HIS and the hospital discharge data set.

The most striking finding of the analyses of these indicators, using measures of association, was that availability of services was not correlated to health status, but accessibility was positively correlated: i.e., areas where services were more accessible also had better health status. All other correlates were essentially zero, but there were trends concerning utilization which indicated:

1. Greater curative care utilization was associated with poorer health status, poorer accessibility and poorer availability scores and
2. Greater preventive care utilization was associated with better health status.

In addition to the use that SEARCH has made of the HIS for research purposes, there have been a large number of external requests ranging from minor requests to substantial analytical undertakings. Some of these applications related to health planning and to the decision making process are highlighted here.

THIRD-PARTY COVERAGE IN RHODE ISLAND

One of the major applications of the survey data has been in assessing the extent of third-party coverage in the State. It is the only method by which estimates can be made of the population without any form of coverage and of those with double coverage. Furthermore, because the information is obtained in the context of other demographic and health-related data, comparisons can be made of the age, sex, race, disability, and utilization patterns of those with and without insurance coverage.

The Office of Health Systems Planning of the Rhode Island Department of Health contracted with SEARCH to produce a report documenting the extent of third-party coverage in the State.

Table 1 from that report, entitled "Third-Party Coverage of Health Care Costs" by Jay Buechner,

Ph.D., and Harvey Zimmerman, displays the distribution of the population by type of coverages. While the distributions were very similar in 1972 and 1975, there was a slight decrease in the percentage of persons without coverage, although the percent with private health insurance declined slightly.

The final impact of this information on policy decisions is yet to be determined. However, the data have been integrated into the State's health systems plan. Specifically, in the goal statement regarding "Accessibility of Services," a target accomplishment is for the percent of Rhode Islanders with no health insurance coverage to be reduced to zero. The population groups most likely to be affected include the poverty group, with 13.8 percent without coverage, the unemployed 18.3 percent without coverage and the young adults aged 17-24, of which 11.4 percent lacked coverage.

An additional analysis was requested of SEARCH by the Department of Health to estimate the cost of providing coverage to those without it. Using additional survey data on the household characteristics of persons without coverage, i.e., single "individuals" vs. two or more person "families," and on employment status of heads of households without coverage, it was estimated that the cost of such coverage would range from 7.25 million dollars if only hospital insurance were provided, to nearly 11 million dollars if surgical insurance and major medical benefits were added as well.[1]

[1] Jay S. Buechner, Ph.D., "Estimated Costs of Providing Private Health Insurance to the Noncovered Population of Rhode Island," Rhode Island Health Services Research, Inc., (SEARCH), April, 1978.

HEALTH CARE COSTS

The information on out-of-pocket health care costs (table 6) which was obtained in the 1975 survey has also been used extensively in the State. One of its major applications has been to provide estimates for the cost of the Catastrophic Health Insurance Plan (CHIP) enacted in 1974. The CHIP legislation was designed to prevent any family in the State from bearing "catastrophic" health care costs in any given year. In order to define what a catastrophic cost was, several criteria were used. They included comprehensiveness of current health insurance coverage accompanied by a varying deductible in out-of-pocket cost. Essentially the impact was that families with a "fully-qualified plan," defined as hospital and surgical coverage with major medical benefits, had the lowest out-of-pocket deductible, while persons with no coverage had the highest deductibe (which amounted to $5,000 or 50 percent of annual income, whichever is greater.)

Table 1. AMBULATORY CARE UTILIZATION BY FAMILY ECONOMIC STATUS, 1975

	Poverty	Low	Middle	High
Mean number of visits per person per year to a physician	4.8	4.2	3.3	3.6
Mean number of visits per person per year to a dentist	1.1	1.3	1.5	2.1

SOURCE: Rhode Island Health Services Research, Inc., (SEARCH), 1975 Health Interview Survey.

Table 2. DISABILITY INDICATORS BY FAMILY ECONOMIC STATUS, 1975

	Poverty	Low	Middle	High
Mean number of bed days/person/year	13.2	7.7	5.6	4.4
% with some degree of interference with usual activity	29.4	21.8	11.2	10.1

SOURCE: Rhode Island Health Services Research, Inc., (SEARCH), 1975 Health Interview Survey.

Table 3. PREVENTIVE CARE INDICATORS BY FAMILY ECONOMIC STATUS, 1975

	Poverty	Low	Middle	High
% Eyes examined in past year	49.6	49.3	48.0	54.2
% Blood pressure checked in past year	71.2	71.6	64.1	68.4
% Women having pap test in past year	29.1	33.2	42.9	52.5
% Women practicing breast self exam in past year	41.0	55.2	68.6	70.4

SOURCE: Rhode Island Health Services Research, Inc., (SEARCH), 1975 Health Interview Survey.

Figure 1 shows the distribution by comprehensiveness of coverage by family economic status group. Nearly 15 percent of the poverty group had minimal or no coverage compared to about 5 percent of the high income group. This information, coupled with the out-of-pocket cost data obtained in the survey and aggregate funds flow estimates has been used to make estimates of the cost of the CHIP program if certain changes were made in the quantifications criteria.[2]

[2] Harvey Zimmerman and Ann Hamilton Walker, "Measurement of the Amount and Distribution of Out-of-pocket Health Care Expenses: Residual vs. Direct Estimates," SEARCH, presented at the 103rd Annual Meeting of the APHA, 1976.

USES BY OTHER AGENCIES

Most requests for the survey data by other agencies in the State centered on the issue of needs assessment. The Department of Elderly Affairs, for example, requested extensive information on the health status characteristics and utilization experience of the 60 and over population by geographic subareas of the State.

Summary

Recently SEARCH surveyed several health-related organizations in the State to determine which questions were of most use to them, and what additional information would be beneficial to them for inclusion in future studies. A major area of expansion that was

Table 4. ACCESSIBILITY INDICATORS BY FAMILY ECONOMIC STATUS, 1975

	Poverty	Low	Middle	High
% Families expressing delay in seeing a physician due to				
Cost problem	19.6	30.5	21.9	10.2
Hard to get appt.	18.5	14.8	17.4	20.0
No dr. known	10.7	7.2	7.9	8.1
No dr. available	13.8	11.6	12.1	12.3
Transportation problem	21.1	9.8	4.7	0.6

SOURCE: Rhode Island Health Services Research, Inc., (SEARCH), 1975 Health Interview Survey.

Table 5. ATTITUDES TOWARD MEDICAL CARE RECEIVED BY FAMILY ECONOMIC STATUS, 1975

	Poverty	Low	Middle	High
% Families dissatisfied with aspects of care				
Quality of care	9.2	5.3	7.4	6.6
Availability to M.D. on nights & weekends	18.8	17.3	25.8	26.5
Amount charged	21.5	24.6	26.3	22.8
Waiting time in office	32.8	28.9	34.1	38.6

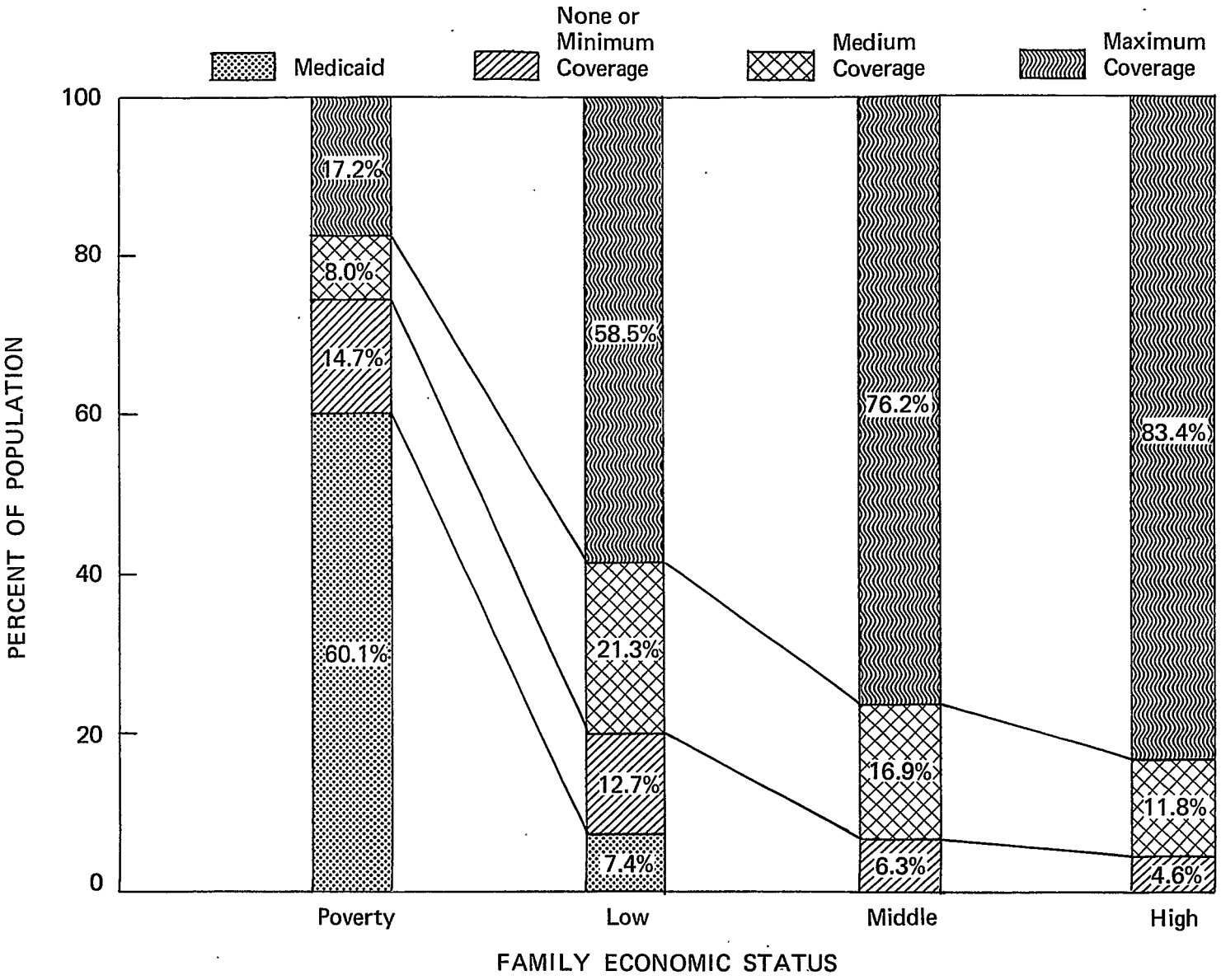
SOURCE: Rhode Island Health Services Research, Inc., (SEARCH), 1975 Health Interview Survey.

Table 6. PER CAPITA OUT-OF-POCKET EXPENDITURES

Category	Dollars
Hospital	$ 7.12
Physician	34.02
Dentist	35.39
Prescription drugs	18.63
Lab/X-rays	3.96
Appliances	3.66
Other	9.32
Total	$ 112.10

SOURCE: Rhode Island Health Services Research, Inc., (SEARCH), 1975 Health Interview Survey.

Figure 1. Comprehensiveness of Third-Party Coverage for Four Family Economic Status Groups in Rhode Island, 1975



Source: Rhode Island Health Services Research, Inc., (SEARCH), 1975 Health Interview Survey.

suggested was in the preventive care and lifestyle sections. Questions on dietary habits, physical exercise, alcohol consumption, use of seat belts, and weight were seen as important additions.

Health status questions were also of interest. Specific questions concerning diseases such as diabetes, respiratory problems, and chronic diseases were suggested. Mental health symptoms and conditions had a high priority for inclusion as did expanded information on health insurance coverage and ways in which hospital care is obtained.

The Health Interview Survey in Rhode Island has been used extensively to aid in the interpretation of information from other data sets, as well as by itself to aid decision makers throughout the State. Even though it only represents a small sample of individuals in the State, it is the primary source of comprehensive health information.

A DISCUSSION OF THREE PAPERS ON HEALTH INTERVIEW SURVEYS

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The major issue which was apparent in all of the three papers which have just been presented is the need at State and local levels for data which are not otherwise available. Although they are certainly not the sole users of health data at these levels, attention was focused on HSA's because their responsibilities encompass the entire health system.

We have created HSA's and assigned them a high technology task based upon the systems planning concept and quantitative methods related to it. In many respects, one could draw an analogy between this situation and a high technology transportation system which works effectively only when all the components can be used in appropriate combinations. The HSA's often lack the fuel for their technology and thus are often compelled to use inappropriate means or may be entirely unable to deal with an issue. The absence of hard data required by the methods which are available to HSA's frequently results in a resort to soft data which is inappropriate in the initial phases of a rational decisionmaking process. There is a place for soft data in the final political decision and no one would want to deny the importance of political decisions in the health planning process. However, these political decisions should be preceded by rigorous analyses based on hard data so that the decision makers are made explicitly aware of the costs of the choices which they are making.

In P.L. 93-641 Congress recognized the need for rational decisionmaking and even specified the categories of data required. Paradoxically, that law and its legislative history have been interpreted so as to limit the acquisition of the needed data. For instance, in the HSA regulations HEW follows quite closely the language of the legislative history and says "the agency shall not undertake the collection of data where adequate data is already collected by other entities including the Cooperative Health Statistics System. Where the agency wishes to undertake design development and operation a new data system . . . it must obtain prior approval of the Secretary." Now the legislative history itself does not say anything about getting prior approval of the Secretary for new data collection efforts, but it was crystal clear that the persons responsible for the passage of the law both in the executive branch and the legislative branch were adamant on the point that there were sufficient data available. This seems to have been the case of a misunderstanding of the availability of data or, phrased somewhat differently, a misunderstanding of the abilities and the limitation of the existing data efforts such as the Cooperative Health Statistics System. One fact that became clear soon after P.L. 93-641 was passed was that the Cooperative Health Statistics System was not, and would not be, available to all agencies for a long period of time. Consequently, as part of an agreement between the National Center for Health Statistics and the Bureau of Health Planning and Resources Development, it was agreed that "for the short run NCHS will identify NCHS activities which have the capability to meet interim needs for data at the local level . . . . Additionally, other governmental and non-governmental initiatives will be identified as sources of data for local purposes on both a short range and long range basis." As a result of this recognition that something had to be done for the interim, NCHS has developed two publications; one is an inventory of national data sources, the other is entitled "Guidelines for Conducting an Inventory of State Data Sources for Health Planners." Unfortunately for the HSA's, the staff of NCHS are mere mortals, not miracle workers, and thus they cannot produce quality data where none exist. The net result is that there are many areas in which HSA's lack the data which they need for the methods available to them.

In the report of the Committee to Evaluate NCHS the authors open their work with a poem by Edna St. Vincent Millay. This poem asserts that the problem is the lack of a loom or framework for converting a deluge of facts into a fabric of information. It now appears that in the health planning process we have such a loom but the available facts are far less useful and complete than we believed they were. The result is that our fabric of information has more holes than cloth and the fine material we are attempting to weave comes out resembling a swiss cheese rather than a well woven garment.

Roger Kropf has presented a number of persuasive arguments for a health interview survey to fill the gaps which have been identified. Frank Mays described how a health interview survey can be carried out and Alan Humphrey demonstrated the tremendous utility of the data collected both as a means of filling the gaps and as a way of enriching our understanding of data from other sources. These papers make a sound, well integrated case for the health interview survey as an essential component of the health planning process. I will carry the discussion forward several steps by first commenting on objections to local health interview surveys and then by identifying several issues which need to be resolved. The items which I discuss have all either explicitly or implicitly been presented in the

excellent papers we have just heard.

There seem to be four major objections to the notion of local agencies conducting health interview surveys. The first of these is cost. Using data from a variety of reports of survey activities I estimate that the average cost for a health interview survey is approximately $70 per sampling unit. Note that these costs are only for the collection of data. At these rates the cost of conducting a local survey of sufficient size for statistical validity would be beyond the means of almost any single agency. Such averages are misleading, however, because they do not take into account the fact that there are a number of fixed costs associated with the conduct of an HIS: e.g., for preparation of the data collection instrument. If these large fixed costs were spread over a larger number of sampling units, the average cost per unit would be substantially reduced. This could be accomplished, for instance, by using the same instrument for many surveys. Second, there is no need to conduct an HIS every year. The data collected tend to be rather stable. Thus a periodic survey, perhaps once every five years, would be adequate for almost all purposes. If this were the case, then the cost per year sampling unit per year would be substantially lower than the average which seems to be such an awesome figure. Finally, we must examine the cost of surveys from the point of view of all users. We must consider the total benefit to the community rather than just the benefits received by the HSA. For example, Montgomery County in the suburban Washington area has just spent approximately $3,000 to get very crude estimates of the health needs of elderly persons. This, by the way, was done by student labor and thus is a grossly underestimated cost. In any event, those same data would have been available much more readily and at a considerably lower cost had a health interview survey similar to the one described by Alan Humphrey been available.

A second objection to local health interview surveys is that they duplicate data available from existing sources. This is perhaps one of the easiest objections to refute. In the first place, the data which are available are institution based; i.e., they are collected by providers. HSA's, on the other hand, are charged with carrying out population based planning. Thus we have situations such as the following. The institution based data reflect the demand for services whereas the HSA requires information on the population's need for services, and, as we all know, given the financing arrangements of our health system, these two items are more likely than not to be quite different. Roger Kropf identified this in his discussion of equity analysis. Secondly, although in theory many of the data are available from existing sources, in fact their availability is quite spotty throughout the Nation. The Cooperative Health Statistics System is an excellent example of this. All of the components are not yet developed and even the developed components are not available in all States. Thirdly, it is often the case that data which are collected by other entities, as they are called in the law, are not available to the HSA's. As a case in point consider the difficulty the HSA's are experiencing in obtaining data from the Professional Standard Review Organizations. Or how many of you have been successful in getting 100 percent cooperation from hospitals in your area when conducting a hospital discharge survey or patient origin study?

The third objection centers on the collection of irrelevant data: i.e., data which are nice but not necessary. Presumably, this relates to data on attitudes and perceptions. However, when we consider the need for data on such characteristics of the health services system as accessibility, which was stressed by Alan, and acceptability, it quickly becomes clear that these are not irrelevant data. For instance, in an effort to clarify the data requirements for health planning the Bureau of Health Planning and Resources Development completed a contract with Orkand Corporation to develop operational measures of the characteristics of the health services system and to indicate data sources for these measures. In reviewing the 12 measures recommended for accessibility, I discovered that five of these would require data that would be available only from a health interview survey.

The fourth objection stems from the lack of skills at the local level. In my view this represents a gross underestimation of the HSA staffs' abilities. I have seen HSA's conduct surveys the instruments for which were comparable in technical quality to those prepared by other organizations which had highly skilled technical assistance. Even in the cases where the HSA staff may not have the technical capacity for this kind of undertaking at the present time, I feel the "lack of skills" argument is somewhat unfair to the HSA's. The HSA staff members may be ignorant of the details of the health interview survey but they are intelligent people who are highly motivated to learn rapidly. I can attest to this fact from experience in teaching 14 ASTI courses to such people. Only a very small percentage of the persons who have participated in these courses would not be able to learn quickly and effectively the necessary skills and procedures for carrying out a survey. Furthermore, this argument overlooks the fact that HSA's skills, even if somewhat limited, can be augmented by a *combination* of (a) well-documented standardized procedures, (b) training, (c) consultation, and (d) contracts with skilled survey organizations. The latter certainly is not an uncommon or undesirable means of augmenting limited staff capabilities. It often is one of the more economical approaches, as seems to have been the case in the Virginia situation described by Frank Mays.

Turning now from objections to local health interview surveys, we can focus our attention on some issues which must be resolved even if we feel that those objections have been refuted. The first such issue is the matter of resources. Here there is an urgent need, I believe, for HEW to encourage wise investments in data. The decisions to make these investments can be based on the concept of the value of information. This

is certainly not a novelty and has been done in many other cases. To illustrate the point, Alan cited an example of making a choice between two policy alternatives with a difference of 4 million dollars in cost. Clearly it would have been worthwhile in this instance to spend a substantial amount of money to collect relevant data before making that final choice. Of course, the people of Rhode Island had the good fortune of having SEARCH and its data base already available to them. Unfortunately, there is no accounting mechanism which will allow us to charge off these benefits against the cost of conducting the survey. This brings the second point concerning resources to mind. The HSA's need a mechanism to spread the costs not only among the planning agencies themselves but among other users. The idea of a consortium is appealing. However, listening to Frank Mays' paper one gets the impression that the organization of such an enterprise is a major drain on the resources of the HSA's. Something needs to be done to establish either a simple process by which people can quickly form coalitions to achieve these purposes or an on-going organization which can take such an assignment in stride without imposing great administrative burdens as part of the preparation. The Model State Health Statistics Act prepared by NCHS could meet this need very effectively. A further problem related to resources is the need to spread the cost over time by storing financial resources for future surveys. This would be analogous to the funded depreciation that we see in corporate or institutional accounting. The purpose of this procedure is to assure that the budgets of the organizations concerned are not disrupted by huge expenditure at a single point in time to obtain benefits which will be received over a rather lengthy period.

This second issue which must be addressed is standardization. First we need to standardize the general content of these surveys to prevent HSA's from reinventing the wheel. By this I mean that we need a centralized effort to identify what data are realistically available so that all HSA's can receive this information and then structure their local surveys to supplement the available data as necessary for their own purposes.

Secondly, there needs to be a considerable effort made toward standardization of the specific items within these surveys. We need standardization in order to permit longitudinal comparisons, cross-sectional comparisons, and aggregation of information at State and multistate levels. Remember that the State level aggregation is mandated by the law when it requires that the State Health Plan be developed on the basis of the information contained in the individual HSP's.

The third issue is technical assistance for HSA's. At present there is a considerable amount of knowledge on conducting health interview surveys, but it is not prepared for effective dissemination to the users. For instance, in doing some background reading for this discussion, I found a paper by Schaible, Brock and Schnack on making estimates for small areas from survey data, and I found another 447 page volume from NCHSR on interviewing techniques. Although the Schaible paper was reported in the NHPIC announcement of technical documents available, it is not well designed for immediate application by HSA's. The NCHSR document as far as I know is not widely publicized nor is it designed for direct application in the conduct of a local survey. Nevertheless, both of these are items of great importance to HSA's. NCHS is making some preliminary moves in the direction of improving their capacity to provide technical assistance. They now have a survey intelligence service to which the Bureau of Health Planning has contributed over $100,000. The service group is conducting research on data needs and disseminating knowledge by sending out materials and by providing consultation. I believe, however, that it is necessary to have a more formal organization even though this would require additional funding. I believe such funding would be a sound investment compared to alternative expenditures of available monies. For instance, if we consider the money required to fund one more CHSS component in a single State, that investment would affect only a narrow subset of data in a single location. The technical assistance program on the other hand would establish a process of acquiring a wide range of data in all fifty States. Similarly, the centers for health planning funded by the Bureau of Health Planning are doing an excellent job of providing technical assistance on planning methods, but as I indicated at the outset of this paper, the methods without the required data are like automobiles without gasoline. I submit that what is needed are perhaps a few less autos and a better fuel supply for the ones we do have.

In summary, Public Law 93-641 is widely interpreted as discouraging primary data collection by HSA's, but it also requires data which are not available from existing sources. The three panelists have demonstrated the necessity and feasibility of adding a health interview survey to the system planning process. I have tried to add to their comments by refuting objections to local health surveys based on cost, duplication and lack of skill. I also identified issues related to resources, standardization, and technical assistance that must be resolved if HSA's are to make effective use of this data collection method without which they cannot do the job mandated by Congress.

A COMPARISON OF ALTERNATIVE PANEL PROCEDURES FOR OBTAINING HEALTH DATA

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Introduction

The importance of reliable national statistics on the incidence of illnesses and the use of and expenditures for health care has led to the establishment of the Health Interview Survey, which is an integral part of the program of the National Center for Health Statistics,[18-20 25 26 29] and to continuing studies by the National Center for Health Services Research. These surveys have proved of great importance and have provided much valuable data. However, they have also run into problems that continue to defy solution. A major problem is that these surveys depend on recall for periods of up to a year, even though it is known that substantial recall errors may occur.[17 19-24 26-28] These errors are basically of two types:

1. *Omissions*—The respondent omits an illness episode or expenditure entirely. These omissions are not random, but are usually concentrated among short illnesses for which hospitalization was not required, or for routine visits to a physician.
2. *Telescoping*—The episode is remembered, but there is an error in the date so that the episode is remembered as occurring more recently than it did.

A second problem with these surveys is that they are very expensive, since substantial detail is required from those who have been most ill. When one turns from national studies to local, State, or regional studies, cost problems become even greater while response errors continue to be a serious concern.

An alternative procedure that may help to solve or reduce some of the problems of health surveys is the use of diaries to obtain health care information. Diaries eliminate or greatly reduce the recall problem, as well as reduce interviewing costs. Diaries may present new problems, however, including level of cooperation, errors in recordkeeping, and possible conditioning effects. Yet, the diary approach has proven very valuable in other types of surveys, and the possibility that diaries may be equally useful in obtaining health information is sufficiently great to warrant their testing in some controlled experiments.[1-4 6-11 13 14 28]

This study attempted to determine the cost-effectiveness of diaries for obtaining health data from a general population sample. Comparisons were made between the results obtained from diaries, and personal and telephone interviews. The effects of differential diary procedures and compensation were also tested. The analyses compare levels of cooperation and frequencies of health episodes reported by the various methods and by level of education and previous medical history of respondent households.

Previous Research

The earliest study of the use of diaries for collecting medical information that we are aware of was conducted by the California State Department of Public Health in San Jose during the period March-May 1952.[1] Comparisons were made between a diary and personal interview for disabling and nondisabling illnesses, medically and not medically attended. As expected, there were substantially higher reported monthly rates of nondisabling, not medically attended, illnesses in diaries than in personal interviews. Conversely, when respondents were asked about illnesses "yesterday," higher rates were reported on the initial interview, indicating telescoping. Although the reporting results are carefully discussed, there is no information given on sample cooperation and the specific diary form used.

More recently, Roghmann and Haggerty have used a diary in their long-term study of health and illness in young Rochester, New York families.[10] Their highly structured diary used a calendar approach with one page for each day of the month that the diary was kept. Families reported on how well each member felt each day and what regular or special medical care was obtained. Cooperating households were paid $10 for the month and the overall completion rate was 82 percent. No methodological tests were performed for the major parts of the diary, but comparisons were made on reported utilization of professional services between the diary and a recall interview that covered a comparable period. No major differences were observed.

There have been several other studies that did not use diaries directly, but utilized them as reminders to respondents at later interviews. Currently, there are several studies in progress or in the planning stage that are using or plan to use diaries.

Recently, the Survey Research Laboratory of the University of Illinois conducted an experimental study from October 1973 through March 1974 to investigate the use of diaries to obtain health care information. Of the many areas that needed to be studied, the following two appeared to be the most critical:

1. *What should be the format for a medical diary?*—In other uses of diaries to obtain information on consumer expenditures, both journal and ledger diaries have been used. In journal diaries, the entries are made in time sequence, while in ledger diaries they are made by categories of events, such as visits to the doctor, absences from work, purchases of medicines, etc. For consumer expenditure studies, the work of Sudman and Ferber[13] has shown that ledger diaries obtain more complete information and a higher level of reporting, but these results may not apply to medical events.
2. Should households be compensated for keeping records? Again the results of Sudman and Ferber,[14] as well as those of commercial panel operators, suggest that cooperation is improved if families are compensated for their diary keeping. These results are for expenditure diaries, which require more work than medical diaries, and may not hold for the easier medical diaries. Obviously, compensation affects the cost-effectiveness of diary procedures.

Respondents in this panel study were members of either the Greater Marshfield Community Health Plan in central Wisconsin or Intergroup Prepaid Health Service, Inc. in the Chicago metropolitan area. The Intergroup respondents were all employees of the Illinois Bell Telephone Company and their families. An initial random sample of 1,007 was selected from membership lists, split equally between the two locations, of whom 987 were eligible for interviewing.

After the initial personal interview, respondent households were randomly assigned to one of the six procedures involving method of compensation and data collection method. In each location, a randomly selected one-third of the respondents kept ledger diaries and one-third kept journal diaries for 3 months; the other one-third participated in a series of three additional personal recall interviews once a month for 3 months. The diaries were collected at the end of each month by an interviewer who discussed the entries with the diary keeper, retrained the household if necessary, and left a new diary for the following month.

In the Chicago metropolitan area, half the households were offered a gift of $10 for cooperating for the 3 months, while half were not offered any gift. In the Marshfield area, half the households were offered a report of their medical experiences summarized over the 3-month period and compared to other households of similar size, while the other half were not offered this report. Nevertheless, in Marshfield after data collection was completed, all cooperating households received this report. The report was offered instead of cash in Marshfield because of concerns that in a small community it would be impossible to keep the two treatments independent. Neighbors and relatives who received a cash gift would tell others who did not receive a gift, which could lead to substantial ill-feeling.

The major findings of that study are summarized briefly below.

Willingness to Participate in Panels

The most important finding was that households are willing and able to participate in panels that report medical events. Regardless of the collection method, noncooperation after the initial interview averaged from 6 to 7 percent in the Marshfield area and from 10 to 14 percent in the Chicago metropolitan area. Almost all losses occurred in the first month. There was no evidence of unwillingness to keep diaries for 3 months (or probably even longer periods, if requested).

There were no significant differences in panel cooperation between households who used diaries and those who participated in monthly recall interviews. Compensation did have a significant effect on increasing cooperation, however, particularly in the Chicago area. The differences between Chicago and Marshfield were primarily due to the generally higher cooperation in the nonmetropolitan Marshfield area.

Although the special character of this sample would probably make households more willing than average to participate in a medical panel, one might still estimate that a national panel recruited by interviewers from the U.S. Bureau of the Census could obtain cooperation from 85 to 90 percent or more.

Levels of Reporting

Households using diaries reported 14 percent more medical events than did households on the recall interview. The major difference was in the category "felt ill but did usual tasks," where the level of reporting on diaries was almost double that from personal interviews. This higher level of reporting in diaries was not observed for all items. For several categories, such as phone calls to physicians, purchases of medicine, and payment of bills, the levels were higher for the personal recall interviews.

There were also some small but consistent differences in levels of reporting between compensated and noncompensated diary households, especially in the Chicago area, with the compensated households reporting higher levels. No effects of compensation on levels of reporting could be seen for the personal recall interviews.

Some indication of an initial conditioning effect was observed, with a higher level of reporting in the first

month, regardless of method. It is not clear whether this was due to changes in accuracy of reporting over time or to changes in actual behavior. That is, the initial interview may have stimulated some households to see a doctor or dentist for a routine checkup.

Validation Comparisons

A comparison of clinic records with household reports indicated that using any procedure, no evidence existed of telescoping or of imaginary doctor or hospital visits. In the Marshfield area, about one-sixth of all clinic visits were omitted from household reports, regardless of the procedure used. In the Chicago area, on the other hand, only about half as many clinic visits were omitted by diary households as by households using personal recall interviews. For diary households in both Chicago and Marshfield, the omission rate was lower for those receiving compensation.

The Chicago validation results contradicted the data on levels of reporting that indicated personal interviews produced a higher level of reports of doctor visits. These mixed results, both statistically significant, but based on different samples of events, indicated that no collection method was clearly superior for all kinds of medical events.

Comparison of Reporting on Initial Interview and in Panel

Comparisons of the initial interview and subsequent recall interviews indicated that the initial interview was significantly higher (about 20 percent) on reports of number of days stayed home, probably due to telescoping. There were virtually no differences between the initial and subsequent interviews in number of bed days reported, but the panel did report many more hospital visits. The latter were almost entirely due to outpatient visits, which seem to have been missed in the initial interview since respondents were asked about hospital patients. Results on reports of doctor visits were mixed, with the initial interview higher than the diary reports but lower than the subsequent recall interviews.

Experimental Procedure

The major problem with the previous research was that a special population was used. While this special population made validation much more direct and complete, it was not clear whether the results could be directly generalized to the population of all households. The next stage of the research reported here is to test the use of diaries on a general household sample in a larger geographic area. This is an intermediate step to testing the use of diaries with a national sample.

It was anticipated that households with lower education levels and higher levels of illness would have the greatest difficulty in keeping diary records as well as recalling medical events. For this reason, a disproportionate stratified sample was selected. Specifically, the following procedure was used:

1. The Survey Research Laboratory screened a probability sample of 6,432 households in Illinois during January-March 1976 using phone interviews to obtain information on medical experiences in the previous year as well as other demographic information. Screener information was obtained from 5,214 households or 81.1 percent of all eligible households. This level of cooperation is excellent, considering that two-thirds of the population in the State of Illinois is concentrated in the Chicago metropolitan area, where cooperation is usually more difficult to obtain. The reasons for this rate were that the screener questionnaire was carefully pretested three separate times, the interviewers had substantial previous telephone experience, and advance post cards were sent to respondents outside the city of Chicago where telephone listings were used. In the city of Chicago, random digit dialing was used since about 50 percent of households have unlisted telephone numbers. Of course, advance postcards could not be sent to these households.

No major efforts were made to convert the refusals or to locate the remaining non-contacts. Past experience would suggest that the cooperation rate might have been increased to near 90 percent if this had been attempted, but that costs would also have risen sharply.

2. From this sample of 5,214 a disproportionate stratified sample of 1,446 households was selected (to obtain a final sample of about 1,200) with the stratifying variables being:

   a. Level of medical experience in the previous year;
   b. Education of female head of house or spouse of male head.

There were four strata, each with about 300 households:

Stratum 1: Low education, low incidence
2: Low education, high incidence
3: High education, low incidence
4: High education, high incidence

Other variables such as household size, race, age of head and respondent, geographic location and other social class variables such as income and occupation were considered for stratification, but previous experience indicates that these are less highly related to accuracy of diary keeping of medical events. These variables are considered in the analysis, rather than increasing the cost and difficulty of the initial screening.

3. An initial interview was conducted with all households which were then randomly assigned to one of the following three treatments:

   a. Three personal interviews at monthly intervals;
   b. Recruit to keep a diary of medical experiences for three months with total compensation of $15;
   c. Recruit to keep a diary with no compensation.

Figure 1. PROPOSED RESEARCH DESIGN FOR STUDY OF USE OF DIARIES FOR COLLECTING HEALTH DATA

	Number of Households			
	High Incidence		Low Incidence	
Treatment	High Ed.	Low Ed.	High Ed.	Low Ed.
Personal	(100)	(100)	(100)	(100)
Face-to-face	50	50	50	50
Phone	50	50	50	50
Diary—compensation	(100)	(100)	(100)	(100)
Pick up	50	50	50	50
Mail	50	50	50	50
Diary—no compensation	(100)	(100)	(100)	(100)
Pick up	50	50	50	50
Mail	50	50	50	50
Total	300	300	300	300

Within a stratum, about 100 households received each treatment.

4. The Survey Research Laboratory attempted procedures for reducing costs with half the households in each treatment method. For the personal interviews, half the households were contacted by phone, rather than face-to-face. For the diaries, half the households were requested to mail diaries in. See figure 1 for a description of the overall design.

5. SRL attempted to maximize the diary mail in cooperation rates by conducting reminder phone calls to respondents whose diaries were not received within two weeks of the expected date.

Summary of Results

The complete discussion of the analysis is in a report prepared for the National Center for Health Services Research. Copies of this report will be available in the near future. Here, I shall summarize some of the key findings and present some illustrative tables.

1. As seen in the earlier work on special samples, diary pick up methods obtain as high levels of cooperation as do repeated personal and phone interviews (table 1).

2. Almost all non-cooperation occurs in the 1st month of the panel for both diary and personal procedures. Losses in the 2nd and 3rd months are only between 1 and 2 percent of the sample (table 1).

3. Diary mail-in methods are substantially worse in obtaining household cooperation than are other methods (table 1).

4. Compensation has no significant effect on cooperation for diary pick up methods, but does have a significant effect for the mail-in procedures (table 1).

5. There is no evidence that less educated households with more health problems have any more difficulty with diaries than they do with personal or telephone interviews. Cooperation was lower on the phone than with the diary pick up methods, although the differences are not significant.

Table 1. COOPERATION BY METHOD AND MONTH

		Percent Cooperating			
			Month		
	n	Initial	1	2	3
Personal	256	91.3	87.4	83.1	82.3
Phone	231	85.5	79.7	78.5	77.7
Diary pick up	432	85.6	82.9	81.0	80.1
Compensation	221	85.5	81.9	81.0	80.1
No compensation	211	85.8	83.9	81.0	80.1
Diary mail	441	89.6	63.7	57.6	52.2
Compensation	223	90.1	69.1	63.2	59.2
No compensation	218	89.0	58.3	51.8	45.0

Table 2. DAYS FELT ILL BUT PERFORMED USUAL ACTIVITIES BY METHOD

Method	Month 1	Month 2	Month 3	3 Month Average
Personal				
Face-to-face	4.31 *(201)*	3.29 *(192)*	3.58 *(190)*	3.73
Phone	3.02 *(205)*	3.91 *(201)*	4.36 *(202)*	3.76
Diary				
Pick up	7.59 *(358)*	5.73 *(347)*	5.26 *(342)*	6.19
Mail	10.14 *(283)*	6.73 *(256)*	7.36 *(230)*	8.08
Compensation	10.57 *(334)*	6.41 *(318)*	8.18 *(305)*	8.39
No compensation	6.83 *(307)*	5.81 *(285)*	3.80 *(267)*	5.48
Compensation-pick up	8.92 *(180)*	5.87 *(176)*	6.73 *(173)*	7.17
mail	12.62 *(154)*	7.16 *(142)*	10.31 *(132)*	10.03
No compensation-pick up	6.36 *(178)*	5.53 *(171)*	3.79 *(169)*	5.23
mail	6.98 *(129)*	6.03 *(114)*	3.81 *(98)*	5.61

Table 3. DAYS STAYED HOME FROM WORK OR SCHOOL OR UNABLE TO DO USUAL TASKS BY METHOD

Method	Month 1	Month 2	Month 3	3 Month Average
Personal				
Face-to-face	3.31 *(201)*	4.09 *(192)*	3.15 *(190)*	3.52
Phone	2.99 *(205)*	3.29 *(201)*	3.45 *(202)*	3.24
Diary				
Pick up	4.71 *(358)*	4.36 *(347)*	3.45 *(342)*	4.17
Mail	4.35 *(283)*	2.88 *(256)*	3.45 *(230)*	3.56
Compensated	5.64 *(334)*	4.72 *(318)*	3.68 *(305)*	4.68
Not compensated	3.46 *(307)*	2.29 *(285)*	3.24 *(267)*	3.00
Compensated-pick up-mail	6.10 *(180)*	3.69 *(176)*	5.33 *(173)*	5.04
	4.36 *(154)*	3.62 *(142)*	4.02 *(132)*	4.00
Not compensated-pick up-mail	2.76 *(178)*	3.22 *(171)*	2.75 *(169)*	2.91
	4.34 *(129)*	3.19 *(114)*	1.42 *(98)*	2.98

Table 4. VISITS TO HEALTH PROFESSIONALS BY METHOD

	Month 1	Month 2	Month 3	3 Month Average
Personal				
Mean visits	1.81	1.59	1.40	1.60
σ	2.38	2.43	1.99	
Phone	1.70	1.52	1.33	1.52
Face-to-face	1.92	1.66	1.46	1.68
Diary				
Mean visits	1.71	1.43	1.45	1.53
σ	2.23	1.99	1.98	
Pick up	1.66	1.33	1.32	1.44
Mail	1.77	1.57	1.64	1.66
Compensated	1.87	1.55	1.56	1.66
Not compensated	1.54	1.30	1.33	1.39
Ratio Diary/Personal	.94	.90	1.04	.96
Initial interview				
Based on month	2.11			
Based on 2 weeks	2.25			
US estimate (HIS)	1.73			

Table 5. VISITS FOR HOSPITAL CARE BY METHOD

Method	Month 1	Month 2	Month 3	3 Month Average
Personal	.36	.25	.21	.27
Face-to-face	.38	.21	.18	.26
Phone	.35	.32	.27	.31
Diary	.30	.24	.27	.27
Pickup	.35	.24	.27	.29
Mail	.23	.24	.27	.25
Compensation	.35	.30	.32	.32
No compensation	.24	.18	.20	.21
Ratio Diary/Personal	.83	.96	1.29	1.0
Initial interview	.09			

Table 6. DAYS FELT ILL BUT PERFORMED USUAL ACTIVITIES BY HOUSEHOLD MEMBER

Household Member	Month 1	Month 2	Month 3	3 Month Average
Children				
Personal	.57	.28	.51	.45
	(467)	*(452)*	*(455)*	
Diary	1.40	.98	1.01	1.13
	(772)	*(739)*	*(702)*	
Ratio	2.46	3.49	1.99	2.51
Male Adults (Head & Others)				
Personal	1.12	.98	1.27	1.12
	(372)	*(362)*	*(360)*	
Diary	3.50	2.36	2.62	2.83
	(763)	*(719)*	*(683)*	
Ratio	3.13	2.41	2.06	2.52
Female Adults (Wife)				
Personal	1.78	2.07	1.90	1.92
	(447)	*(438)*	*(440)*	
Diary	2.40	2.06	1.57	2.01
	(469)	*(441)*	*(420)*	
Ratio	1.35	1.00	.83	1.05

Table 7. NUMBER OF MEDICAL SUPPLIES OBTAINED BY METHOD AND TYPE

Type	Month 1		Month 2		Month 3		3 Month Total	
	Phone	Face	Phone	Face	Phone	Face	Phone	Face
Personal								
Prescription	1.14	1.50	.91	1.23	.99	1.19	1.01	1.31
Non-prescription	.17	.65	.24	.55	.18	.53	.20	.58
% prescription	86.3	69.9	78.9	69.3	84.3	69.3	83.2	69.5
n	*(205)*	*(201)*	*(201)*	*(192)*	*(202)*	*(190)*		
	No/comp	Comp	No/comp	Comp	No/comp	Comp	No/comp	Comp
Diary								
Prescription	1.04	1.01	1.06	1.19	1.18	1.31	1.09	1.17
Non-prescription	.43	.61	.59	.68	.68	.77	.57	.69
% prescription	70.8	62.2	64.1	63.8	63.6	63.1	65.7	62.9
n	*(307)*	*(334)*	*(285)*	*(318)*	*(267)*	*(305)*		

6. For the less salient events, especially days "felt ill," but "performed usual tasks," substantially higher reporting of events is obtained from diaries than from personal interviews. For the more salient events, such as visits to health professionals and hospitals, the differences between diary and personal methods become insignificant. Diary methods yield more accurate reporting than personal methods for household members other than the respondent. On personal interviews, the data about the respondent are considerably more complete than are the data about other household members (tables 2-6).

7. Diary households who are compensated consistently report higher levels of events than do non-compensated households (tables 2-5).

8. There are no differences in total household events reported by phone and face-to-face methods, although there is the possibility that accuracy of reporting about different individuals in the household differs between phone and face-to-face procedures.

9. The same method effects are generally seen for all sample types. There is no evidence that education has an effect on diary keeping. There is some indication, however, that households with less education may be subject to larger response effects on the personal interview.

10. Diary households report slightly higher purchases of medical supplies, but the number of payments to medical care providers does not differ by method (table 7).

11. Reports on the details of a medical event or expenditure are consistently more accurate in the diaries. As an illustration, there is evidence that respondents on the personal interviews misclassify a substantial proportion of over-the-counter medical supplies as being prescriptions (table 7).

12. Comparisons to data from the National Health Interview indicate that the sample of Illinois households used in this study does not differ in its medical experiences from a national sample. Comparisons of the initial and unbounded interview to the panel results, however, indicate that some of the National Health Interview results may be inaccurate, although in some cases the effects of telescoping and forgetting events cancel each other.

13. Looking only at costs and cooperation, the tele-

Table 8. DIRECT COSTS PER SINGLE INTERVIEW BY METHOD AND LOCATION

	Initial Interview		Single Followup Interview					
	Phone	Face-to-Face	Phone	Face-to-Face	Diary Mail Compensated	Diary Mail Uncompensated	Diary Pickup Compensated	Diary Pickup Uncompensated
Chicago		$13.88 *(n=548)*		$11.36 *(n=353)*			$13.80 *(n=295)*	$ 8.86 *(n=288)*
Urbana		$17.56 *(n=430)*		$14.88 *(n=236)*			$17.14 *(n=242)*	$12.94 *(n=229)*
TOTAL	$ 3.42 *(n=219)*	$15.50 *(n=978)*	$ 4.33 *(n=604)*	$12.77 *(n=589)*	$ 5.48 *(n=427)*	$ 1.06 *(n=338)*	$15.31 *(n=537)*	$10.68 *(n=517)*

phone procedure is the least expensive method that yields high cooperation (table 8).

14. Face-to-face interviews are more expensive than diary procedures except when compensation is used for diary pick up households (table 8).

15. Diary mail-in procedures after an initial face-to-face interview are more expensive than phone interviews, but cheaper than all other methods (table 8).

16. The diaries that were picked up were the easiest to code, having the most complete and detailed information.

Recommendations

Comparing the results simultaneously, no one procedure is both most accurate and cheapest. The cheapest method, repeated telephone interviews, results in cooperation rates as high as those in face-to-face interviews. The levels of reporting and the quality of the data, however, are clearly inferior to data obtained from diary procedures and marginally inferior to data from face-to-face interviews on selected topics. The differences are greatest, however, for the less important and salient items and for purchases of medical supplies. If the major purposes of a study were to monitor more serious illnesses, the losses in accuracy from using phone procedures would not be very serious and these procedures would become very attractive.

If the greatest possible accuracy is required in terms of both sample and reporting, the diary pick up procedures are optimum. These yield not only the highest levels of all kinds of medical events and expenditures, but also the most complete and accurate recording of details. If households are to use diaries, there is no reason to use the diaries only as memory aids. The data from the diaries can be processed with little difficulty by a trained coding staff.

Compensation had no effect on cooperation in this study, but did improve the level of reporting of diary households. One might expect that compensation would become even more important if the length of the period were extended beyond three months. Governmental agencies that have implicit or explicit policies against compensating respondents might consider the possibility of alternative forms of compensation instead of money. Attractive publications from the U.S. Government Printing Office or a small electronic calculator for use in keeping track of medical expenses are among the possibilities.

Diary mail-in procedures resulted in substantially lower cooperation levels than did all the other procedures, although the quality of the diaries returned by mail was not significantly lower than that of diaries which were picked up by interviewers.

All of the panel procedures eliminate telescoping and are, in that respect, superior to a single interview. There is some indication, however, that the current two-week period used in the Health Interview Survey balances telescoping and omissions. The results are closer to those found in the diaries than to the bounded interviews. Bounded interviews unadjusted for omissions would produce lower levels than those seen currently.

Given the variety of cost and quality considerations, are there procedures that are only a little more costly than the cheapest procedures, but for which the gains in accuracy more than compensate for the increased costs? Some combined procedures seem to be worth consideration. One method might combine the use of diary mail-in and phone procedures. Households would be recruited to mail in diaries, but those who refused to do so, or promised to do so but did not, would be contacted by phone. The phone work and mailing could be handled from a central location after the initial face-to-face recruiting interview. The presence of the diary in the home and at least its partial use as a memory aid should improve the quality of the phone reporting, although phone responses would still not be as accurate as reports in diaries that are picked up. At the same time, the low cooperation of the mail-in diaries would be overcome by the use of the phone procedures.

This procedure could be tested either with or without compensation for responding households. It is not clear that compensation would have any effect on the households contacted by phone, but compensation would improve the level of reporting of the households who mailed in diaries.

Even if diary pick up procedures are used, telephone calls might be made to obtain missing data or correct errors in diaries or to contact households who were unavailable during the diary pick up period.

One combined method that is currently used, an initial face-to-face interview followed by later phone interviews, appears to have no major advantage in terms of cost, cooperation, or quality of data over straight telephone interviewing. For a very careful sample, however, it might be necessary to have the households without telephones represented. (Although less than ten percent of all U.S. households are without a phone in their homes, the percentage is substantially higher in some parts of the country, particularly the rural South.) For these households, a diary pick up procedure could be used, while phone interviews were used elsewhere.

It should be noted that the same optimum allocation formulas that are used in other stratified samples would also be appropriate here. That is, if combined methods with different costs are used, the optimum allocation of the sampling rate in a stratum is inversely proportional to the square root of the unit costs in the stratum.

Finally, it should be noted that all the panel methods yield better data at lower cost than do independent interviews. This is true even if one is interested primarily in levels since the increase in response accuracy in panels more than compensates for the increase in sampling variance. If one is particularly interested

not in measuring levels, but changes, the advantages of panels are even greater since both response and sampling errors are lower for panels than for independent interviews. There is little doubt that households are interested in health topics and willing to cooperate in surveys that gather health information on a continuing basis, regardless of whether diary or personal interview procedures are used.

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THE TELEPHONE INTERVIEW: PROGRESS AND PROSPECTS

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Just over 100 years ago Alexander Graham Bell sent the first message over the telephone, "Come here, Watson, I want you." In more recent years hundreds of U.S. citizens have received a somewhat different message, "Hello, I want to interview you."

Mr. Bell's invention has spread from that first phone to over 90 percent of U.S. homes, a sufficiently high proportion to permit drawing samples of phone numbers which can closely mirror the national population. WATS lines now cover the entire country, substantially reducing the costs of long-distance calls and making telephone surveys feasible for a State, a section, or the whole Nation.

The survey research community has enthusiastically adopted this new potential for data collection. Within the past several years, government, university, and private survey organizations have turned to phone interviewing in place of personal interviews for at least some of their research. Compared with the organizational costs of developing or maintaining a widespread field interviewing staff, it is relatively easy and comparatively inexpensive to establish and staff a facility which can make phone calls throughout the United States.

The purpose of this paper is to introduce and discuss briefly some of the issues relating to telephone interviewing. Survey methodologists have only recently begun to study efficient uses and effective techniques for telephone interviewing. Because of this, few research findings are presently available, and our present ideas derive primarily from experience, impressions, and guesses. For this reason any statement we make here today is subject to change, alteration, and correction as we add to research findings and expertise about telephone interviewing.

First, consider some *general* topics and problems of telephone surveys. Of primary interest to potential users is the question of the quality of the data obtained from telephone interviews, compared with that derived from personal interviews. There is no definitive study which makes this comparison, and several that are available in the literature blur the comparisons because of the samples used, or because respondents interviewed on the telephone had previously been interviewed in person.[1] These studies show few differences indicating that one or the other data-collection method is consistently superior. In fact, the most striking findings pointed to a problem of reporting invalidity shared by *both* telephone and personal interviews.

Wiseman[2] asked a series of opinion questions of respondents, some in person, some over the telephone, and some in a mail questionnaire. There were no significant differences between telephone and personal interviews on most items, but on two particularly sensitive issues—attitudes toward the availability of contraceptive information to unmarried women—the telephone interviews showed a somewhat more liberal position.

Henson, Roth, and Cannell[3] found evidence that respondents were somewhat *less* likely in person than over the telephone to claim positive qualities for themselves on the Lubin mental health scale. Reporting on other indices of mental health did not vary with the data-collection method used.

Hochstim's study[4] of health variables found evidence that responses were generally comparable in personal interviews, telephone interviews, and mail questionnaires. His data did suggest that on some social-desirability items, slight differences were found which favored the telephone for obtaining reports of socially undesirable information. In contrast, Colombotos,[5] interviewing a sample of physicians, reports that personal interviews obtained as many reports of socially undesirable information as did telephone interviews.

Groves and Kahn,[6] in a carefully controlled comparison of telephone and personal interviews, found few significant differences. For the telephone interviews, however, they do report somewhat higher

[1] The exception is the Groves/Kahn study, which makes a comparison of national samples based on comparable samples of personal interviews and telephone interviews.

[2] Wiseman, F. "Methodological Bias in Public Opinion Surveys." *Public Opinion Quarterly, 36,* 1972:105–8.

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[5] Colombotos, John. "Personal versus Telephone Interviews: Effect on Responses," *Public Health Reports, 84,* 1969:773–82.

[6] Groves, Robert M. and Robert Kahn. *Comparing Telephone and Personal Interview Surveys.* New York: Academic Press (forthcoming).

item-nonresponse, and shorter answers to open questions.

These studies typify the overall findings of small and inconsistent differences in the information yielded by the two methods. Two studies, however, demonstrate the important and shared problem of response invalidity. Rogers[7] reinterviewed a personal interview sample, randomly assigning them to a telephone or a personal interview. Questions asked for complex knowledge, attitudes, income, voting behavior, and education. As in the studies described earlier, few differences were found between reports from the two types of interviews. Those differences that did occur were small, and tended to favor telephone interviews, but the sample sizes were too small to permit any firm conclusions. The most significant finding, however, was the invalidity of report in *both* methods. For example, in both telephone and personal interviews, voting in the presidential and mayoral elections was overreported by about 20 percent.

Similarly, Locander, Sudman, and Bradburn[8] found only minor differences between personal and telephone interviews in the validity of reporting of embarrassing events. They did, however, find that invalid reporting by telephone ranged from 12 percent for voter registration to 46 percent for drunken driving. These studies point to the major issue of response validity.

At present, little is known about what constitutes effective telephone-interviewing techniques. Historically, the motives for turning to telephone interviews have been primarily a desire to avoid high costs and low response rates rather than a desire to explore a new and promising data-collection method. Consequently, the telephone interview has tended to be perceived as a less desirable alternative to the personal interview—simply a personal interview conducted from a distance.[9]

The goal in turning to telephone interviewing should not be simply to obtain the same quality of data on the telephone as from personal interviews (a quality which research demonstrates is sometimes quite poor), but rather to take full advantage of the new technology, and to develop techniques which will minimize error and bias. There are basic differences between personal and telephone interviewing which need to be studied.

One of these differences is the absence of visual communication on the telephone, substantially reducing the usual cues by which interviewer and respondent communicate with and are perceived by each other. Another difference is the lack of the naturally occurring, pre-interview interaction which characterizes a personal interview. In personal interviews, there are usually several minutes of pre-interview conversation beginning on the doorstep while the interviewer and respondent become acquainted and prepared for the interview. In contrast, the natural tendency over the telephone is to introduce the survey briefly and move quickly to the questions. This is probably due in part to conventions governing telephone behavior which dictate that strangers state their business, transact it efficiently, and avoid nonessential conversation.

In personal interviewing, the elements of visual communication plus the pre-interview acquaintance period allow the interviewer easily and naturally to establish both the legitimacy of the interview and the image of herself[10] as a pleasant, understanding, and safe person with whom to interact. In personal encounters, perceptions of others are biased in large part on a constant stream of nonverbal communication, including smiles and other facial expressions, posture and postural changes, eye contact, and other physical behaviors. The interviewer's physical presence allows her to communicate attention to, interest in, and acceptance of what the respondent has to say, through nonverbal as well as verbal indicators.

The absence of visual communication in the telephone interview may seriously hamper the interviewer's ability to maintain and strengthen the image of safeness, permissiveness, and acceptance of what the respondent has to say. Since these qualities contribute to respondent motivation, techniques for communicating them over the telephone need to be developed. Without special efforts there may be lingering suspicion of the purpose of the interview and uncertainty about how to respond to the unknown, unseen interviewer.

The preceding pages have raised some fundamental issues which confront telephone surveys, and answers will come only through methodological investigations. But researchers are unlikely to declare a moratorium on telephone surveys until firm answers are given. Such methodological lag is not unique, and research in science seldom awaits the development of perfect measurement techniques. One only hopes that progress is not too long delayed.

Interviewing Technique

While the basic principles of face-to-face interviewing are applicable to telephone use, there are some major differences due primarily to the need to compensate for the missing nonverbal communication. Social scientists have demonstrated that much of the

[7] Rogers, Theresa F. "Interviews by Telephone and in Person: Quality of Responses and Field Performance," *Public Opinion Quarterly, 40,* 1, 1976:51–65.

[8] Locander, William, Seymour Sudman, and Norman Bradburn. "An Investigation of Interview Method, Threat and the Response Distortion," *Journal of the American Statistical Association, 71,* 1976:269–75.

[9] The exception has been in the development of sampling techniques unique to the telephone interview.

[10] We use the female pronoun since interviewing staffs tend to be women.

significant content of interpersonal communication consists of eye contact, head and body motion, smiles or frowns, head nods, etc. Much of this nonverbal, visual communication reinforces the verbal communication, and is especially significant in providing feedback to the other person. Such feedback may convey affection or messages of liking, acceptance, and warmth, as well as cognitive messages that the communication has been understood and achieves its intended purpose. In telephone interviews, the absence of nonverbal visual stimuli needs to be compensated for by increased use of verbal feedback.

Interviewers are very aware of this need for feedback and, if not given adequate techniques, will invent their own. Unfortunately, these often consist of spontaneous comments, directive probes, or agreement—all types of feedback which are potentially biasing. Interviewers have been overheard making such comments as, "That's a good answer," "Sorry to hear you had the flu. I had it myself and felt terrible." "My uncle had the same disease you have." "I'll bet you felt terrible!" "Yes, that is a tough question; give a guess."

To avoid these idiosyncratic interjections, preplanned feedback responses need to be incorporated into the questionnaire, or the interviewers provided with a list of acceptable feedback items to use after each response. These may be simply, "I see," or "Umhmm," to communicate understanding; or they may be longer, "That's useful information," "We're interested in that."

Another major interviewer problem is the speed at which telephone interviews are conducted. Interviewers proceed too rapidly both in reading questions and in rushing to the next question following the response. Rapid pace in reading questions leads to misunderstanding and misinterpretation. A rapid response time also inculcates a reaction that the interview is superficial and that careful consideration of responses is unnecessary and not desired. Special training in interviewing at a slower pace is called for.

Attention to feedback will communicate to respondents that they are understood and are performing well; a slow pace will communicate a sense that the interview is a serious undertaking, and requires careful attention. Both techniques are incentives to diligent respondent performance, hopefully producing more valid responses.

Monitoring Interviewer Performance

Telephone interviews conducted from a central location permits close monitoring of interviewer performance, especially to evaluate and correct faulty techniques. This is a major advantage over household interviews; it leads to better standardization of performance, and can substantially improve the quality of interviewing.

Properly done, monitoring is not simply a matter of listening to interviews but is structured listening, based on a system for objectively coding the quality of performance on all major interviewer techniques.

The monitoring forms that we are presently using for telephone interviewing include ratings of a sample of questions for such variables as: question-asking pace, naturalness of speech, probes, reinforcement, etc. Each sampled question in each sample interview is rated on a 4-point scale for these variables. The results can be summed for overall evaluation of the interviewer's performance. Immediate feedback to the interviewers, evaluating and correcting their performance, will maintain a high standard of data collection.

Sampling

The sampling objective for the telephone interview survey is the same as for the personal interview survey—to select a probability sample which truly reflects the population which one wishes to describe. Assuming that one wishes a sample of the adult population, the first step is to establish a sampling frame containing the telephone numbers of the entire population from which a sample can be drawn.

For special samples—for example, members of Health Maintenance Organizations—one would sample from a list of all such members. Obtaining a sample of the general population is more complicated because no complete, up-to-date list is available; but even if such a list were available, not everyone has a telephone.

We mentioned that over 90 percent of U.S. households had telephones; but there is considerable variability in this coverage by geographical sections of the country, by urban versus rural areas, and by other personal demographic characteristics of potential respondents. Before deciding on a telephone survey, it is important to determine the telephone coverage for the particular population to be sampled. (Such information is usually available from AT&T offices.) Naturally, the first idea which comes to mind in considering how to obtain a sample of telephones is to use the telephone directory. Telephone directories, however, pose at least two serious obstacles to good sampling methodology; the omission of all unlisted telephones (a large and growing population), and the rapid outdating of the directories.

A sampling method that avoids these problems has been called "random-digit dialing." While somewhat more complicated than this simple description implies, sampling consists of generating a set of randomly chosen, 4-digit numbers.

Such a sample is not very efficient, since it will include nonworking numbers and business establishments. Systems to increase efficiency by reducing nonworking numbers are beginning to appear. Methods developed by Sudman [11] and by Waksberg [12] are

[11] Sudman, Seymour. "The Use of Telephone Directories in Survey Sampling," *Journal of Marketing Research, 10,* 1973:204–07.

[12] Waksberg, Joseph. "Sampling Methods for Random Digit Dialing," *Journal of the American Statistical Association, 73,* 361, 1978:40–46.

among the best examples. I recommend that a sampling statistician be consulted in designing a sample. Although simpler by far than generating an area probability population sample, designing the telephone sample is still a complex technical undertaking.

Response Rates

Some investigators claim a higher response rate for telephone surveys than for personal interviews, while others find the rate to be about the same or even somewhat lower. But regardless of what the response rates actually are, it is clear that telephone interviews are not the answer to low response rates. There is some evidence, however, that the rates are more nearly equal for urban and rural segments of a sample, a gain over personal interview rates which usually show significantly lower rates in highly urbanized areas.

Data-Collection Costs

Cheaper data is one attraction of telephone surveys, and they are considerably cheaper than area probability samples and personal interviews. They are, however, not as cheap as might be assumed, being one-third to one-half the cost of personal interviews. An analysis of costs shows that approximately 33 percent of the costs are for interviewers' salaries, and 40 percent are for equipment costs and long-distance (WATS) line charges. A higher proportion of data-collection salaries are spent on monitoring and supervising than is the case for personal interviews because of the opportunity for better control. While cheaper data is a desirable goal, the objective is not to find the cheapest method but to determine the method yielding the most valid data per dollar.

Computer-Based Telephone Surveys

A relatively new development in telephone surveys is the use of interactive interviewer-computer systems. The interviewer faces a TV screen using a console on which either precoded or free responses can be entered directly into the computer. The questionnaire is stored in the computer, which displays the appropriate question on the screen. Such systems presently exist or are being developed at some commercial organizations, at the Census Bureau, and at a few universities. Although not likely to be available for widespread use at least for some time to come, it does extend the potential of telephone interviewing by providing better control over interviewer behavior and by eliminating at least two survey steps: independent coding, and card-punching. For most questions, these two steps become part of the interviewer's activities.

Concluding Statement

As these comments suggest, telephone interviewing is a new methodology in survey research and not simply an adaptation of face-to-face interviewing. It presents a new potential, but also new methodological problems. When techniques are properly developed and researched, telephone interviewing may yield survey data which are more valid than are usually produced in field interviews, largely because of the potential for greater standardization and control over interviewer performance. The new developments in telephone interviewing portend exciting times ahead for survey research. Taking advantage of new technical developments could mean a revolution in survey research, perhaps the most significant since probability sampling and the advent of the computer.

METHODOLOGICAL CONSIDERATIONS FOR THE DEVELOPMENT OF A HEALTH INTERVIEW SURVEY CAPABILITY AT THE STATE OR LOCAL LEVEL

Robert R. Fuchsberg, *Director, Division of Health Interview Statistics* and Monroe G. Sirken, Ph.D., *Associate Director for Mathematical Statistics, NCHS, Hyattsville, Maryland*

The National Center for Health Statistics under Public Law 93-353 was authorized to develop a cooperative health statistics system "to assist State and local health agencies and Federal agencies involved in matters relating to health in the design and implementation of a cooperative system." The purpose of this legislation was to establish and maintain coordinated and uniform data systems to guide decisionmaking regarding health care in the United States by enabling decision makers to learn of current and future health needs, to make better planning possible, and to allow more effective monitoring and evaluation of health programs and services.

In an effort to implement Public Law 93-353 the Division of Health Interview Statistics examined its present data collection program which was designed to gather health, disability, and medical care information for the Nation as a whole, for the four major regions of the country, and also for several of the largest standard metropolitan statistical areas. Expansion of the sample to provide annual State and local estimates was considered and discarded because of the very high costs. It would require about 50 million dollars to provide annual estimates for all States and many hundreds of millions to produce local estimates for every sizable community. Instead of attempting to meet State and local population health data needs through a sample expansion of the National Health Interview Survey, it was decided that the survey staff would provide technical assistance to State or local governments which requested assistance in conducting their own survey. A limited number of States and local agencies have contacted the National Center for Health Statistics and requested varying amounts of technical assistance. Assistance has been provided to Tennessee, Virginia, Hawaii, New Hampshire, Puerto Rico, Fort Lauderdale, Florida, and a number of other areas in an attempt to share our knowledge and experience with our colleagues either contemplating or carrying out household surveys. In addition, members of the Center staff conduct courses annually under the auspices of the Applied Statistics Training Institute in Health Survey Methods and Procedures and in Health Survey Sampling Methods in a further effort to share our experience in hope of improving survey research design and encouraging greater survey validity, reliability, and comparability.

In carrying out these technical assistance activities, a number of training materials, reports, and manuals are being developed to assist State and local data gatherers. These survey methodological descriptions are used in conjunction with our technical assistance efforts. They are not designed as do-it-yourself survey instructions since we believe that scientific population sample surveys are too complex for the do-it-yourself handbook approach.

While proceeding with our efforts to provide technical assistance to State and local health interview surveys, we are also pursuing other approaches in our efforts to meet the local data needs. We have proposed a redesign and fourfold sample expansion of the National Health Interview Survey. This will permit the Health Interview Survey to produce a limited amount of key statistics for all States by combining up to three years of data on continuing or core topics. For States with the largest populations, annual estimates could be produced. For medium population States, estimates could be produced by combining two years of data, and States with low population density would require information combining three years of data to produce reliable estimates. In addition to enabling the Health Interview Survey to provide such direct State estimates of key health variables, the sample expansion would provide a greatly improved capacity to produce indirect or synthetic State or local estimates for items too rare to be measured directly. The indirect or synthetic estimates are constructed by using regional or national population rates for a health variable and adjusting the rate for each State in accordance with the demographic characteristics of the State's population.

Another new initiative is currently being developed to aid in meeting the increased demand for health and medical care statistics. The staff of the Division of Health Interview Statistics has long been dissatisfied because of its inability to meet urgent needs for data on emerging health concerns quickly. For example, during the past year when there was accumulating medical evidence of the dangers of liquid protein diets, there was an urgent need to know how many people were taking liquid protein and what other foods they were eating. The Health Interview Survey normally requires 2 or more years to develop a new supplementary item, pretest it, collect the data over the course of a year, tabulate the results, and analyze and write a report. Even if this procedure was speeded up due to the urgency of the situation, it is still too cumbersome to meet immediate data demands of this kind. Plans are now in progress to establish a telephone interview capability within the National Center for Health Statistics using random-digit dialing and the

computer assisted electronic questionnaire which could produce data on important, new or urgent health concerns within a matter of a *few months* instead of a *few years*. This telephone interview survey system will permit the National Center for Health Statistics to develop an expertise in the conduct of telephone surveys on health topics. This expertise will be used to assist State and local health agencies to conduct limited surveys within their target areas or even permit the National Center for Health Statistics to conduct such a survey for a local health agency. This system will be tested in the late summer and fall of this year, and we will be conducting some methodological research before the end of this year.

In summation, the Center is making a concerted effort to be responsive to State and local data needs by expanding the Health Interview Survey sample to produce direct and indirect (synthetic) estimates for State and local areas. It will continue to provide and expand its ability to give technical assistance to State and local agencies who wish to conduct health surveys by personal interview or by telephone. It may conduct demonstration telephone surveys using random-digit dialing for States or local areas to refine the methodology and develop technical assistance manuals. The Center will continue undertaking methodological studies to investigate the cost and error effects of alternative methods for producing State and local area and national statistics. These activities are currently being coordinated under the National Center for Health Statistics' recently established Survey Intelligence Service.

REMARKS ON PAPERS BY SUDMAN AND LANNOM, CANNELL, FUCHSBERG AND SIRKEN

Thomas B. Jabine, *Chief Mathematical Statistician, Social Security Administration, Washington, D.C.*

In spite of all the surveys going on today, there is very little useful research on survey methodology being done. There are probably good reasons for this. Good methodological research is expensive. Results tend to be dependent on target populations and survey content and therefore difficult to generalize. People in charge of surveys are understandably reluctant to complicate their lives by building in methodological experiments (Noelle-Neumann is an outstanding exception[1]).

Nevertheless, more research on survey methodology is necessary if we are to get our money's worth on the millions (billions?) of dollars spent annually on surveys. Those of us who work on the design of *samples* for surveys often comfort ourselves with the statement that "the optimum is very broad," meaning that even a fairly substantial departure from optimum allocation of resources may cause only a small increase in sampling error. However, if we expand our horizon to think about *total* survey design rather than sample design (i.e., minimizing the total error from all sources, or in Cannell's words obtaining "the most valid data per dollar"), we are no longer in the same comfortable environment. We are faced with a bewildering variety of alternative data collection procedures, which can lead to a wide range of outcomes measured in terms of quality and cost.

The number of organizations doing significant research on survey methodology can be counted on the fingers of one or at most two hands. We are fortunate to have 3 of them represented on this part of the program.

The paper by Sudman and Lannom provides useful information on the results of two specific methodological experiments with the use of diaries to obtain health data. There is little doubt that the diary is a useful weapon in the arsenal of the survey researcher. Not every respondent can be persuaded to keep a diary and to make entries on a regular basis or when events occur. However, for those who do, reports are likely to be more accurate than reports obtained retrospectively at the end of the reporting period.

The authors deserve particular credit for providing detailed unit cost data for the different procedures used, so that survey designers can use the results in the context of total survey design.

Since a discussant is expected to comment on the findings and their interpretation, I will proceed to raise some specific questions. No doubt many of these questions will be answered in the full report.

1. Testing of ledger versus journal-type diaries was described as a key feature of the first experiment; however, the findings for this comparison are not presented, nor are we told which type was used in the second experiment.
2. No information is given on sampling errors or levels of significance for the comparisons presented. I trust appropriate information will be included in the full report.
3. The relationships between the key findings and the data in the tables are not always clear. For example, looking at table 1, the conclusion that "losses in the 2nd and 3rd months are only between 1 and 2 percent of the sample" (item 2) does not appear to be true for diaries that were sent in by mail. The statement that "the number of payments to medical care providers does not differ by method" (item 10) is not supported by the data in table 7. The statement that "Diary methods yield more accurate reporting than personal methods for household members other than the respondent" may very well be true, but the data in table 6 do not clearly demonstrate this.
4. Health data are obtained in the National Health Interview Survey from one-time retrospective interviews, as opposed to the panel or longitudinal approach used in the experiments conducted by the SRL. For many items a 2-week reference period is used. The authors of this paper twice allude to evidence or indications that, at least for some items, errors due to telescoping and omissions tend to offset each other. I think it would be dangerous to rely on the limited evidence that now exists as grounds for complacency about the present design of the HIS. There is much evidence that the bounded interview approach reduces errors in reporting less memorable events, and for this and other reasons I believe that a thorough review of the total survey design of HIS is long overdue.
5. The most striking contrast between diary and personal interview methods was for the item "days felt ill but performed usual activities."

[1] Noelle-Neumann, Elisabeth, "Wanted: Rules for Wording Structured Questionnaires," *Public Opinion Quarterly*, Vol. XXXIV, No.2, Summer, 1970: 191–201.

However, it is not easy to imagine what value this particular item might have for health services planners. I make this point only to underline and call special attention to the authors' comment that the choice of method is a function of the information needed, and that the cheaper telephone procedures may be adequate for many data requirements.

6. Conclusions about the relationship between education of respondents and success with diaries should be interpreted with caution, because of the exclusion of non-telephone households from the second experiment. The relatively small sample sizes could also conceal real differences of sufficient size to be important in survey design decisions.

Finally, with respect to Sudman and Lannom's paper, I would like to second the authors' recommendations that *combined procedures* be considered. Whether the issue is what sampling frame to use or what data collection method to adopt, it is usually true that no one approach is optimum for the entire target population.

The paper by Cannell is more general in scope. It provides a thoughtful analysis of how telephone interviewing differs from other methods of data collection, especially face-to-face interviews. Recent developments, such as random-digit dialing and computer assisted telephone interviewing (CATI) are described. Readers are encouraged to consider telephone interviewing not merely as a substitute for personal visits to respondents, but as a method of data collection that offers unique advantages in terms of cost and potential improvements in quality if its special features are properly exploited.

Cannell touches briefly on the positive features of CATI. A recent report by Rustemeyer [2] gives considerably more detail on the potential for such things as pretesting questionnaires in an interactive mode, use of questionnaires tailored to respondent characteristics, greater facility for conducting split-panel tests of questionnaire variations, and faster tabulations. The possibilities seem almost limitless. For example, random assignment of cases to interviewers working out of a central location would permit reliable measurement of the contributions of interviewer variance and bias to total error. While these components of error are believed to be important in many types of surveys, they are difficult and expensive to measure in conventional surveys using face-to-face interviews.

I am not trying to say that the millenium is close at hand. CATI is not necessarily the answer to everyone's problems. While overall unit costs are low, the development costs are significant and it is likely that only a few organizations will establish sophisticated facilities for conducting national or local telephone surveys. The setup costs for particular surveys (e.g., programming the questionnaire display systems and the on-line edits) may be substantial, at least in the early stages. The CATI approach is likely to be of limited use when the content of the survey requires many open-end questions, use of flash cards or consultation of records by the respondent. In other words, CATI is probably not suitable for some of the more complex kinds of surveys.

I would also like to add a cautionary note about random-digit dialing. Like other tools, it can be used well or poorly. We all know that coverage loss can result from leaving out non-telephone households. However, there are some other problems with random-digit dialing that are not always acknowledged. First, what can we conclude about telephones that are not answered after one or more tries? Without going into detail, it is obvious that computing a response (or completion) rate in surveys using random-digit dialing is not a simple matter. Second what should be done about households with more than one telephone number? This problem can be dealt with readily, but is sometimes ignored, leading to overrepresentation of multi-telephone households in the sample estimates.

In spite of these caveats, I share Cannell's enthusiasm for the potential benefits from using telephone interviewing as a new methodology, and not just a way to conduct face-to-face interviews at a distance.

Fuchsberg and Sirken's paper tells how NCHS tries to assist State and local health agencies to obtain health survey data for the areas they serve. The sources of assistance include:

- Direct or synthetic estimates based on the National Health Interview Survey.
- Training and technical assistance for States and localities wishing to conduct their own surveys.
- Development of improved methodology for various kinds of State and local health surveys.
- (Possibly) conducting telephone surveys for States and localities, presumably on a reimbursable basis.

All of the proposed new initiatives have potential value for State and local agencies. However, the resources available to NCHS will continue to be limited and a realistic set of priorities is essential. The following comments represent my personal views on the probable payoffs from alternative courses of action.

1. *If* new money becomes available for the National HIS, it is not at all obvious that it should be used to expand the sample. This may seem like a strange statement in a meeting dedicated to helping State and local agencies. To understand it, I ask you to think in terms of total survey design rather than sample design. Providing State and local estimates with

[2] Rustemeyer, Anitra, "Toward Development of a Computer-Assisted Telephone Interviewing System," U.S. Bureau of the Census, July 1977.

somewhat lower sampling errors is not cost effective if the main source of error in these estimates is response bias. Better results *might* be achieved by changing the data collection procedures in the national survey (e.g., by using a diary-panel approach) and using indirect or synthetic methods to obtain State and local estimates.

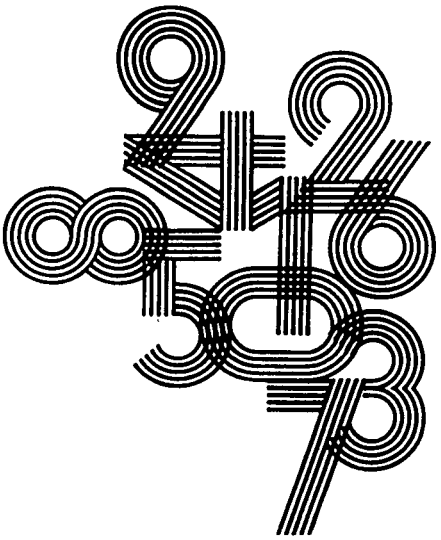
Applying the principles of total survey design to HIS will not necessarily call for a large investment in new methodological research. It will require a careful analysis of the considerable body of information already available (including that provided by Sudman's diary studies) on the components of sampling and nonsampling error for health survey variables. As stated earlier, I believe that such an effort is long overdue.

2. In my opinion, State and local agencies should not try to conduct local replicates of the Health Interview Survey, either on a continuing or an *ad hoc* basis, and NCHS should not encourage them to do so. HIS is a complex and expensive survey, requiring specialized professional resources which are usually not readily available to State and local agencies, especially for one-time surveys. Nor can many of these agencies afford to contract for such a survey.

   On the other hand, there are surely some local needs that can be met readily by relatively simple low-cost surveys, conducted either by the agency itself, or on its behalf by NCHS or by a contractor. Therefore, I am enthusiastic about NCHS's plan to develop a capability for conducting computer-assisted telephone surveys. With a reasonable investment, it should be possible to develop a set of survey modules for CATI surveys that will be responsive to State and local needs and which can be used either by NCHS or by other organizations to do surveys for the agencies that want and can afford them.

3. I am also happy to see that NCHS is planning the development of a facility for conducting surveys that can provide quick response to needs for data on special concerns that cannot be anticipated far ahead. The problem of the long time lapse between perceived needs for new survey data and the actual availability of these data is pervasive in the Federal statistical system. There have been a few serious attempts to attack this problem. Perhaps the greatest success has been achieved by the Center for Disease Control in establishing facilities for conducting epidemiological studies quickly in response to special health problems.

   The use of CATI techniques, although potentially helpful, will not in itself result in an effective facility for quick response surveys. Paradoxically, what will be needed is very careful advance planning over an extended period to develop special budgeting, clearance and (if applicable) contracting procedures. Only in this way will it be possible to move quickly when the need arises.



CONCURRENT SESSION C

National Health Monitoring and Surveillance

NATIONAL HEALTH MONITORING AND SURVEILLANCE

Welcome to the session on National Health Monitoring and Surveillance. I'm Paul Leaverton of the National Center for Health Statistics (NCHS).

I was requested to organize a session on this topic, one that is dear to my heart, and was very pleased to do so. It is an important area and interest is escalating. Pending national legislation has NCHS playing a more prominent role in environmental epidemiology. We will be orienting our resources more toward health monitoring and there will be more coordination with other Federal agencies for this purpose.

We have arranged this session to present and discuss a variety of national health monitoring and surveillance systems. The common thread is that they are national in scope. Some, but not all, will be able to point to new areas of concern with the environment, with occupational hazards, or with consumer products.

We have a distinguished lineup of speakers. It should be an interesting afternoon.

INFANT MORTALITY SURVEILLANCE: SUMMARY OF PRESENTATION

Joel C. Kleinman, Ph.D., *Special Assistant to the Director, Division of Analysis, National Center for Health Statistics, Hyattsville, Maryland*

In this presentation, I discuss two methodological issues related to infant mortality surveillance. Surveillance is defined as the identification of geographic areas or population segments with unusually high rates or with rates having unusual temporal patterns. Two purposes are distinguished: health program planning and evaluation, and monitoring or identifying potential environmental hazards.

The first issue involves the use of total versus race-specific rates. In 1976, the black infant mortality rate (IMR) was 92 percent higher than the white rate (25.5 versus 13.3 per 1000). Furthermore, there was virtually no overlap in the distribution of white and black IMR's over Health Service Areas (HSA's): 95 percent of HSA's had white IMR's *below* 16.5 and black IMR's *above* 18.4. If total IMR's are used for identifying HSA's with unusually high rates, the differences among HSA's in the proportion of black births can lead to the omission of areas with high rates. For example, only half of the HSA's with black IMR's in the highest 20 percent had their total IMR among the highest 20 percent.

These results suggest different approaches to surveillance for program planning versus environmental monitoring. In the latter case, race-specific (or adjusted) rates should be used since race is a confounding variable when searching for potential environmental hazards. For program planning, however, both total and race-specific rates should be used. The total IMR will identify areas with high race-specific rates or with a high proportion of black births (which can all be considered at high risk). The race-specific IMR's will identify areas with high rates among their white or black for other race groups even when the proportion of births in each group is small.

The second issue relates to the effects of random error on IMR's based on small numbers of births and deaths. For example, in 1975–76 only 69 percent of the 40 HSA's with the highest white IMR's (above 15.3) were significantly ($P < .05$) higher than the United States white rate of 13.7. Similarly, only 54 percent of the 28 HSA's with the highest black IMR's (above 28.9) were significantly higher than the U.S. rate of 25.8. The effects of random error when examining change is even greater. For example, 45 HSA's had white IMR's which were in a higher quintile in 1975–76 than in 1974–75, i.e., relative to other HSA's these 45 lost position. Yet only four of these HSA's had significantly ($P < .05$) less decline than the United States decline for whites. For blacks 32 HSA's lost position and only seven had significantly less decline than was the case nationally.

Thus, with only two years' experience it is difficult to make sound inferences about the relative positions of HSA's and how they changed. When the geographic units become smaller, the problems increase rapidly.

The need for some criteria involving stability as well as level in identifying high-risk areas is therefore crucial. Unfortunately, such criteria tend to favor more populated areas at the expense of rural areas. The aggregation of years and areas improves stability but may mask isolated areas or emerging problems. It is difficult, however, to suggest other practical alternatives.

CAN BIRTH DEFECT DATA FROM BIRTH RECORDS EVER BE USED FOR ENVIRONMENTAL HEALTH MONITORING?

Robert L. Heuser, *Chief, Natality Statistics Branch, Division of Vital Statistics, National Center for Health Statistics, Hyattsville, Maryland*

The birth registration system is a convenient source of information on congenital anomalies, an adverse health outcome, which many researchers want to relate to environmental information. First, it is an already functioning system. Data are currently available without having to design and implement a new data collection mechanism. Second, it is a comprehensive system, covering virtually all births in the United States. All but four States currently have an open-ended write-in item which permits maximum detail in reporting the birth defects. The other four States have on their certificates either a checklist of limited categories or a yes/no indication of congenital anomaly.

However, there are some disadvantages which must be seriously considered. First, congenital anomalies are relatively infrequent events—less than 1 percent of all births as reported on birth certificates. For many of the over 3,000 counties in the country there are only a few hundred births and therefore only a handful of anomalies reported each year. In many cases a change of one or two events has a significant impact on the anomaly rate, increasing or decreasing it up to 100 percent. Therefore, we must look not only at the rate but also at the actual number of events.

When congenital anomaly data are correlated with environmental data it is necessary to look at the specific conditions and not just at the overall level of anomalies. This can drastically reduce the number of events available for analysis.

One way of overcoming the problem of small numbers is to aggregate data for a number of years, as was done by Dr. Mason for his *Atlas of Cancer Mortality for U.S. Counties: 1950–1969*. The problem of the small number of specific anomalies is probably at least as great as for the cancer study for which 20 years of data had to be aggregated. While this can solve the problem of small numbers, it works against the need for timeliness which is essential for monitoring and surveillance purposes.

A second problem is the fact that there is extensive underreporting of congenital anomalies on birth certificates. Some conditions are not detected in the first day or two of life and therefore could not be expected to be reported on the birth certificate. For other conditions there may be many reasons why they are not completely reported on the certificate. Underreporting is not necessarily a problem if it is uniform. But, when there is differential underreporting, one must be careful in drawing conclusions from the data. A relatively low rate may mean a low incidence of a particular condition or it may be the result of incomplete reporting. Conversely, a relatively high rate may reflect conscientious reporting and the true incidence may be no higher than in other areas. A high rate can be a clue that there may be a special problem, but a low rate does not necessarily mean that there is no problem.

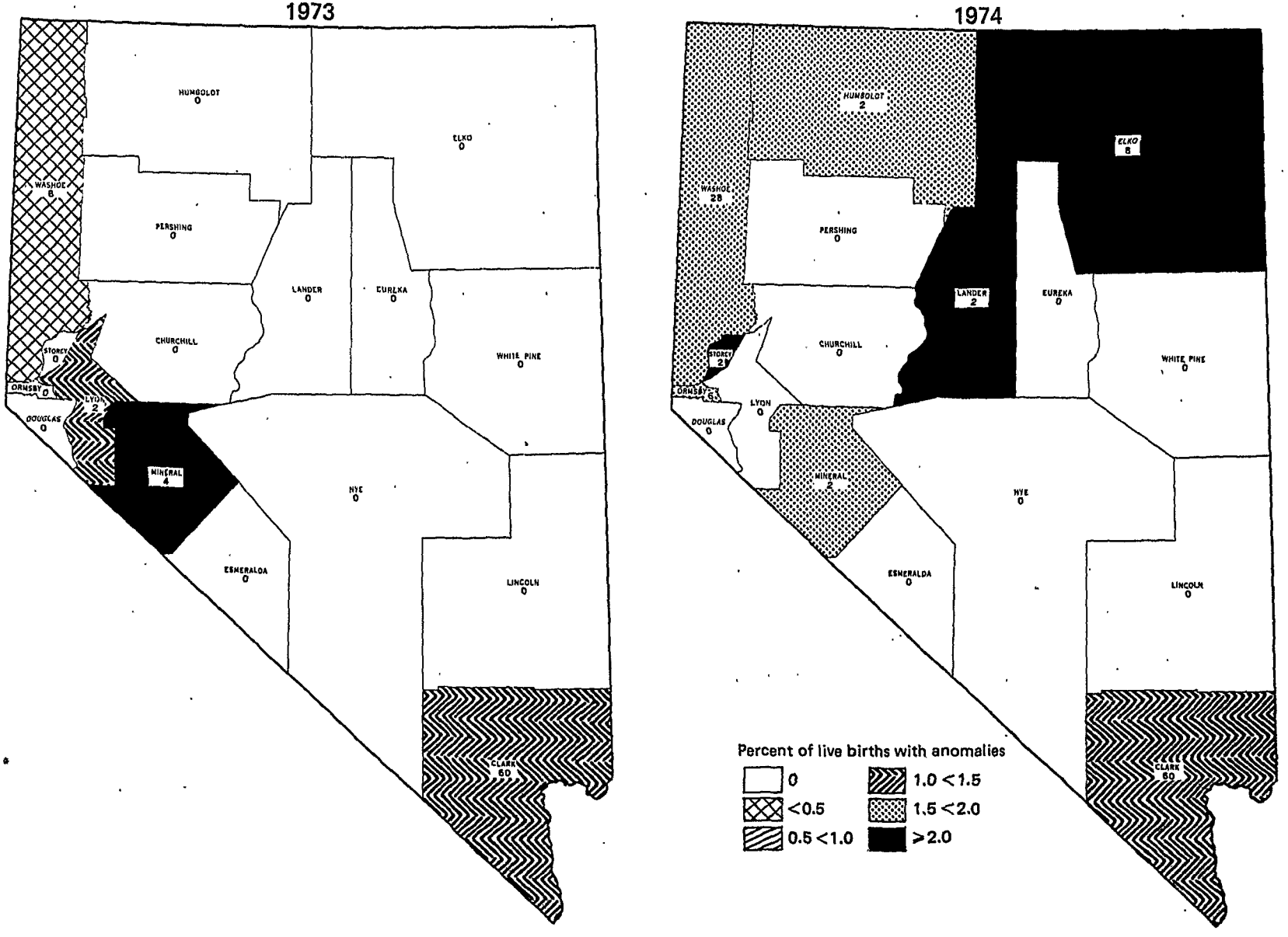
The effects of differentials in completeness of reporting are especially important when making geographic comparisons, such as industrialized versus nonindustrialized areas, which is a primary concern in studying environmental hazards. One of the complicating factors is that there can be differences in the level of completeness from region to region, from State to State, from county to county, and even from physician to physician within a hospital.

In our analysis of 1973–74 data we see some indirect evidence of regional variation in completeness of reporting. It has been observed that the incidence of congenital anomalies is related to birth weight—low birth weight infants have a higher level of anomalies. The South region has about the same percent low birth weight as the country as a whole for both white and black births. It would therefore be expected that the level of congenital anomalies in the South would be about the same as in the entire country. However, the anomaly rate for both white and black births in the South was 20–25 percent lower than for the country as a whole. There is a related analytic problem in studying trends over time. If an increase is seen in the congenital anomaly rate for a particular area, is it a real increase or the result of improved reporting?

To illustrate the problem of small numbers and what is probably differential underreporting, congenital anomaly rates have been computed for the counties of selected States for 1973 and 1974. For this purpose the rates are expressed as the percent of all live births that have a reported anomaly. Figures 1–3 show these rates for Nevada, New Mexico, and Alabama. The number shown on the map in each county is not the anomaly rate; it is the number of births with anomalies.

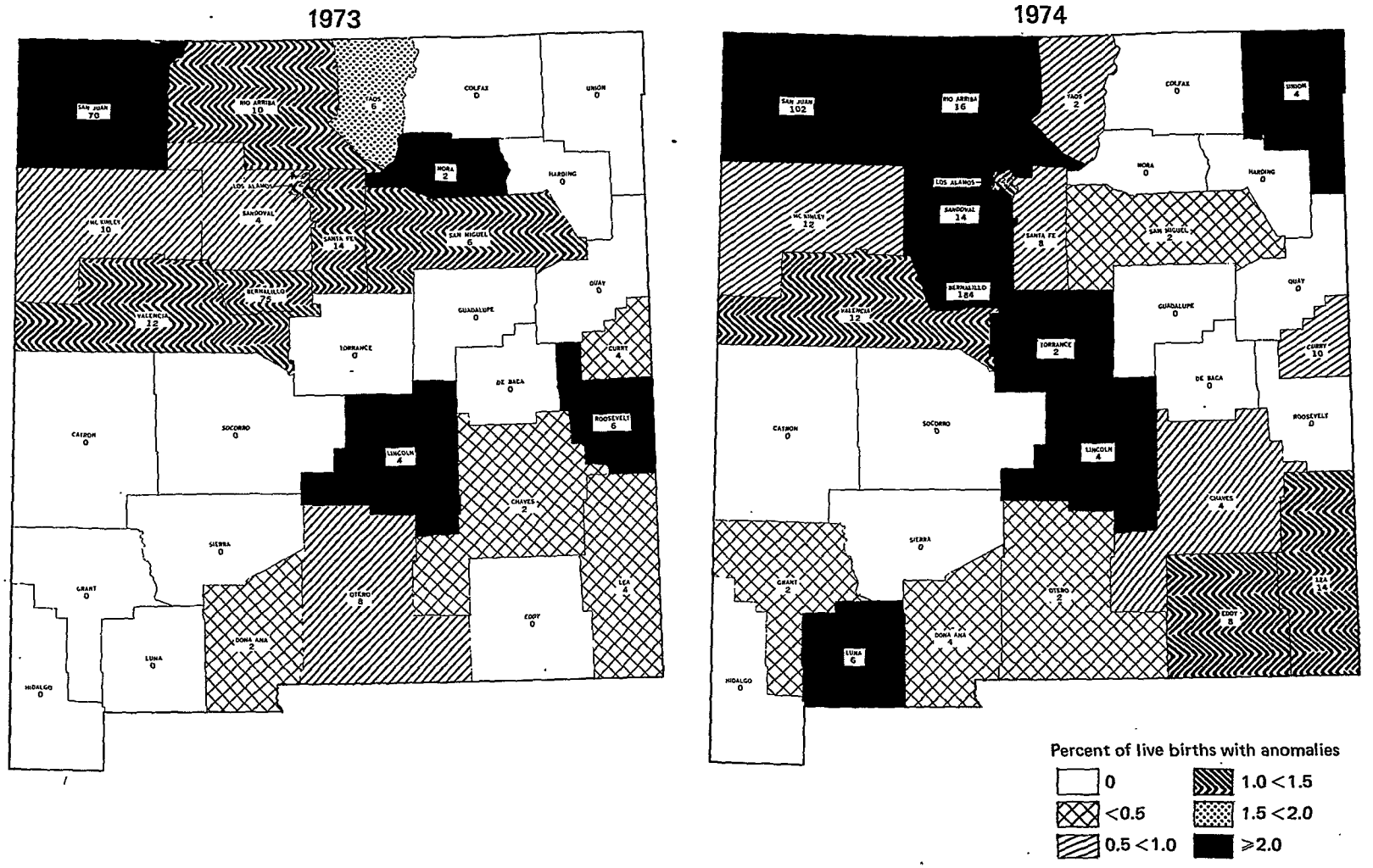
Nevada and New Mexico illustrate the kind of year-to-year variation in the overall congenital anomaly rate that can occur with small numbers of events. In Nevada (fig. 1) there are three counties where the rate was zero in 1973 and over 2 percent (the highest category) in 1974. For two of these counties the 1974 rates were computed with only two births with anomalies. In New Mexico (fig. 2) there were three counties with this kind of change in rates between 1973 and 1974, and

Figure 1. Congenital Anomaly Rates by County: Nevada, 1973 and 1974



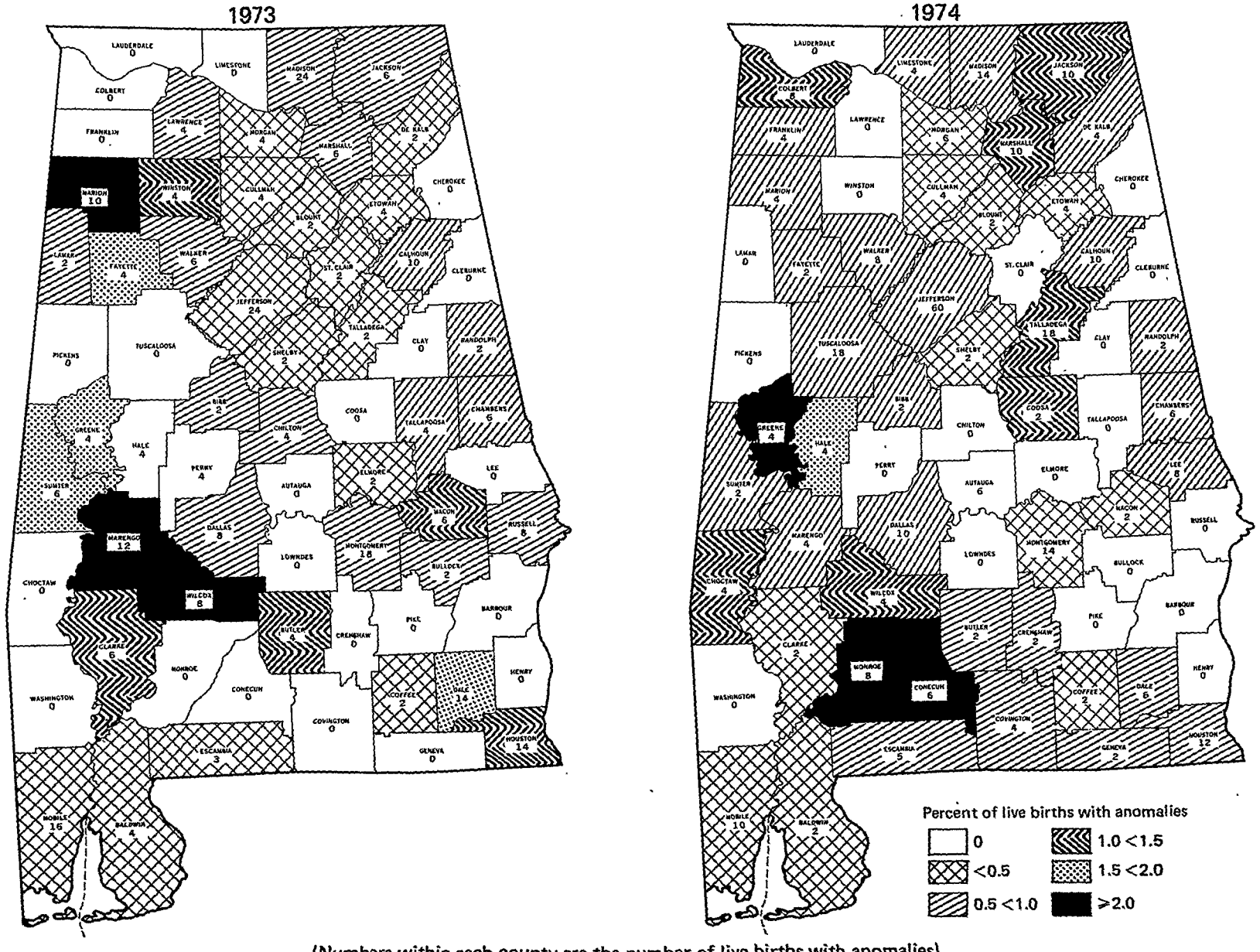
(Numbers within each county are the number of live births with anomalies)

Figure 2. Congenital Anomaly Rates by County: New Mexico, 1973 and 1974



(Numbers within each county are the number of live births with anomalies)

Figure 3. Congenital Anomaly Rates by County: Alabama, 1973 and 1974



(Numbers within each county are the number of live births with anomalies)

two counties whose rates went from over 2 percent to zero. For both States there were other counties where the rate more than doubled. There are also examples of large declines. If rates were computed for specific anomalies, these problems would be magnified.

I have selected Alabama (fig. 3) primarily to illustrate the need for caution in correlating the level of congenital anomalies as reported on birth certificates with the level of industrialization. It is widely suspected that the incidence of congenital anomalies is higher in the industrialized areas. The major industrial area of Alabama is around Birmingham, yet these counties had a reported anomaly rate of less than 0.5 percent in 1973 and no more than 1.0 percent in 1974, while other less industrialized counties in the State had higher rates. Low rates were also seen in the industrial areas of Pittsburgh, Buffalo, and Detroit, but high rates were seen in industrial areas of eastern Ohio. Also seen in many Alabama counties is the problem of small numbers.

The data for New Mexico illustrate the usefulness of being able to look behind a 4-digit ICDA code and see what is actually written on the birth certificate, an option not available to many researchers.

One of the counties had an extremely high rate—5–7 percent. A look at the specific conditions reported revealed a high level for ICDA code 746.7 (fibroelastosis cordis). One possibility was that this represented an outbreak of a rare condition, endocarditis. At the request of the Center for Disease Control, we reviewed the entries on a sample of the birth certificates. This showed that the entries were not endocarditis but heart murmurs, which also can be coded to 746.7. Without the ability to go back to the original record, erroneous conclusions could well have been drawn. Many researchers would have only the statistical information on a data tape and would not have access to the original entry.

Can birth defect data on birth records ever be used to monitor environmental hazards? Yes, I believe they can if they are used to identify possible problem areas for much more in-depth studies, such as those based on the cancer atlas which have just been mentioned by Dr. Mason. For this a number of years may need to be aggregated to give stability to condition-specific rates. The usefulness of these data would be increased by improved reporting to reduce the variations in level of completeness. It must be remembered, however, that birth certificate data cannot be used to infer a causal relationship between congenital anomalies and any particular environmental agent. The in-depth studies are needed to provide that information. Therefore, my answer to the question is "Yes, but..."

THE FEASIBILITY OF USING U.S. BIRTH CERTIFICATES TO TEST OCCUPATIONAL AND ENVIRONMENTAL HYPOTHESES OF BIRTH DEFECTS ETIOLOGY

Steven H. Lamm, M.D., D.T.P.H., *Tabershaw Occupational Medicine Associates, Rockville, Maryland*

I. Etiologic Theory

Each period has had its own unified field theory of disease causation to serve as the foundation for its public health research, policy, practice, and organization. In the same way, etiology has been more a characteristic of the period than of the disease under consideration—whether cancer, birth defect, or mental illness.

For centuries, "the will of the gods" was to many a sufficient etiologic explanation. In the early Middle Ages, comets and coincident but striking natural phenomena were believed to cause diseases. In the 18th and 19th centuries, "miasmas" or bad air (malaria) explained disease causation. Tuberculosis sanitaria were to be built on hills, situated, as it were, safely above the miasma. One traveled to the good airs. Even John Snow's pump experience was explained on the basis of the miasmas.

The last hundred years has seen the development of the sanitary movement and the germ theory. The discovery of bacteria and the development of bacterial technology led to a new etiology—bacteria—that was applied to all diseases and answered the causation of some. In the last 50 years, viruses were discovered, the electron microscope was invented, and viral culture techniques have been developed. It took about half a century to demonstrate the role of some viruses in some animal cancers, of rubella virus in human teratology, and of slow growing viruses in Alzheimer's pre-senile dementia.

The tantalizing pursuit of results gained in the Rous sarcoma virus studies and those in the rubella virus work, led to an enormous effort devoted to the unraveling of possible viral etiologies for all cancers and likewise for birth defects. Few positive findings, however, have become established to support such a hopeful hypothesis.

Fairly recently, application of the "unitary etiology" concept has focused upon "chemicals" as the cause of disease—whether it be cancer, birth defects or mental illness. Sparked by the Thalidomide tragedy, the first focus was on pharmaceuticals. More recently the focus has been on natural occurring substances such as asbestos, arsenic, and lead; man-made or synthetic chemicals such as DDT, PCB, and TRIS; and dietary factors such as vitamin E, fiber, or trace metals. Governmental response has followed suit with increased funding for the FDA, NIOSH, EPA, OSHA, NIEHS and CPSC.

Since one of the major reasons for a health system is the reduction of the incidence of diseases, data from health systems have been used to observe the pattern of specific diseases over time in a community. The information derived from these data have been used not only for the descriptive epidemiology, but also as the data base for the analysis epidemiology directed toward etiologic considerations. Thus, data from health systems have served, and will continue to serve, as data sources to develop and to test etiologic hypotheses of disease transmission.

For instance, is it feasible to develop or test chemical hypotheses—occupational or environmental—of birth defect etiology using the U.S. birth certificates?

II. Model

The fundamental equation is $E + I \rightarrow O$ where E = exposure, I = interaction, and O = outcome, or a derivative of that, $\Delta E + \Delta I \rightarrow \Delta O$. Differences in outcome rates are due to differences in exposure and differences in interactions.

III. Measurement of Outcome Variable

If birth defects are considered as an outcome variable in this model, how well can we measure it?

Two nationwide data systems currently exist for the monitoring of U.S. birth defect incidence. The Center

Table 1
BIRTH DEFECT REPORTING FREQUENCIES—USA, 1974

	NCHS*	BDMP+	NCHS/BDMP
Anencephaly	2.1	4.4	47%
Spina-bifida	4.5	5.9	77%
Hydrocephalus	1.6	6.1	27%
Cleft Palate	3.0	5.2	57%
Cleft Lip	6.3	9.3	68%
Anorectal Stenosis	1.5	3.4	44%
Down's Syndrome	3.7	8.0	46%

* Vital Statistics Section, NCHS, per 10,000 births.
+Congenital Malformation Surveillance Report, CDC, per 10,000 births.

Table 2. TIME TRENDS IN BIRTH DEFECT REPORTING

	NCHS*			BDMP+	
	1973	1974	1970–73	1974	1975–76
Anencephaly	2.1	2.1	5.2	4.4	4.3
Spina bifida	4.2	4.5	7.2	5.9	5.1
Hydrocephalus	1.6	1.6	4.7	6.2	4.1
Cleft Palate	2.9	3.0	5.3	5.2	4.7
Cleft Lip	6.5	6.3	10.0	9.3	9.2
Anorectal Stenosis	1.7	1.5	3.6	3.4	3.2
Down's Syndrome	3.8	3.7	8.3	8.0	8.3

*Vital Statistics Section, NCHS, per 10,000 births.
+Congenital Malformation Surveillance Report, CDC, per 10,000 births.

for Disease Control's Birth Defect Monitoring Program since 1970 has been receiving notification of birth defects diagnoses on hospital discharges from approximately one-third of U.S. births. The U.S. birth certificate (NCHS) offers a second monitoring system that has been coded and recorded since 1973. The lack of completeness of birth defect information on birth certificates is well-known. Table 1 demonstrates the variation in reporting rates between the two systems.

This variation in reporting frequencies is a function of individual malformation and depends to a large extent on the ease with which a malformation is observable in the delivery room. This difference is accounted for by the recognition that birth certificates—the data source for the NCHS program—are filled out after the baby has been seen in the delivery room or immediately thereafter, while hospital discharges—the data source for the BDMP program—are filled out after at least three days of observation of the newborn. Table 2 demonstrates, however, that within each system the reporting incidence is fairly constant for each malformation type.

Thus, while birth defect data on birth certificates may be markedly underreported and thus a poor measure of their incidence rate (0), their consistency over time suggests their suitability as a data set to monitor changes in the incidence rate ($\Delta 0$).

IV. Measurement of Exposure Variable

There are few exposure variables that are directly or indirectly recorded on the birth certificate. New York State and West Virginia are the only two States that still record maternal and paternal usual occupational and industry on the birth certificate, though many States still record maternal information. Rarely, however, is this data coded. Unless the data is coded and accessible, it is of little value without returning to the original document. Currently, it is difficult to develop exposure frequency rates (E) prospectively.

An alternative analytic approach is to compare incidence rates of specific birth defects for aggregates of populations with different exposure opportunities. County-based data on "pollution" levels in air and water or presence or absence of certain types of industry can be compared with birth defect data. County-based correlations can be determined; however, the rates of rare events such as specific birth defects in 30,000 counties are not at all stable, even aggregated over many years. Such county-based correlations have not proven very useful for multifactorial analysis of infant mortality rates, which deal with more frequent events. Furthermore, such studies suffer from the "ecological fallacy" of attributing to the affected individuals the ecological characteristics of the mass population. Identification of strong associations that may be etiologically related has only been possible where exposure is definable and most successful where it is quantifiable.

V. Measurement of Interaction Variable

The interaction variable is unmeasureable because the indices to measure are not known. Various hypotheses will be developed to suggest that specific categories of women or pregnancies due to certain genetic or physiological propensities may be at higher risk of certain birth defects. However, until the specific hypotheses are developed, the evaluation of the interaction variable must be postponed.

In occupational oncology studies, it has often been demonstrated that excess cases are only identifiable in the group with known high exposure and not in groups with assumed, probable, or estimated low exposures. This may well demonstrate that at the low levels of exposure, the interaction variables are stronger determinants of outcome incidence than are the exposure variables. Similarly in birth defect studies, etiologic associations have been demonstrated where exposure is identifiable (such as early pregnancy pharmaceutics or infection) but rarely where exposure differences are attributable only to groups and not to individuals. Again, this may indicate that interaction variables are the dominant determinants unless direct exposure can be demonstrated.

VI. Role of Public Health Governance

The public health institutions of the United States have a responsibility to respond to the public's demand

for etiologic information on birth defects and cancer, to identify and protect it from true agents, and to limit the social consequences of false hypotheses. New specific hypotheses are reported in the national news weekly. Most frequently the data bases do not exist in an accessible manner to rapidly test these hypotheses.[1] Such data bases should be developed, for the cost of not doing so is enormous.

It may well be that a proper data system cannot be built in the United States until a national health program or record system exists. However, appropriate programs in the United States should be developed. Further analytic capabilities and trial studies should be assisted in foreign countries which have national health systems such as Great Britain and Canada.

Through international cooperation and the development of appropriate data systems locally and nationally, more complete linkable record systems may merge which can be used to develop and test etiologic hypotheses of birth defects.[2]

[1] Mark Twain commented that "A lie has made it half way around the world while the truth is still putting its boots on."

[2] Research was compiled for this presentation while in the employ of: 1. Senior Epidemiologist, NICHD, NIH; 2. President, Consultants in Epidemiology; 3. Tabershaw Occupational Medicine Associates.

THE NATIONAL ELECTRONIC INJURY SURVEILLANCE SYSTEM: MONITORING EMERGENCY ROOM DATA TO IDENTIFY HAZARDS ASSOCIATED WITH CONSUMER PRODUCTS

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One of the primary missions of the U.S. Consumer Product Safety Commission is to protect the public against unreasonable risks associated with consumer products. In order to help the Commission address product safety issues, a surveillance mechanism is needed to identify hazards resulting from a myriad of products on the marketplace. One such tool currently available to the Commission is the National Electronic Injury Surveillance System, or NEISS (pronounced "nice").

I. What is NEISS?

The NEISS is the primary data collection system used by the Commission to determine the nature and scope of the consumer product injury problem in the United States. The NEISS is a bi-level system in which data are collected at the first level through a network of statistically selected hospitals and at the second level through the follow-up of selected reported injuries with in-depth investigation. Only product involvement, not accident causation, is measured at the surveillance level. Therefore, the second level or in-depth investigation is required to determine how and why accidents happen.

II. Why NEISS?

NEISS is based on the premise that if the etiology of various kinds of accidents is known, many of them can be prevented. However, this knowledge cannot be obtained without some data, and more particularly without quality data; for in accident research, as with all other types of studies, the conclusion drawn must be justified by the quality of data employed. No amount of refined processing can improve upon the quality of the data.

Since the decisions made by the Commission impact on all of us as consumers and often have a major economic impact on our society, it is important that they be made on the best data available. The requirement exists not only to develop a systematic basis to find certain types of accident cases, but also to obtain reliable statistics intended to reflect the accident picture of the nation. This requirement cannot be met by relying solely on voluntary reporting on the part of the consumer.

Also, the injury problem presented on the basis of voluntary reporting would not adequately highlight certain types of accidents which should be seriously addressed. People are not always eager to report accidents which they suffer or which the people under their charge suffer for the simple reason that they feel they might be embarrassed. Also, knowledge of how accidents happen must be gained through careful and unbiased weighing of the best available evidence. The sorting and sifting of a mixture of factors associated with the accident must be elicited as objectively as possible at the onset. The characterization of the interaction between host, agent and environment is a complex task that cannot be left to chance observation alone.

Although there are other possible sources of injury statistics such as household surveys, NEISS remains the primary data collection system of the Commission because hospital emergency rooms with their large reservoir of injury cases represent the most cost effective single source for product-related injuries. Since only an approximate 40 percent of the Nation's product-related injuries are treated in emergency rooms, data from this source only does not provide a measure of the entire injury problem. It does, however, represent a good surrogate for the injury problem.

Because the Commission is interested in all types of consumer product-related injuries, including those seen in all types of medical facilities as well as those minor injuries that receive no professional medical attention, the NEISS is being supplemented by other sources of data, such as death certificates, consumer complaints, petitions and newspaper clippings.

III. Role of NEISS to Identify Hazards

How is NEISS monitored to provide meaningful information to identify hazards associated with consumer products?

1. Identifying the scope and magnitude of the product-related injury problem (statistical inferences from the data).

   Data collected through the NEISS contains information on the "who," "when," "where," and

"what," each product-related injury. This includes hospital record number, age and sex of patient (the "who"); date of treatment (the "when"); the accident type or location (the "where"); injury diagnosis or disposition of patient (the "what").

One advantage of NEISS is that statistical inferences from these data can be generalized to the Nation as a whole. This thereby makes possible an unbiased assessment of the relative magnitude of a variety of injury problems associated with consumer products.

NEISS hospital emergency rooms are statistically selected to provide injury data that are representative of those seen in emergency rooms throughout the Nation. The NEISS sample is being currently updated and redesigned to maximize the potential for statistical interpretation of the data collected through the system.

The redesigned sample, similar to the current sample, captures injuries associated with consumer products which are treated in hospital emergency rooms. The new sample was drawn from a list of all hospitals that report having an emergency department and those hospitals without emergency departments which report treating one or more emergency visits in the following categories: "general, medical and surgical"; "hospital units of an institution"; "eye, ear, nose and throat"; and "orthopedics." The universe of the new sample has been expanded to include hospitals in all 50 States and the U.S. Territories. Excluded are penal hospitals, because they treat a select population, and hospitals with fewer than six beds because there is no complete listing of hospitals of this group.

In order to draw a sample which will yield the greatest precision within a given budget allocation, several possible methods of grouping the hospitals were examined. Hospital size (as measured by the total number of emergency room visits) and geographical distribution were found to be the most effective modes for stratifying the hospitals. All hospitals (without specialized burn care facilities) were grouped into four strata. Then within each group they were put in order by zip code to ensure adequate geographic distribution. Hospitals were then sampled from each group in such a way as to ensure adequate representation of all hospitals by size and geography.

Because of the concern that hospitals with specialized burn care facilities may be unique in the type of emergency burn injuries that they treat, all hospitals with specialized burn care facilities were gathered in a fifth stratum. A sample of hospitals was then randomly selected from this group. The selection procedure also allows the total number of hospitals in this group to be increased if the need arises. The resulting sample for the NEISS is shown in table 1.

Data collected from the sample hospitals can then be referred back to their respective groups and totaled to reflect the emergency room treated injuries associated with consumer products in the United States. Similarly, data collected from statistically selected follow-up investigations can be projected to all injuries treated in emergency rooms in the United States and its Territories.

2. Case Finding Mechanism (Systematic and Timely).

Injury cases collected through the NEISS surveillance level constitute a reservior of accident cases that can be immediately tapped for investigation and further research, following leads on potential product hazards.

The timeliness of the computerized data collection procedure is a valuable advantage for gathering quality information on accidents and identifying current problems. The daily transmittal of injury reports allows cases of interest to be quickly assigned for investigation. As a result,

Table 1. DISTRIBUTION OF HOSPITALS IN NEW SAMPLE

Hospital Group	Range of Total Emergency Room Visits	Total Emergency Room Visits in Universe [1]	Hospitals in Universe	Hospitals in Sample	Sampling Rate	Percent of Sample Hospitals in Size Group
1	1—14,770	20,319,634	4,290	78	.0182	60.0
2	14,771—24,315	13,974,757	729	16	.0219	12.3
3	24,316—39,717	16,743,861	549	16	.0291	12.3
4	39,718+	15,645,371	268	12	.0448	9.2
5	Hospitals with Burn Care Facilities	7,224,946	181	8	.0442	6.2
Total		73,908,569	6,017	130	—	100.0

[1] Universe all specified hospital emergency rooms within the United States and Territories. See text for more detailed definition.

it is possible for investigations to be conducted within 72 hours of the victim's being seen in the emergency room, thereby reducing both memory bias and the likelihood that the product involved in the accident has been discarded.

Figure 1 and the following narrative describe the NEISS operation. Numbers in parentheses throughout the narrative refer to data flow arrows in figure 1.

Surveillance begins when, for example, a man with an injury involving a mower is admitted to the hospital emergency room for treatment (1). Basic information is obtained about the accident by the admissions clerk and is written on the emergency room record (2). A hospital employee designated and trained as a coder/transmitter reviews records daily for those injuries involving consumer products (3) and transcribes coded equivalents for all relevant data to a code sheet (4).

At the end of each day's coding, the coder/transmitter types the coded data into a teletypewriter (5) installed for this purpose. While typing, a perforated paper tape is automatically punched with complete data on each case. The perforated tape is then loaded in a special "reader" on the machine.

During late night hours of low telephone line traffic, a special switching device attached to the Headquarter's computer in Washington automatically polls each of the hospital-based terminals (6). This device turns on each remote teletype machine and reads the perforated paper tape at high speed, edits the data for accuracy and completeness, and records the data in the computer (7). The central computer then prepares a daily summary register (8) and detailed case printouts for Headquarter's review each morning (9).

Detailed case printouts are consulted for priority items from which individual cases are selected for investigation. Hospital identification and case numbers are noted and typed into the Headquarter's teletype terminal (10) which relays the information to the computer (11) for later simultaneous transmission to the appropriate hospital and CPSC field terminal (12). Hospital personnel check the records (13) for name, address, and telephone number of the victim. This information is then given by telephone to the CPSC field investigator (14) who initiates contact with the victim or his family to request an investigatory visit (15).

If the victim grants permission for an investigation, he is visited at the earliest practicable time—ideally, within three days of the injury. A comprehensive interview is undertaken to verify surveillance data, identify make and model of the product, and to diagram, photograph, or collect a sample where appropriate (16).

Complete data on the product-related injury are collated then to form the investigation report which is sent to Headquarters in Washington for confidential staff review and analysis (17).

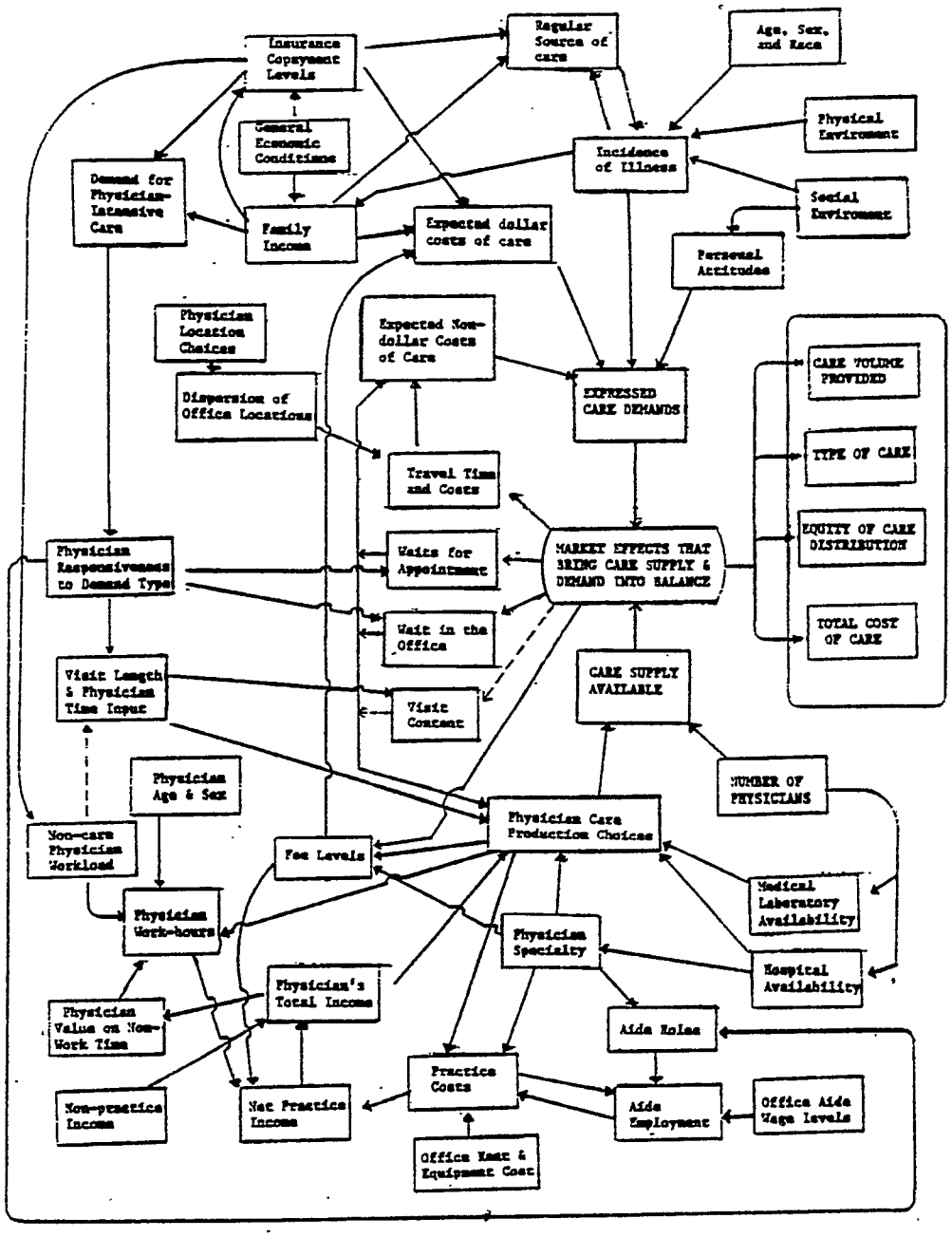
3. Identifying the emergency room treated population injured in product-related accidents.

Table 2. ESTIMATED NUMBER, RATE [1] AND MALE/FEMALE RATIO OF PRODUCT-RELATED INJURIES ADMITTED TO HOSPITAL EMERGENCY ROOMS BY SEX AND AGE: CONTIGUOUS UNITED STATES, JANUARY 1, 1976—DECEMBER 31, 1976 [2]

	Both Sexes [3] Number of Injuries		Male Number of Injuries		Female Number of Injuries		Ratio Male/Female Number of Injuries	
	In Thousands	Per 1,000 Population	In Thousands	Per 1,000 Population	In Thousands	Per 1,000 Population	In Thousands	Per 1,000 Population
All Ages [4]	8,753	40.8	5,421	51.9	3,325	30.2	1.6	1.7
Under 1 Year	91	30.1	53	34.4	38	25.6	1.4	1.3
1–4 Years	1,062	86.3	632	100.5	430	71.4	1.5	1.4
5–14 Years	2,494	67.1	1,644	86.7	850	46.7	1.9	1.9
15–24 Years	2,328	57.3	1,585	77.6	744	36.9	2.1	2.1
25–44 Years	1,712	31.2	1,017	37.7	695	24.9	1.5	1.5
45–64 Years	737	16.9	371	17.7	366	16.1	1.0	1.1
65 Years and Over	314	13.7	115	12.3	199	14.6	0.6	0.8

[1] Rate: Number per 1,000 population for contiguous U.S. as of July 1, 1976, U.S. Bureau of the Census.
[2] Totals may not equal the sum of the parts due to rounding.
[3] Includes an estimated 7,000 injuries for which sex was unreported.
[4] Includes an estimated 8,000 injuries for which age was unknown or unreported.

A SCHEMATA ILLUSTRATING SOME OF THE VARIABLES AND RELATIONSHIPS WHICH MAY BE IMPORTANT TO ESTIMATING THE CAUSES OF CHANGE IN MEDICAL OFFICE CARE DELIVERY



Through the system, age and sex information are gathered for each emergency room patient injured in product-related accidents. As a result, the NEISS provides a systematic basis for comparing the rate of emergency room admissions for various population groups.

As illustrated in chart A[1] and presented in table 2 [1], the rate of emergency room admissions (number per 1,000 population) was highest for each sex in the age group 1–4 (101 males, 71 females). The next highest rate was in the age group 5–14 (87 males, 47 females). The lowest rate for each sex was in the age group 65 and over (12 males and 15 females); the highest rate for any sex/age group was in the male age group 1–4. The ratio of males to females for rates generally resembles the ratio of numerical admissions, since the proportion of each sex within most age groups is quite similar. However, the major exception is within the oldest age group in which females experience almost 1 3/4 times as many injuries as males, but the rates for these two groups are not too disparate due to the higher number of females in this older population. Again, this corresponds to the data in the National Health Survey where the estimated rate of medically attended injuries was quite similar for both sexes in the age group 65 and over.

4. Surfacing Potential Product Hazards.

There are several general systematic approaches to surface potential product hazards associated with the emergency room treated population injured in product-related accidents.

One approach is to flag out among a multitude of product categories those that are associated with the highest frequency and/or the most severe injuries for a defined population. Three of the data elements collected in NEISS used to generate one of the severity scales at the Consumer Product Safety Commission are: nature of injury, body part affected, and disposition of patient. All non-fatal injuries are classified into a 6-point scale ranging from minor to most severe. These scale scores are then incremented by 1 if the patient is admitted for in-patient hospital care. A 7th point on the scale is, therefore, established to include these injuries among the most severe injury classification which require hospitalization. Poisonings are an exception to this procedure. A poisoning which is treated and released is classified as a 2 on this scale, while a poisoning requiring hospitalization is classified as a 6. Deaths are classified as 8 on this scale, but are grouped with category 7 in the weighting procedure to be discussed below. This ranking is based on medical judgment in terms of expected physical impact as well as life threat and potential for permanent impairment (see table 3).

The classification of injury according to this severity scale thus involved some value judgments. However, the most subjective aspect of the scale is the use of an inflation factor designed to reflect differences in degree of severity between scale categories. To accomplish this, the least severe category has been assigned a value of 10. This value is increased by 20 percent to arrive at 12 for the next value. Thereafter, each succeeding scale category is increased according to a geometric progression, i.e., 40 percent, 80 percent, up to a 640 percent increase for category 6 to arrive at a value of 2516 for category 7.

Several indices can be developed to surface potential hazards. One of the indices, known as the Hazard Index (see Appendix A), was originally developed as a management tool to generate a list of potentially hazardous products for further study. The Hazard Index is a numerical ranking of products based solely upon NEISS injury frequency and severity data, adjusted to give greater weight to injuries to children under 15 years of age. Children are often exposed to injury risks of which they are unaware. Because of this vulnerability, CPSC wanted to ensure that injuries to this population would have greater opportunity to surface. Therefore, any injury occurring to a child under 15 years of age is inflated by a factor of 2.5. This factor was selected based on the fact that the population 15 years of age and over is approximately 2 1/2 times the size of the population under 15 years. Therefore, this inflation factor neutralizes the difference in population size.

As a management tool, the Hazard Index has a number of advantages and disadvantages which are discussed below.

Although the Hazard Index is obviously subjective in nature, it provides a relatively simple method of ranking products according to criteria which reflect important judgments in the decision process. It quantifies severity of injury together with frequency and incorporates procedures which highlight injuries that are life-threatening, impairment-threatening, or occur to a specifically vulnerable age group.

Since the basic philosophy underlying the Hazard Index is to surface those product groups which involve injuries of particular concern to CPSC, there is an increased risk of highlighting product groups which may be of lesser public health concern. In other words, as the sensitivity of the Index is increased, i.e., surfacing those areas of true concern, specificity of the Index

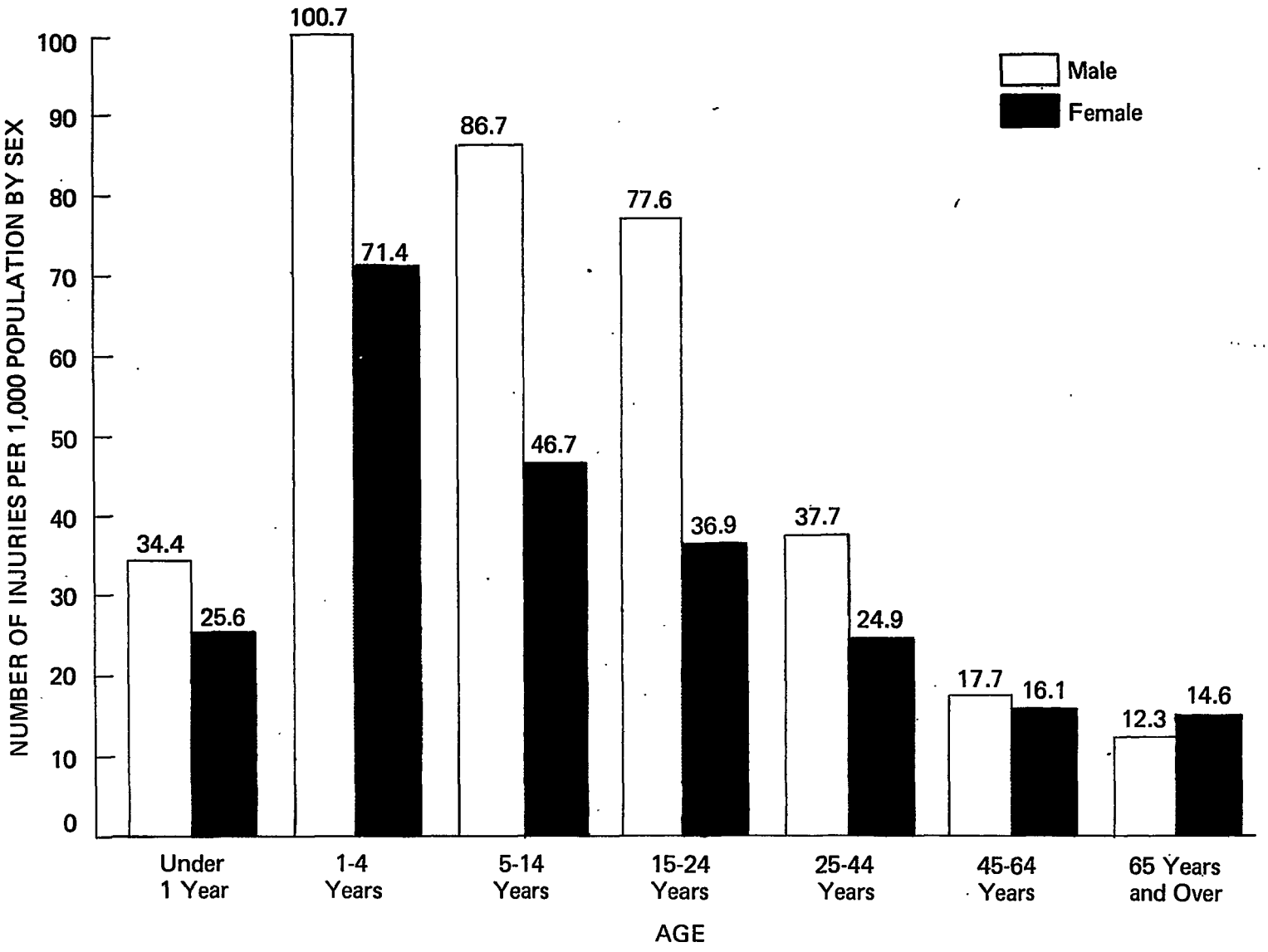
[1] HIA Special Report, "Consumer Product-Related Injuries Treated in Hospital Emergency Rooms, January 1, 1976—December 31, 1976."

Table 3. SUMMARY OF SEVERITY INDEX

Diagnosis	Severity Category 6 Severity Value—340	Severity Category 5 Severity Value—31	Severity Category 4 Severity Value—31	Severity Category 3 Severity Value—17	Severity Category 2 Severity Value—12	Severity Category 1 Severity Value—10
Amputation	Any part of body					
Avulsion	25% of body+	head, face, neck, eye, upper trunk	lower trunk	leg, arm, hand, foot, finger, toe	mouth, ear	
Burns	25% of body +, eye	all single body parts except finger, toe, ear			finger, toe, ear	
Cell Damage	25% of body+	head, face, eye, ear, mouth, neck, trunk		leg, arm, hand, foot, finger, toe		
Concussion	25% of body+	head				
Contusion or Abrasion	25% of body+			head, face, upper trunk	ear, mouth, neck, eye, lower trunk	arm, leg, hand, foot, finger, toe
Crushing	head, arm, leg, trunk, foot, hand		finger, toe			
Dermatitis			25% of body +		head, face, mouth, eye, neck, trunk	arm, leg, hand, foot, finger, toe, ear
Dislocation	25% of body+	head, face, mouth, neck, upper trunk	lower trunk, eye		arm, leg, hand, foot, finger, toe	
Foreign Body	25% of body+	head, face, ear, neck, upper trunk	lower trunk	mouth	arm, leg, hand, foot, finger, toe, eye	
Fracture	25% of body+	head, face, neck, trunk		arm, leg, hand, foot, finger, toe, mouth		
Hematoma	25% of body+	head, face, upper trunk	eye, lower trunk	arm, leg, hand, foot	finger, toe, ear, mouth, neck	
Internal Organ Injury	25% of body+	head, neck, trunk	mouth, eye			
Laceration	25% of body+		head, eye, face, mouth, neck, trunk		arm, leg, hand, foot, finger, toe, ear	
Nerve Damage	25% of body+	all other body parts				
Poisoning	Hospitalized				Not Hospitalized	
Puncture	25% of body+	head, face, neck, ear, upper trunk	eye, lower trunk		arm, leg, hand, foot, finger, toe, mouth	
Strain or Sprain	25% of body+			neck, upper trunk	lower trunk, eye	arm, leg, hand, foot, finger, toe, ear
	anoxia, electric shock, submersion	ingested or aspirated foreign object				

Category 7—Category 6's who are hospitalized and deaths—Severity Value of 2516
NOTE: Hospitalized cases are moved to the next higher severity category.
Example: A hospitalized category 4 will be classified under category 5.

Chart A. Estimated Number of Product-Related Injuries Admitted to Hospital Emergency Rooms per 1,000 Population by Age and Sex: Contiguous United States, January 1, 1976-December 31, 1976[1]



[1]Population figures based on July 1, 1976 Bureau of the Census estimates of the resident population of the United States.

tends to decrease by increasing the false positives. The primary criticisms directed at the Index include the subjectivity of the weighting procedure and in particular the high severity values applied to specific injury diagnostic categories such as hospitalized poisonings. It is argued that persons poisoned are often hospitalized merely for observation, usually resulting in no real injury outcome. The age inflation factor is also deemed unfair by some. It is argued that parents tend to be more conscientious about obtaining medical care for their children than for themselves. Therefore, it is further argued, since children's injuries tend to be overrepresented when the emergency room serves as the source of injury data, the age inflation factor further compounds this age differential in the Hazard Index.

Another approach to surface potential product hazards is to identify an emerging hazard through certain injury trends associated with particular product categories. An example of such an emerging problem is reflected by data on skateboard-related injuries which show a statistically significant increase from FY 1976 to FY 1977. Much of this increase was due to a greater number of users, but the sheer magnitude of the increase indicated a public health problem that is worthy of further investigation. A major effort was undertaken by the Commission in FY 1977 to further analyze the skateboard problem. As a result, the Commission is currently pursuing an educational intervention strategy and encouraging safer skateboarding through the use of protective equipment.

5. Identifying the nature and type of hazard associated with consumer products

The NEISS is much more than a case finding mechanism and a flagging device to bring product hazards to light. The second level of the system, or investigation, provides information on the nature, types, and relative magnitude of hazards associated with a given product category.

In-depth investigations elicit detailed background information on how and why accidents occur. Following the assignment of a case for in-depth investigations, a comprehensive interview is conducted to verify and expand surveillance data, identify make and model of product and to diagram, photograph or collect a sample, as appropriate, and to determine precisely how and why the injury occurred. The completed investigation report is sent to CPSC Headquarters in Washington, D.C., for staff review and analysis.

When surveillance cases are statistically selected for investigation, inferences about the relative magnitude of different types of hazards can be made.

The answers gathered through in-depth investigations of a particular consumer product provide the means for an engineering, statistical and behavioral analysis of the product's design characteristics, its inherent hazards, and the way in which it was used. All data, both surveillance and investigation, are used to assist in determining options for remedial activities.

The resulting analysis can be used by the Commission as a tool to develop remedial courses of action to protect the consumer against an unreasonable risk of injury. For example, the Commissioners may decide that an informational and educational program on the inherent hazards of a particular product may be an effective course of action. On the other hand, the analysis may indicate a hazard of such proportion that the only remedial step is the development and promulgation of mandatory standards to overcome the risk of a ban. In addition, there is a middle-of-the-road approach—that is, a program of close work with industry representatives to encourage them to initiate and develop voluntary standards.

IV. Potential Expansion of the System

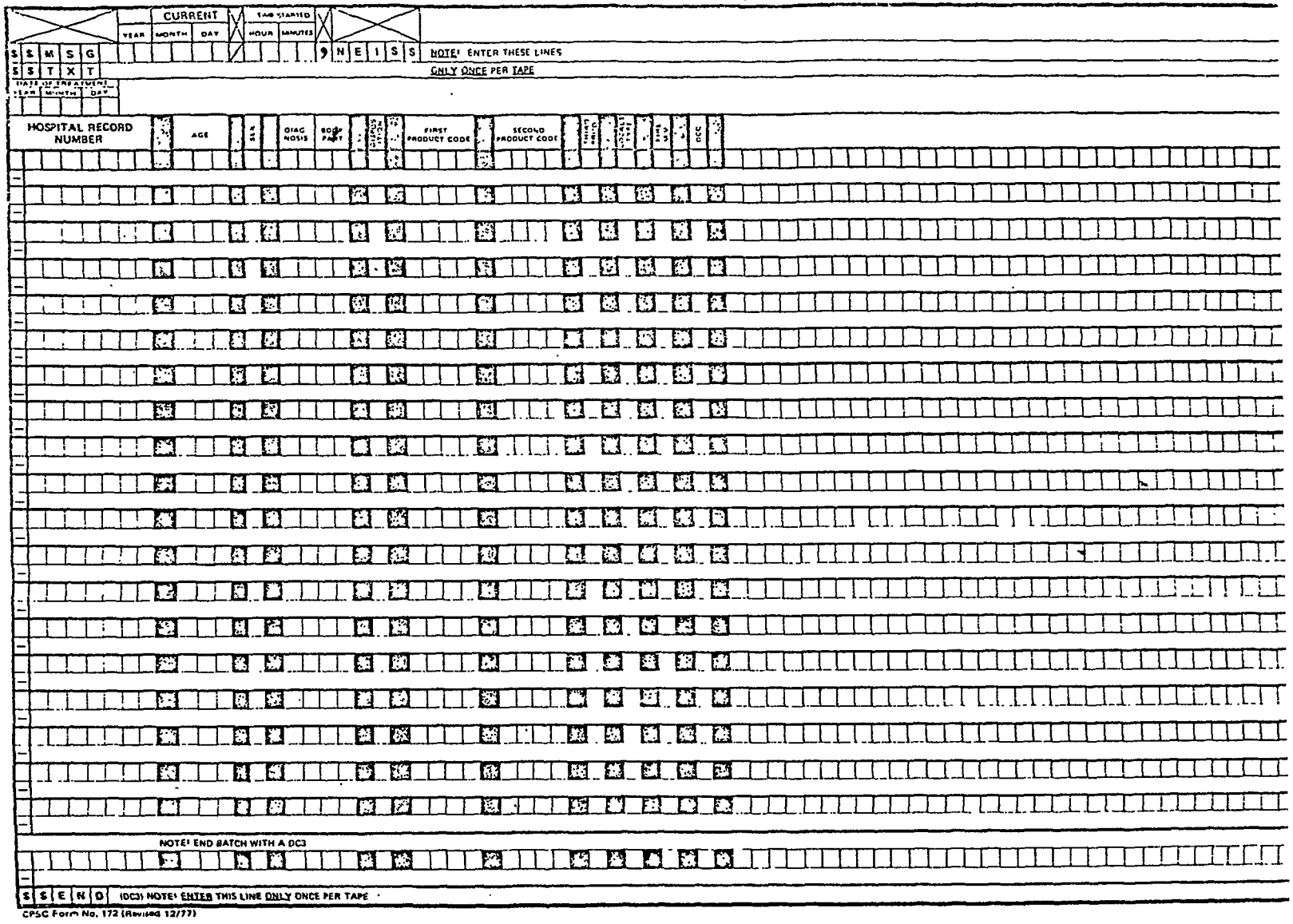
One big advantage of the NEISS resides in the amount of data collection flexibility present in the system.

The surveillance level of the NEISS is basically a structured data system designed to collect, on a continuing basis, fixed data elements. However, the NEISS coding sheet used in the emergency room is formatted in such a way as to allow for information other than the core data elements to be added as new needs arise (see CPSC form no. 192, exhibit 1). Information for each hospital case is recorded on two lines. The first line consists of the core data elements and some additional space that can be formatted to code other information. The second line can be used to record unstructured information such as a brief scenario of the accident.

The cases collected through the surveillance level constitute a sampling frame from which samples responding to various criteria can be selected for follow-up investigation.

As a result of this flexibility, the Commission was able to conduct through both levels a variety of special studies designed to obtain more specific information tailored to the particular needs of the moment. The Commission is also sharing the system with two other government agencies with similar data needs. The Commission is currently negotiating interagency agreements with the U. S. Environmental Protection Agency and the National Highway Traffic Safety

Exhibit 1. NATIONAL ELECTRONIC INJURY SURVEILLANCE SYSTEM CODING SHEET



CPSC Form No. 172 (Revised 12/77)

Administration at the Department of Transportation to collect specific information on injuries associated with pesticides and involving vehicle accidents.

We envision that this system could be of use to other agencies and we are currently exploring this possibility.

APPENDIX A

Consumer Product Hazard Index

Rank [1]	Product Number [2]	Product Description [3]	AFSI [4]
1	1202	Bicycles & Bicycle Equipment, Inc. Add-On Features (Baskets, Horns, Non-Standard Seats, Handlebars)	35.746
2	1842*	Stairs (inc. Folding Stairs), Steps, Ramps, Landings	25.411
3	1211*	Football, Activity, Related Equipment & Apparel	13.766
4	1204	Baseball, Activity, Related Equipment & Apparel	11.960
5	1241*	Swings, Slides, Seesaws and Playground Equipment	11.013
6	0645*	Non-Glass Tables & Unspecified Tables	10.243
7	1231*	Swimming, Swimming Pools & Related Equipment	9.221
8	0601*	Beds, Inc. Springs, Frames, Bunk Beds, & Unspecified Beds (Exc. Mattresses or Box Springs, Water Beds, Sofa Beds, Infant Beds & Special Beds)	8.717
9	0910*	Liquid Fuels, Kindling, Illuminating (Inc. Gasoline, Kerosene, Lighter Fluid, Fuel for Chafing Dishes & Fondue Pots, Charcoal Starter, etc.)	8.440
10	1819	Nails, Carpet Tacks & Screws, Thumbtacks	7.623
11	1205	Basketball, Activity, & Related Equipment	7.140
12	0602*	Chairs, Sofas & Sofa Beds	6.932
13	0902*	Bleaches & Dyes, Cleaning Agents & Caustic Compounds	6.176
14	1815*	Architectural Glass, Inc. Glass Doors	6.087
15	1807	Floors & Flooring Materials	5.808
16	0202*	Cooking Ranges, Ovens & Related Equipment	5.768
17	1401*	Power Lawnmowers & Unspecified Lawnmowers	5.046
18	1308*	Skates, Skateboards & Scooters	4.945
19	0309*	Furnaces & Floor Furnaces	4.704
20	0610*	Bathtub, Non-Glass Shower Enclosures & Shower Structures Other Than Doors & Panels	4.504
21	0604*	Desks, Storage Cabinets, Bookshelves & Magazine Racks	4.163
22	0921*	Household Chemical Products Other Than Bleaches & Dyes, Cleaning Agents, Caustic Compounds, Paints, Solvents & Lubricants, Waxes & Polishes (For Ex., Fumigants, Adhesives, Photographic Chemicals, Carbon Tetrachloride, Acid, Chemical Deodorizer)	3.749
23	1834*	Non-Electric Fences & Unspecified Fences	3.721
24	0917	Charcoal	3.693
25	0618*	Ladders & Stools (Exc. Chain Ladders)	3.353
26	1118*	Glass Bottles & Jars (Exc. Baby Bottles)	3.219
27	0102	Washers with Wringers	3.059
28	1210	Fishing Equipment, Poles, Lines, Lures, Hooks, Fishing Knives, Scalers Nets, Tackle Boxes, Loaders, etc.	3.020
29	1817	Porches, Balconies, Open Side Floors & Floor Openings	3.020
30	0801*	Home Workshop Power Saws & Unspecified Saws	3.010
31	1630	Money, Paper & Coins, Inc. Toy Money	2.817
32	1217*	Toboggans, Sleds, Snow Discs & Snow Tubing	2.601
33	0849*	Batteries, All Kinds	2.395
34	1103*	Cans, Inc. Self-Openers & Resealable Closures	2.355
35	1704	Matches	2.313
36	0605*	Electric Fixtures (Light Bulbs, Lamps, Light Fixtures, Electrical Outlets, Electric Chandeliers, Appliance Cords, Extension Cords & Replacement Wire)	2.283
37	1216*	Snow Skiing & Associated Equipment, Skis, Poles, Boots, etc., Inc. Ski Jacks	2.251
38	1648*	Pens, Pencils, & Other Desk Supplies	2.203
39	1270	Wrestling, Activity, Related Equipment & Apparel	2.152

Rank [1]	Product Number [2]	Product Description [3]	AFS1 [4]
40	1614*	Clothing, Inc. Day & Nightwear (Exc. Outerwear & Clothing Accessories)	2.058
41	1272	Gymnastics, Activity & Associated Equipment	1.966
42	1237*	Gas, Air & Spring Operated Guns (Inc. B-B Guns)	1.906
43	1861	Walls, Not Otherwise Specified	1.885
44	0313*	Heating Stoves & Space Heaters (All Types, Inc. Recreational)	1.823
45	0407*	Unpowered Cutlery & Knives, Inc. Switchblades & Pocket Knives	1.812
46	1279*	Hockey (Inc. Ice & Field Hockey) & Related Equipment	1.802
47	1811	Bricks, Concrete Blocks, Not Part of Structure	1.781
48	0907*	Paints, Solvents & Lubricants	1.713
49	3204	Motor Scooters, Minibikes & Other Such Vehicles (Two or Three Wheels)	1.638
50	1831	Window Sills, Door Sills, Door Frames, Window Frames	1.615
51	1616*	Jewelry (Except Toys), Watches, Keys & Key Rings	1.529
52	1822*	Non-Glass Doors (Inc. All Garage Doors & Unspecified Storm Doors)	1.526
53	1838	Lumber, Boards, Panelling Pieces, Not Part of Structure	1.516
54	0848*	Welding, Soldering, & Unpowered Cutting Equipment, Torches and Irons	1.491
55	0418*	Tableware, Inc. Flatware & Accessories	1.439
56	3205	Go Carts	1.437
57	1652	Pins & Needles	1.399
58	1245	Ice Skates	1.345
59	0820	Internal Combustion Engines, Gasoline Engines, Household (Not Automotive)	1.344
60	0424	Drinking Glasses (Glass)	1.323
61	0337*	Pipes (Hot Water, Steam, & Unspecified)	1.315
62	1405*	Tractors or Other Large Power Garden Tools	1.307
63	1223*	Outdoor Grills, Stationary & Portable	1.299
64	1267	Soccer, Activity & Related Equipment	1.257
65	1609*	Sun Lamps & Heat Lamps	1.255
66	0821*	Automotive Tools & Accessories, Tire Chains, License Plates, Tire Irons, Inc. Automotive Chemical Products	1.126
67	1291	Tennis, Badminton & Related Equipment	1.205
68	1212*	Golf Equipment, Inc. Golf Carts	1.185
69	0501*	Television Sets	1.157
70	0520*	Telephones & Sound Recording, Reproducing, Transmitting & Receiving Equipment (Exc. Children's Toy Phonographs)	1.140
71	1602*	Hair Accessories	1.137
72	0852	Rope & String	1.119
73	0238*	Irons & Ironers (Exc. Toys)	1.111
74	1328*	Wagons & Other Ride-On Toys (Exc. Bicycles, Tricycles)	1.077
75	0101*	Home Laundering Appliances (Washers & Dryers, Exc. Wringer Washers)	1.063
76	0319*	Other Heating Systems, Inc. Heat Pumps, Panel & Baseboard Electric Radiant Units, Boilers, Ductwork for Heating or Cooling Systems, Thermostats for Heating or Cooling Systems	1.021
77	0415	Wax Candles/Paraffin	1.010
78	0320*	Home Radiators & Unspecified Radiators	1.002
79	1403*	Hand Garden Tools (Rakes, Hoes, Trowels, Garden Shovels, Pitchforks, etc.) Inc. Winter Manual Yard Tools, Snow Shovels, Scrapers	1.001
80	1305	Toy Cars & Trucks & Non-Flying Airplanes, Boats, Exc. Models	1.001

Rank [1]	Product Number [2]	Product Description [3]	AFSI [4]
81	1853	Interior Walls or Panels	0.992
82	1266	Volleyball, Activity & Related Equipment	0.938
83	0827	Hammers	0.915
84	1806	Roofs & Roofing Materials	0.904
85	0456*	Cookware (Metal, Ceramic, Glass)	0.903
86	1631	Grocery Carts & Luggage Carriers, Personal Use	0.894
87	1313	Fireworks	0.857
88	1505*	Baby Carriages, Walkers & Strollers	0.853
89	1233	Trampolines	0.842
90	1294	Bleachers	0.834
91	1601	Razors & Shavers, Razor Blades	0.829
92	1301	Tricycles	0.825
93	1832	Wire, Not Electric, Inc. Picture Hanging Wire, Barbed Wire, Construction Wire	0.800
94	1290	Snowmobiles, Inc. Apparel & Protective Gear, Exc. Helmets	0.784
95	0648*	Plumbing Fixtures (Sink, Toilets)	0.770
96	0613*	Carpets & Rugs	0.750
97	1829	Handrails, Railings & Banisters	0.743
98	1109	Paper Wrapping Products	0.737
99	1646*	Outerwear, Footwear & Clothing Accessories	0.715
100	1341	Juvenile Sports Equipment (For Ex., Toy Baseball Bats, Gloves, Football, Kicking Tees, etc.)	0.712

[1] Excluded from this Principal Product List are products either not under CPSA jurisdiction or under questionnaire jurisdiction as well as products lacking in sufficient specificity to be meaningful.

[2] Except where two or more NEISS products have been grouped, Product Numbers correspond to Product Codes as they appear in the NEISS Coding Manual. For grouped products, the Product Number is the NEISS Product Code for a typical product in the group. In the listing these grouped Product Numbers are starred(*).

[3] In some cases, the product descriptions include more than one NEISS product category.

[4] The Age Adjusted Frequency-Severity Index (AFSI) was derived by multiplying the estimate of the numbers of injuries treated in an emergency room for a product category by the mean severity of these injuries, repeating the same calculation for the injuries occurring to children (0–14 years) by one time and a half to bring the 0–14 population to par with the 15 and older population, then summing all such weighted injury severity values. This sum was then divided by 10 and the last three digits of the resulting number were truncated to obtain the AFSI index number.

NATIONAL CENTER FOR HEALTH STATISTICS PLANNED PROGRAMS

Paul E. Leaverton, Ph.D., *Associate Director for Research, NCHS, Hyattsville, Maryland*

Since early in this century the Division of Vital Statistics (DVS) of the National Center for Health Statistics (NCHS), or its predecessor offices, has chronicled deaths in this country by publishing annual volumes on United States mortality. In the 1950's, NCHS was formed, combining DVS with the national health surveys which were begun at that time to systematically assess morbidity levels as well. In our 20-year history over 20 national data systems have now evolved to measure various aspects of national health including population trends, health services and facilities, illness, and death.

NCHS is legislatively mandated to "collect and analyze" data in these diverse areas. In fulfilling this mandate the Center has earned an international reputation for collecting, tabulating, and disseminating quality data. However, two major consensus criticisms have been directed to NCHS from various sources in recent years. One is that data release could be more timely. Paradoxically, the other has stressed the need for more in-depth analyses.

One of the more specific and pointed examples of this occurs in the widely circulated 1977 report of a Technical Consultant Panel (chaired by John Goldsmith) entitled "Statistics Needed for Determining the Effects of the Environment on Health."

This report contains eight recommendations. The first three are:

1. Establish a National Death Index;
2. Formally recognize the epidemiologic responsibilities, and substantially strengthen the epidemiologic capability at NCHS;
3. Provision by NCHS of data in such format, detail, and timeliness that epidemiologic analyses can focus on environmental health problems. This includes analysis of variations in morbidity and mortality by age, race, sex, economic status, time of year, and geographic area in order to detect or obtain evidence pointing toward environmental effects.

The Center is attempting to respond to these recommendations made to, and endorsed by, the U.S. National Committee on Vital and Health Statistics.

An Epidemiology Branch is being established in the Office of Statistical Research. It will be the responsibility of this branch to conduct epidemiologic research using NCHS data systems as well as to develop methodology to facilitate such analysis by others both in and outside the Center.

Establishing a National Death Index is not a new idea; it has been under discussion since 1964. What is new is that, finally, we are planning to establish such a registry beginning with deaths occurring in calendar 1979. This index will make it possible for investigators to determine whether or not an individual who is included in study groups exposed to various environmental or occupational risks has died during a given period of time without the investigators' having to go through the very costly and time-consuming process of checking the vital records indexes of each of the States. If the National Death Index indicates that such a death has probably occurred, the investigator can obtain additional statistical information on the death by contacting *only* the vital statistics office in the State where the death occurred.

Requests for use of the National Death Index will be screened by a group of consultants, serving in an advisory capacity to the Director of NCHS, to determine if they meet the minimum criteria for approval, the most important of which are that the study be strictly statistical in nature and that the information provided by the investigator be sufficient for valid and efficient use of the index. As a minimum, each query shall include the decedent's name (or maiden name, if an adult female) and either the decedent's date of birth or Social Security Number. It would also be desirable to obtain other data items such as place of residence, sex, race, marital status, and State of birth.

NCHS will prepare a User's Manual including a fee schedule, the application procedures, and other information necessary to use the service. Funds for the index are included in our FY 1979 appropriation bill. If it is passed, we will start the system with 1979 deaths, and should be able to begin servicing users by early Fall in 1980.

I want to spend the rest of this time discussing our response to the third recommendation in the Goldsmith Report. This is our plan to "automate" national health monitoring for the United States. This is my fondest dream. I think it is the most exciting activity at the Center. Exciting because although, to my knowledge, no national health statistics reporting system has yet led to the discovery of a disease cause or contributing factors. But we haven't really utilized computer technology efficiently to display national data toward this purpose. And there have been some tantalizingly close calls.

In England in the early 1960's an annual dramatic rise in deaths due to childhood asthma was eventually attributed to the use of a type of pressurized bronchodilator. An on-line more rapid display and analysis

of time trends might well have spotted this trend before clinicians and epidemiologists noted and verified this association. The bronchodilator was banned and the death rate came back down.

In this country, the Environmental Epidemiology Branch of the National Cancer Institute has led the way in demonstrating how innovative geographic displays can generate epidemiologic leads in the search for new contributors to mortality, particularly environmental factors. As we have just heard from Tom Mason, the atlases produced by this group have led to many field studies which have great promise to add to our knowledge about environmentally induced cancer.

This important new epidemiologic activity has prompted NCHS to take steps to begin developing methods which would, in a similar manner using computer produced maps, display age-adjusted and age-specific death rates for major diseases. Simple dot maps of cases (not rates) are contemplated for rarer diseases. There is no technological reason why we can't develop such a system so that, shortly after the annual mortality data tape is produced by DVS, such a display can be generated. In addition time-trends by region would be examined. Unusually young deaths should also be noted. Hopefully, a system can be constructed which would detect unusual patterns or leads for field study follow-up by epidemiologists in appropriate Federal agencies. One must be careful, of course, not to unduly alarm the public during this process.

As a first step, we are in the process of producing an atlas for all major diseases. A color version should be published later this year. However, black and white excerpts will be available this summer.

As is frequently pointed out, mapping for epidemiologic reasons is fraught with many dangers. Aren't there too many errors in the recording of primary cause on death certificates? Also couldn't regional "fashions" in listed causes be a major contributor to regional differences, thus obscuring environmental factors? Our view is that this is undoubtedly true for some diseases. However, since the data are collected and made public anyway, a clearer presentation would be helpful in assessment of this and other "quality control" types of problems in the data. The cancer atlases have already shown that interesting patterns may still be revealed amongst such noise. It should be noted that NCHS has used the Automated Classification of Medical Entities (ACME) system since 1968. This technique of handling multiple or secondary listed causes "corrects," in a nationally uniform manner, any illogically written causal sequences.

Other issues which must be resolved relate to years covered, size of geographic unit, choice of disease classifications, and grouping. A major question is what constitutes a reliable rate and, should unreliable rates (those based on small numbers) be displayed at all?

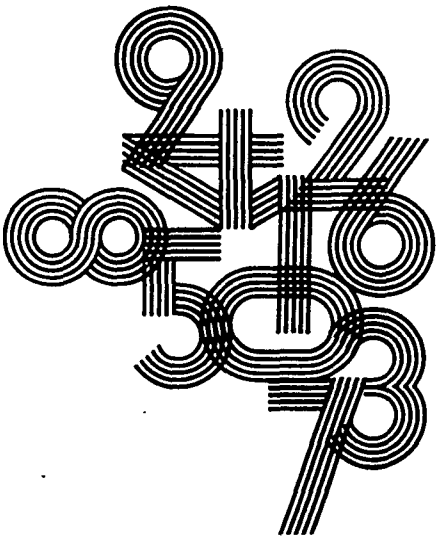
The first three variables epidemiologists would ordinarily "control for" in such mapping projects are age, race, and sex. Our approach is to construct separate maps for the four groups: white males, white females, non-white males, and non-white females, and, as stated, account for age by standard adjustment procedures using census values for each county. Due to the relationship between poverty level and health, it might seem reasonable to similarly adjust for this factor. However, such an adjustment could well reduce the apparent geographic discrepancies which are due to direct environmental causes. This would certainly be the case for many variables correlated with income level. Thus no such adjustment has been made. The important association between income and illness will continue to be investigated, of course, and the atlas should be of assistance to researchers in this particular activity. In fact, one important set of studies resulting from such maps may be of geographic associations between certain diseases and medical care availability.

I'll present only a few of the maps from this atlas. One depicts total mortality by State Economic Areas (SEA) for white males.

These data relate only to the "underlying" cause of death. Of significant monitoring potential is the use of contributing causes, something DVS does code but which, as yet, has not been tapped on a national basis. There is a later session at this conference on multiple causes of death.

In addition to mortality, we have heard discussion today of infant mortality and birth defects monitoring systems. We are also in the process of investigating fuller utilization of the annual Health Interview Survey data in monitoring. Because the primary sampling units are changed only after several years it may be possible to construct special types of morbidity rate maps.

In summary, the National Center for Health Statistics is responding to an increasing need for epidemiology. A major component is developing methods for more timely and systematic monitoring of death and disease. It is eminently reasonable that the national focal point for the gathering of health statistics increase its efforts in this direction. The benefits should be manifold and long-term. A variety of health agencies, whether they be concerned with health results or occupational, environmental, or other health hazards, should be tuned in. Perhaps we are a bit ambitious, but we are obligated to make the effort.



CONCURRENT SESSION D

Hospital and Acute Care Utilization Section

DIAGNOSTIC ENCODING OF MEDICALLY ORIENTED NOMENCLATURE

Don A. Brothers, *Health Division, Statistics Canada, Ottawa, Ontario*

Introduction

The purpose of this report is to present the results of an application of Diagnostic Encoding of Medically Oriented Nomenclature (DEMON), the automated medical coding system, for a representative sample of records from the Hospital Discharge Statistics System of the National Center for Health Statistics (NCHS). See appendix A for a description of the sample.

No attempt is made to describe how the system performs the coding as that topic has been covered in considerable detail by previous reports.[1] Those reports present the results from prior testing of DEMON *diagnostic* coding on mortality and morbidity records.

The importance of this test is that it represents a first attempt to apply an integrated diagnostic/surgical coding system to the complex medical narrative structures found on hospital admission/separation records (hereafter referred to as A/S/R's). The system now performs multiple component coding [2] on both surgical as well as the diagnostic narrative descriptions. In most cases, the coding is accomplished by two separate DEMON modules.

However, in certain instances the system can, where necessary, interrelate the machine coded diagnostic information to the surgical area in order to reconcile the problems of code selection caused by missing or assumed information. This information is generally visually transmitted by the manual coder. This is accomplished by a post diagnostic and surgical linkage module (EDIT) and this provides for the integration of the two coding areas.

The remainder of the report will describe the methodology employed for the test, analyze both the quantity as well as the quality of the coding, and provide some analysis of the cost/effectiveness of the DEMON system for processing hospital A/S/R's.

Characteristics and Preprocessing of the Data Set

A computer tape obtained from NCHS contained 13,077 physical records, representing 10,031 logical records (1 per A/S/R). Appendix B is a copy of the keying instructions and record format for the original tape.

The file was randomized by assigning a computer generated random number to each A/S/R and then sorting the file by that number. The first 5,000 A/S/R's were used to educate and "tune" the DEMON system dictionaries, and the remaining 5,031 records were retained for the test data set.

It should be noted that during the free form keying of the medical narratives, the operator delineated between diagnostic and surgical information. In addition, the operator attempted to separate the narratives into single diagnostic or surgical phrases.

By employing these operator assigned delimiters, the file of 5,031 A/S/R's was split into two files: one for diagnostic and the other for surgical information. Each designated single condition phrase became a logical record with added linkage characteristics back to the total A/S/R. Each logical record should contain a single diagnostic or surgical condition and these records are hereafter referred to as "lines" of input.

Examination of table 1 shows that the 5,031 A/S/R's contained 13,853 lines of input to DEMON (10,032 diagnostic + 3,821 surgical). These narratives produced 14,983 ICDA code assignments, and the attempt to have the operator delimit single conditions was reasonably successful; table 1/line 4/column 3 (T1/L4/C3) indicates an average of 1.13 ICDA codes assigned per line.

Approximately 4% (619) lines required no ICDA code at all. These lines contained either nonmedical

Table 1: TOTAL ICDA CODES ASSIGNED

LN #	Line Description	Diagnostic	Surgical	Total
1	Number of lines input	10,032	3,821	13,853
2	Total codes assigned	11,027	3,956	14,983
3	Lines with no codes	339	280	619
4	X codes per line requiring codes	1.14	1.12	1.13

Table 2: SOURCE OF CODE ASSIGNMENT

LN #	Line Description	Manual Coded	Machine Coded	Man/Mach	Total Coded
1. –	Number of lines processed				
.1	Diagnostic	1,496	6,538	1,998	10,032
.2	Surgical	615	2,547	659	3,821
.3	Total	2,111	9,085	2,657	13,853
2. –	% lines processed				
.1	Diagnostic	14.9	65.2	19.9	100.0
.2	Surgical	16.1	66.6	17.2	100.0
.3	Total	15.2	65.6	19.2	100.0
3. –	Number of codes assigned				
.1	Diagnostic	1,212	6,533	3,282	11,027
.2	Surgical	478	2,451	1,027	3,956
.3	Total	1,690	8,983	4,309	14,983
4. –	% of codes assigned				
.1	Diagnostic	11.0	59.2	29.8	100.0
.2	Surgical	12.1	61.9	26.0	100.0
.3	$\bar{X}$	11.3	60.0	28.7	100.0

information, the word "none" or items not generally coded by ICDA. In some instances, certain repetitive occurrences of phrases led to the assignment by the system of a default dummy code (R999 or R998) or an expanded code for certain conditions where it was thought useful to code their occurrence. Eg. P001= spontaneous delivery. With these exceptions, the coding adheres to the rules of ICDA-8 coding.

After the test was completed it was discovered that the NCHS system relaxes some ICDA rules and simplifies some code structures (eg. fracture dislocation surgical codes as well as procedures accompanying deliveries). Had these changes been made it is probable that fewer errors would have been made by the DEMON system.

Analysis of Quantity Performance

Table 2 provides information on the source of code assignment for the 13,853 lines input to the DEMON system.

T2L2.3C1 indicates that 15.2% of the lines were unresolved by DEMON and therefore require manual coding.

T2L2.3C2 indicates that 65.6% of the lines were resolved by DEMON and require no further coding action.

T2L2.3C3 indicates that 19.2% of the lines were resolved by DEMON. However, conditions detected by the system indicate an unacceptable probability of error. These records are isolated for checking (scanning) by a manual coder in order to correct coding errors. The criteria for isolating these records are as follows:

(a) A word(s) of 5 or more characters was not recognized by the system.
(b) Less than 75% of the recognized words having codes associated with them were used in the code assignment.
(c) The system assigned more than 1 code for the line (theoretically only 1 code should be assigned per line).

Employing the quality control legend (Appendix C), examination of table 3 shows the type and number of errors corrected by the scanning process. The manual coder is assisted by a system output listing which highlights the problem areas. Because of their complexity or imcompleteness, these records provide a challenge to the manual coder. Estimates based on this test determined that scanning requires 25% of the time it requires to manually code the records.

In a preliminary analysis of the test results, scanning criteria "C" had not been used to isolate records. Later analysis of error source clearly showed that it is essential to isolate these records for manual checking, even though this increased the percentage to be scanned from 11.1% to 19.2%.

Analysis of Quality Performance

Table 4 displays the type and number of errors remaining (residual) in the 65.6% of lines totally resolved by the machine. The table also includes those

Table 3: ERRORS DETECTED AND CORRECTED BY SCANNING *

LN #	Line Description	Diagnostic	Surgical	Total
1	Error type 1	544	79	623
2	Error type 2	109	50	159
3	Error type 5	171	64	235
4	Error type 7	266	46	312
5	Deviation type 9	94	18	112
6	Total (1–9)	1,184	257	1,441

*Includes errors detected by manually checking all lines which returned more than 1 code.

errors occurring on lines returning GT 1 code even though these errors were effectively isolated for correction by the inclusion of scanning criteria "C".

Analysis of error source in this table shows that 47.5% diagnostic and 43.5% surgical errors (LN12) occurred on 11.7% and 9.3% of the input records respectively (LN13). When this is displayed as a rate per 1,000 lines T4L14 it is even more evident that lines returning GT 1 code are the most damaging source of errors. In order to correct these errors scanning criteria "C" was established.

Table 5 displays the number and percent of residual errors expected to remain in the data set after completion of all machine and manual processes. T5L6 indicates a residual diagnostic error rate of 4.7%, surgical at 2.8% for an average of 4.1%. This is within the 3–5% projected residual error rate for the system.

As in all previous emperical testing of the DEMON system, analysis of unresolved records, scanned records, and errors have lead to an upgrading of the system dictionaries in order to enhance future system performance. This is generally accomplished by responding to conditions such as

(a) unknown but valid words encountered by the system for the first time,

(b) previously unestablished relationships which determine code assignment,

(c) systematic defect in dictionary in selecting a default code, or

(d) the addition of new abbreviations or common misspellings.

Given that this same test data set were rerun with the upgraded system, many of the errors would no longer occur. This upgrading process should probably continue until a residual error rate of approximately 2.5% is attained with regularity. That rate is probably the

Table 4: ERROR ANALYSIS MACHINE ONLY CODED RECORD

		Diagnostic			Surgical		
LN #	Error Type	Lines Returning 1 Code	Lines Returning GT 1 Code	Total	Lines Returning 1 Code	Lines Returning GT 1 Code	Total
1	1	270	165	435	16	20	36
2	2	90	46	136	46	13	59
3	3	—	—	—	2	1	3
4	4	—	—	—	1	0	1
5	5	85	10	95	25	3	28
6	6	—	—	—	1	1	2
7	7	3	183	186	0	28	28
8	8	—	—	—	0	4	4
9	9	219	77	296	36	8	44
10	Total (1–9)	667	481	1,148	127	78	205
11	Minus LN 9	219	77	296	36	8	44
12	Total Errors	448	404	852	91	70	161
	% Dist. Errors	52.5%	47.5 %	100.0%	56.5%	43.5%	100.0%
13	# of Lines	6,538	866	7,404	2,547	260	2,807
	% Dist. Lines	88.3%	11.7%	100.0%	90.7%	9.3%	100.0%
14	Error Rate per 1,000 Lines	68.5	466.5	115.0	35.7	269.2	57.3

Table 5: CODING QUALITY EVALUATION

LN #	Line Description	Diagnostic	Surgical	Total
1	No. of errors in manually coded records (estimated @ 3.1% error rate)	37.6	14.8	52.4
2	No. of errors in man/machine coded records after manual checking (estimated @ 3.1% of prior existing errors)	33.7	7.4	41.1
3	No. of errors remaining in machine only coded records	448.0	91.0	539.0
4	Total Residual Errors	519.3	113.2	632.5
5	Total Codes Assigned	11,027	3,956	14,983
6	% Residual Error	4.7%	2.8%	4.1%

optimal performance level for the DEMON system.

The information required for upgrading is readily available from the output listings, provided the manual code for coding or scanning and in fact updating would be performed or identified at the same time.

Cost/Effectiveness Analysis

For the purpose of analyzing the cost effectiveness of the DEMON system the characteristics of the test data set of 5,031 A/S/R's were doubled and therefore approximate a data set of 10,000 A/S/R's.

Cost obtained from both NCHS and Statistics Canada do not include any overhead.

Definitions and Sources

1. *U.S. Cost Data*— Supplied by NCHS Data Preparation
   - (a) Cost = .38 per A/S/R plus overhead
   - (b) Cost is 90% Medical Coding = 34.2¢ A/S/R
   - (c) Annual Volume = 232,000 A/S/R's

2. *Computer/Data Processing*—Supplied by Service Divisions Statistics Canada
   - (a) Computer time charged as per normal Statistics Canada project (see Appendix D)
   - (b) Key edit data entry @ $6.00 hour and estimated @ 8,000 key strokes per hour.

3. *Manual Coding and Checking*—Supplied by Nosology Reference Center, Statistics Canada
   - (a) Totally manual coded records costed as per U.S. costs @ 34.2¢ for medical coding on each A/S/R.
   - (b) Manual checking (scanning) of man/mach records costed @ 25% of total medical coding cost 25% of 34.2 = 8.5¢ per A/S/R.

DEMON Cost Analysis

Data Entry—1,000,000 key strokes

1 million/8K—125 hours @ $6.00 ..... $ 850.00
Computer Time 350.00
Manual Coding
4,222 lines @ 2.6 per A/S/R—
1,623 A/S/R's @ .342 ..... 555.00
Manual Checking
5,314 lines @ 2.6 per A/S/R
2,043 A/S/R's @ .085 ..... 173.65

Total Cost DEMON ..... $ 1,928.65
Current Cost NCHS # .342 A/S/R 3,420.00

Potential Savings per 10,000 A/S/R's .... $ 1,491.00
Potential Annual Savings
.1,491 × 232,000 ..... $34,591.20

Evaluation of Cost/Effectiveness

Any potential savings produced by the DEMON system would be reduced by the initial cost of implementation and periodic upgrades until some optimal performance is obtained. These costs when amortized over a number of years would be minimal. Revisions of ICD would require dictionary modifications; however, this cost would be partially offset by the reduced requirement for retraining manual coders as well as purchased supplies. It is estimated that conversion from ICDA–8 to ICD–9 will require 6 months work and approximately $1,000 computer time.

Conclusion

No automated system will ever totally replace the need for qualified medical coders of statistical data, nor is such a system desirable if innovation and excellence in this area are to be encouraged.

The DEMON system when applied within a coding environment can relieve the medical coder from much of the tedious, repetitive and simplistic coding structures (65.6%). The 15.2% of lines unresolved by DEMON and the 19.2% which require manual check-

ing would provide the coder with a challenge in coding records characterized by their complexity or incompleteness.

The quality of coding resulting from this test falls within the range of acceptance now employed at NCHS. The potential for savings within the current hospital discharge system as well as possible spinoffs into other medical record areas would appear to make the current DEMON system economically as well as technically feasible.

FOOTNOTES

1. Brothers, D.A. *DEMON* published proceedings of Computerized Medical Coding of Statistical Uses Conference, Orlando, Florida, December 1976.

2. Each line of input to the system should theoretically contain a single diagnostic or surgical entity; however, DEMON can if required assign up to seven codes from a single record. This feature is referred to as multiple component coding.

APPENDIX A*

Automated Coding Project

Approximately 10,000 Hospital Discharge Survey (HDS) abstracts from data year 1975 were used to test the DEMON system. Because of time and fiscal constraints, abstracts were selected by batch number (HDS abstracts are stored in batches of approximately 1,000 records) rather than abstract number. Ten batches were systematically sampled from a total of 231 batches using a random start procedure. All narrative pertaining to diagnoses and procedures was keyed from the abstracts to tape. The tape was forwarded to Don Brothers at Statistics Canada for computer assignment of ICDA–8 codes via the DEMON system.

Because the sampling unit for abstracts was the batch rather than the individual record, there is a greater likelihood of clustering by hospital and/or by data month (date of discharge). To assess this possibility, selected characteristics of the subsample of 10,000 abstracts used for the Automated Coding Project were compared to the total HDS sample of 231,670 abstracts.

The subsample of abstracts represented 95 of the 432 hospitals that participated in HDS in 1975. Table 1 indicates that the bed size and ownership percent distributions of the subsample were similar to the distributions for the total sample. However, the subsample did contain more abstracts from hospitals in the South region and fewer abstracts from hospitals in the Northeast and North Central regions than would be expected by chance ($x^2 = 15.4$, df = 4, $P<.01$).

Table 1. PERCENT DISTRIBUTION OF PARTICIPATING SHORT-STAY HOSPITALS IN THE HOSPITAL DISCHARGE SURVEY SAMPLE AND IN THE AUTOMATED CODING PROJECT SUBSAMPLE BY SIZE OF HOSPITAL, BY GEOGRAPHIC REGION AND BY OWNERSHIP, 1975

Bed Size of Hospital (beds)

	6–49	50–99	100–199	200–299	300–499	500–999	1,000 or more
HDS Sample	8.6	12.5	17.4	13.7	23.8	20.4	3.7
Subsample	4.2	11.6	17.9	11.6	29.5	21.1	4.2

Geographic Region

	Northeast	North Central	South	West
HDS Sample	26.9	30.1	29.2	13.9
Subsample	18.9	22.1	47.4	11.6

Ownership

	Voluntary, Nonprofit	Government	Proprietary
HDS Sample	47.9	24.3	27.8
Subsample	49.5	24.2	26.3

*Appendix A was provided by the National Center for Health Statistics.

Table 2. PERCENT DISTRIBUTION OF ABSTRACTS IN THE HOSPITAL DISCHARGE SURVEY SAMPLE AND IN THE AUTOMATED CODING PROJECT SUBSAMPLE BY CONTROL MONTH 1975

Control Month	HDS Sample	Subsample
January	8.6	9.5
February	8.1	9.1
March	8.7	8.1
April	8.4	9.9
May	8.6	9.9
June	8.1	8.6
July	8.5	7.9
August	8.6	7.4
September	8.0	7.8
October	8.5	6.2
November	8.0	7.0
December	7.8	8.7

Table 2 shows the percent distributions for the subsample and total HDS sample by data month. Abstracts in the subsample represented all 12 data months, although more abstracts were sampled from the earlier data months and fewer from later months than would be expected by chance ($x^2 = 165.26$, $df = 12$, $P < .01$).

Although there are statistically significant differences between the subsample and sample, there is no reason to believe that these variations would produce bias in regard to the narrative recorded on the abstract. In other words, the subsample of HDS abstracts should contain diagnostic and procedural terminology that are representative of the total HDS sample.

APPENDIX B*

DEMON

COLUMN	ITEM	KEYING INSTRUCTIONS
1	Card Number	
2–5	Hospital Number	Enter as stated.
6	Component Number	Enter digit following Hospital Number. If no entry is given, leave blank. NOTE: The following hospitals must have a component: Hospital 1014 = "1" or "4" Hospital 6204 = "1" or "4" Hospital 5305 = "1", "2", or "3"
7–10	HDS Number	Enter as stated.
11–16	Medical Records Number	Enter as stated. If no Medical Record Number is given, blank entire field. A. Ignore alphabetic characters. Example: C5427 will be keyed as 005427 B. If more than six digits are given, key the last six digits. Example: 6732461 will be keyed as 732461 C. If less than six digits, precede with zeros. D. Ignore dash and the digit following the dash when given. Example: 1234-1 will be keyed as 001234 NOTE: An entry of 14–17–84 will be keyed as 141784. The dashes are to be ignored. E. When data year follows the Medical Records Number, delete data year. Example: 2606-75 will be keyed as 002606 F. If data year precedes Medical Records Number and is given with or without a dash, key last six digits. Example: 75–6823 will be keyed as 756823

*Appendix B was provided by the National Center for Health Statistics.

17–	Diagnoses Full Text	A. Key each diagnosis in full text in the order it appears on the abstract. If necessary, continue on to next record. Each additional record will have the next card number. The identifying information in columns 2–16 will be duplicated on each additional record pertaining to a particular abstract. B. Each diagnosis will be separated by an asterisk (*). C. One slash (/) will separate diagnoses from operations. D. If no operation is recorded, key two slashes (//) to denote completion of abstract.
?	Operations Full Text	A. Key each operation in full text in the order it appears on the abstract. If necessary continue onto next record. Each additional record will have the next card number. The identifying information in columns 2–16 will be duplicated on each additional record pertaining to a particular abstract. B. Each operation will be separated by an asterisk (*). C. Key two slashes (//) to denote completion of abstract. NOTE: The following abbreviations given as diagnosis and/or operations will be keyed as indicated below: 1. $\overline{c}$ = with 2. 2° = secondary 3. $\overline{s}$ = without All other abbreviations, numerals, etc., will be keyed as given.

APPENDIX C

Quality Performance: Legend

Code Types

D – Diagnostic Codes
P – Operations
A – Biopsy/Procedures
R – Radiology, etc.

Error Types

1 Error in D or P code
2 Error in D or P code last digit only
3 Error in A or R code
4 Error in A or R code last digit only
5 Missing D or P code
6 Missing A or R code
7 Extra D or P code
8 Extra A or R code
9 Deviation (non error)*

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*Type "9" represents deviations from perfect code assignment rather than errors. They are characterized by the following types of conditions.

(a) An identical condition was expressed on two separate lines of an A/S/R. Therefore the system assigned the code twice, thereby producing a redundant code.
(b) The system assigned a dummy code (R999 or R998 for generally noncoded entities.
(c) Conventions established at a particular installation will determine the inclusion or exclusion of certain codes: eg. Should conditions following "STATUS POST" be coded?
(d) Age criteria will be required to select appropriate code, eg. certain diagnostic conditions applying to either mother or infant.

Resolution of the above coding deviations could be resolved by a post DEMON edit module.

APPENDIX D

Computer Time and Charges*

LN #	Line Description	C.P.U. Time	Step Time	Total Charges
1.–	Total			
.1	Diagnostic	396.3 sec	1,778.8 sec	$ 117.97
.2	Surgical	74.5 sec	510.9 sec	35.42
.3	Total	470.8 sec	2,289.7 sec	$ 153.39
2.–	$\overline{X}$ Per Line			
.1	Diagnostic	.034 sec	.161 sec	$ .0116
.2	Surgical	.019 sec	.133 sec	.009
.3	$\overline{X}$	.029 sec	.147 sec	$ .010
3.–	$\overline{X}$ Per Code			
.1	Diagnostic	.036 sec	.161 sec	$ .010
.2	Surgical	.019 sec	.129 sec	.0089
.3	$\overline{X}$	.027 sec	.145 sec	$ .0094
4 –	$\overline{X}$ Machine cost per A/S/R – 153.39 – 5,031 – $.03			

*These charges apply to the machine coding run for the 5,031 A/S/R's. The timings and changes do not include the pre- and postprocessing charges; however these are relatively small (see cost/effectiveness evaluation).

STRUCTURE FOR DATA QUALITY IN A MEDICAL RECORD INFORMATION SYSTEM

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Introduction

The quality of data in information systems based on medical records has become a major concern. The use of data from these systems for health planning, quality assurance, and other health care policy decisions by organizations such as Professional Standard Review Organizations (PSRO's), Health Systems Agencies (HSA's), and others has raised important questions concerning the quality of data in these systems.

Two recent studies by the Institute of Medicine (IOM) of the National Academy of Sciences [1,2] showed that the reliability of coding principal diagnosis was no better than 65 percent. It was a startling revelation that diagnosis coding, a traditional medical record department function which was considered fairly simple and was rarely questioned, could produce data with such a high error rate.

The IOM study results are important in pointing out the need for a concerted effort to improve the accuracy of diagnosis and procedure coding. But coding accuracy is only one component of data quality in a medical record information system, and attention to coding accuracy alone will give an incomplete picture of data quality.

The purpose of this paper is to present a structure for data quality in a medical record information system. This structure is three-dimensional. One dimension is comprised of the six components of data quality. Another dimension is made up of the three processes in data flow and the process of using information in a medical record information system. The third dimension consists of the three control activities which make up the data quality function.

Six Components of Data Quality

The components of data quality are characteristics of data that render it useful. The six components of data quality in a medical record information system are defined as follows:

1. Accuracy—Conformity of data in the information system to the actual care and condition of the patient.
2. Confidentiality—Protection of data from unwarranted disclosure.
3. Security—Prevention of data loss or data damage.
4. Timeliness—Availability of all data when needed.
5. Totality—Inclusion of all data, and only the data that should be there, in the system.
6. Utilization—Use of data.

The concept of data quality in any medical record information system must include all six components. If any one component is deficient, the ultimate purpose for the data may not be realized. For example, producing 99 percent accurate data two years after it was needed serves no useful purpose.

Processes

Every medical record information system involves a series of processes which must occur in order to translate the reality of the original situation into the data which reflects that reality and ultimately to act on that data. These processes comprise a second dimension in data quality which must be identified and analyzed in relation to the six components of data quality. These processes must be identified and analyzed because it is in this dimension, the performance dimension, that errors occur.

The three processes in the data flow in a medical record information system are:

Medical record documenting. The medical record is a compilation of information regarding patient care that ranges in content from subjective professional observation to objective findings regarding the patient. Many individuals from different professions and with different levels of experience contribute to the record. Entries in the record vary from handwritten narrative to machine-produced graphic displays and originate throughout the facility at varying times in the episode of care.

Coding and abstracting. Coding is the translation of medical terminology and other information about the patient into code. The coding of diseases and procedures is accomplished through the use of classifications such as *H-ICDA-2* [3] or *ICDA-8.* [4] More detail about coding can be found in "Accuracy of Diagnosis and Operation Coding"[5] Abstracting is the selection of information to be encoded and the lifting from the record of certain predefined data items, e.g., patient sex.

Data processing. Data processing includes all the steps, by humans and machines, required to convert the coded and abstracted data into a usable form for data users and for storage. Major steps include entry of data into a computer system, computer manipulation of the data, and production of required outputs, e.g., reports.

Following the three processes which occur in the data flow, a fourth process occurs—using information. This fourth process is the realization of the purpose for which the information system was created. It is in this process that decisions are made and actions are taken based upon that information.

The relation of the four processes to the six components of data quality is shown in figure 1.

Errors can occur in the design, implementation, or operation of these four processes. These errors result in data which is not fit for use because of an inadequacy in one or more of the six components of data quality.

The identification, control, and correction of these errors take place in the data quality function.

The Data Quality Function

The data quality function is a set of activities through which we obtain data which is fit for use by all who use the data. [This definition is based on concepts of J. M. Juran, for example in the *Quality Control Handbook.* [6]]

The three steps in the data quality function are:

Specification. In this step the standards for design, performance, procedures, and outputs are set. These specifications serve as a basis for measuring the conformance of each component of data quality to the actual standard.

Quality control. Quality control is defined by Juran[6] as the " . . . regulatory process through which we measure actual quality performance, compare it with standards, and act on the difference." Quality control is a management activity within the system in that decisions are made based on deviations of performance from standards.

Audits. An audit is the set of activities independent of the system itself through which the quality of outputs from a data system and the adequacy of quality control procedures for the system are reviewed.

The relation of the data quality function to the six components of data quality and the four processes in an information system are shown in figure 2. This relation is the structure for data quality in a medical record information system.

Structure for Data Quality

The structure for data quality in a medical record information system allows for the definition of specific procedures and activities within each process in a medical record information system as they apply to the individual components of data quality. An analysis of each activity during the design of an information system permits the building of a strong data quality function as part of that design.

Many systems in operation today have not been designed with the data quality function in mind. Therefore, to evaluate this function in such a system, it is necessary to examine the system in detail, build a matrix of the process activities for each data quality component, and determine the specifications, quality control activities, and audits that exist or can be put into place for that system.

The structure for data quality can be used

1. during the design of an information system to ensure that the data quality function is included,
2. to identify and evaluate the data quality function in an already existing information system, and
3. to evaluate the quality of data in an information system.

Examples

The following examples show how the data quality function can be applied to individual components of data quality within individual processes of a medical record information system. The procedures listed within each example are not intended to represent all that might be required, but exemplify how the data quality function can be applied to a process.

Example 1: Component of Data Quality: Timeliness Process: Processing Weekly Clinic Status Report

Assume the medical record information system is a discharge abstract system which receives paper abstracts by mail from ambulatory care clinics in an urban environment and produces a weekly clinic status report for each clinic.

1. Specifications

   Standard: Weekly clinic status reports shall be produced 24 hours after the last abstract is received from the clinic.

   Procedures:

   a. All mail will be opened the same work day it is received.

Figure 1. Relation of Data Flow Processes to Components of Data Quality

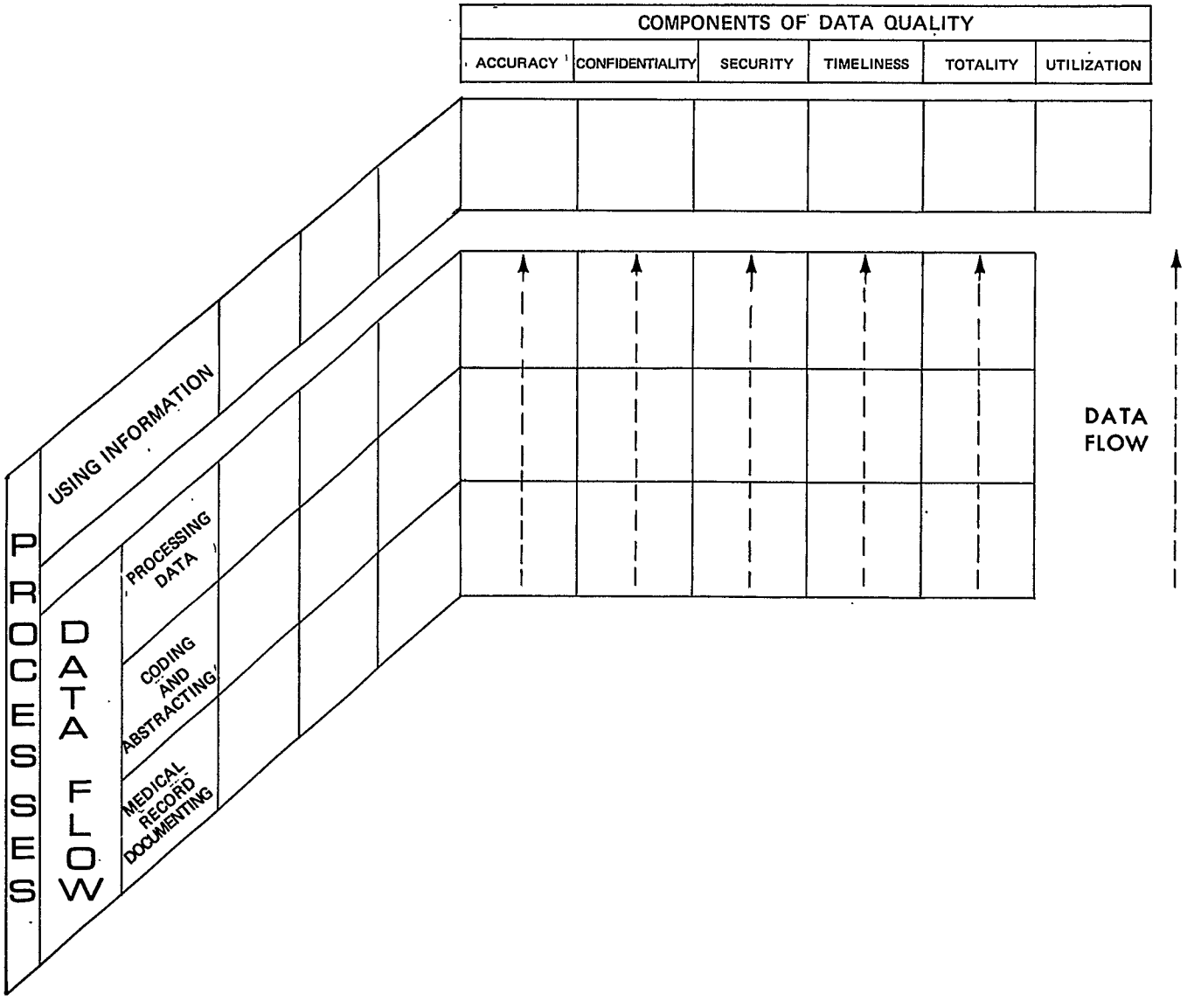
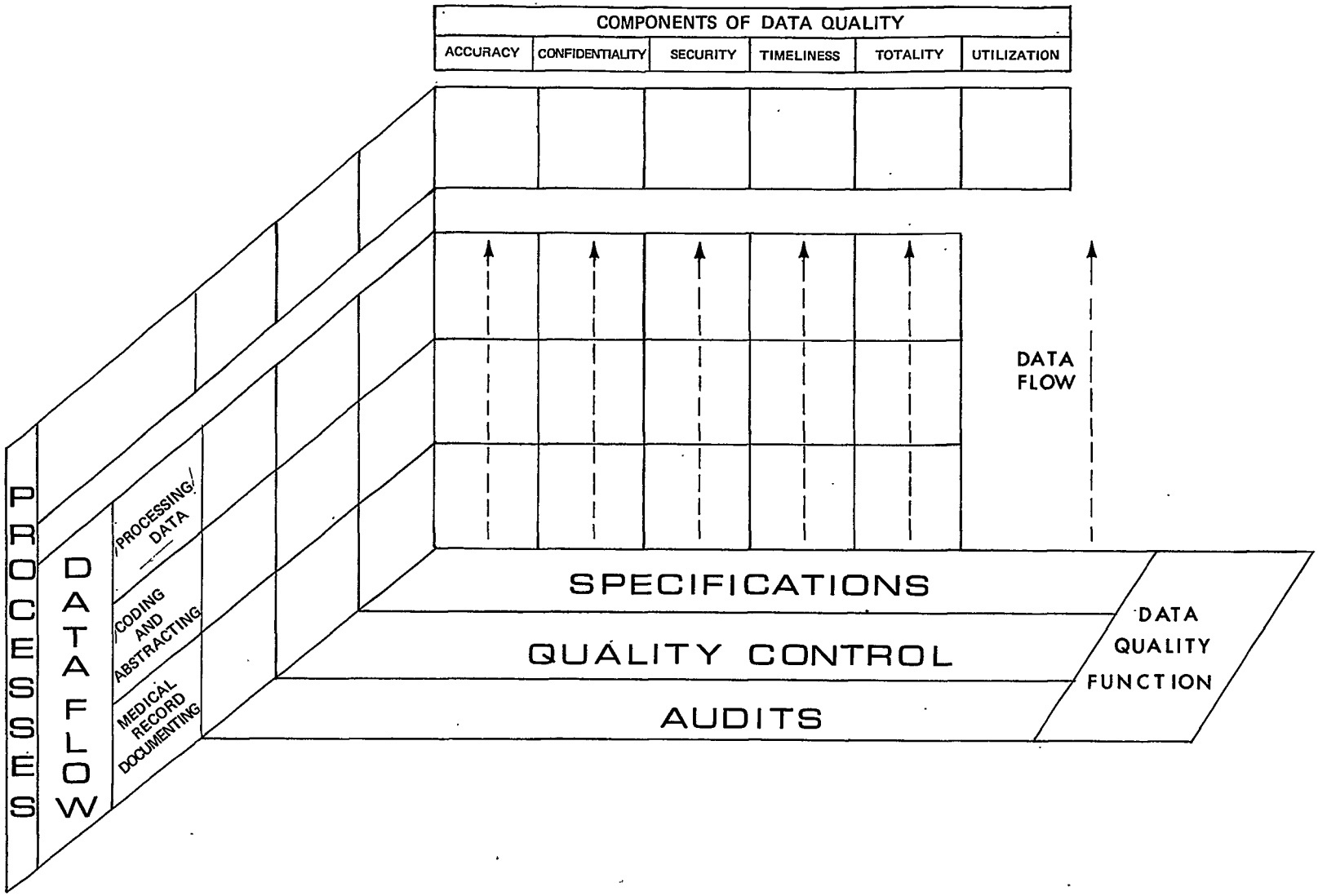


Figure 2. Structure for Data Quality Medical Record Information System



b. All batches of abstracts containing the final record for a week will have special identification on the envelope and have priority for processing.
c. All records will be entered into the data processing system the day they are received.
d. All corrections will be made to any records in the system on the day the corrections are received.
e. Reports will be produced immediately following completion of input and corrections.
f. Reports will be mailed immediately after they are produced.

The proper application of these procedures (and others not enumerated here) makes possible the attainment of the timeliness standard for processing the weekly clinic status report.

2. Quality Control

a. A weekly production status report is prepared which gives receipt dates of batches, run dates, mail dates and other information which the manager monitors to determine that the standard is being met.
b. Exceptions are flagged and investigated by management, and corrective action taken to solve problems.

Once standards have been set, quality control activities must be established that are a part of the system itself. Performance of the system related to the overall timeliness standards and the procedures must be monitored on a regular basis to be sure that performance is within certain specified control limits. If deviations are found, the manager must take action (e.g., change behavior, change procedures) to improve performance.

3. Audits

a. An auditor checks that procedures are being followed. For example, the auditor goes to the mail room and determines what day's mail is being opened, what week's reports are being processed, mailed, etc.
b. An auditor interviews employees to determine whether they know the performance standards and their role in carrying them out.

Example 2: Component of Data Quality: Accuracy Process: Coding

1. Specifications

Standard: The encoded data will accurately reflect the condition of the patient (diagnoses, problems) and describe the treatments performed during the patient care episode.

Procedures to be followed by the coder:

a. Select the terms to be coded. Examine the entire medical record to select the terms necessary to form complete diagnostic statements and select the "totality" of information, i.e., *all* the diagnostic statements and all the descriptions of treatments necessary to completely describe the patient's condition and care.

If conflicting or ambiguous information is found, refer the record to the attending physician for clarification.

b. Code the terms. Look for the terms in the Alphabetic Index to the classification. If the term is found, refer to that code number in the Tabular List of the classification and follow additional coding instructions which may be present there.
c. Classify the terms. If the terms cannot be found in the classification index, write on the coding document the statement to be coded. Forward the document to a nosologist at the coding clearinghouse who will assign the code and will notify you of the assignment.

2. Quality Control

The supervisor of the coding process will apply the criteria from *Quality Control of Diagnosis and Procedure Coding*[7] and monitor the accuracy of codes. Quality control studies of coding accuracy will be carried out following the structure presented in *Quality Control of Diagnosis and Procedure Coding.*

3. Audits

Carry out a reabstracting study by selecting a sample of records and having an expert coder independently recode and compare the results to the original coding. This study provides accuracy rates that can be used to assess the validity of the quality control activity and provides information that can be used to determine that the correct procedures for the coding process are defined and operating.

Summary

This paper presents a structure for data quality in a medical record information system. This structure is based on six components of data quality, four processes in medical record information systems in which errors can occur, and three steps in the data quality function. Uses of this structure for data quality and examples of its applications are presented.

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USEFULNESS OF THE MEDICARE STATISTICAL SYSTEM TO PROFESSIONAL STANDARDS REVIEW ORGANIZATIONS AND HEALTH SYSTEMS AGENCIES

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Introduction

With the passage of the 1965 amendments to the Social Security Act creating the Medicare program, the Federal Government established for the first time a uniform nationwide program of health insurance for persons aged 65 years and over. Because of the pressing need for information on this landmark program for use in program administration, planning, research and evaluation, a statistical system had been designed and was ready to operate when the program began. It collected a wide variety of data on the enrolled population, the providers, and the use of Medicare services. The system has now been operating for 12 years.

My talk today and the two that follow focus on Medicare data developed not directly for the Medicare program but for two major Department of Health, Education, and Welfare (HEW) programs begun more recently. The first program is the Professional Standards Review Organization (PSRO) program of 1972, the purpose of which is to promote the effective, efficient, and economical delivery of health care services of proper quality provided under the Medicare, Medicaid, and Maternal and Child Health programs. The second is the areawide planning and resource development program established by the National Health Planning and Resources Development Act of 1974.

To implement the PSRO program some 200 PSRO areas were designated nationwide, each with a Professional Standards Review Organization to be developed to assume program responsibilities. Similarly, the areawide planning program works through a network of some 200 Health Service Areas nationwide, each with a Health Systems Agency (HSA) organization to be developed to carry out planning responsibilities.

Usefulness of Medicare Program Data to the PSRO's and HSA's

As the PSRO's and the HSA's began to develop, it was perceived that the Medicare data system could serve these programs in several ways. Because the Medicare program preceded the PSRO and HSA programs by several years, Medicare data could provide information about how services were used both before and after the implementation of these new programs. Second, because Medicare was a national program covering nearly all persons aged 65 years and over, it could provide the PSRO's and HSA's with regional and national data to compare with those of their own areas. Third, because both enrollment and utilization data can be produced at the PSRO and HSA area levels, rates of use of Medicare services can be computed. Fourth, areawide planning and resource development requires information about the flow of patients into and out of an area. Such information is not readily available except from a data system covering a broad geographic area. Analysis of utilization rates in a specific area also requires information about the flow of patients. Fifth, the scope and flexibility of the Medicare statistical system makes it useful in evaluation and administration. In summary, Medicare data can be used by the PSRO's and HSA's for:

- Baseline data before the start of the program
- Regional and national data to compare with area data
- Data for determining utilization rates
- Patient origin data
- Data for program administration and evaluation

For these reasons our office, which is responsible for the Medicare data base, and offices responsible for administering and evaluating these new programs cooperated to generate a wide range of acute care hospital utilization data based on PSRO and HSA areas.

Limitations of Medicare Data for the PSRO's and HSA's

It is important to note that data available from the Medicare statistical system is limited to Medicare enrollees, whereas the concerns of the PSRO's include all federally funded patients. Similarly, HSA's are responsible for health planning and resource development for the entire Nation.

Nonetheless, Medicare data is important for two reasons. First, Medicare patients account for about 20 percent of all acute care admissions and about 30 per-

cent of all acute care days. Second, a study sponsored by HCFA is underway that includes an analysis of the usefulness of the Medicare data system as a surrogate for data systems which cover the entire population. Preliminary results indicate that Medicare data can be useful for understanding patterns and trends in the use of health care services by persons of all ages. In particular, Medicare data can be useful for patient origin studies and estimates of per capita bed use and expenditures. Although this research was done in selected areas in New England, the findings suggest that information on the patterns of hospital use by the Medicare population may be generalizable in many aspects to the entire population.[1]

Sources of the Data

The sources of the data generated for the PSRO's and HSA's come primarily from three Medicare statistical files:

1. The master health insurance enrollment file, which contains information about the residence and demographic characteristics of each person enrolled in the Medicare program.
2. The short-stay hospital discharge bill file, which contains information taken from the billing forms submitted by hospitals for each patient.
3. The provider of service file, which contains information about the location and characteristics of hospitals certified to provide Medicare services.

Data from all three files are incorporated into a single hospital record. Each record represents an individual hospital stay. The size of the record varies, depending upon the data elements required for a specific statistical project. Each record is annotated with PSRO and HSA codes for the beneficiary's area of residence, and PSRO and HSA codes for the hospital's location. This effort primarily uses a file of these records representing Medicare discharges throughout the nation in a particular reporting period. A fourth file that consists of admissions notices is used if very current counts of the number of hospital stays is required.

Designing Data for PSRO's and HSA's

Before focusing on one of the statistical programs designed for the PSRO and HSA programs, we should like to make this observation. Because the responsibilities of the PSRO's differ from those of the HSA's, it was assumed at first that certain kinds of information would be useful to the PSRO's while other kinds of information would be useful to the HSA's. The experience from our effort, however, is that they often request the same information. We began to perceive that although the PSRO's and HSA's have different roles, they can have a strong effect on each other. That is, the effectiveness of one program is often tied to the effectiveness of the other. Under that assumption, it follows that the same kind of information can be useful in the administration of either program, albeit the focus of interest and perspective be different. Consequently, all data sets are now designed so that they can be arrayed by PSRO areas or by HSA areas.

The MEDPAR Report

I am going to give a brief overview of the Medicare Provider Analysis and Review (MEDPAR) report developed for the PSRO's and HSA's; following that, an overview of two other information programs will be presented by members of our office.

The MEDPAR report consists of a set of 20 tables and a booklet explaining how the data were derived and how they may be used.

The set of 20 MEDPAR tables is designed to show different aspects of Medicare utilization. Arranged by hospital within PSRO or HSA area, each table focuses on specific variables to provide hospitals and areawide profiles of patient mix and utilization. The hospital-level profiles help to identify particular hospitals with patient mixes or patterns of utilization that differ substantially from other hospitals in the area. Similarly, the area profiles can be compared with those for the region and Nation.

Each table focuses on a specific element of information, e.g., surgical status of patients, average stays for diagnostic categories, day of the week of admission, or long-stay cases. In approaching each table, the reader might ask:

1. What specific pattern of Medicare hospital use is displayed by this table?
2. What questions or issues are raised by this table which may require further study?
3. What is already known about hospital administrative and clinical practices or about the type of Medicare patients in the hospital or area which might explain the observed utilization patterns?
4. What additional data, including that in the other tables, are needed to help explain the questions or issues raised by this table?

Using the MEDPAR Tables

Of the 20 tables, five of them illustrate the potential utility of MEDPAR report to the PSRO's and the HSA's. Tables 9 through 12 answer questions about admissions and discharge patterns by day of the week.

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[1] The research on which these findings are based was done by The Codman Research Group, Inc., with funds provided under HEW Contract 600–77–0039.

Table A. LIST OF MEDPAR TABLES

Table 1: Number of Discharges and Average Length of Stay by Status at Discharge (Live/Dead), by Hospital
Table 2: Selected Hospital Characteristics from the Automated Certification System as of 12/75, by Hospital
Table 3: Number of Discharges, Average Length of Stay, and Percentile Stays for Selected Discharge Diagnoses, by Area
Table 4: Number of Discharges, Average Length of Stay, and Percentile Stays for Selected Surgical Procedures by Area
Table 5: Number of Discharges and Average Length of Stay for Selected Primary Discharge Diagnoses, by Hospital
Table 6: Percentage Distribution of Total Discharges by Length of Stay, by Hospital
Table 7: Percentage Distribution of Live Discharges by Length of Stay, by Hospital
Table 8: Percentage Distribution of Dead Discharges by Length of Stay, by Hospital
Table 9: Percentage Distribution by Day of the Week of Admission, by Hospital
Table 10: Average Length of Stay by Day of the Week of Admission, by Hospital
Table 11: Percentage Distribution by Day of the Week of Discharge, by Hospital
Table 12: Average Length of Stay by Day of the Week of Discharge, by Hospital
Table 13: Average Length of Stay for Non-Surgical and Surgical Discharges and Percent of all Discharges with Surgery, by Hospital
Table 14: Average Length of Stay, Preoperative and Postoperative for Nonendoscopic Surgical Discharges, by Hospital
Table 15: Number and Average Length of Stay for all Surgical Discharges by Single and Multiple Diagnoses, by Hospital
Table 16: Number and Average Length of Stay for All Non-Surgical Discharges by Single and Multiple Diagnoses, by Hospital
Table 17: Percentage Distribution of Discharge and Length of Stay by Age, by Hospital
Table 18. Percentage Distribution of Discharges and Mean Length of Stay, by Sex and Race by Hospital
Table 19: Average Hospital Charges per Discharge and per Day by Hospital
Table 20: Long-Stay Discharges by Surgical Status and Age, by Hospital

They also raise questions about how hospital resources can be utilized most efficiently and economically. If patients were admitted and discharged uniformly throughout the week, on the average 14.3 percent would be admitted each day and 14.3 percent would be discharged. These tables should be useful to health planners since admission and discharge practices affect the daily census which affects occupancy rates which in turn affect the need for beds.[2] The tables should also be useful for utilization review because admission and discharge practices affect average length of stay (ALOS).

[2] William Shonick, *Elements of Planning for Areawide Personal Health Services*, (Saint Louis: The C.V. Mosby Company, 1976).

Table 9. SHORT-STAY HOSPITAL DISCHARGES FOR A 20 PERCENT SAMPLE OF MEDICARE ENROLLEES AGED 65 YEARS AND OVER: PERCENTAGE DISTRIBUTION BY DAY OF THE WEEK OF ADMISSION (1–40 DAY STAYS ONLY).

Test Run

PSRO Area XXXX

Period covered 01/75—12/75

Provider Number/Hospital	Total Discharges In Sample	Percentage Distribution by Day of Admission							
		Total	Sun	Mon	Tue	Wed	Thu	Fri	Sat
US Total	1299839	100.0	13.6	19.1	16.7	14.9	13.6	12.4	9.7
HEW Region 01	73009	100.0	13.5	18.3	16.9	14.7	14.0	12.7	9.9
PSRO Area XXXX	3978	100.0	14.2	17.9	18.1	14.3	14.4	12.0	9.2
Hospital A	451	100.0	13.1	20.0	19.3	14.0	14.6	9.8	9.3
Hospital B	824	100.0	17.7	16.4	16.7	16.9	12.7	11.3	8.3
Hospital C	486	100.0	12.6	23.0	20.0	12.8	14.2	10.5	7.0
Hospital D	208	100.0	13.5	16.8	23.6	14.4	13.0	12.0	6.7
Hospital E	611	100.0	14.1	15.4	15.4	14.1	14.2	15.1	11.8
Hospital F	301	100.0	13.0	18.6	21.9	13.0	13.3	10.3	10.0
Hospital G	491	100.0	14.9	16.9	18.1	14.3	16.9	10.2	8.8
Hospital H	606	100.0	11.9	17.7	16.5	12.9	15.5	15.2	10.4

Calculated data not shown when total sample discharges for a hospital are less than 5.
NOTE: Tables 9–19 display data for discharges of 1–40 days only.

Table 9 presents hospital-level and area-level data, displaying the percent distribution of discharges by the day of the week of admission. A low percentage of Friday or Saturday admissions could indicate inefficient utilization of facilities and services and physician admitting practices, or both.

A test run of Medicare data arrayed by hospital (with identifiers deleted) within PSRO areas is shown. Table

Table 10. SHORT-STAY HOSPITAL DISCHARGES FOR A 20 PERCENT SAMPLE OF MEDICARE ENROLLEES AGED 65 YEARS AND OVER: AVERAGE LENGTH OF STAY BY DAY OF WEEK OF ADMISSION (11–40 DAY STAYS ONLY).

PSRO Area XXXX

Test Run

Period covered 01/75—12/75

Provider Number/Hospital	Total Discharges In Sample	Average Length of Stay	Average Length of Stay by Day of Admission						
			Sun	Mon	Tue	Wed	Thu	Fri	Sat
US Total	1299839	10.1	9.5	9.6	9.8	9.9	10.2	11.1	11.0
HEW Region 01	73009	10.8	10.3	10.4	10.5	10.6	11.0	11.9	11.7
PSRO Area XXXX	3978	11.3	10.4	11.3	10.6	11.1	11.1	13.2	11.9
Hospital A	451	11.4	11.0	11.8	10.2	11.0	11.8	12.0	12.8
Hospital B	824	11.2	9.4	11.7	10.6	11.1	12.2	12.7	11.4
Hospital C	486	11.3	12.6	11.5	10.1	10.8	9.8	13.3	12.3
Hospital D	208	11.0	10.9	12.1	11.4	10.0	8.9	11.2	12.3
Hospital E	611	12.0	10.5	11.7	11.5	12.7	12.6	12.9	12.3
Hospital F	301	11.0	11.9	10.4	11.0	9.6	10.1	15.3	9.9
Hospital G	491	10.0	8.2	9.9	8.4	10.6	9.7	13.3	12.9
Hospital H	606	11.8	11.3	11.2	11.8	11.2	11.5	14.3	11.4

Calculated data not shown when total sample discharges for a hospital are less than 5.
NOTE: Tables 9–19 display data for discharges of 1–40 days only.

Table 11. SHORT-STAY HOSPITAL DISCHARGES FOR A 20 PERCENT SAMPLE OF MEDICARE ENROLLEES AGED 65 YEARS AND OVER: PERCENTAGE DISTRIBUTION OF LIVE DISCHARGES BY DAY OF WEEK OF DISCHARGE (1–40 DAY STAYS ONLY).

Test Run

Period covered 01/75—12/75

PSRO Area XXXX

Provider number/hospital	Total live discharges in sample	Percentage distribution by day of discharge							
		Total	Sun	Mon	Tue	Wed	Thu	Fri	Sat
US Total	1208412	100.0	8.8	12.3	14.6	16.3	14.5	17.2	16.5
HEW Region 01	67615	100.0	8.6	12.0	14.4	16.6	14.3	17.5	16.6
PSRO Area XXXX	3663	100.0	10.2	10.6	13.7	16.3	15.7	16.2	17.2
Hospital A	419	100.0	10.5	7.9	13.4	18.1	13.6	17.4	19.1
Hospital B	757	100.0	10.6	10.6	13.3	17.2	15.7	15.5	17.2
Hospital C	458	100.0	8.3	13.1	15.1	12.4	17.7	17.5	15.9
Hospital D	195	100.0	17.9	11.8	11.3	17.9	17.9	11.8	11.3
Hospital E	554	100.0	12.3	9.2	14.1	18.6	12.8	15.3	17.7
Hospital F	277	100.0	13.7	11.6	13.0	15.9	12.6	13.7	19.5
Hospital G	445	100.0	5.4	9.4	14.2	13.9	21.1	20.2	15.7
Hospital H	558	100.0	8.6	12.4	14.0	15.9	15.1	15.6	18.5

#Calculated data not shown when total sample discharges for a hospital are less than 5.
NOTE: Tables 9—19 display data for discharges of 1—40 days only.

Table 12. SHORT-STAY HOSPITAL DISCHARGES FOR A 20 PERCENT SAMPLE OF MEDICARE ENROLLEES AGED 65 YEARS AND OVER: AVERAGE LENGTH OF STAY OF LIVE DISCHARGES BY DAY OF WEEK OF DISCHARGE (1–40 DAY STAYS ONLY).

Test Run

Period covered 01/75–12/75

PSRO Area XXXX

Provider number/hospital	Total live discharges in sample	Average length of stay	Average length of stay by day of discharge						
			Sun	Mon	Tue	Wed	Thu	Fri	Sat
US Total	1208412	10.1	9.9	10.8	10.4	10.3	9.7	9.8	10.0
HEW Region 01	67615	10.9	10.5	11.9	11.5	11.2	10.4	10.6	10.3
PSRO Area XXXX	3663	11.4	10.4	12.8	12.5	12.2	10.5	11.2	10.4
Hospital A	419	11.5	11.5	14.5	10.7	11.9	9.3	11.7	11.6
Hospital B	757	11.1	10.8	12.3	12.0	11.5	10.9	11.2	9.6
Hospital C	458	11.2	9.8	12.4	13.2	12.8	11.1	9.8	9.4
Hospital D	195	11.2	11.5	10.3	10.4	14.0	9.8	10.8	11.0
Hospital E	554	12.3	10.2	15.0	13.5	13.3	11.1	12.2	11.1
Hospital F	277	11.2	9.1	9.8	14.3	11.8	8.4	12.2	11.8
Hospital G	445	10.3	8.9	11.0	12.0	10.4	8.9	9.6	11.2
Hospital H	558	12.1	10.3	14.9	12.9	12.6	12.3	12.6	9.4

#Calculated data not shown when total sample discharges for a hospital are less than 5.
NOTE: Tables 9–19 display data for discharges of 1–40 days only.

9 indicates that in this PSRO, 17.9 percent of all patients in 1975 were admitted on Monday, whereas 9.2 percent were admitted on Saturday. It may be observed that this general pattern occurs in all of the hospitals in the PSRO.

Table 10 presents hospital-level and area-level data displaying the ALOS of discharges by the day of the week of admission. A relatively high ALOS for Friday or Saturday admissions might indicate less efficient operation: i.e., such patients may have been rendered fewer services on the weekend of admission thus prolonging their hospitalizations.

In the hospitals in this PSRO patients admitted on Friday stay nearly 2 days longer than average. Note that average length of stay for patients admitted on Saturday is also longer in many of the hospitals in the PSRO area.

Table 11 presents hospital-level and area-level data displaying the percent distribution of live discharges by day of the week. A low percentage of Sunday discharges could indicate inappropriate use of facilities and physician discharge practices.

In this PSRO, 17.2 percent of all patients in 1975 were discharged on Saturday; only 10.2 percent were discharged on Sunday.

Table 12 presents hospital-level and area-level data on the ALOS of live discharges by the day of the week. A relatively high ALOS for Monday discharges may correlate with a low percentage of Sunday discharges (from table 11) and may indicate less efficient use of resources if some Monday discharges could have occurred during the weekend.

In this PSRO, patients discharged on Monday stayed 1.4 days longer than the average for that area.

Figure 1 summarizes tables 9 through 12 for the U.S. It seems clear that admissions and discharge patterns are related to physician and hospital practices that may not be the most economical ones for providing hospital services.

The last table we would like to mention in the MEDPAR set is table 20, which focuses on long stay cases. This table shows the percent of all hospital stays that were over 28 days. Note that nationwide 5.9 percent of all patients stayed 29 days or more. These discharges accounted for 23.1 percent of all hospital days paid for by Medicare. Note that in Hospital F 11.9 percent of all patients stayed more than 4 weeks and these patients accounted for 42.7 percent of all days of care.

Summary

It is hoped that these profiles of hospital practice can be useful for health planning and for utilization review. Such profiles can help detect problems in resource allocation and development. Over time, these profiles can also show the success of measures taken to overcome known problems in hospital practices. Moreover, such data can help define factors of joint programmatic interest and responsibility between PSRO's and HSA's and can foster a cooperative effort to effect changes.

Figure 1. Effect of Day of the Week on Admissions and Discharges for Medicare Patients in Short-Stay Hospitals in the United States, 1975

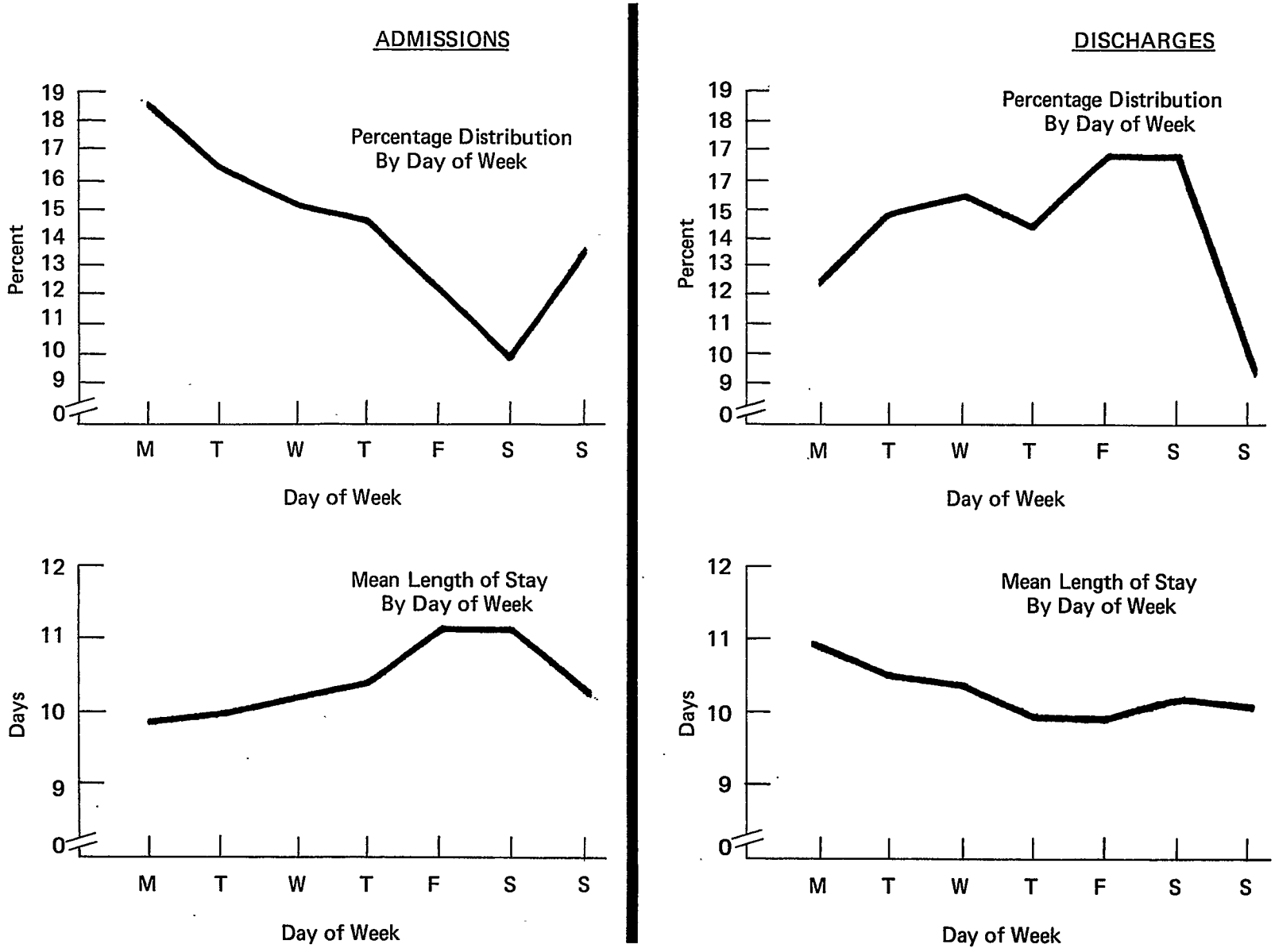

Table 20: SHORT-STAY HOSPITAL DISCHARGES FOR A 20 PERCENT SAMPLE OF MEDICARE ENROLLEES AGED 65 YEARS AND OVER: LONG STAY DISCHARGES (29 DAYS OR MORE).

Test Run

Period covered 01/75—12/75

PSRO Area XXXX

Provider number/hospital	Total long stays: Total discharges in sample	Total long stays: Total days of care	Number of long stays (29 days or more) in each category as a percentage of: All stays	All non-surg. stays	All surg. stays	All stays ages 65–74	All stays ages 75+	Number of days of care for long stays (29 days or more) in each category as a percentage of: All days	All non-surg. days	All surg. days	All days ages 65–74	All days ages 75+
US Total	79120	3447917	5.9	4.9	8.2	5.2	6.7	23.1	20.2	28.1	21.3	24.8
HEW Region 01	5627	247381	7.5	6.0	10.3	6.5	8.5	26.7	23.1	32.4	24.3	28.8
PSRO Area XXXX	323	13700	7.9	5.9	10.9	6.8	8.9	26.4	21.9	32.4	24.0	28.4
Hospital A	37	1487	8.0	5.3	14.1	6.7	9.3	25.9	19.2	37.5	21.7	29.5
Hospital B	52	2059	6.2	4.7	7.5	6.2	6.1	20.2	15.8	23.6	20.1	20.2
Hospital C	48	2045	9.5	9.0	10.5	6.0	12.9	31.3	30.1	33.7	23.3	37.6
Hospital D	15	522	7.1	6.6	8.0	3.1	10.5	22.0	19.8	24.7	12.0	27.4
Hospital E	41	1622	6.6	4.0	11.2	7.8	5.4	20.1	12.9	30.3	24.6	15.8
Hospital F	38	1997	11.9	8.9	17.9	10.1	13.4	42.7	39.6	48.0	35.1	48.5
Hospital G	29	1166	5.8	4.0	8.9	5.6	6.0	21.2	14.8	31.7	22.2	20.4
Hospital H	63	2802	9.9	6.7	14.6	7.9	11.7	31.7	25.8	39.0	28.8	33.9

#Calculated data not shown when total discharges in sample for a hospital are less than 5.

MEDICARE HOSPITAL PATIENT ORIGIN AND DESTINATION DATA FOR HEALTH PLANNING

James Lubitz, Ronald Deacon, and Carol Walton, *Office of Policy, Planning, and Research, HCFA, Baltimore, Maryland*

Introduction

Motivated by the creation of the national network of Health Systems Agencies (HSA's) and Professional Standards Review Organizations (PSRO's) and their data needs, the Office of Policy, Planning, and Research, Health Care Financing Administration (HCFA), produced patient origin and destination data for the Medicare population for the entire nation by HSA and PSRO areas. The data are intended both for analysis at the national level and for use at regional, State, and local levels for health planning and PSRO functions. Patient origin and destination data were sent in April 1978 to the Bureau of Health Planning and Resources Development, Health Resources Administration (HRA), Department of Health, Education, and Welfare (HEW), for distribution to the HSA's.

This paper discusses how the data were derived and some possible applications for them and outlines projects involving patient flow data now underway at HCFA. Although the data should be useful to PSRO's in assuring the "...effective, efficient, and economical delivery..." of federally reimbursed health services [1] and to national policymakers and Medicare program administrators concerned with questions of equity and access to hospital care, the paper will concentrate on applications to health planning. It will suggest some ways the data may aid HSA's to carry out their responsibilities, particularly for planning ways to increase access to health services while "...preventing unnecessary duplication of health resources..."[2]

Source of Data

The data are derived from records of hospital stays kept in Baltimore for the administration of the Medicare program. Although the potential exists to use records of all of the 7.5 million stays occurring annually to generate patient flow data, a 20 percent sample of Medicare beneficiaries was drawn to make the data processing task less formidable. For this first effort, data were limited to Medicare beneficiaries aged 65 and over, but disabled persons under 65 covered by Medicare can also be included in further studies if desired.

Because information on the location of the hospital and the residence of the beneficiary is fundamental to a study of patient origin and destination, it is important to describe from where these two items come. The bill submitted by the hospital gives the hospital's Medicare provider number and the patient's health insurance claim number or Medicare number. The provider number is matched to a file called the Provider of Service File that contains information on the hospital and its location. The street address and zip code are submitted by the hospital itself. The State and county of the hospital are coded at the HEW Regional Offices, and the HSA and PSRO of the hospital are entered in Baltimore.

Similarly, the patient's Medicare number from the hospital bill is matched to a central file called the Health Insurance Master File, which contains his/her address. Because in most cases the address is the one at which the beneficiary receives his/her social security check, there is reason to believe it is generally valid. However, whenever a beneficiary delays in notifying the Social Security Administration of a change of address, the data will reflect his/her old address rather than current address.

Patient origin and destination data have been produced for 1974, 1975, and 1976. It is estimated that for 1974 and 1975 the data reflect a nearly complete count of Medicare discharges nationally, with only 1 or 2 percent of the discharges still not processed into our files. For 1976, about 5 percent of the discharges may not yet be in the data files.

The items in the data files for 1974 to 1976 relevant to a patient origin and destination study are:

1. Patient residence— State and county
2. Hospital location—State and county
3. Date of admission
4. Date of discharge
5. Medicare status of patient—aged or disabled
6. HSA of hospital
7. HSA of patient
8. PSRO of hospital
9. PSRO of patient

Beginning with 1977, the following data items are being added:

[1] U.S. Congress, 1972 Social Security Amendments, Public Law 92–603, Section 249F, 92nd Congress, Second Session.

[2] *Health Planning and Resources Development Act of 1974*, U.S. DHEW, Bureau of Health Planning and Resources Development, 1975.

1. Zip code of patient
2. Age of patient
3. Sex of patient
4. Race (white, black, other, unknown) of patient

Generating Patient Origin and Destination Data

The basic step in programming the output of patient origin and destination data was to design a 203 by 203 matrix to cover all the HSA's in the country. The row of the matrix represents the beneficiary's HSA of residence. The column of the matrix represents the HSA where the discharge occurred. For example, the coordinates (HSA_2, HSA_1) indicate the number of discharges of beneficiaries living in HSA_2 who were hospitalized in HSA_1. Figure 1 presents the scheme of the matrix.

The main diagonal of the matrix shows the number of discharges of residents of an HSA occurring in their own HSA. A similar matrix was produced to distribute days of care.

Although the 203 by 203 matrix presents a complete picture of patient flow among HSA's, it is too unwieldy for routine use. Therefore, a set of summary tables were produced. These tables distribute:

A. Discharges (or days of care) of residents of an HSA by the HSA's where they occur, displaying the most frequent HSA's of hospitalization; the remainder are put into an "all other" category.
B. Discharges (or days of care) occurring in an HSA by the HSA's of residence of the patient, displaying the most frequent HSA's of residence; the remainder are put into an "all other" category.

Tables A and B illustrate the format of these tables.

Advantages of Medicare Data for Patient Origin and Destination Studies

The nature of the data source gives it both inherent advantages and limitations for patient origin and destination studies. Among the advantages is that as a product of an existing administrative data system, the information is obtained without the cost of special surveys. In addition, the data are produced on a continuing basis, facilitating longitudinal comparisons.

An advantage the data have over studies done at the hospital or area level is that they present a complete national picture of patient flow for a defined population. Local area hospital-based studies can generally provide data on the origin of a hospital's or area's patients but cannot readily provide a complete picture of where the residents of the area go for all their hospital care. The complete geographical coverage of our data allow it to be arrayed either to show where the patients served by hospitals in an HSA come from or where residents of an HSA go for hospital care.

Another advantage of the data is the existence of accurate figures on the population at risk. Medicare enrollment information is available yearly down to the county and zip code level and contains data on age, sex, and race. The enrollment data can be related to the patient flow information to produce rates of flow. Enrollment data is also essential to adjusting the population at risk in an area to take into account patient movement among areas. The adjustment method is described in the paper to follow by Deacon.

Limitation of Medicare Data for Patient Origin and Destination Studies

The greatest limitation of the data is that it applies only to Medicare beneficiaries. If, however, there is a stable relationship between the patterns of patient flow of the general population and that of the Medicare population, then the data may be useful to study overall patient movement. As noted in the previous paper by Gornick, a study is currently examining this question by comparing patterns of hospital use of the Medicare and the general population in New England. Preliminary results indicate that patient origin measures for Medicare beneficiaries and the entire population are highly correlated.[3]

For those years when an HSA has both patient flow data based on studies of the entire population and Medicare patient flow data, data from both sources could be examined to explore possible relationships between them. If a relationship is found, Medicare patient flow data could substitute for population patient flow data for those years when data on the entire population are unavailable.[4]

Uses of the Data

Examination of Medicare patient origin and destination data suggests a number of potential uses at

[3] Codman Research Group, Inc., "Progress Report No. 3: Feasibility of Using Medicare Part A Data in Health Planning," October 1977. Work performed under Contract No. 600–77–0039 with Health Care Financing Administration, HEW.

[4] The value of patient flow data based on a subset of the population in substituting for data based on the whole population was suggested in a study by Drosness and Lubin. They compared patient flow data on obstetric patients obtained from birth records with data on all patients in Santa Clara County, California, and found that the patterns of flow in the two groups were similar. They suggested that data from birth records could substitute for data on all patients for years when population patient flow data were unavailable. Daniel L. Drosness and Jerome W. Lubin, "Planning Can be Based on Patient Travel," *Modern Hospital*, April 1966, pp. 92–94.

Figure 1. Scheme of a 203 by 203 HSA Matrix to Show Patient Origin and Destination.

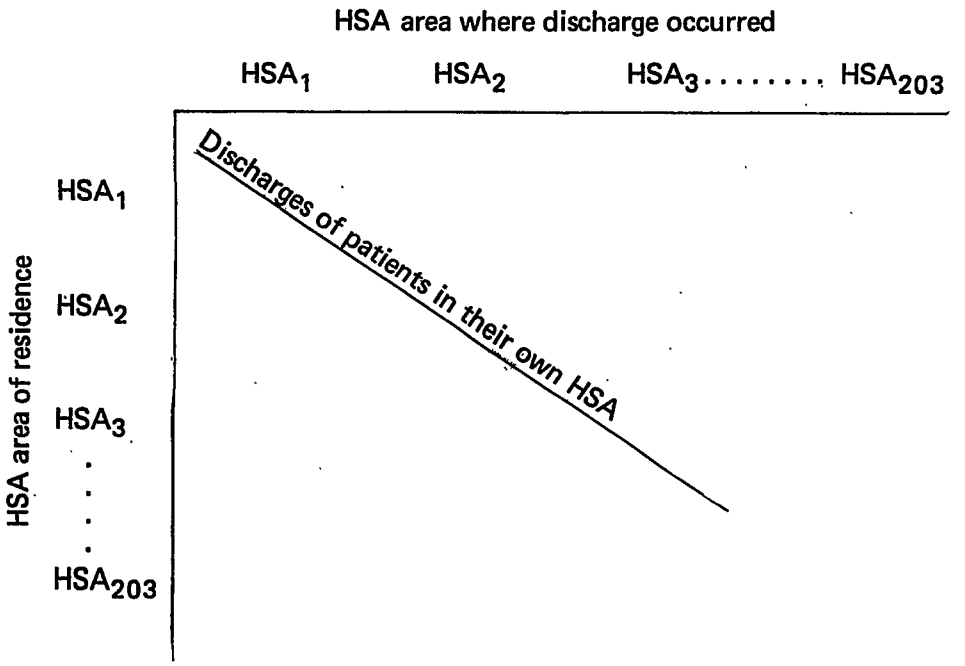

Table A. DISTRIBUTION OF ACUTE CARE HOSPITAL DISCHARGES OF MEDICARE BENEFICIARIES AGED 65 YEARS AND OVER RESIDING IN HSA AREAS IN THE DISTRICT OF COLUMBIA, MARYLAND, AND VIRGINIA, BY HSA AREA WHERE DISCHARGES OCCURRED, 1975.

	HSA Area Where Patient Resides	HSA Area Where Discharge Occurred							
State	HSA	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
District of Columbia	(D.C.)	Total	DC 1	MD 2	VA 2	MD 3	NY 7	MD 4	All other and Location Unknown
	Number	15,515	13,330	740	245	190	80	75	855
	Percent	100.0	85.9	4.8	1.6	1.2	.5	.5	5.5
Maryland	(MD) 1	Total	MD 1	WV 1	MD 4	PA 4	PA 9	DC 1	
	Number	9,410	8,145	295	250	185	155	70	310
	Percent	100.0	86.6	3.1	2.7	2.0	1.6	.7	3.3
	(MD) 2	Total	MD 2	DC 1	MD 1	MD 3	VA 2	MD 4	
	Number	9,090	5,835	2,290	125	125	125	70	520
	Percent	100.0	64.2	25.2	1.4	1.4	1.4	.8	5.7
	(MD) 3	Total	MD 3	DC 1	MD 2	MD 4	VA 2	MD 5	
	Number	10,070	4,620	3,235	1,075	330	195	40	575
	Percent	100.0	45.9	32.1	10.7	3.3	1.9	.4	5.7
	(MD) 4	Total	MD 4	PA 4	MD 2	MD 1	DC 1	MD 3	
	Number	46,810	44,180	380	270	260	165	150	1,405
	Percent	100.0	94.4	.8	.6	.6	.4	.3	3.0
	(MD) 5	Total	MD 5	MD 4	DE 1	PA 1	DC 1	MD 3	
	Number	8,615	7,070	875	340	75	25	20	210
	Percent	100.0	82.1	10.2	3.9	.9	.3	.2	2.4
Virginia	(VA) 1	Total	VA 1	VA 4	VA 3	VA 2	DC 1	VA 5	
	Number	19,335	17,215	615	530	320	125	65	465
	Percent	100.0	89.0	3.2	2.7	1.7	.6	.3	2.4
	(VA) 2	Total	VA 2	DC 1	VA 1	MD 2	MD 4	VA 3	
	Number	12,560	10,045	1,130	350	70	55	55	855
	Percent	100.0	80.0	9.0	2.8	.6	.4	.4	6.8
	(VA) 3	Total	VA 3	TN 1	WV 1	NC 2	VA 1	VA 4	
	Number	40,000	34,915	1,240	850	585	430	390	1,590
	Percent	100.0	87.3	3.1	2.1	1.5	1.1	1.0	4.0
	(VA) 4	Total	VA 4	VA 5	VA 3	VA 1	NC 4	NC 6	
	Number	26,695	23,970	750	640	460	205	140	530
	Percent	100.0	89.8	2.8	2.4	1.7	.8	.5	2.0
	(VA) 5	Total	VA 5	VA 4	VA 1	MD 5	VA 3	NC 6	
	Number	27,855	24,255	2,050	285	150	150	115	850
	Percent	100.0	87.1	7.4	1.0	.5	.5	.4	3.1

Data are based on a 20-percent sample of Medicare beneficiaries. Counts of discharges have been multiplied by 5 to inflate to an estimate of total discharges.

national and local levels for the information. To illustrate some of the uses, 1975 data for HSA's in Maryland, Virginia, and the District of Columbia (D.C.) have been chosen. Tables A and B display patient origin and destination data for these areas; table 1 presents some summary patient flow statistics for these areas.

A. To Study Patient Flow Among HSA's

One use of the data, of course, is to study the flow of Medicare patients among HSA's for hospital care. Patient flow information tells, on the one hand, where the patients for the HSA's

Table B. DISTRIBUTION OF ACUTE CARE HOSPITAL DISCHARGES OF MEDICARE BENEFICIARIES AGED 65 YEARS AND OVER OCCURRING IN HSA AREAS IN THE DISTRICT OF COLUMBIA, MARYLAND, AND VIRGINIA BY THE HSA AREA OF RESIDENCE, 1975

State	HSA Area Where Discharge Occurred: HSA	(1)	(2)	(3)	HSA Area Where Patient Resides: (4)	(5)	(6)	(7)	All others and Location Unknown
District of Columbia	(D.C.)	Total	DC 1	MD 3	MD 2	VA 2	MD 4	VA 1	
	Number	21,610	13,330	3,235	2,290	1,130	165	125	1,335
	Percent	100.0	61.7	15.0	10.6	5.2	.8	.6	6.2
Maryland	(MD) 1	Total	MD 1	WV 1	PA 9	PA 4	MD 4	MD 2	
	Number	10,475	8,145	855	345	315	260	125	430
	Percent	100.0	77.8	8.2	3.3	3.0	2.5	1.2	4.1
	(MD) 2	Total	MD 2	MD 3	DC 1	MD 4	VA 2	MD 1	
	Number	8,785	5,835	1,075	740	270	70	60	735
	Percent	100.0	66.4	12.2	8.4	3.1	.8	.7	8.4
	(MD) 3	Total	MD 3	DC 1	MD 4	MD 2	MD 1	MD 5	
	Number	5,380	4,620	190	150	125	25	20	250
	Percent	100.0	85.9	3.5	2.8	2.3	.5	.4	4.6
	(MD) 4	Total	MD 4	MD 5	MD 3	MD 1	PA 4	WV 1	
	Number	47,910	44,180	875	330	250	245	125	1,905
	Percent	100.0	92.2	1.8	.7	.5	.5	.3	4.0
	(MD) 5	Total	MD 5	DE 1	VA 5	MD 4	PA 1	MD 3	
	Number	8,165	7,070	460	150	110	70	40	265
	Percent	100.0	86.6	5.6	1.8	1.3	.9	.5	3.3
Virginia	(VA) 1	Total	VA 1	WV 1	VA 4	VA 3	VA 2	VA 5	
	Number	20,635	17,215	1,250	460	430	350	285	645
	Percent	100.0	83.4	6.1	2.2	2.1	1.7	1.4	3.1
	(VA) 2	Total	VA 2	VA 1	DC 1	MD 3	MD 2	WV 1	
	Number	12,315	10,045	320	245	195	125	80	1,305
	Percent	100.0	81.6	2.6	2.0	1.6	1.0	.6	10.6
	(VA) 3	Total	VA 3	WV 1	VA 4	NC 2	VA 1	TN 1	
	Number	39,685	34,915	1,240	640	560	530	425	1,375
	Percent	100.0	88.0	3.1	1.6	1.4	1.3	1.1	3.5
	(VA) 4	Total	VA 4	VA 5	VA 1	VA 3	NC 4	NC 6	
	Number	28,100	23,970	2,050	615	390	130	105	840
	Percent	100.0	85.3	7.3	2.2	1.4	.5	.4	3.0
	(VA) 5	Total	VA 5	NC 6	VA 4	VA 3	VA 1	NY 7	
	Number	26,930	24,255	835	750	100	65	50	875
	Percent	100.0	90.1	3.1	2.8	.4	.2	.2	3.2

Data are based on a 20-percent sample of Medicare beneficiaries. Counts of discharges have been multiplied by 5 to inflate to an estimate of total discharges.

hospitals come from, and, on the other, where residents of an HSA travel for hospital care. Such information is basic to defining hospital service areas and to estimating the effect of changes in the supply of hospital beds or in the population in one area on hospital occupancy and hospital use in other areas. In addition, the information may point out the need for studies of travel times for hospital care if it appears a substantial number of an HSA's residents use facilities in another area.

Column 1 of table 1 gives the total number of discharges of residents of HSA's in Maryland, Virginia, and D.C. Columns 2 and 3 give the number and percentage of discharges of residents of an HSA occurring in the HSA of residence. The later figure may be thought of as a "self-sufficiency index,"[5] reflecting the degree to which an HSA's residents are served by its hospitals. For most HSA's this percent is high.

[5] The term is suggested in Codman, p. 464.

Table 1. SUMMARY PATIENT FLOW STATISTICS FOR HSA AREAS IN MARYLAND, VIRGINIA, AND THE DISTRICT OF COLUMBIA BASED ON ACUTE CARE HOSPITAL DISCHARGES OF MEDICARE BENEFICIARIES AGED 65 YEARS AND OVER, 1975.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		Discharges of HSA area residents			Discharges from HSA area hospitals			Patient Flow			
			from hospitals in own HSA area			for residents of own HSA area					
State	HSA	Total	Number	Percent of Total	Total	Number	Percent of Total	Inflow of non-Residents	Outflow of Residents	Net Flow (Inflow-Outflow)	Percent Net Flow: (Net Flow ÷ Total Discharges of HSA area residents)
District of Columbia		15,515	13,330	85.9	21,610	13,330	61.7	8,280	2,185	6,095	39.2
Maryland	1	9,410	8,145	86.6	10,475	8,145	77.8	– 2,330	1,265	1,065	11.3
	2	9,090	5,835	64.2	8,785	5,835	66.4	2,950	3,255	– 305	– 3.4
	3	10,070	4,620	45.9	5,380	4,620	85.9	760	5,450	– 4,690	– 46.6
	4	46,810	44,180	94.4	47,910	44,180	92.2	3,730	2,630	1,100	2.4
	5	8,615	7,070	82.1	8,165	7,070	86.6	1,095	1,545	– 450	– 5.2
Virginia	1	19,335	17,215	89.0	20,635	17,215	83.4	3,420	2,120	1,300	6.7
	2	12,560	10,045	80.0	12,315	10,045	86.6	2,270	2,515	– 245	– 2.0
	3	40,000	34,915	87.3	39,685	34,915	88.0	4,770	5,085	– 315	– 0.8
	4	26,695	23,970	89.8	28,100	23,970	85.3	4,130	2,725	1,405	5.3
	5	27,855	24,255	87.1	26,930	24,255	90.1	2,675	3,600	– 925	– 3.3

Data are based on a 20-percent sample of Medicare beneficiaries. Counts of discharges have been multiplied by 5 to inflate to an estimate of total discharges.

But this is not always the case. For Montgomery County (Maryland HSA 2) and Southern Maryland (Maryland HSA 3 consisting of Prince Georges, Calvert, Charles, and St. Mary's Counties), only 64.2 and 45.9 percent of the discharges of residents were in hospitals in their own HSA. Column 3 of table A shows an outflow of 25.2 and 32.1 percent respectively of the discharges of residents to hospitals in D.C. In these and other similar cases, the need for inter-HSA cooperation should be emphasized in making decisions affecting hospital services and bed supply.

Column 4 of table 1 shows the total discharges in an HSA's hospitals. Columns 5 and 6 show the number and percentage of total discharges that are discharges of residents. This percentage reflects the extent to which an HSA's case load is made up of its own residents. A high percent means most discharges are of residents. A relatively low percent indicates that a substantial part of the case load is made up of residents of other HSA's. In most HSA's in Maryland, Virginia, and D.C. most discharges are of their own residents, but for the District of Columbia, for Montgomery County and for Western Maryland (Maryland HSA 1), residents account for only 61.7, 66.4, and 77.8 percent of the case load. These HSA's experience a large inflow of patients from other HSA's.

In the case of D.C., as table B shows, 15.0 percent of the Medicare case load comes from Southern Maryland, 10.6 percent from Montgomery County, and 5.2 percent from Northern Virginia (Virginia HSA 2). In the case of Montgomery County, 12.2 percent of the discharges come from Southern Maryland and 8.4 percent from D.C. In Western Maryland, 8.2 percent of the discharges come from West Virginia.

It is interesting to note that substantial inflow of cases is not limited to the urban HSA's. Montgomery County is suburban and Western Maryland is fairly rural. Planning decisions in neighboring HSA's which increase or decrease bed supply may have a pronounced effect on the number of discharges and occupancy of hospitals in these three HSA's.

A statistic which unites the concept of inflow of nonresidents and outflow of residents for hospital care is net flow, or inflow minus outflow. A positive value indicates that the number of discharges of nonresidents entering the HSA for care exceeds the number of discharges of residents who go outside the HSA for care. A negative net flow indicates the reverse, i.e., that the

Table 2. DISTRIBUTION OF HSA AREAS BY THE "SELF-SUFFICIENCY INDEX"* BASED ON DISCHARGES OF MEDICARE BENEFICIARIES AGED 65 AND OVER FROM ACUTE CARE HOSPITALS, 1975

Self Sufficiency Index	Number of HSA's			Percentage of HSA's		
Total	203			100.0		
100–96	5	63	186	2.5	31.0	91.6
95–91	58			28.6		
90–86	83	123		40.9	60.6	
85–81	40			19.7		
80–76	11	17		5.4	8.4	
75–71	2			1.0		
70–66	0			0.0		
65–61	3			1.5		
60–56	0			0.0		
55–51	0			0.0		
50–46	1			0.5		

*The self-sufficiency index is the percentage of discharges of an HSA area's residents that occur in the HSA area. See Codman p. 464.

Data are based on a 20-percent sample of Medicare beneficiaries.

discharges of its residents occurring outside the HSA area exceed the number of discharges of nonresidents in the HSA area. Percent net flow is simply net flow divided by the total number of discharges of an HSA's residents, regardless of where they occur.

Net flows close to zero can result either where there is little travel out of and into an HSA for hospital care or when outflow and inflow are balanced. HSA's with high positive net flows can be thought of as net importers of patients from (or exporters of hospital care to) other HSA's. Those with high negative net flows can be thought of as net exporters of patients to (or importers of hospital care from) other HSA's.

Colums 7, 8, 9, and 10 of table 1 illustrate the inflow, outflow, net flow, and percent net flow for HSA's in Maryland, Virginia, and D.C. Two HSA's, the District of Columbia and Western Maryland (Maryland HSA 1), experience rather high positive net inflows, 39.2 and 11.3 percent. Southern Maryland (Maryland HSA 3) shows a high negative net flow of −46.6 percent. Hospitals in HSA's with high positive net flows generate more discharges and have higher occupancies than if they served only their own residents. Conversely, in those HSA's with high negative net flows, there are fewer discharges than if they served all their own residents.

Table 3. PERCENTAGE OF DISCHARGES OF MEDICARE BENEFICIARIES AGED 65 YEARS AND OVER RESIDING IN THE DISTRICT OF COLUMBIA HSA AREA AND THE MONTGOMERY COUNTY HSA AREA CONTAINED IN EACH HSA AREA AND IN BOTH HSA AREAS COMBINED, 1975.
(SELF-SUFFICIENCY INDICES* ARE CIRCLED.)

HSA Area	Discharges of Residents			
	Total	In D.C.	In Montgomery	In other HSA Areas
District of Columbia				
Number	15,515	13,330	740	1,445
Percent	100	85.9	4.8	9.3
Montgomery County				
Number	9,909	2,290	5,835	965
Percent	100	25.2	64.2	10.6
D.C. and Mont. Combined				
Number	24,605	22,195		2,410
Percent	100	90.2		9.8

*The self-sufficiency index is the percentage of discharges of an HSA area's residents that occur in the HSA. See Codman p. 464.

Data are based on a 20-percent sample of Medicare beneficiaries. Counts of discharges have been multiplied by 5 to inflate to an estimate of total discharges.

B. To Aid in Designating Health Service Areas

The Medicare patient origin and destination information may also be used to aid in designating and evaluating boundaries of health service areas. Guidelines issued in February 1975 by the Bureau of Health Planning and Resources Development state that, "*To the extent practicable,* the area shall include at least one center for the provision of highly specialized health services," and note that this requirement reflects the "...desire that the health service areas provide a self-contained, comprehensive and complete range of health services such that an individual residing in the area would rarely, if ever, have to leave it in order to obtain medical care."[6]

In this regard, it is instructive to examine the self-sufficiency indexes for the nation's HSA's. It will be recalled that the self-sufficiency index is the percentage of discharges of residents of an HSA occurring in the HSA of residence. Table 2 shows that for 1975, 186 (91.6 percent) of the 203 HSA's had self-sufficiency indexes of more than 80 percent. Of these 186 HSA's, 123 (60.6 percent) had indexes of 81 to 90 percent and 63 (31.0 percent) had indexes of more than 90 percent. However, in 17 HSA's (8.4 percent) the self-sufficiency indexes were less than 80 percent.

If HSA boundaries are ever redesignated, it would be possible to use the Medicare patient flow data to assist in redrawing them to include more discharges of residents. For example, the District of Columbia contains 85.9 percent of resident discharges; Montgomery County contains 64.2 percent. As table 3 shows, an HSA combining both areas would contain 90.2 percent of resident discharges. Of course, many other factors must enter into the decision on what an HSA's boundaries should be.

When days of care, as opposed to discharges, were used to compute self-sufficiency indexes,

Table 4. DISTRIBUTION OF HSA AREAS BY THE "SELF-SUFFICIENCY INDEX"* BASED ON DAYS OF CARE OF MEDICARE BENEFICIARIES AGED 65 YEARS AND OVER IN ACUTE CARE HOSPITALS, 1975.

Self-Sufficiency Index	Number of HSA Areas			Percentage of HSA Areas		
Total	203			100.0		
100–96	10	65	175	4.9	32.0	86.2
95–91	55			27.1		
90–86	78	110		38.4	54.2	
85–81	32			15.8		
80–76	19	28		9.4	13.8	
75–71	4			2.0		
70–66	2			1.0		
65–61	2			1.0		
60–56	0			0.0		
55–51	0			0.0		
50–46	0			0.0		
45–41	1			0.5		

*The self-sufficiency index is the percentage of days of care of an HSA area's residents that occur in the HSA. See Codman p. 464.

Data are based on a 20-percent sample of Medicare beneficiaries.

[6] *Guidelines for Designation; Health Service Areas: Under the National Health Planning and Resources Development Act of 1974,* Department of Health, Education, and Welfare, Bureau of Health Planning and Resources Development, February 1974, p. 8.

Table 5. SELF-SUFFICIENCY INDICES* BASED ON DISCHARGES AND ON DAYS OF CARE IN ACUTE CARE HOSPITALS OF MEDICARE BENEFICIARIES AGED 65 AND OVER FOR HSA AREAS IN MARYLAND, VIRGINIA, AND THE DISTRICT OF COLUMBIA, 1975.

State	HSA	Self-sufficiency index		Difference
		Based on Discharges	Based on Days of Care	
District of Columbia		85.9	89.2	−3.3
Maryland	1	86.6	87.4	−0.8
	2	64.2	64.8	−0.6
	3	45.9	45.2	0.7
	4	94.4	95.1	−0.7
	5	82.1	79.2	2.9
Virginia	1	89.0	88.1	0.9
	2	80.0	81.0	−1.0
	3	87.3	87.5	−0.2
	4	89.8	90.3	−0.5
	5	87.1	87.8	−0.7

*The self-sufficiency index is the percentage of discharges or days of care of an HSA's residents that occur in the HSA. See Codman p. 464.

Data are based on a 20-percent sample of Medicare beneficiaries.

roughly similar conclusions were reached on the amount of care received by residents of an HSA in their own HSA. This is illustrated by a comparison of the distribution of HSA's by indexes based on days of care (table 4) with the distribution based on discharges.

One hundred and seventy-five HSA's contain more than 80 percent of the days of care of residents, while 186 have more than 80 percent of the discharges. Twenty-eight HSA's contain 80 percent or less of the days of care of residents, while 17 have 80 percent or less of the discharges of residents.

For individual HSA's in Maryland, Virginia, and D.C., the indexes based on discharges were very similar to those based on days of care. As table 5 shows, the largest difference between the two indexes (found in the District of Columbia) was only 3.3 percent.

Future Projects Involving Medicare Patient Origin and Destination Data

Future projects involving Medicare patient origin and destination data include production of patient flow information at the county, hospital, and perhaps zip code levels. The data files now available allow the generation of patient flow information at the county and hospital level. Such data will allow studies of patient movement within an HSA as well as more detailed studies of patient movement among HSA's. In addition, the data will permit identification of those hospitals drawing many patients from outside their HSA. Moreover, the data will make possible a more precise definition of hospital service areas and provide patient flow data for small area studies of the use of health services. Patient flow information at the zip code level cannot now be produced from the data file used to generate the data discussed here. However, with the addition of beneficiary zip code to the file in October 1977, it should be possible to produce patient flow data at the zip code/hospital level. This will furnish even more detailed patient flow information.

Also projected are studies comparing the characteristics of persons who go out of their HSA or counties for hospital care with those who do not. With the addition of age, sex, and race information to the file in October 1977, it will be possible to study patient flow by these demographic characteristics.

Another project is the generation of Medicare patient origin and destination information for posthospital care in skilled nursing facilities (SNF's). Patient flow for acute hospital care will be compared with that for SNF care.

Conclusion

Hospital patient flow information, derived from the administrative recordkeeping system of a national health insurance program (Medicare) provide for the first time a picture of patient movement for the entire Nation. In addition to national coverage, the data have other inherent advantages over patient flow data from other sources, including low cost of production, production on a continuing rather than *ad hoc* basis, and accurate data on the population at risk. A limitation of

the data is that they are confined to persons covered by Medicare.

The data should aid planners at the national, State, and local levels in making decisions about resource allocation. The Health Care Financing Administration is interested in learning how planners and researchers apply the data and in receiving suggestions for improving their usefulness.

DEVELOPMENT OF HOSPITAL UTILIZATION MEASUREMENTS FOR PSRO AREAS

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Introduction

The fundamental purpose of the Medicare statistical system is to provide information about beneficiaries, providers, and use and cost of benefits. However, certain inherent characteristics of the system, which the two previous papers outlined, make it adaptable for other purposes. Briefly, these characteristics include national coverage, accurate information on the population at risk, and historical as well as current data. This paper will describe how the statistical system was extended to provide information about hospital use in the Nation's 203 Professional Standards Review Organization (PSRO) areas.

The 1972 Amendments to the Social Security Act authorized the creation of a national network of PSRO's to review health care provided under Medicare, Medicaid, and the Maternal and Child Health Programs to assure their effective, efficient, and economical delivery. The Amendments also called for an evaluation of the PSRO program; the responsibility for the first evaluation, conducted in 1977, was assigned to the Office of Policy, Evaluation, and Legislation (OPEL) of the Health Services Administration, Public Health Service, Department of Health, Education, and Welfare.

The Office of Policy, Planning, and Research, Health Care Financing Administration (HCFA) assumed the responsibility of designing and developing the Medicare hospital data for the first evaluation of the PSRO program.

The data had to meet four basic requirements.

1. Be as up-to-date as possible.
2. Be as complete as possible.
3. Represent as accurately as possible, utilization in hospitals within a PSRO area.
4. Measure the extent of review activity in the 203 PSRO's.

Generating Current and Complete Data

For most purposes, data on Medicare hospital use are derived from a system which gathers hospital bills for a 20-percent sample of Medicare beneficiaries. A record representing each hospital stay is formed by linking all the hospital bills submitted for a stay. The principal diagnosis and the surgical procedure first listed are coded into the record based on a narrative in the bill.

Naturally these processes take time. To produce the most up-to-date data possible, the processes of linking all the bills for a stay to make a record of the stay and of coding the principal diagnosis and surgical procedure first listed were bypassed. A new system was devised based on only the final bill for a hospital stay. The final bill contains the date of admission and discharge, thus making it possible to compute length of stay. This system generates data on discharges of all beneficiaries (as opposed to a 20-percent sample) whose bills for hospital care had been received and processed at the time the file was created. It is estimated that this file contains about 95 percent of all final bills for a year within three months after the end of the year and about 98–99 percent within 15 months after the end of the year.

To adjust for the small shortfall in final discharge bills, data from the Medicare Query System were used. This system is employed by fiscal intermediaries to query the Medicare central office on the eligibility and benefits available to Medicare patients admitted to a hospital and contains a nearly complete count of admissions within a month after they occur. Thus, it was decided to use counts of admissions from the query system rather than counts of discharges to compute the number of hospitalizations. The average length of stay was computed from the final bill system. Days of care were estimated by multiplying average length of stay by admissions.

Developing Measures of Hospital Use for PSRO Areas

The development of a data system based on the final bill and the query system met the requirements that the data be as complete and as current as possible since the system produces good estimates of Medicare hospital utilization at the PSRO level within 3 months after the end of a year. But the requirement that the data reflect hospital use in a PSRO area remained unmet. Measures customarily used to describe hospital utilization are based on the beneficiary.

The discharge rate for an area is simply the number of discharges for beneficiaries resident in the area divided by the number of beneficiaries living in the area. Similarily, the rate of days of care for an area is the number of hospital days used by resident beneficiaries divided by the number of beneficiaries residing in the area. Average length of stay, of course, is

days of care for residents of an area divided by discharges of residents.

Beneficiary-based rates have drawbacks in examining PSRO performance. A beneficiary-based rate is an accurate reflection of hospital use by the enrollee population of a PSRO area. But part of this population will use hospitals outside their area and thus outside the purview of the PSRO. Because up to 63 percent of the discharges of residents in a PSRO area are from hospitals located outside the area, it seems inappropriate to include them in the computation of utilization rates for PSRO evaluation. In addition, residents of other PSRO areas use hospitals in the PSRO area under study. Although review of these hospital stays is the responsibility of the PSRO under study, they do not enter into computation of a beneficiary-based rate.

The considerations mentioned above have led to the use of provider-based rates for PSRO evaluation. Both the 1977 evaluation of the PSRO program [1] and the recently published study of a prototype PSRO in Sacramento and nearby counties in California [2] employed provider-based utilization measures. The key distinguishing feature between these provider-based measurements (admission rates, average length of stay, and days-of-care rates) and the beneficiary-based measurements discussed previously is that all hospitalizations and only those hospitalizations occurring in a PSRO are represented in the measure. Admission and days-of-care rates for PSRO's are calculated by dividing the total of each for stays in hospitals in the PSRO by the number of enrollees residing in the PSRO area. Average length of stay is the number of days of care incurred in hospitals located in the PSRO divided by the number of discharges that occurred in the PSRO.

Comparison of Beneficiary-Based and Provider-Based Rates

Table 1 contains both the beneficiary-based and provider-based discharge rates for all PSRO's in DHEW Region 3. Quite obviously there are some large differences between the two rates which are directly related to the net-flow factor [3] among the PSRO's. Those with very low net flow have almost identical beneficiary and provider-based discharge rates (PSRO's 08000, 39003, 39008, and 39009) and PSRO's with large net-flow factors, either positive or negative, vary greatly in discharge rates (PSRO's 09000, 21002, 21004, 39005, and 39006).

Adjustments to Provider-Based Measurements

The data developed for the first PSRO evaluation met the imposed requirements fairly well. The measurements were used to examine longitudinal changes in hospital utilization during the period when PSRO's began their reveiws. Yet, the provider-based rates of admission and days of care are not fully satisfactory. The numerator includes all of the stays in hospitals in a PSRO area, but the denominator is the enrollee population of the PSRO area, regardless of where its residents are hospitalized. Thus, there is a lack of correspondence between the numerator and denominator. A PSRO provider-based rate would appear artificially low if there were a net outflow of patients from the area. On the other hand, a PSRO provider-based rate would appear artificially high if there were a net inflow of patients to the area. Unless provider-based rates are somehow adjusted for the inflow and outflow of patients across PSRO area boundaries, it will be misleading to use such rates in comparisons of PSRO utilization rates. A more accurate representation of a rate can be based upon the enrollees at risk in a PSRO area.

A methodology was devised to estimate the number of enrollees at risk in any given PSRO area by allocating portions of Medicare enrollment from all PSRO areas based upon each individual PSRO's contribution to patient load in the given PSRO area. This method is an adaptation of one proposed by Bailey [4] which estimated the population at risk for a selected group of hospitals. The methodology is presented in the formula below, along with an example:

Allocation Formula

$$E_i = \sum_{j=1}^{n} \frac{d_{ij}}{D_j} e_j \quad i=1,2,....n$$

Where E_i = total number of Medicare entrollees at risk in the i^{th} PSRO

d_{ij} = number of discharges from hospitals in the i^{th} PSRO of patients who resided in the j^{th} PSRO

D_j = total number of discharges of patients who resided in the j^{th} PSRO

$$\left(D_j = \sum_{k=1}^{n} d_{kj}\right)$$

e_j = Medicare enrollment in the j^{th} PSRO

n = total number of PSRO's

[1] Office of Planning, Evaluation, and Legislation, U.S. Department of Health, Education, and Welfare, *PSRO: An Initial Evaluation of the Professional Standards Review Organization, Volume 1: Executive Summary,* February 1978.

[2] Maura Bluestone and David Baugh, "An Evaluation of a Medicare Concurrent Utilization Review Project: The Sacramento Certified Hospital Admission Program," *Health Insurance Statistics,* U.S. Department of Health, Education, and Welfare, Social Security Administration, Office of Research and Statistics, (H1–80), March 1978.

[3] The net-flow factor as defined by Lubitz et al. is the difference between inflow (number of discharges of nonresidents occurring in the PSRO) and outflow (number of discharges of residents occurring outside the PSRO) divided by the total number of discharges of the PSRO's residents, regardless of where they occur.

[4] Norman T. J. Bailey, "Statistics in Hospital Planning and Design," *Applied Statistics,* November 1965, pp. 146–157.

Table 1. BENEFICIARY-BASED AND PROVIDER-BASED DISCHARGE RATES IN PSRO's in DHEW REGION 3 FOR MEDICARE BENEFICIARIES AGED 65 OR MORE AND NET FLOW OF PATIENTS INTO AND OUT OF PSRO's FOR HOSPITALIZATION, 1976

PSRO		Beneficiary-based discharge rate (Discharges per 1,000 enrollees)	Provider-based discharge rate (Discharges per 1,000 enrollees)	Net flow (Percent)
Number	Name			
08000	Delaware Review	264.7	251.4	−3.3
09000	National Capital	230.2	327.4	43.8
21001	Western Maryland	275.6	321.2	11.9
21002	Baltimore City	250.0	326.5	31.0
21003	Montgomery County	256.9	229.5	−7.0
21004	Prince George County	286.5	159.3	−46.7
21005	Central Maryland	269.6	197.6	−25.0
21006	Southern Maryland	277.2	201.1	−28.7
21007	Delmarva	269.9	259.8	−4.8
39001	Area 1	354.7	337.0	−5.6
39002	Central Pennsylvania	336.6	367.2	8.7
39003	Northeastern Pa.	293.3	290.5	−3.2
39004	Eastern Pennsylvania	268.4	249.7	−5.8
39005	Midwestern Pa.	364.1	304.2	-15.8
39006	Allegheny	322.6	366.5	15.5
39007	Southwestern Pa.	350.1	294.8	−14.4
39008	Highlands	332.4	337.7	−.8
39009	Southcentral Pa.	259.8	267.1	1.0
39010	Delaware-Chester	271.4	261.7	−6.6
39011	Montgomery/Bucks	275.7	287.8	3.8
39012	Philadelphia	279.1	301.4	7.1
49001	Shenandoah	320.0	334.6	4.3
49002	Northern Virginia	291.8	282.2	−2.8
49003	Southwest Virginia	366.6	343.2	−4.5
49004	Southcentral Va.	305.5	322.2	7.8
49005	Colonial Virginia	312.0	287.8	−5.0
51000	West Virginia	382.9	383.2	−2.8

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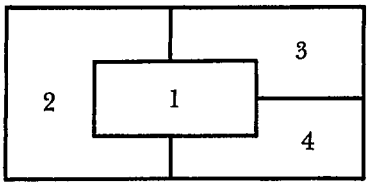
Example

The figure below represents a hypothetical configuration of four PSRO areas. The number of enrollees at risk in PSRO 1 is calculated by allocating a proportion of the enrollees from each of the four PSRO areas. The proportion is based upon the extent to which patients from each of the four PSRO areas use hospitals in PSRO 1.



In order to determine the enrollees at risk in PSRO 1, the following computations are required:

Col. 1 Residence of beneficiary	(2) Total discharges (in thousands)	(3) Discharges from hospitals in PSRO 1 (in thousands)	(4)=(3)÷(2) Proportion of total discharges from hospitals in PSRO 1	(5) Medicare enrollment	(6)=(4)×(5) Enrollment allocated to PSRO 1
PSRO 1	3,250	3,000	.92	75,000	69,000
PSRO 2	1,300	600	.46	30,000	13,800
PSRO 3	2,570	500	.20	30,000	6,000
PSRO 4	3,025	400	.13	50,000	6,500
Total enrollees at risk in PSRO 1					95,300

The matrix below contains the number of discharges for residents of each of the four areas appearing in the stub from hospitals in the areas listed in the field. For example, there were 3,250,000 total discharges for residents of area 1 of which 3,000,000 were from hospitals located in area 1; 50,000 from hospitals in area 2; 125,000 from hospitals in area 3; 75,000 from hospitals in area 4.

Adjusted Rates of Admissions and Days of Care

The allocation formula is used to calculate the number of enrollees at risk in all 203 PSRO areas. Adjusted PSRO rates of admissions and days of care are calculated by dividing the number of admissions and days of care associated with hospitalizations in the PSRO area by its number of enrollees at risk.

Comparison of Unadjusted and Adjusted Rates of Days of Care

Table 2 contains both unadjusted and adjusted rates of days of care for all PSRO's in DHEW Region 3. Cross-sectionally, the differences between the two rates are quite large for several PSRO's. The differences, of course, are due to the effects of patient flow into and out of PSRO's for hospital care. An extreme example is PSRO 21004 (Prince Georges County, Maryland) in 1974 where the adjusted rate (3486.7) was more than twice as large as the unadjusted rate (1639.0) reflecting an unusually large outflow of residents for care (net-flow factor was −47 percent).

By and large though, the trend data for changes in days-of-care rates are the same if unadjusted or adjusted rates are used. Exceptions must be noted, however. Two PSRO areas in table 2 have significantly different rates of increase depending upon which rate is used (PSRO's 21004 and 21006). Closer examination reveals that their changes in net flow were quite large. From 1974 to 1976, the net-flow factor increased from −53 percent to −47 percent in PSRO 21004 and from −37 percent to −29 percent in PSRO 21006. These differences most likely reflect changes over time in the number of available beds in the two PSRO areas due to new or expanded hospitals.

Comments on Rate Adjustment Methodology

Several comments should be made concerning the method used to adjust provider-based rates. First, it assumes that the proportion of enrollees served by hospitals within a PSRO is equal to the proportion of patients served by those hospitals. This assumption may or may not be valid depending upon the extent to which rates of hospitalization for nonresidents are influenced by characteristics of the hospitalized, such as type of illness and socioeconomic status.

Second, since data used to construct patient origin matrices were from a 20−percent sample file of inpatient bills, there is a sampling error associated with the estimated number of enrollees at risk in each PSRO. The formula for sample variance is given in the ap-

Patient origin matrix (In thousands)

Residence of Beneficiary	Total Discharges	Discharges from Hospitals Located in:			
		PSRO 1	PSRO 2	PSRO 3	PSRO 4
All PSRO's	10,145	4,500	690	2,235	2,720
PSRO 1	3,250	3,000	50	125	75
PSRO 2	1,300	600	575	100	25
PSRO 3	2,570	500	50	2,000	20
PSRO 4	3,025	400	15	10	2,600

Table 2. UNADJUSTED AND ADJUSTED DAYS OF CARE RATES AND CHANGES IN RATES FOR MEDICARE BENEFICIARIES AGED 65 OR MORE IN PSRO'S IN DHEW REGION 3, 1974 THROUGH 1976

PSRO		Days of care per 1,000 enrollees						Change in days of care per 1,000 enrollees (Percent)					
		1974		1975		1976		1974 to 1975		1975 to 1976		1974 to 1976	
Number	Name	Unadj.	Adj.	Unadj.	Adj.	Unadj.	Adj.	Unadj.	Adj.	Unadj.	Adj.	Unadj.	Adj.
08000	Delaware Review	3365.0	3462.2	3287.4	3345.9	3467.9	3604.1	−2	−3	5	7	3	4
09000	National Capital	4766.1	3519.1	4951.7	3769.7	4800.5	3616.8	4	7	−3	−4	1	3
21001	Western Maryland	3689.1	3417.8	3943.4	3666.1	3905.3	3625.8	6	7	−1	−1	6	6
21002	Baltimore City	4641.0	3601.8	4842.3	3790.6	5119.9	4056.9	4	5	5	7	9	11
21003	Montgomery County	3012.0	3354.5	2903.9	3092.8	3028.0	3327.1	−4	−8	4	7	1	−1
21004	Prince Georges County	1639.0	3486.7	1827.2	3775.2	2156.0	3990.4	10	8	15	5	24	13
21005	Central Maryland	2297.0	3138.9	2458.9	3293.4	2590.1	3414.7	7	5	5	4	11	8
21006	Southern Maryland	1996.3	3197.9	2178.5	3219.6	2293.8	3229.6	8	1	5	0	13	1
21007	Delmarva	2749.4	2927.1	2845.8	3029.0	2880.1	3046.5	3	3	1	1	5	4
39001	Area 1	3859.2	3963.0	3839.2	4041.5	3992.8	4218.5	−1	2	4	4	3	6
39002	Central Pennsylvania	3956.2	3615.0	3847.4	3571.2	3863.4	3525.3	−3	−1	0	−1	−2	−3
39003	Northeastern Pa.	3554.5	3659.7	3513.8	3636.2	3670.1	3787.3	−1	−1	4	4	3	3
39004	Eastern Pennsylvania	3156.2	3441.2	3261.8	3513.8	3322.8	3572.8	3	2	2	2	5	4
39005	Midwestern Pa.	3044.8	3604.0	3071.0	3604.9	3180.5	3763.3	1	0	3	4	4	4
39006	Allegheny	4679.6	4178.9	4687.0	4175.7	4740.2	4184.0	0	0	1	0	1	0
39007	Southwestern Pa.	3396.3	3945.2	3336.3	3839.5	3487.9	4072.3	−2	−3	4	6	3	3
39008	Highlands	4016.0	4076.4	3945.7	4038.1	4046.7	4115.3	−2	−1	2	2	1	1
39009	Southcentral Pa.	3499.9	3553.6	3408.4	3417.5	3462.6	3481.8	−3	−4	2	2	−1	−2
39010	Delaware-Chester	3616.8	3876.0	3549.8	3818.3	3617.8	3941.0	−2	−2	2	3	0	2
39011	Montgomery/Bucks	3623.9	3506.1	3630.5	3556.7	3709.3	3590.2	0	1	2	1	2	2
39012	Philadelphia	4488.9	4204.5	4519.0	4264.5	4607.0	4322.6	1	1	2	1	3	3
49001	Shenandoah	4168.8	3983.2	3953.0	3757.0	3978.2	3852.9	−5	−6	1	2	−5	−3
49002	Northern Virginia	3544.1	3738.6	3429.0	3570.1	3422.3	3553.4	−3	−5	0	0	−4	−5
49003	Southwest Virginia	4150.2	4356.8	4069.1	4297.1	4022.8	4197.2	−2	−1	−1	−2	−3	−4
49004	Southcentral Va.	4281.7	4101.0	4216.4	4028.0	4397.3	4126.8	−2	−2	4	2	3	1
49005	Colonial Virginia	3909.3	4146.6	3781.6	3942.1	3821.9	4053.3	−3	−5	1	3	−2	−2
51000	West Virginia	4322.1	4373.1	4137.1	4203.3	4197.4	4275.1	−4	−4	1	2	−3	−2

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pendix and can easily be calculated and applied to the rate calculations.

Third, when viewing adjusted rates longitudinally, a phenomenon can occur when the number of discharges from hospitals in a PSRO area is reduced. The reduction is reflected as an increase in the number of enrollees at risk in the surrounding PSRO's that contribute to its patient load. In turn, this results in lower utilization rates in the neighboring PSRO's. The lower rate will or will not be an artifact depending upon whether or not the reduction results in a substitution effect. If, as a result of PSRO influence, patients not admitted do not go to surrounding PSRO areas for hospital care, then the lower rate is most likely an artifact of the adjustment methodology. We are presently developing methods to correct for these longitudinal effects when appropriate to do so.

Level of PSRO Review

To meet the fourth and final requirement of our data, we developed a measure of the extent of PSRO review activity. Information on when a PSRO-type utilization review was initiated and whether it was nondelegated or delegated to the hospital by the PSRO is periodically collected from Medicare regional offices. By relating the date of initiation of review to the number of admissions to each hospital in a PSRO, a measurement of the percent of Medicare admissions under review is obtained. The following formula illustrates how to calculate the level of review for a PSRO area during a year:

$$\text{Level of Review} = \frac{\sum_{i=1}^{n} \frac{a_i m_i}{12}}{\sum_{i=1}^{n} a_i} \times 100.$$

When n = number of hospitals in the PSRO area
a_i = number of admissions to hospital i
m_i = number of months hospital i was under PSRO review.

These measures were important in the PSRO evaluation study because they were used to select which PSRO's were to be designated as control and which as active study areas. The measurements of level of review do not indicate the mix of admissions reviewed directly by the PSRO and by delegated hospitals, although this refinement in the measurement will be made shortly.

Conclusions

The utilization and level of review measurements that have been developed from the Medicare Data System present for the first time up-to-date measures of hospital utilization in PSRO areas. The development process, progressing from beneficiary-based measurements to provider-based measurements adjusted for patient migration, illustrates that true measures of hospital utilization within a PSRO must be developed in a manner consistent with available data resources and imposed data requirements. We feel that the adjusted provider-based rates are the most representative of hospital utilization in PSRO areas but we are continuing to explore ways to develop truer and more sensitive measurements.

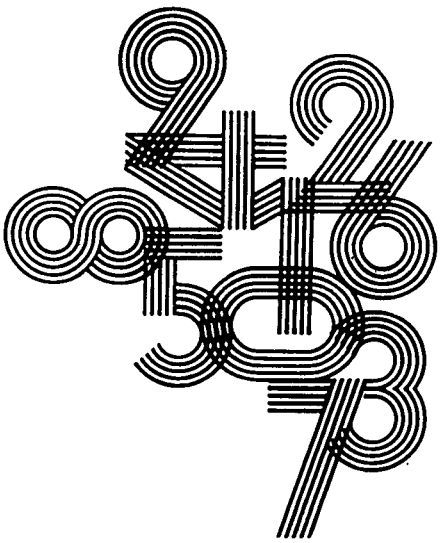
APPENDIX

Sampling Errors Associated With Adjusted Rates

The error is given by the following formula:

$$\text{Variance of } E_i = \sum_{j=1}^{n} \frac{d_{ij} D_j - d_{ij}^2}{.2 D_j^3} .e_j^2$$

These variances have been calculated for each PSRO area and must be considered in any analyses involving estimates of enrollees at risk or measures based upon these estimates.



SECOND PLENARY SESSION

Cost Containment, Health Needs, Access, Quality, Environment

CALL TO ORDER

Robert A. Israel, *Deputy Director, National Center for Health Statistics*

For this morning's second plenary session, according to the program that you have, the session chairperson is Mrs. Rice. As you know, she is not here. There is a sheet that was given out with the program that indicated some changes. It indicated that I would be substituting for Mrs. Rice. But, as a matter of fact, I have asked Mrs. Hanft to substitute for me who is substituting for Mrs. Rice. I thought it would be much more appropriate if Mrs. Hanft made the introductions for this very important second plenary session. So, I will ask Mrs. Hanft to take over from here.

OPENING REMARKS

Ruth S. Hanft, *Deputy Assistant Secretary for Health Policy, Research, and Statistics, Hubert H. Humphrey Bldg., Washington, D.C.*

Your program indicated that Dr. Karen Davis would be the speaker this morning. As you know, the Executive Branch of the Government does not control the Congress. Unexpectedly, the Congress scheduled the cost containment markup in the House this morning. Since Dr. Davis is the lead person in the Department on hospital cost containment, it was imperative that she be at the committee this morning.

Susan Stoiber of her staff will deliver the remarks instead. Mrs. Stoiber joined HEW's Office of Planning and Evaluation to help develop the Administration's national health insurance proposal. She is the Project Director for national health insurance within the Planning and Evaluation Office, and responsible for coordinating the work of the analytic support staff in the Department on the subject of national health insurance. I will tell you that the paper production is extraordinary. Most of us have great difficulty in keeping up with Ms. Stoiber's production.

Before coming to the Department, Susan was with the Congressional Budget Office, the Division of Human Resources, where she authored a major study on catastrophic health insurance. From 1969 to 1974, Ms. Stoiber served as the Assistant Director of the Committee for National Health Insurance. I think you can see her expertise in the subject area.

Ms. Stoiber holds a Bachelor's and a Master's of Public Administration from the University of Colorado and a Master of Science Degree in Health Policy and Social Insurance from the London School of Economics. She has published numerous articles on health insurance and disability insurance. It is my pleasure to present Susan Stoiber.

A VIEW FROM THE ADMINISTRATION

Susan Stoiber, M.S., *Project Director for Planning and Evaluation, DHEW, Washington, D.C.*

I am very sorry that Karen Davis could not be with you this morning. She had specifically wanted to come to talk to you about the data needs that we currently face with respect to the development of national health insurance and permanent hospital cost containment proposals. But, as Mrs. Hanft indicated, she is at mark-up on our hospital cost containment proposal.

I would like to talk to you a bit this morning about the Administration's hospital cost containment proposal, because it is so closely related to our ability to gain enactment or even complete the development of a national health insurance plan. The two of these major policy initiatives, hospital cost containment and national health insurance, will, depending upon their form, really dictate the data needs of the Department and of the people in this country working on health policy development over the next decade.

The reason the Administration has so aggressively pursued a hospital cost containment program this year is that it was painfully apparent to us from the time the current Administration came into office that the first step that must be taken before we could go to Congress with a national health insurance program was to do something about hospital costs. I think no one would quarrel with the statement that we have excellent hospital care in this country, but unfortunately, as you know, there is much too much waste and duplication in the hospital sector. We have great unmet health care needs for which funds are badly needed. Our ability to generate those in a tight budget situation depends upon achieving some reduction in hospital spending.

A year ago this past April, the Administration introduced its hospital cost containment proposal as the first major step in the direction of making our health care system more efficient and more effective, in the sense that resources that are now being wasted could be redirected into areas where the pay-off in terms of health care status will be greater.

One might ask why cost containment for hospitals and not for other parts of the health care system? It is because, in our view, nowhere else is the problem of health care cost inflation so serious. Last year alone, acute care hospital costs increased by 15.6 percent. This extremely high rate of increase has been with us for a very long time in the hospital sector. The average annual rate of increase from 1965 through 1976 was also 15.6 percent. The consumer price index data showed that the rate of increase in hospital prices has been far higher than the overall inflation rate. Since 1950, the price of a semi-private hospital room has increased by 970 percent, whereas all the items in the CPI during that same period have increased by only 165 percent. According to the figures released this week, the annual rate of overall inflation in the economy is about 6.6 percent, whereas hospital service charges are increasing at 10.5 percent annually. In other words, hospital prices are going up 70 percent faster than the overall rate of inflation.

Such rates of increase have serious consequences for the future. If hospital costs continue to grow at 15 percent a year, costs will double every five years. Moreover, this trend would also have a very major impact on any future national health insurance program, since it would cause the health insurance program also roughly to double in cost every five years, as has been our experience with Medicare. At the present rate also, the average person's health insurance premiums will go up by more than $100 by 1980.

Rates of increase in spending and prices tell only part of the story. There is also considerable evidence that there is much waste and duplication in the hospital industry. A few examples:

There are about 240,000 empty hospital beds in community hospitals, of which at least 100,000 are unnecessary. The cost of maintaining these empty beds is $1,000,000,000 to $2,000,000,000 a year. There are as many as 100,000 people in acute hospitals who should not be there. These are people who do not need hospitalization and would in fact be better cared for at home, in skilled nursing facilities or on an outpatient basis. These inappropriately placed patients generate excess charges of $7,000,000 per day in operating costs alone, totaling about $2,600,000,000 a year. Currently, there are about 500 CAT scanners. Total operating costs amount to $150,000,000 to $259,000,000. At present rates of adoption, the bill for CAT scanners could quadruple over the next three years with little noticeable change in the health of the American people.

A recent Blue Cross/Blue Shield study in Michigan showed that a large number of patients are admitted to hospitals on Friday and Saturday. These Friday and Saturday admissions have an average length of stay of 1.7 days longer than admissions made during the rest of the week. The study noted that the sheer number of patients in hospitals suggest that many patients hospitalized on Friday and Saturday receive only custodial care and not medical care on these days. As much as $2,000,000,000 could be saved by eliminating such admissions.

The average hospital stay is 6.3 days in the West, 7.2 days in the South, 8.1 days in the North Central States and nine days in the Northeast. If all hospital stays were as short as those in the West, the resulting savings would amount to $1,500,000,000.

The Food and Drug Administration has estimated

that up to 50 percent of hospital diagnostic x-ray exposure is unnecessary. Up to 30 percent of the x-rays are done merely to protect the physician against malpractice suits. As much as $75,000,000 could be saved if these units were used in a more appropriate fashion.

What these examples demonstrate is that there is a great deal of trimming that could be done in the hospital sector. Furthermore, this could take place without any reduction in the quality of care delivered. This is exactly what the Administration's hospital cost containment proposal would do.

Many of you may be familiar with the basic features of the legislation proposed last year. But for those of you who are not, I will describe them very briefly. The proposal would establish a transitional hospital cost containment program which would be replaced within a few years by a system of permanent reforms in hospital reimbursement. The transitional program would consist of two parts. The first would set a basic limit on total in-patient hospital revenues. These would be constrained by limited increases in payments from third party payers. The limit would be about 9 percent in the first year of the program or about one and a half times the rate of inflation last year.

The intent is to tie the rate of hospital inflation to a measure of overall inflation in the economy with an allowance being made for a moderate expansion of services and a steady improvement in their quality.

In addition, the second part would place a ceiling of $2,700,000,000 on capital spending in hospitals. Each State's limit would be a portion of the $2,500,000,000 allocated on the basis of population. Implementation of the spending limit would occur through the certificate of need process. The intent of this limitation on capital spending is to restrict investment in expensive hospital capital equipment and in bed capacity in areas which already have an excess of beds. This would encourage local decisions on the trade-off between the need for additional resources versus available dollars. Over the long run, it would help us to limit operating expenses.

In general, the transitional program would force institutions to spend against a fixed revenue limit. It does contain disincentives to arbitrary increases in admissions. It would also create incentives for careful prospective budgeting, which would do much to reduce wasteful spending.

This program would reinforce incentives provided for better use of hospital resources by existing legislation in the areas of professional standards review—that is, the quality review of services provided by physicians—and in health planning. Since it places a limit on the growth of in-patient revenues only, it has the potential for encouraging greater use of less expensive out-patient care. It would also foster the development of health maintenance organizations by exempting hospitals controlled by them from the revenue limit. This could do much to increase efficiency in the delivery of hospital care, since recent studies have shown that hospitalization rates are substantially lower in HMO settings where the cost of health care is prepaid and fixed.

Currently, about 25 States have functioning hospital cost containment programs. Many of these programs are doing a good job of holding down hospital costs. The proposed transitional Federal program would permit States to retain their programs if they demonstrated the ability to curtail hospital inflation as well as the Federal program.

These are the basic features of the Administration's bill. Since it was introduced, the bill has been reported out of the two health subcommittees in the House and one of two necessary full committees in the Senate.

The bill has been somewhat modified by the two House subcommittees, but the approach is still essentially the same. The one major change has been the addition of the voluntary program for hospital cost containment. Many of you know that the American Hospital Association, the American Medical Association and other organizations have joined together in what they call the voluntary effort of hospital cost containment. This is a program of voluntary review that attempts to reduce the rate of increase in hospital expenditures by 2 percentage points in this year and next. What the House modified version of the original bill does is to allow this program of voluntary restraint to be tried first. If it is unsuccessful in meeting its self-defined goals, the mandatory Federal controls will be imposed.

Starting this morning, the bill will be considered by the full House Subcommittee of Interstate and Foreign Commerce. If the Committee reports the bill out, attention will then shift to the full House Ways and Means Committee, which must also take action on this bill.

On the Senate side, the bill still remains to be taken up by the Subcommittee on Health of the Senate Finance Committee. The Chairman of that Subcommittee, Senator Herman Talmadge, has his own hospital cost containment bill. We are attempting to negotiate a compromise between his approach and that of the Administration.

The transitional hospital cost containment program would realize substantial savings in the Nation's hospital bill. The House versions of the bill would save between $700,000,000 and $800,000,000 in the first year, fiscal 1979. The annual savings would grow to between $11,000,000,000 and $14,000,000,000 by the end of fiscal 1983. The total cumulative savings would be between $27,000,000,000 and $38,000,000,000. Roughly 35 percent of the total savings would accrue to the Federal Government under the Medicare and Medicaid programs. State and local governments would realize about 15 percent of the savings and the private sector would be the beneficiary of about half of the total savings, which would be manifested primarily through smaller increases in hospital and health insurance premiums.

As I mentioned earlier, the hospital cost containment proposal currently being considered would es-

tablish a transitional program only. The Department is now developing a system that would take into account differences in operational efficiency among hospitals in the limit setting process. This would involve the establishment of a hospital classification system which would distinguish among different types of hospitals according to several types of variables. These could include size, local wages and prices, urban versus rural setting, case mix and teaching status. The long run system would also allocate the national capital spending pool according to a more sophisticated formula that could insure the varying needs of different States, such as those with rural areas, aging populations or antiquated facilities, and assure that those are equitably treated while overall expenditures are limited to a reasonable rate of increase.

This brings me to the subject of data needs. In the course of the development work that is proceeding on a permanent hospital cost containment system, it has become clear that a system that is both effective and equitable will require new types of data. This is particularly true in the area of hospital classification. Ideally, hospitals should be classified on the basis of two broad classes of variables, input prices and the characteristics of their output. The first would be the prices they must pay for labor and non-labor components of total cost. The second would be some measure of case mix or complexity of the medical care rendered.

Information on the first type of variable should ideally be available by geographic area. Presently, there is at least one fairly good data source to proxy the variation by area in hospital cost. On a monthly basis, the Bureau of Labor Statistics collects information by SMSA on the hourly earnings of workers in manufacturing. The data, however, does not really reflect true wage rates since it is derived by dividing total payroll by the number of employees in an establishment. It also does not take into account variations in the proportions of lower skilled and higher skilled workers in the labor forces of different areas. Nevertheless, it is the best available on a monthly basis with only a one month lag.

It would be preferable, of course, to have more sensitive data. This could take the form of information on wage rates by geographic areas for several dozen types of occupations representing different skill levels.

There is also a need, but a less critical one, for data on non-labor factor prices by geographic area. Currently, the consumer price index provides monthly price information for 40 cities, which is too few for purposes of hospital classification. In addition, the price information should be for items purchased by hospitals, not by consumers. Such data could be provided by the wholesale price index, but it is also not available by area.

With respect to the measures of complexity of care provided by hospitals, there are currently very few. So far two different methodologies have emerged which could be used to measure case mix. One is called the diagnostic related grouping and is based upon the idea that diagnoses can be linked directly to the level of resource intensity. The other methodology, called staging, is based on the concept of the occurrence of different stages of progression of a particular disease in the absence of medical intervention. Each stage is associated with a different level of resource use and its treatment. Each of these case mix methodologies has its own set of limitations and both are unlikely to come into widespread use soon. At the present time, both are being tried on a limited experimental basis. It is not clear that either one of them would require a massive data collection effort if it were to be included as a part of a national hospital classification system.

Of course, instead of using a specific case mix measuring methodology, a proxy measure could be employed. Various demographic and economic variables could be used, most of which are currently available. However, such proxies would be unlikely to measure subtle differences in case mix, nor would they allow a hospital to be reimbursed for specializing in different cases of a specific type. Information on the types of specialized services available in a hospital might be another possibility. But information on the presence or availability of such services would not be particularly useful without accompanying information of their rates of utilization. Such information, not surprisingly, is currently unavailable, although it could be developed.

Finally, for the purposes of hospital cost containment, there is a need for data related to capital and construction costs. Again, some information is available, but it is quite limited. Better data could greatly aid in the estimation of the impact of a capital spending pool on different areas. One type of data that would be quite useful is the age of facilities in different areas of the country, so that allocation of the pool could be based in part on the need for replacement of facilities.

In conclusion then, it is clear that hospital cost containment has many important data needs for which much developmental work is required. But, of course, hospital cost containment is not unique in this respect.

As we move into the planning of national health insurance and begin to examine various strategies for reimbursement of providers, for attempting to place some limit on total national spending for health care, we are faced very starkly with the lack of adequate data for making allocation decisions for noninstitutional services in particular, for assessing the varying needs for health care expenditures by area and for disaggregating the location from which a patient comes in order to seek treatment in areas which draw patients from throughout the country. This has forced us, for example, in looking at national health insurance resource allocation decisions, to the assumption that at least for the present it would not be possible to think of a national budgeting system which would attempt to allocate total health care spending among geographic areas and then allow for some kind of budgeting or fixed expenditure limits within those areas.

But, I believe over the next 5 years the Department

will make a very major effort to collect this kind of data. So, if a decision is made on the national level to pursue a fixed budgeting system under national health insurance, we will be prepared with the data that would be required to put such a system into place.

In the hospital area and for perhaps other institutional services, we are relatively close to having that kind of data capability. In the area of physician expenditures and other non-institutional services, we are very far from having the kinds of data that would be required for a budgeting system.

Yet, I would like to leave you with a sense not only of the importance of data needs for policy decisions on national health insurance and hospital cost containment, but also of the many other areas of resource management that could be better aided by a more accurate sense of what we are currently spending and what the outcomes of such expenditures are by institution, by type of service and by the people that we are helping through the provision of those services.

Thank you very much.

MRS. HANFT: Thank you very much, Susan.

We have time for questions. I would ask those with questions to please step up to one of the microphones in the room, identify yourself and please make the question as brief as possible.

MR. KECK: I understand the voluntary cost containment program is running into some trouble regarding antitrust implications, in that the hospitals are now awaiting a judgment from the FTC on those implications. I wonder if you have any additional information on that at this point.

MRS. HANFT: We know that there is a request for a ruling from the Justice Department, but no response has been given as of this date.

MR. SILVERMAN: I am from the Health Care Financing Administration. As I was listening to the speech, I visualized a very complex administrative system to carry out this program, including appeals and very refined judgments to be made in 6,700 hospitals. What kind of administrative mechanism do you have in mind, or do you visualize, to carry out this program?

MRS. HANFT: One of the reasons for the design of the program, as it was designed, was because it could be implemented through use of the Medicare cost reports. The Health Care Financing Administration is currently working on the details of the administration of the program, and their estimate is that it can be done without too much more of an investment in resources. Bob O'Connor at the Health Care Financing Administration is handling that effort for the Department.

DR. WHITE: I have two questions. I speak in my capacity both as an individual and as Chairman of the U.S. National Committee on Vital and Health Statistics. The first is that the notion of cost containment, at least as examined in other countries, has to do with the balance between hospital care and other forms of care. As I tried to suggest yesterday, without relating these balances, the mixes of different types of physicians and different types of institutions make it virtually impossible to control hospital costs. This has been shown in Holland and other countries which have data available to examine that particular issue.

My more pertinent question is this. If you really expect to use case mix, if you really expect to use local area data, and if you really recognize that the use of case mix has to be entirely separated from such things as costs and length of stay in order to be logically sensible, why is it that we have taken ten years to promulgate the uniform hospital discharge data set? Why is it that we are taking apart the cooperative health statistics system, rather than infusing more resources and more directions that will provide the necessary information at local areas and at State areas to accomplish these missions? The exercise, it seems to me, is absolutely impossible without State and local data. You have to believe ten crazy things before breakfast before you think it is going to work with only national hospital data available.

MRS. HANFT: Dr. White and I have had many discussions on this subject.

As you all may or may not know, there is discussion underway in the Department of Health, Education, and Welfare to make a decision on what type of organization should be the processor of uniform hospital discharge. That decision is not firm. Whatever will be done, however, will be supervised technically and for quality purposes by the National Center for Health Statistics. This was the decision made by the Under Secretary a couple of weeks ago. The issue is now, "What should the collection and processing point be?" There is no decision on that.

I know that it has been ten years. I must say that I am just as frustrated.

MR. POSNER: My name is James Posner from New York. Could you give us more information about the Administration's viewpoint on case mix analysis? How will it proceed and how complicated will it be? The reason I ask is that there are more than 300 DRG's which are used to measure case mix. I suspect that many hospitals will take a negative viewpoint. They will reason that case mix is "infinitely" complex; that one cannot analyze it and that therefore the hospitals should not be subject to any control over their utilization. On the other hand, we have certain kinds of case mix data at present. Patient day statistics are collected for maternity, medical-surgical, psychiatric, and long term care. These figures are proxies for case mix which hold up pretty well.

Where will the Administration end up between the present level of data and a system such as the DRG's, which is unwieldy and complex?

MRS. HANFT: I cannot give you a final answer on any of that. I would tell you that we are watching very closely the case mix work being done in New Jersey, in the State of Washington and in a number of areas. There is a technical work group that has been working in the Department with a great many outside experts on the development of case mix. We think it is going to take several years. That is one of the main reasons that we went forward with the transitional hospital cost containment bill. We see this as something where the techniques will be developed over time. As the techniques are developed, they will be implemented. It is no doubt an extremely complex thing to do. There are several different approaches that are being used out in the field. We are watching them very closely and we will be evaluating them.

MR. CUMMINS: Will there be any penalty to address the situation? The HSA executive directors like myself now find the hospitals quite understandably and quite naturally saying, "Please approve everything we can get our hands on, because you may not be able to get it for our people in this community later." I think the longer that the Senate and the House debate, the more rush to purchase and to lease will be. Is there any incentive planned?

MRS. HANFT: On the cap, no. But on the cost containment itself, there is a base year. The calculation goes from the base year, which means if a hospital has started to inflate after that base year period, it is going to be in trouble. On the capital cap, no; we have no penalty on it. I do not know how you prevent that, except by having your communities and your HSA's stand up to the hospitals and say, "If we do not need it now, we may not need it in the future, and we are just not going to do the approval."

I think the Department is going to look very unkindly on plans that come from the HSA and from the State agencies that exceed the guidelines. The one penalty which we do have, as you know, and which is kind of an extreme penalty, is not to fund the HSA again. But we will be looking at the record of the HSA's in relation to the guidelines and in relation to their patterns of approval. We do not have any legislative authority to go beyond that.

MS. SHETH: I am from the Los Angeles HSA. We just received our certificate of need designation. We were told that three years after our full designation, we have to develop plans for appropriateness reviews. However, there are no Federal guidelines on the matter. Are there any coming in the near future?

MRS. HANFT: Yes, they are in draft form. We hope to have most of the regulations related to the HSA's appropriateness review and all the regulations that need to come out, by the fall. They are in draft form now and in the process of review within the Department.

MS. SHETH: The Federal Register of May 17 said that most of the HSA's are told to take it easy on the facility based appropriateness review; just go ahead with the service base. Is that true?

MRS. HANFT: What that means is they do not want you to rush ahead at the moment on the institution-by-institution review, but rather to start by looking at your whole service area and the service mix in your area. Ultimately, I think we will get to institution-by-institution review. But the thinking within the Department is to let the HSA's evolve to that point as they develop expertise and to start with the area-wide service reviews.

MS. SHETH: Thank you.

MR. WOOLSEY: I am a health statistics consultant from Bethesda, Maryland. It seemed to me that one of the obstacles to achieving a solution to the data needs in connection with national health insurance and many other matters has been the absence in recent months of any kind of a Department-wide group that could come to grips with the problems of ironing out difficulties and disagreements within the Department.

What I would like to ask is what is standing in the way of this and what is it going to take to reestablish the Health Data Policy Committee on a Department-wide basis?

MRS. HANFT: The charter for the Health Data Advisory Committee went forward to the Secretary's office some months ago. I cannot give you the answer as to what is holding that up. I am very sorry; I just do not have the answer for you.

MR. JACKSON: Along with Dr. White's comment concerning the UHDDS, recently the PSRO elements have been reduced in the requirements at the Federal level. This has not occurred, however, at the local level. In Massachusetts, there are five different PSRO's and different sets of elements that the hospitals are required to collect.

In the course of dealing with this data, is the Federal Government going to look at the wonderful notion of having individuality to the extent that the participant hospitals find themselves collecting different sets of data and therefore becoming incomparable?

MRS. HANFT: I can tell you what our objective is on the hospital discharge. That is to have a uniform hospital discharge where a hospital will not have to fill out four or five or six different forms for the same information. One of the reasons for the delay in the decision as to who should be the collector and the processor is to assure that we have some instrument that will really be

able to follow through and to assure that the discharges are uniform and that we are not overburdening the institutions with different forms for different users.

MR. FREEDMAN: I am from the Massachusetts Department of Public Health. Mrs. Stoiber indicated in her presentation that the decision on the administrative mechanism was still under review. If States had programs that appeared to be capable of meeting your program goals, there would be flexibility in terms of State administration of programs.

My question is in terms of the data side of the issue. If a voluntary approach of public sector—private sector cooperation around health information is in place in the State, how will that affect the decision around the information requirements for implementation of the program you described?

MRS. HANFT: I think what Susan was referring to is where there are State rate regulation commissions in place. If they meet certain standards under the cost containment bill, the Administration will allow the State to implement its own cost containment. In terms of the data, if it is a State regulatory system, obviously the State is going to need certain types of data to administer its own system.

As far as I know, there have been discussions in the Department as to whether the Department will take any role in either designing or approving that data system. However, we will be putting in place the uniform hospital discharge for Medicare, Medicaid and general data collection purposes at the national level. I do not see in the discharge area why that should be inconsistent with what the State needs. I think it is in the area of financial information that there may be differences between what the Federal Government will collect under its cost containment program and what the States need for variations of their own cost containment programs.

DR. WHITE: What about local area data?

MRS. HANFT: Local area data will be collected for the Planning Act.

DR. WHITE: But it has to be mandated Federally so that they can be collected uniformly.

MRS. HANFT: That is why we have the uniform data sets and that is why we are going to have the uniform hospital discharge.

DR. COONEY: Mrs. Hanft, I could not quite hear a response you made a few moments ago. You make a difference between uniform data and a uniform form; at least that is what I heard. Were you saying that Federally there is going to be both uniform hospital data and a uniform form?

MRS. HANFT: No, I am saying a uniform hospital data set. There have not been any discussions on imposing a uniform form at this point in terms of the hospital discharge. Now, that is different on the financial side. The Department is working on uniform financial reporting, which is different than the hospital discharge.

DR. COONEY: But in that, you are not thinking of the claims process per se. Are you talking about uniform institutional reporting or uniform claims reporting or both?

MRS. HANFT: In the first instance, I am talking about uniform institutional reporting to be able to do cost containment in the long run. At some point, I am talking about uniform billing, but not in the near term.

DR. COONEY: But that unfiorm billing, when it comes, would include the uniform hospital discharge data set?

MRS. HANFT: Not necessarily attached to the billing.

DR. COONEY: Thank you.

DR. WHITE: But if it is going to flow through the fiscal intermediaries, as the present situation suggests it may, according to my informants, that will certainly restrict the information available for local and State planning and other uses to those patients covered by Medicare, Medicaid, and related programs, unless in some way it is mandated across the board for all patients. That is the only way you can get the information.

MRS. HANFT: One of the things the Department is looking at is the legality of mandating collection on all patients. The general counsel is looking at the possibility of doing that. It is also possible to set some standards for partucipation in the program by saying to an intermediary that you can collect if you will collect for all patients.

DR. WHITE: The second point is who is going to do the analysis? The only way that you can really understand the balance of resources at the local level is to compare hospital data, acute care data, long term care data, home care data, and household interview data. You have to examine the balance among these factors and understand the choices that are going to have to be made by the local politicians. If you focus on hospitals, you take a very limited view of the total spectrum of possible cost savings, to say nothing of the need to provide a balanced array of services for the needs of people. Now, how is that going to be accomplished at the local level by focusing on information from hospitals going through the fiscal intermediaries for a selected group of patients?

MRS. HANFT: As you know, the long term goal of the Cooperative Health Statistics System is to collect not only hospital discharge data, but long term care data and ambulatory care data. The Co-op system is not fully in place yet. We are hoping to move forward rapidly enough to get at least the first three components in place in all the States within the next year and to proceed rapidly thereafter to get the hospital discharge, the ambulatory care data and the long term care data. Until we have those data sources, you are absolutely correct. Getting that balance for planning purposes is quite difficult. What we will have to use is the data that are available right now in the interim period of time.

MR. JAFFE: This is a *non-sequitur*. I am from the HSA in Miami. The question is is there a correlation between the caps or at least disincentives on additional admissions contained in the cost containment bill and any kind of giant increase in admission or at least use of health facilities, such as was experienced with Medicare and Medicaid when people came out of the woodwork just because of the availability of it?

MRS. HANFT: The cost containment bill contains certain adjustments for both increases in admissions and decreases in admissions. Unless you can clearly indicate that the increase in admissions beyond a certain point was due to a need for services or a shortage of services in the area, you do not get dollar for dollar per admission. It is a disincentive to have the hospital jack up the admissions.

There is also a certain amount of leeway on a decline in admissions. You do not lose quite as heavily until you have exceeded a certain percentage of your base year's admissions.

So, there are adjustments to try to keep from gaining by adding admissions to institutions.

MR. HOMEYER: You have mentioned the possibility of trying to get the first three components of the CHSS implemented within the next year or so. What level of funding are you anticipating? Is there an anticipated provision of technical assistance to the States that are quite a ways away from being able to implement?

MRS. HANFT: I cannot give you the dollar figures off the top of my head. We did get a considerable increase in the 1979 budget from both the Department and OMB. It looks like appropriations will probably at least come to that level, if not possibly provide a little more in the way of resources.

In 1980, we are budgeting even more than we did in 1979. There is another increase from the Co-op system, to be able to move it as rapidly as possible.

Yes, we are planning to increase our technical assistance as requested by the CHSS systems.

MR. RICHMOND: I would like to follow up on a question by Kerr White. I am with the HSA in central New York. I think that one thing that I have noticed in the last few years is that we have funded quite a few mechanisms to collect uniform data, whether it be discharge data or cost data. Quite often, this is to support administrative mechanisms at the State level and things like that.

One of the things that I have increasingly become concerned about is the fact that we really have not put too much effort into ways to make data available or funding efforts to analyze this information. We can see that, yes, there is information being collected. It is perhaps being sent on to Washington, but there is no really organized way to make it available, either through access to a tape or through standard reports or things like that to the local levels, so that we can carry out the work of analyzing this information. I am not sure whether my point is a plea or a question about whether something is going to be done about this.

MRS. HANFT: The purpose of the Co-op system was to have the data needs of all users met through one source and a sharing of that data close to the line, where the analysis needs to be done in terms of local planning. That is why we are trying to push ahead rapidly on that system.

I think once that system is in place, these data systems that spring up would be able to withstand the pressure to keep adding new and different sources of data.

MR. RICHMOND: The point I want to make is, as we move along this way, we need to define a little bit better what sharing really means and how it can be achieved. I think that has become the stumbling block.

DR. SHANNON: I am interested in the section of the talk referring to the identification of data gaps. I have an interest in radiology, so I would like to speak about something that is unpopular perhaps. There was an assumption that the CAT scanners' significance is the simple multiplication of units times price, as opposed to information about the cost trade-offs that occur with its use. The Arthur Little report, which is just out, indicates that recently there is a trade-off between the cost of CAT scanners and other costs replaced.

The second area that I would like to comment on is the assumption that a very large percentage—I believe you said 50 percent—of x-rays are taken purely for the protection of the physician. This is in direct contradistinction to the only large study that I know (recently completed by the American College of Radiology on hospital emergency rooms) on efficacy of films taken in emergency rooms. Would you like to comment on the replacement of hard data by assumptions?

MS. STOIBER: The statement with respect to CAT scanners did not imply obviously that they have no

utility or that there were no offset costs, but that there is no relationship between the growth in the number of CAT scanners now in place and their projected growth over the next few years in any reasonable ratio of need to number.

With respect to the FTC study on x-rays, again they looked at those which seemed to be superfluous rather than saying that all x-rays were unnecessary and done defensively. That was not their point. Their point was an assessment of those which seemed to be extremely excessive and without utility other than defensive medicine. Their assessment was, I believe, that about 34 percent of those in emergency rooms were in no way justifiable. I would be glad to give you the documentation on the FTC study. You can examine it and see whether it looks reasonable to you.

MRS. HANFT: We have time for one more question and then we have to end this session.

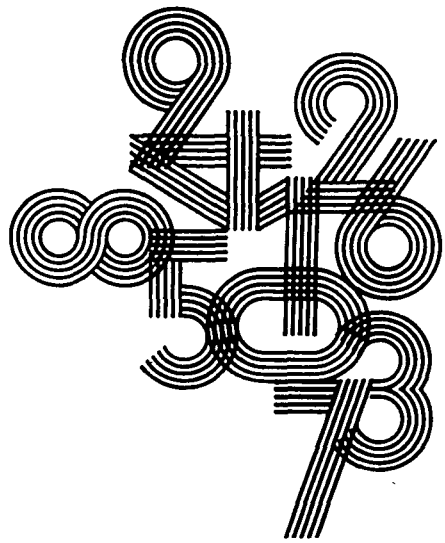
MR. TRAXLER: By merely focusing on admissions or lengths of stay and reducing these, you may face a problem in terms of the existing capacity and inflexibility in certain hospital costs. Spreading these costs over a smaller number of patient days will bring the unit cost up by necessity. So, unless you link this with appropriateness review and mandatory decertification provisions, where you reduce the excess capacity—especially by closing down whole hospitals—you will close but one gap. You will reduce the patient days or the admissions but at the same time force costs up without the hospitals' being able to do anything about it. You may be able to limit payments under Titles XVIII or XIX, but this will force the insurance rates up. The money has to come from somewhere, to pay for underutilized facilities and services.

The second issue is one we faced in Florida. (I am with the Florida State agency.) In Medicaid, we tried to limit basic inpatient services and outpatient services. There are a number of circumventive measures which physicians and hospitals can do by billing less for inpatient days but more for ancillary services and providing more of these other services. So, if you only limit one specific item, there are other ways in which the providers can bill to receive the same—or more—total compensation as before.

MRS. HANFT: I would like to respond to that. We are aware of what happens to the cost if you shorten the length of stay. In our planning legislation that is on the Hill and also in Part 3 of Roger's cost containment bill, there is a provision to assist hospitals with closure and conversion of their facilities. The hospital cost containment bill also covers ancillary services. It is not just per diem. It is a cap on per admission revenues. So, we are at least reaching the ancillaries in the hospital.

Now, you are quite correct. Human beings can manage to figure out how to beat any system. I personally expect to see some ballooning of out-patient ancillary services as possibly a consequence of just putting the squeeze on the hospital side.

Thank you all very much.



CONCURRENT SESSION E

Health Expenditures Studies

ESTIMATING HEALTH EXPENDITURE AT THE STATE LEVEL

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Only a few years ago, we were preoccupied by problems of access to the health care system. A great deal of time and energy was spent in devising ways to improve access to medical care. Programs ranging from encouraging construction of faciilities and training of professionals to financing care through Medicare and Medicaid to the direct provision of care through neighborhood health centers were instituted. This attitude is evident in the provisions of the National Health Planning and Development Act of 1974 which requires HSA's to assemble data on health care needs, utilization, and resources. Although we have not yet achieved ideal access, we have become increasingly aware of the costs of medical treatment and concerned with our ability to pay for present and proposed programs. This latter concern is apparent in the Bureau of Health Planning and Resources Development regulations which extend the mandate of HSA's to collect data on the patterns of health expenditures and health financing.

The recency of our interest in the estimation of sources and uses of aggregate health care funds is demonstrated by the fact that most of the attempts to estimate aggregate expenditures have been made in the past ten years. The notable exceptions to this are the pioneering studies done by Dorothy Rice, Barbara Cooper, and others through Bob Gibson on the national level and by Nora Piore for New York City. When we began making annual estimates for Rhode Island, these were the only models available. The influence of these researchers on the methods we use will be apparent.

In the remainder of this presentation, I will briefly discuss some considerations to be made prior to beginning estimates on the State level, data sources for estimation of expenditure by type, data sources for estimation of revenues, and, in conclusion some suggestions for further research.

Preliminary Considerations

Since the subject of utilization of the data is going to be addressed in another paper, it will not be extensively discussed here. However, it is important to know how the estimates are to be used at the outset. For example, a basic use of the estimates is to monitor the health care systems at the State level. For planning and policy making purposes, it is useful to know whether more or less money per capita is being spent in one State than in another for a specific type of health care service. If such a comparative analysis is planned, then the estimates of health expenditures should be commensurable with others with which they are to be compared. Thus the definitions of the expenditure or source of funds category should be comparable. Since the units of measure of expenditure is dollars per time period, it is also necessary to keep in mind that different levels of government and different institutions have different fiscal years. To estimate expenditures consistently for one annual period, it is generally necessary to collect data for 2 fiscal years.

One of the most frequent problems that arises in making estimates at the State level is the result of trying to make the estimates too current. When secondary data sources are used, time laps in the availability of data are prevalent. It is much easier to estimate expenditure for calendar year 1976 than for 1977. Estimates for current years involve projections as well as estimation. Since data for one year from a meager basis for projection, it is recommended that the first attempt to estimate expenditure be done for a period 18 months to 2 years before the present time. If nothing drastic has happened recently in your State, your estimates will provide fairly accurate information. If something drastic has happened, your projections are likely to be poor.

Data Sources for Expenditure Estimation

The expenditure categories used here are similar to those used in the national estimates. In some cases the definition is modified to more clearly reflect the State health care system. For example, administrative expenditures for Medicare and Medicaid which are incurred at the national level are omitted, but those incurred at the State level are included.

The largest expenditure for health services is incurred for hospital services. Several sources exist for hospital expenditure estimates. These include Medicare cost reports, American Hospital Association *Guide Issue* and *Hospital Statistics* data, budgets of government hospitals and cost commission data. If you gather statistics on expenditures from several sources, they will disagree. In fact, you should be alarmed if they agree. The reason is quite simple. Different third parties impose different definitions of allowable costs on hospitals. For example, some allow accelerated depreciation while others insist on straight line depreciation. Some will allow for bad debts or educational expenditure in whole or in part while others exclude them.

The same observations apply to other accounts. Consequently, the reported expenditures vary by source of the data. However, these differences do not totally destroy the usefulness of the data. My comparisons in Rhode Island suggest that the difference between the highest and lowest estimate is on the order of 6 percent. If an intermediate estimate is used, the potential error is even less. Since I aspire to be within 5 percent of the "true" estimate, I'm satisfied with this. The choice among data sources is more likely to be based on the cost of making the estimates. For small States, examination of Medicare Cost Reports is a messy, but not insurmountable, task. For larger States, the convenience of AHA data makes it attractive. If this source is used, be aware that the data for osteopathic hospitals may or may not be included. This possible source of error should be examined.

Estimation of physician expenditures involved the product of two estimates—one for the number of physicians and one for physician gross income. Two basic data sources to be considered are AMA data and IRS data with a corresponding estimate for active physicians. In either case separate estimates for osteopathic physicians and the value of physician services in HMO's must be added in. Comparison of AMA with IRS *Business Income Tax Returns* estimates for gross income reveals that AMA estimates are much larger. On the other hand, comparison of AMA estimates of active nonfederal physicians with Rhode Island licensing files of physicians practicing in-State indicates that AMA reports a much smaller number of physicians. One explanation of these observations is that AMA samples include only part of the part-time physicians in both cases. These two sources also aggregate physicians differently—a fact that makes comparisons more difficult. IRS reports physician income by proprietorship, partnership, and corporation. The proprietorship income is reported separately by State. AMA income data are reported by census region and specialty. Although other breakdowns such as metropolitan-nonmetropolitan are used, the fact that location and specialty are not independent makes further adjustment impossible. Comparison of IRS-based estimates with AMA-based estimates for Rhode Island for 1973 (the last year for which I have AMA income data) indicates that the alternatives fall within my arbitrary 5-percent criterion.

Estimation of expenditures on dental services is similar to physician expenditure estimates. In this case American Dental Association data substitute for AMA data. ADA data is based on surveys conducted every three years. This means extrapolation or interpolation is necessary for other years. In the case of dentists, the IRS sample size is not sufficiently large in most States for separate estimates to be reported. This leaves the ADA data as the only source of estimates for small States.

Expenditure on other professional services can be estimated in a similar manner. In this case, separate professions must be handled separately. This is a time-consuming job. There is a simpler method if you are willing to accept cruder estimates. It may be reasoned that expenditure on physician services indicates the relative demand for health care services in an area and also reflects prevailing wage levels. Hence it may be expected that expenditure on other professionals will vary from the U.S. average proportionally to the variation in expenditure on physician services. This allows a relatively simple method of making a rough estimate.

Sales by drug stores are reported by State in *Sales Management* annually. Annual prescription surveys by *American Druggist* provide information on the percentage of prescription sales in total drug store sales. These two items of information allow for estimation of sales of prescription drugs. There are no good sources for estimation of sales of nonprescription drug sales and sundries. Even the definition of this category seems to be changing in Department of Commerce classifications. For a rough estimate, one may observe that prescription drugs account for about 60 percent of drugs and sundries nationally and use this proportion to estimate drugs and sundries by State.

For eyeglasses and appliances, I use national per capita estimates. An alternative is to base an estimate on personal consumption expenditure by State. *Survey of Current Business* national estimates reveal that expenditures on opthalmic and orthopedic products are a stable proportion of consumption expenditures accounting for about .18 percent.

Nursing home expenditures which include both skilled and intermediate care facilities are difficult to estimate. Medicare and Medicaid cost reports provide data for participating facilities. Applying expenditure per bed derived from this date to nonparticipating facilities will produce a rough estimate for total expenditures.

Prepayment expenditures for private insurance may be estimated from the difference between premiums and benefits reported in *Source Book of Health Insurance Data.* Administrative expenses of public third-party programs may be derived from their budgets.

Government public health activities include expenditures typically found in State and local health departments. Budgets provide a source of data. State level expenditures are also reported in *Services, Expenditures and Programs of State and Territorial Health Agencies* published by the Association of State and Territorial Health Officials.

Finally, other health expenditures include undistributed residuals of third-party expenditures and expenditures which are not included in other categories. These include such things as school health, in-plant expenditures, and expenditures by nonprofit agencies such as March of Dimes or the American Cancer Society.

Data Sources for Estimation of Revenues

Sources of funds may be identified as public or private. Public sources may be further broken down by level of government. Expenditure under major national programs are published. Examples are *Medicare, Reimbursement by State and County, Medicaid Statistics,* and *State Vocational Rehabilitation Agency Program Data Book.* Data for State and local programs may be gotten from budgets.

In general, information is available by total expenditure of private third parties, but not by specific type of expenditure. For example, *Source Book of Health Insurance* reports total benefit payments under private insurance, and Workmen's Compensation expenditures are now reported annually in the *Social Security Bulletin.* National data may be used to prorate totals by type of expenditure.

Once total expenditure by type of service and supply has been estimated and third-party sources of funds have been identified and estimated, then direct out-of-pocket expenditure can be derived as the difference. Since all estimating errors accumulate on this smaller base, this estimate will generally be subject to the largest relative error.

Subjects for Further Research

There are additional alternatives for estimating all of the information discussed here. Additional study is needed on the use of alternative techniques to determine how good the estimates are.

Once we can convince ourselves that we are not dealing with mere statistical artifacts, then this data base will provide for significant new research in health care delivery systems. In particular, it will allow the development of better forecasting models.

In the area of health planning, this suggests a systematic approach to the health care system. The use of input-output matrix techniques will provide further insight into the indirect effects on other types of services of a change in one service or in the financing system. Although it is fashionable to refer to a nonsystem of health care delivery, Lawrence Hill once observed, "If you don't think it's a system, try to change part of it." This approach to planning encourages consideration of all parts of the system when seemingly independent changes in one specific area are suggested.

ESTIMATING SPENDING FOR HEALTH CARE—A NATIONAL PERSPECTIVE

Robert M. Gibson, *Health Care Financing Administration, DHEW, Washington, D.C.*

Estimates for total spending for health care in the Nation are compiled by the Health Care Financing Administration in the Department of Health, Education, and Welfare. Over a number of years, a conceptual framework or model has been developed to identify each dollar in the economy that was used for the maintenance and restoration of health and to count each dollar only once. In simplest terms, this model is a matrix for classifying health expenditures according to the type of service or goods purchased and by the method or channel of financing. This paper outlines the data sources used in compiling these national estimates with a focus on those sources that allow disaggregation below the national level. In a limited number of cases, such as estimates or hospital spending and Medicare benefit payments, data can be compiled on a county basis. Other sources can yield State-level estimates. Some of the problems associated with using these national data sources deriving from provider payment processes for local area expenditure estimates are discussed.

USES OF EXPENDITURE AND UTILIZATION DATA FOR HEALTH PLANNING

Suzanne Grisez Martin, *Consultant, Dover, Massachusetts,* and Nancy Russell Hill

Introduction

Limiting increases in the cost of health care is a goal of most health planning agencies, although they rarely have information on the pattern or level of local health expenditures. This information gap is recognized by planners at the State, local and Federal level and there are a growing number of activities aimed at improving the ability of State and local agencies to estimate health care costs. The Applied Statistics Training Institute (ASTI) has offered a course on estimating health expenditures for several years: conferences such as this one now have panels discussing the availability of expenditure data at the local level; and policy statements by the Bureau of Health Planning and Resources Development (BHPRD) have emphasized the need for expenditure data for health planning. Many Health Systems Agencies (HSA's) and State Health Planning and Resource Development Agencies (SHPDA's) are in the process of estimating health expenditures within their own areas.

In the fall of 1976, while I was a staff member at the Harvard Center for Community Health and Medical Care, my colleagues and I began work on a manual that would outline methodologies for the collection of health expenditure and utilization data and the uses of these data for health planning. Development of the manual, which was cosponsored by BHPRD, was part of a 3 ½ year contract with the National Center for Health Statistics. The purpose of that contract was to develop a model for a system of health accounts, which is a population-based framework for integrating information on various aspects of the health care system, such as manpower, facilities, expenditures, utilization and health status (figure 1). Prior to preparation of the manual, contract activities involved collection of expenditure, utilization and health status data for 76,000 Rhode Island children aged 0–4 in four socioeconomic groups. This experience provided firsthand knowledge of the difficulties encountered in collecting/estimating expenditure and utilization data, even in a State with a comparatively extensive information network.

Understanding the sources and appreciating the limitations of locally-based data are important in the formulation of recommendations on data uses. Agencies that implement health expenditure studies are encouraged to utilize the knowledge of those collecting and assembling the data to assist in the interpretation of the limitations of the data for specific policy choices. A delicate balance must be achieved however, as knowledge of the limitations or non-existence of certain types of information can be so discouraging that no attempt to assemble what data are available is ever made. Realistic expectations regarding the potential uses of the data should be established prior to the beginning of data collection. Producing a manual that discusses both methodologies for estimating expenditures and uses of that data was considered an important contribution because it would highlight the relationship between data uses and the quantity and quality of existing data.

My background in public policy analysis and my colleague Nancy Russell Hill's training in both health planning and public health gave each of us a basis for anticipating how health expenditure data might be used in health planning activities. To explore whether our proposed uses were realistic and to gain new perspectives, we conducted extensive interviews of health policy makers and health planners. We visited nearly a dozen HSA's and SHPDA's to speak with staff about their information needs, the quantity and quality of local data, how expenditure and utilization data could be used, and whether they would use a manual outlining basic data collection/estimation methodologies and data uses.

Agency staff reactions to the proposed guide were uniformly positive, but ranged in degree from very enthusiastic to somewhat tentative. Their primary reservations were with the expected expense of implementing such studies and with the unavailability of key data at the local level, such as information on private physician services and drugs. Based on the site visits, project staff decided to go ahead and prepare the guide, with the hope that it would be a useful resource for those agencies choosing to implement such studies and with the recognition that while the existing information base is limited, the process of completing the studies may lead to eventual improvements in the data system.

The *Guide to the Development and Use of Expenditure and Utilization Data for Health Planning Agencies* was published this spring by BHPRD and is available through the National Technical Information Service (NTIS). It describes how and why it is important to prepare expenditure and utilization profiles. It is written for use by both HSA's and SHPDA's, although it is expected that more State agencies will have the resources to begin such profiles in the near future.

The expenditure profile, depicted in figure 2, is essentially a table that plots sources by uses of funds (funds flow). The categories used are adapted from

those in the National Health Expenditures Series. The utilization profile, outlined in figure 3, is organized by the expenditure categories and includes measures of the volume of health services delivered. This approach differs from a strict funds-flow study in the incorporation of utilization information to highlight the volume and type of services purchased, such as the breakdown of inpatient vs. outpatient hospital services.

These two profiles format information to address three basic questions:

- What does an area spend on health care?
- What quantity and types of services are purchased?
- Which sources of funds provide the health dollars?

All major categories of health services are included in the profiles. While the expenditure categories are broad, they are explicit and consistent with other classification systems in use and represent the most feasible taxonomy of health services for the purpose of assembling financial data. For example, neither third parties nor health providers can supply estimates of expenditures in the services/settings taxonomy of health services recommended for use by the health planning agencies. Further refinement of the expenditure categories is one of the *Guide's* principal recommendations, for it is only when service units are well-defined and easily identifiable that measures of service use can provide a link between health inputs, such as dollars, and health outputs, such as health status measures.

The *Guide* itself was prepared over a 5-month period. Much of the methodology reflects the content of the ASTI course on funds-flow given by Harvey Zimmerman. The limited availability of health expenditure data has constrained refinement of the state of the art for these kinds of financial studies. We consider the *Guide* to be a working document that should be updated to reflect changes in the data base and the need for different kinds of information and to incorporate suggestions from those that implement the profiles. This is just one of the many steps necessary to increase awareness of the need for improved financial information in the health care sector.

Uses of the Data

This section of the paper will cover potential uses of the expenditure and utilization profiles. The discussion will deal with three general types of profile use:

- as a framework for structuring data collection,
- as an aid in plan development, and
- as a tool in project review and evaluation.

Public Law 93–641 requires that health planning agencies determine the extent to which the system of health services and the health status of the State or area residents have improved and the extent to which increases in the cost of health care have been restrained. Although this information would be valuable, there is no commonly used methodology for collecting the data, nor for monitoring system-wide changes that may occur as a result of health planning. To assess the success of health planning in meeting its objectives, a system for documenting health expenditure, service utilization, and health status data should exist.

The profiles discussed here could help to meet this need. The profiles can form a framework that will help to structure data collection efforts, as they inventory the entire spectrum of health services using definitions that can be made comparable across States or areas. They can, therefore, form a basis for comparison with other States, areas, the Nation, or within an area over time. Figure 4 illustrates a comparison of Rhode Island, Northeast Florida, and national expenditures for ten categories of health services and supplies. Both per capita and percentage distribution of health dollars are presented. Such a comparison raises questions such as: Why does 45 percent of Rhode Island's health care dollar go to hospital care vs. only 41 percent nationally and 40 percent in Northeast Florida? Although comparisons will not indicate which are the most desirable expenditure or utilization figures, they can begin to show how areas differ and to raise questions for further inquiry. As planners seek to reshape the system of health care, their efforts can be monitored through data collected for the profiles, beginning from the baseline established by the first set of profiles. In this way, changes in health expenditures and utilization can be monitored over time.

Production of the profiles will involve different degrees of effort in various States or areas. Most will require extensive data collection procedures and in the process will uncover many inadequacies in current information systems. It is important to recognize that such data problems will not be unique to health profile development and will be faced in any system of data assembly.

In addition to providing a general framework, the profiles can help accomplish tasks necessary for plan development. The process of profile production will inventory the entire spectrum of health services in a State or area, and, in so doing, will describe areawide patterns of health expenditures, funding, and utilization. This will aid in the identification of the basic relationship between health services. For example, how many dollars are spent on hospitals relative to expenditures on physician services and total expenditures? Agencies that are interested in exploring the sources of funding for various types of health services will be able to document the current funding pattern in relation to a projected future funding allocation, such as a shift from State and local funding to Federal funding for specific types of health services.

If data are organized on a geographic or population group basis, the profiles could serve to highlight

urban/rural differences or other equity issues. Figure 5 summarizes some of the findings of the Rhode Island child health studies mentioned earlier. Profiles organized in this manner facilitate planning for specific population groups. Questions are raised such as: Why do the expenditures of various socioeconomic groups vary? Are certain groups not using health services? Are public sources of funds reaching targeted service or population groups?

Although the *Guide* does not specifically address the assembly of health status profiles, health status information is integral to the development of a system of health accounts. Health planning agencies are currently collecting health status data and should consider developing health status profiles to be used in conjunction with expenditure and utilization profiles. While an analysis of the effects of health service utilization on health status requires special epidemiologic studies, the profiles can help identify groups with health status problems or excess or below-average utilization and present such findings in relation to expenditures made by the group. Organizing data in such basic profiles can highlight problem areas, thereby forming the basis for goal and objective statements in the health plan.

The profiles, by depicting the health care system as it exists, including its use and costs, can help set the broad policy upon which project review and program evaluations are based. The use of an expenditure profile as a framework and common reference point for analyzing the fiscal impact of programmatic changes is reported by the staff of the Massachusetts Office of State Health Planning as the most important function of funds-flow information. In a statement describing the value of funds flow, that staff said that the evaluation of the financial feasibility of alternative actions is facilitated by funds-flow information which provides an indication of costs involved in gross changes in expenditure categories, such as hospitals or nursing homes, and suggests the rough impact of such cost changes on State, local and Federal sources of funds. Funds flow information was used in this way in Rhode Island, in the design of that State's catastrophic health insurance program.

Both the expenditure and utilization profiles can serve to inform consumers and providers about the cost of health care, to raise questions regarding the sources of funds for new programs, and to focus attention on the question of what we are willing to pay for which types of health services. These data can dramatize the reality of limited resources, the need for eliminating unnecessary services, and the need to make trade-offs among alternative proposals. Areas that have produced local estimates of health care expenditures report that their figures have been used by politicians, medical societies, hospital associations, research groups, newspapers, and human service agencies.

To summarize, health planning agencies can benefit from both the process of collecting and assembling health expenditure and utilization information and from a review of the actual numbers. The process will allow specification of the inadequacies of current information systems and suggest strategies to improve those systems. Because the process requires that attention be given to the full range of health services, it may facilitate a health planning approach that considers all components of the delivery system and their possible interrelationships.

A review of the actual health expenditure and utilization figures will highlight areas in need of attention (such as excessively high hospital admission rates) and provide information for the development of policy alternatives (such as the cost of including coverage for nursing home care in a catastrophic health insurance program). As information becomes available from a variety of areas over a number of years, more detailed studies of expenditure patterns will be possible, such as an examination of the relationship between per capita income and health expenditures. Local health planning agencies can use cross-sectional data to explore reasons why their area's expenditures differ from a national average or a similar community. Time series data can assist such agencies in predicting future needs and may identify areas where cost controls are most necessary. Both kinds of data can be used to assess which components of health expenditures are fairly consistent and which exhibit sizable fluctuations in both price and utilization.

Findings of past studies indicate substantial differences between per capita health spending in different States and localities and the national average. The availability of locally-based data will allow HSA's and SHPDA's to respond to the real situation in their communities, rather than assuming that their expenditure patterns mimic the national profile. Information on these communities will indicate the variability in expenditure patterns that make up the national average, which should have implications for policy making at the Federal level as well.

The expenditure and utilization profiles herein described are a first step in the evolution of a more comprehensive description of the health care system. Before we can design policies that can help shape the future health delivery network into a more efficient, effective and equitable human service system, we must better understand that system as it exists today.

Figure 1

A Prototype Framework For A System Of Health Accounts

INPUTS[1]

Demographic Characteristics	Utilization of Services									Manpower							
	Physician Services		Dental Services		Nursing Visits		Hospital Admissions		Etc.	Physicians		Dentists		Nurses		Etc.
	No.	Rate	No.	Rate	No.	Rate	No.	Rate		No.	Rate	No.	Rate	No.	Rate	
Age																
Sex																
Race																
Education																
Etc.																

INPUTS[1]

Demographic Characteristics	Facilities—Beds								Expenditures					
	Hospitals		Nursing Homes		Homes for Aged		Etc.	Total	Public			Private		
	No.	Rate	No.	Rate	No.	Rate			Federal	State	Local	Insurance	Out-of-Pocket	
Age														
Sex														
Race														
Education														
Etc.														

OUTPUTS

Demographic Characteristics	Mortality		Morbidity, by Cause				Disability			Persons with Impaired—								
	No. of Deaths	Rate	Incidence		Prevalence		Days Lost		Etc.	Hearing		Eyesight		Mobility		Feeding Capacity		Etc.
			Cases	Rate	Cases	Rate	No.	Rate		No.	Rate	No.	Rate	No.	Rate	No.	Rate	
Age																		
Sex																		
Race																		
Education																		
Etc.																		

[1]Some inputs may be difficult to cross-classify against certain demographic variables. Such classification problems must be resolved in further development of the basic concept.

SOURCE: Committee to Evaluate the National Center for Health Statistics, *Health Statistics Today and Tomorrow,* Vital and Health Statistics Series 4:15, September 1972.

Figure 2

National Health Expenditures, by Type of Expenditure and Source of Funds, Fiscal Year 1976

Type of Expenditure	Total	Source of Funds					
		Private			Public		
		Total	Con-sumers	Other	Total	Federal	State and local
		[In Millions]					
Total	$139,312	$80,492	$75,622	$4,870	$58,820	$39,863	$18,957
Health Services and Supplies	131,022	77,722	75,622	2,100	53,300	36,247	17,053
Personal health care	120,431	72,013	70,457	1,556	48,417	33,683	14,735
Hospital care	55,400	25,004	24,352	652	30,396	21,394	9,002
Physicians' services	26,350	19,718	19,700	18	6,632	4,884	1,748
Dentists' services	8,600	8,131	8,131	.....	469	288	181
Other professional services	2,400	1,607	1,559	48	793	540	254
Drugs and drug sundries	11,168	10,144	10,144	.....	1,023	550	474
Eyeglasses and appliances	1,980	1,866	1,866	.....	114	61	53
Nursing-home care	10,600	4,744	4,706	38	5,856	3,417	2,439
Other health services	3,933	800	.....	800	3,133	2,548	585
Expenses for Prepayment and administration	7,336	5,709	5,165	544	1,627	1,322	306
Government Public Health activities	3,255	.....			3,255	1,243	2,012
Research and medical-facilities construction	8,290	2,770	.....	2,770	5,520	3,616	1,904
Research	3,327	258	.....	258	3,069	2,818	251
Construction	4,963	2,512	.....	2,512	2,451	798	1,653
Publicly owned facilities	1,673	.....			1,673	37	1,636
Privately owned facilities	3,290	2,512	.....	2,512	778	761	17

SOURCE: R.M. Gibson and M.S. Mueller, "National Health Expenditures, Fiscal Year 1976," *Social Security Bulletin,* 40:4 (April, 1977), Table 3, p. 9.

Figure 3

Utilization of Health Services Profile

Expenditure Categories	Measures of Utilization							
	Patient days	Admissions	LOS	Number of persons served	Number of visits	Number of units of Service*	Number of Products	Other
A. Hospital services								
1. Inpatient	X	X	X	X				
2. Outpatient				X	X			
B. Nursing homes	X	X	X	X				
C. Physician services				X	X			
D. Dentist services				X	X			
E. Other professional services				X	X (by type practitioner)	X (x-rays lab tests)		
F. Drugs							X (prescriptions filled)	
G. Eyeglasses and Appliances							X (eyeglasses sold # appliances sold, by type)	
H. Government public health activities				X	X (by type)	X (eg. lab tests, x-rays)		
I. Other health services				X	X (by type)			

*Type of Service/product unit to be specified in each case

Figure 4

Per Capita and Percentage Distribution of Personal Health Care Expenditures by Type of Expenditure, 1973: United States, Rhode Island, Northeast Florida

Expenditure	U.S.		R.I.		Northeast Fla.	
Categories	Per Capita	Percentage	Per Capita	Percentage	Per Capita	Percentage
Hospitals	$178.88	41.4%	$222.68	45.0%	$170.64	40.0%
Physicians	85.07	19.7	78.60	15.9	95.72	22.4
Dentists	27.90	6.5	29.63	6.0	32.09	7.5
Other Professionals	8.88	2.1	12.62	2.5	10.25	2.4
Drugs & Sundries	43.47	10.1	62.81	12.7	51.24	12.0
Eyeglasses and Appliances	9.77	2.3	9.77	2.0	10.23	2.4
Nursing Homes	32.95	7.6	32.60	6.6	15.88	3.7
Prepayment and Administration	18.68	4.3	21.26	4.3	13.54	3.2
*GPHA	8.90	2.1	11.60	2.3	18.80	4.4
Other Health Services	17.03	3.9	13.70	2.8	8.72	2.0
Total**	$431.55	99.9%	$495.29	100.1%	$427.11	100.0%

*Government Public Health Activities
**Errors in percentages due to rounding.

SOURCES: "Health Expenditures in Rhode Island: 1973," 1976, p. 9 and *Health Care Dollar Flow Study/1973,* 1975, p. 29.

Figure 5

Selected Measures of Health Care Expenditures, Service Utilization and Health Status for Rhode Island Children, Age 0–4 by Socioeconomic Status, 1972

	Expenditures	Utilization		Health Status
Socioeconomic Status	Per Capita* Expenditures	Hospitalization Rates/1,000 pop.	Mean Number of Physician Visits**	Mortality Rates (Deaths/1,000 pop.)***
High	$171.63	73.52	3.47	2.76
Middle	$192.96	89.83	3.87	3.22
Low	$220.26	123.71	3.66	4.30
Poverty	$389.54	216.83	2.81	6.72
Total	$221.47	105.73	3.62	3.72

*Based on 1970 Rhode Island 0–4 population: High SES—18,825; Middle—29,275; Low—21,687; Poverty—6,249; Total—76,036.
**Includes physician visits in all settings (e.g. physician office, emergency room, health center).
***Based on three-year average (1971–1973); total of 849 deaths.

SOURCES: Studies of Rhode Island Children by S. Martin, C. Clay, N. Russell, P. Densen, Harvard Center for Community Health and Medical Care, 1976.

ESTIMATING HEALTH EXPENDITURES AT THE LOCAL LEVEL

Karl W. Bredenberg, *HSA of Northeast Florida, Jacksonville, Florida*

To do a precise job of estimating health expenditures at a local level can be a very difficult job and in some ways more difficult than doing it on a national or State basis.

I think this can be illustrated by the *Guide on Health Expenditures for HSA's* published by HEW. The reaction I've had from many HSA people is that they do not have the time or the expertise to develop an acceptable product and are scared off at the prospects of a major project.

In Northeast Florida we have been estimating health expenditures yearly since 1972 and we labored long and hard to acquire useful and reasonably accurate data. We have updated the estimates yearly and have now developed sources of data and shortcuts which provide a very useful product without spending too much of our manpower.

If an HSA has the resources to do a comprehensive study of health expenditures in its area, I would certainly recommend that they use the *Guide* to obtain as much information as possible. But I think it should be emphasized that there is another alternative. An HSA can develop a very useful profile of health expenditures for its area without the expenditure of a great deal of manpower. It may not be as complete as they may like it but it can be a statement that can be refined, improved and made more precise as time goes on, enhancing its value to the HSA.

An analysis can be made of some categories of expenditures where information is most readily available moving on to other categories as information and expertise is acquired.

Hospital Expenditures

To develop estimates for the biggest part of health expenditures is relatively simple. Hospital expenditures represent 40 percent of all health expenditures and 46 percent of personal health care expenditures. The primary source for hospital expenditures is the American Hospital Association's annual guide which is issued in September. This lists total expenses for most of the hospitals as well as other information. When information is incomplete, a call to the hospital administrator or an estimate based on bed count and the average daily cost per patient day can fill the gap.

Physician Expenditures

Local agencies receive from Health Care Financing Administration a listing showing Medicare expenditures for the residents of each county. According to national data from the Social Security Administration, 77 percent of Part B expenditures nationally are identified as expenditures for physician services. By comparing the per enrollees cost of Part B nationally with the county figure, an index figure can be developed which in our experience will produce the best estimate available for estimating expenditures for physician services. Our experience in Northeast Florida was that this produced better results than the methods recommended in the *Guide.*

For 1976 the reimbursement under Part B per enrollee nationally was $196.56. Let's assume that the reimbursement per enrollee locally was $186.76 or 95 percent of the national average. This same percentage is applied to the national per capita expenditure for all ages which in 1976 was $120.67. Ninety-five percent of the national average results in a local estimate of $114.64 per capita which when multiplied by the population provides an estimate of total expenditures.

Better yet, we go to the article "Age Differences in Health Care Spending" by Bob Gibson, Marjorie Mueller, and Charles Fisher, issued in July 1977. This shows the per capita costs by three major age groups. By applying the same index figure to the per capita expenditure for each age group and multiplying by the estimated population in each such group, the agency can compensate for differences in the age structure and come out with a better estimate.

Dentists' Services and Other Health Professionals

Our experience has shown that the same index used for physician services can be used in an area for dentists' services and for other health professionals. As a check on this, however, I believe it is well to count the number of dentists practicing in the area and the number of specialities represented, comparing this with national data. IRS data for 1974 shows the average receipts for dentists by State. A caution here is that Health Service Areas in each State vary widely. For example, our area is far different from the Miami area or Central Florida. IRS data also shows that there were 4.1 dentists per 10,000 population practicing in the U.S. If the number in the area is different from this, appropriate judgements need to be made: One note to keep in mind is that the gross receipts of dentists tend to be higher than physicians because of their higher overhead, i.e., 54 percent for dentists and 42 percent for physicians, according to IRS data.

So far we have accounted for two-thirds of all health expenditures and three-fourth of personal health care expenditures.

Nursing Home Care

We are fortunate in Florida in that the State office which administers Medicaid provides us with information regarding nursing home expenditures.

Where information is not available from the State, sometimes a phone call to the administrator of a nursing home gets the information. Where this doesn't work, a call for information about their charges per day, week, or month can be secured. Multiplied by the bed count and/or patient days, this will provide a good basis for an estimate.

Drugs, Drug Sundries

Each year *Sales Marketing Management Magazine* computed for each county information regarding drugstore sales. The 1977 issue of *Survey of Buying Power* is dated July 25, 1977. From census studies we learned that 38.2 percent of drugstore sales in our area were for drugs and drug sundries. On the other hand, the Department of Commerce estimates that 54.8 percent of drugstore sales are accounted for by drugs and drug sundries.

Eyeglasses and Appliances

I have assumed that the more optometrists and opthamologists there are, the greater will be the expenditures for eyeglasses. According to IRS publication 438(7–77), there were 7.55 optometrists per 100,000 population in the U.S. According to the AMA, in 1974 there were 4.1 opthamologists practicing in the U.S. per 100,000 population. By comparing the local count with national data, you can get a good estimate of the local expenditures as compared to national. Also, if advertising of eyeglass prices is forbidden in the State and the national discount eyeglass chains do not do business in the area, the price per unit is likely to be up to 25 percent higher.

For appliances, prosthetics, rentals of hospital equipment, etc., I'd suggest a count of suppliers in the area and a general estimate based on size of the establishments, etc. Very likely expenditures for this type of equipment will be proportionate to the costs of drugs.

Other Health Services

This covers all personal health expenditures not included above. This requires more effort for the results obtained. It is necessary to check on variety of sources such as the United Fund, the Chamber of Commerce for industrial inplant services, home health agencies, etc.

Government Public Health Activities

Obtained from budgets of local and State agencies.

Expenses for Prepayment and Administration

A valuable source for this information is the article by Marjorie Mueller entitled *Private Health Insurance in 1975,* published in the Social Security Bulletin in June 1977.

For determining governmental costs in this area, I'd suggest using national per capita data and making modifications based on knowledge of local conditions: for example, the percentage of persons on Medicare in the area compared to national averages.

Research and Construction

Most of this can be obtained from HSA files on Certificate of Need actions and from the agency which does the A–95 reviews.

Source of Funds

Among the readily available sources for information on who pays the bill are:

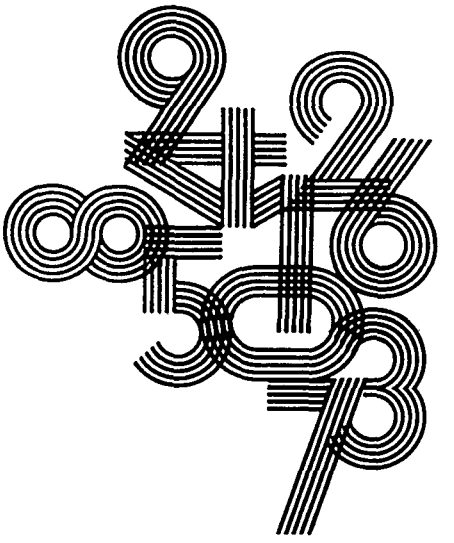
- Medicare statistics by county for 1976.
- Medicaid data from the appropriate State agency.
- Budget data from local government.
- *The Source Book of Insurance Data* (Health Insurance Institute, 277 Park Avenue, New York, New York 10019)—for insurance coverage on a State basis for various health expenditures.
- Spot check of hospitals for sources of payment. From the same information you can get some idea of private insurance as it applies to physician services.
- Local medical society and dental society to get estimates of sources of payments.

Where information is unavailable, using the national per capita figures will provide a starting point. Then by analyzing the local information in comparison with national data for those categories for which information is available, a reasonable estimate can be made not only of the expenditures but also of the sources of the funds.

Time does not permit the description of methods to be used in analyzing expenditures in greater depth. However, once an initial analysis is made, rough though it may be, it can be of immediate use. Information from various sources are received from time to time. An active file should be maintained to gather this material and make modifications of estimates on a periodic basis.

I feel that it is most helpful to do an annual analysis to study the trends from year to year. Using AHA data, Medicare statistics, the national study and agency data, if nothing else, very useful information regarding the trend of health expenditures can be developed. As time goes on, the HSA can gather data with greater ease and can determine what items need to be explored in greater depth. The HSA can make decisions as to those items which would provide the greatest payoff and other areas of expenditures where greater expenditures of time may not be fruitful.

I would urge that the Health Care Financing Administration make more information available regarding reimbursement for various types of services such as home health care, nursing home care, etc. I hope that the National Center for Health Statistics can do even more to provide data on a county and State basis that is both timely and meaningful. The issuance of the guide for estimating health expenditures will make the job easier. I would recommend that on a regular basis, information be sent to HSA's on newly available data, sources of information, suggestions on methodology, etc. If we are to do a meaningful job on a local basis on cost analysis and cost containment, we need to be fed a continuous flow of data. It makes more sense to have much of it done by one organization than separated by 200 plus agencies with very limited resources.



CONCURRENT SESSION F

Multiple Causes of Death

INTRODUCTORY REMARKS

Deane L. Huxtable, *Director, Bureau of Vital Records and Health Statistics, Richmond, Virginia*

Today, we are to discuss the medical certification of cause of death with emphasis on multiple case data and its utilization.

But first, I wish to call your attention to a horrible mistake that has been made on the agenda that should be corrected. Do you all have a pencil? It seems that the word "chairperson" has been used; whereas, it should be "chairman."

Before this thing was printed, I sent Dorothy Rice a resolution from the National Parliamentarians which said, in effect, that the word "chairman" was an honorable title like "President" or "Secretary." The word "chairperson" was contrived, and if you wish sex distinction the terms "mister chairman" or "madame chairman" are correct.

Dorothy sent it on to the Conference Management Branch, saying "Isn't that cute?" This all led me to compose the following:

> Oh, to be a "chairman" again,
> I've been scrubbed at the stroke of a pen,
> I simply don't buy it,
> I won't even try it,
> Dear Dorothy—Bring back the manhood to men!

On behalf of the research community, this morning's subject has been near and dear to NCHS's activities. It has helped lead to the development of ACME. I'm sure that you all know that ACME means "Automated Classification of Medical Entities."

NCHS has been coding multiple causes of death on a continuing basis since data year 1968. These data are coded in a manner that assigns the most precise and descriptive ICDA–8 code to *each entity* on the death record with minimum regard to other entities in the cause-of-death statement. This practice in coding is utilized for two reasons. First, an overall objective of the multiple cause-of-death coding and data processing is to determine the traditional underlying cause of death through computer applications as a byproduct of multiple cause-of-death coding. The precision of each entity must be maintained in order to apply the international rules for selection of the underlying cause of death. Secondly, high priority is placed on preserving in data processing form the order and character of the original certification for indepth study of diseases, impairments, and injuries.

At the present time, seven States are producing multiple cause-of-death data through CHSS contracts. NCHS and some of those States have done some work in analyzing, interpreting, and publishing these data. Three reports will be given on this topic during the session.

ICD–9 will be implemented in January 1979 at which time new rules and computer systems will be put into use in NCHS and seven States for producing multiple cause and underlying cause data. Highest priority is placed on developing these systems and having them ready for use on schedule in 1979. An aggressive program is underway to develop software systems to tabulate, store, and retrieve multiple cause data. NCHS plans to disseminate multiple cause data through statistical tables, technical reports, and release of data tapes.

The goal is to have systems developed and tested on a schedule that will allow release of initial multiple cause data tapes by December 1978. The first tapes to be released will be the most recent data year completed. Plans call for working back from there to produce multiple cause data tapes for all years back to 1968. ICD–9 data are expected to be released on the same current schedule as that on which underlying cause-of-death data are released.

After conversion to ICD–9 is completed for NCHS and the seven CHSS States, NCHS will undertake an active program to expand multiple cause data production to as many States as possible. Hopefully, a number of CHSS contracts will be modified for data year 1980 to include multiple cause data.

USES OF MULTIPLE CAUSES OF DEATH DATA IN NORTH CAROLINA

Charles J. Rothwell, *Head, Public Health Statistics Branch, North Carolina Division of Health Services, Raleigh, North Carolina*

Introduction

The concept of using multiple causes of death to describe a mortality event is not a new idea. In a way, we have been doing it all along. For years certificates have collected multiple conditions contributing in some manner to death. For years nosologists have been using decision rules based on multiple conditions, to determine the one underlying cause that best depicts the event. For years epidemiologists have gone back to the original death certificate to examine all listed conditions.

Yet during this time, little has been done with the analysis of multiple causes listed on the certificate. It is somewhat amusing that an event not directly related to the problem of the tabulation of multiple cause data brings us quite close to the reality of multiple cause analysis. ACME, developed under contract for NCHS, is a software system that determines the underlying cause of death. The input to the system are ICDA codes depicting all conditions listed on the certificate. The output is the ACME computed underlying cause of death. The intent of the system was not to develop multiple cause files; its aim was to standardize the method of determining the underlying cause of death and hopefully to reduce the coding time of nosologists. Yet ACME's biggest contribution may be a by-product of the system. Along with the ACME computed underlying cause, there is also the list of ICDA codes of all mentioned causes. Thus, ACME produces, albeit not in a very usable form, a machine-readable image of the morbid conditions listed on the certificate. This by-product of ACME gives us the opportunity to better depict the complexities of the disease process and the hidden impact of contributing causes of death such as diabetes, hypertension and arteriosclerosis.

North Carolina first sent NCHS vital statistics tapes under contract with the Cooperative Health Statistics System in 1975. At that time we decided to use the ACME system to determine the underlying cause of death. It soon became obvious to us that ACME was not going to save time of our nosologists and that its major potential benefits would be in the areas of consistent assignment of the underlying cause and the availability of multiple cause data.

North Carolina Experience

The first step that was taken by us in the use of multiple cause data was to advertise to our data users that these data were available. We were not overwhelmed with inquiries concerning this data file!

Infectious Disease Listings

The first request for work on the multiple cause file was from our Epidemiology Section. For years we had created listings of certificates that had an *underlying* cause of death in certain infectious disease categories. The request was a natural extension of this listing in that we created a new report of certificates that had any mention of these infectious diseases. This proved to be a more valid report, since the epidemiologists were not necessarily interested in whether a certain disease was the underlying cause, but just whether it was a contributing factor at death.

Public Health Planning

The Chronic Disease Branch of our State health agency sponsors various detection and treatment programs in such areas as hypertension and diabetes. In the disbursement of scarce funds to support these programs, health officials have used a variety of factors to determine "need" on a county-by-county basis. Unfortunately one of these factors was the underlying cause of death data.

Using the underlying cause of death masks the insidious nature of such diseases as hypertension, arteriosclerosis, diabetes, etc. Only 201 deaths were attributed to hypertension in 1976 for North Carolina; yet 4,150 deaths listed hypertension as a contributing factor. Only 579 deaths were attributed to arteriosclerosis in 1976 for North Carolina; yet over 8,100 deaths listed arteriosclerosis as a contributing factor. Thus, if planning for future health initiatives in the area of chronic disease uses mortality data as a measure of health status, then serious consideration should be given to the use of multiple cause data. At this time our Chronic Disease Branch is using these data.

Mapping of Multiple Cause Data

Each year the Public Health Statistics Branch publishes an atlas on county population, health care resources, and the leading causes of mortality. This publication contains over 60 computer generated maps,

associated tables, and narratives. In the atlas is a section on multiple cause data that includes

- discussion of hypertension, arteriosclerosis, diabetes and alcohol related deaths relative to multiple cause data;
- maps depicting incidence rates of hypertension, diabetes and arteriosclerosis at death;
- cross-tabulations of underlying causes of death and all conditions mentioned;
- discussion of the relevance of multiple cause data.

Public Access of Data

For many years we have offered "public access" tapes on statistical data concerning births, deaths, fetal deaths, matched births/infant deaths, marriages and divorces. The "public access" mortality tapes contain only the standard underlying cause of death. Such a position seems to run counter to what I have been discussing. However, the raw format of ACME multiple cause data is not conducive to easy analysis. ACME generates a 59 character field that can contain any number and combination of 3- and 4-digit ICDA codes, ACME "housekeeping" characters that delineate such things as the placement of the code in the certificate and special characters for "nature of injury" codes and component parts. Instead of placing the raw ACME data on public tapes and letting users struggle with the formatting problems, we offer

- a publication that explains what ACME generates and some software we've developed that reformats the data into a more usable form;
- software that provides two reformatting schemes for the user or if the user requests, he can receive the raw data;
- our own services to undertake multiple cause data analysis for the user.

By the way, this software, written in PL−1, is available to anyone who desires it.

States not Using ACME

Is the use of multiple cause data only for those States that have installed the ACME system? If so, there would be little need for this session! For at the moment, few States have a vital statistics component of CHSS that includes the use of ACME. What alternatives does a State have that wants to use multiple cause data and does not have ACME?

It should be remembered that for those States not using ACME, the National Center codes their cause of death portion of the death certificate using ACME. Thus there exists a multiple cause file of your State's mortality experience at NCHS. Also, NCHS has been using ACME on their mortality files well before CHSS came into being.

In North Carolina we only had available multiple cause data for the period of 1975−1977. We wished to expand our old mortality tape files to include multiple cause data. We asked for and received from NCHS multiple cause data sets back to 1969. We then developed some software to match the NCHS all-condition files with our own demographic and underlying cause files. This matching routine is not an easy process, but it can be done and it is a relatively quick way to build a multiple cause file. One also reaps the benefits of NCHS's expert nosology staff. The match is a three-step process in which the first match is on certificate number. For those records remaining unmatched, a second match is performed on the date of death, sex, race, and county of residence of the decedent. For those records still remaining unmatched, a physical search for the death certificate is undertaken. After the matching process is completed, one then can apply the reformatting software to generate multiple cause files that are more amenable to data manipulation. Again, we offer the matching routine, written in COBOL, to anyone interested in its use.

Future Work

In North Carolina we have just scratched the surface in the use of multiple cause data. In the past we have conducted studies on the geographical patterns of mortality experience in North Carolina and possible associations between these patterns and social, economic, and environmental factors. The geographical units studied have either been counties or cities exceeding 10,000 in population. A natural extension of this work will be to use multiple cause files in place of our traditional underlying cause files. We also need to examine chronic disease incidence from multiple causes on an age-specific basis. Work also needs to be done on age/race/sex adjusted rates for counties and major cities using multiple causes. We need to do further work when examining statistical associations between reported diseases. Multiple cause data needs to be examined to determine the joint probabilities of occurrence of diseases being studied. The first step is to develop cross tabulations on all conditions mentioned on the certificates.

Additional work needs to be done in multiple cause data to identify if there exists any recognizable and often reported "string" or grouping of contributing factors surrounding certain deaths. If so, then such a "string" of factors should be reported as a distinct type of mortality event. We also need to determine how to classify or group "general" disease categories. Is it necessary to classify multiple cause data in the same manner as underlying cause of death data? For example should we classify hypertension as any mention of codes 400, 401 and 403 or should we be more liberal and include other codes that mention hypertension as a factor? We also need to make researchers more aware of multiple cause data and what such data have

to offer. We have extolled the virtues of using underlying cause of death data for such a length of time that we may have either completely converted researchers or driven them away from the use of mortality data. I believe we must initiate a vigorous re-education effort relative to the advantages of multiple cause data.

At this time, we are in the process of examining statistical associations between occupation and industry of the decedent and the multiple cause files. This project is not only necessitating a major coding effort of occupation and industry data, but also the use of the previously mentioned matched NCHS/NC multiple cause files for years 1969–71. This time horizon was chosen due to its close proximity to the census and thus, hopefully, more reliable estimates of the population at risk. Again, we plan to use multiple cause data because we feel that possible associations between occupation, industry and types of diseases dictate the examination of all contributing factors at death.

Multiple Causes—Problems—Challenges

I will talk briefly on only one problem with using multiple cause data, due to the subject matter of the next speaker's presentation. It has been argued that an inherent danger in using multiple cause data in examining geographic patterns is that these patterns may be an artifact of varying reporting conventions of certifiers. Similarly, it has also been argued that the underlying cause of death may be the most appropriate measure for a mortality event, because there is at least enough information on the certificate to assign an underlying cause.

First let me say that rates developed from multiple cause data will at worst be conservative. That is, certifier variability will only have an effect in the failure of reporting all factors contributing to death and not in the direction of reporting factors that did not exist.

More importantly, multiple cause files can be used to strengthen our weakest link in mortality reporting. In North Carolina we spend a great deal of time making the files "look good." We do this by extensive edits and follow-up on missing or inconsistent data. However, one area, the cause of death section, has been considered sacrosanct. Whatever the certifier puts down, we accept. Multiple cause files give us the opportunity to have a machine readable image of the certifier's response and this can allow us a better capability to match these responses with medical records of the decedents. This type of study could uncover items that certifiers have trouble in reporting and could be a first step in initiating refresher courses for certifiers. Naturally, the strengthening of the cause of death reporting would have a positive effect on the perceptions of researchers in the usefulness of these data.

Conclusion

I believe NCHS as well as the statistical staffs at the State level all make a strong attempt at insuring the accuracy and precision of their data files. We are now in a period of time that deaths are not due to single, catastrophic types of diseases, but in many cases are the culmination of an interwoven chronic disease process. We are not just interested in the culmination of each event; we are also interested in what leads up to each event. To depict a complicated disease process by a single code is not only foolhardy but also is diametrically opposed to our efforts in insuring the accuracy and precision of our data.

There are many "housekeeping" problems with using multiple cause data generated by ACME that can cause high levels of frustration. However, the richness and utility of this data source should more than compensate for the frustrations.

Like it or not, the analysis of mortality data will continue to be an ongoing reality affecting the health community. We all have a stake in these statistics, for they form a basis in measuring progress in health care delivery in each State and in the Nation. This measurement process, in the final analysis, equates to the direction of future health care funding. Surely we must insure that these data give the most complete and accurate picture of our mortality experience.

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ACKNOWLEDGEMENTS

Many of my more germane thoughts on the uses of multiple causes of death data have been crystallized by conversations with Kenneth G. Manton, Ph.D., of the Duke Center for Demographic Studies.

PROBLEMS IN INTERPRETATION OF MULTIPLE-CAUSE MORTALITY

Raymond D. Nashold, Ph.D., and Margaret Hollerman[1], *Dept. of Health and Social Services, Madison, Wisconsin*

Multiple-cause mortality coding is certainly an idea whose time has come. Like all such ideas, there are many antecedents. The Office of Vital Statistics has been doing studies of contributory causes of death from 1917 to the present, including a multiple-cause study of over one-half million deaths which occurred in the U.S. in 1955.

In 1948, the Sixth Revision of the International Statistical Classification (ISC) included a suggested form of multiple-cause tabulation. The Sixth Revision also included linkage rubrics for deaths with two causes reported jointly, for example, hypertensive heart disease.

In 1964, Harold F. Dorn and Iwao M. Moriyama asserted "that a single cause, no matter how selected, no longer adequately describes the morbid conditions responsible for a large proportion of deaths."[2]

For the United States, the proportion of deaths listing more than one cause has increased from 35 percent in 1917, to 58 percent in 1955, to 75 percent in 1968. State registrars are aware that this proportion has been increasing. We do not know how much it has increased in Wisconsin; however, in 1975 there were two or more entities coded on 87 percent of the approximately 40,000 deaths. Despite these trends and the decades of interest, very limited multiple-cause analysis has taken place to date.

A new thrust for multiple-cause of death coding began in 1968 when the National Center for Health Statistics (NCHS) began coding routinely all causes on the certificate. A computer program, Automated Classification of Medical Entities (ACME) was designed to select the underlying cause automatically. Wisconsin has been using the ACME system since 1973.

The principal elements of the ACME tape are the certificate number and the cause-codes from the certificate, with the underlying cause separately distinguished and every other code clearly identifiable as coming from a specific line of the certificate. The ACME system places on a data tape all of the cause-codes which can be accommodated in a 59-column, floating-field format. The ICDA codes are of various lengths requiring from three to five columns. Therefore, for any one death record, a specific cause, with the punctuation to help in identifying its location on the death certificate, may begin or end in almost any of the 59 allotted columns. For this reason, it is difficult to edit the ACME tape in order to identify errors in transcribing or keying the codes. Furthermore, in a few instances, because of space limitations, some causes on very long records may have been omitted.

In order to produce summary tables from the ACME tape, it is necessary to collapse categories of data. There are peculiarities of multiple-cause data that must be noted when this is done. Notably, underlying causes and associated conditions behave differently when they are summarized from a detailed classification into broader categories. The number of underlying causes will always remain constant regardless of how finely the disease categories are broken down, because there is only *one* underlying cause per death. The underlying causes are merely dispersed by fine classification. When they are gathered up into broader categories, the total number will be the same as if they had been coded according to the broader categories in the first place.

For the associated conditions the case is quite different. The number of associated conditions is maximally counted when the most detailed classification, that is, the 4-digit ICDA code, is used. If causes are tabulated by 4-digit codes and these frequencies are then summed to 3-digit codes, the total number of separate diseases or conditions which will be counted will be 2 to 3 times greater than if they had been classified according to 3-digit codes initially.

Another way of describing this problem is to say that any summing up of causes classified in one scheme into another scheme at a higher level of generalization retains the frequencies associated with the lower level of generalization. This frequency is then always larger than that which would have resulted from the use of the more general classification.

Because of the floating-field layout of the ACME tape, it was difficult to develop programs to tabulate the data. Therefore, in Wisconsin we began to use a program that was developed by our neighboring State, Iowa. This program reads the tape and creates a two-dimensional cross-classification of underlying causes with the frequency of associated conditions. Categories are then collapsed into a 78 x 78 matrix; however, the resulting table still requires 10 pages for publication, excluding a key or any interpretation. This table also presents a number of difficulties to those who seek understanding of the multiple-cause data it contains. Iowa recognized this and now produces essentially a listing of underlying causes by frequency of associated conditions.

To illustrate the problem of using the 78 x 78 table, let us consider a single 3-digit code, 250, diabetes mellitus, which in Wisconsin in 1975 accounted for a total of 761 underlying causes and a total of 3,198 diabetic conditions listed as associated. A total of 859 of these conditions occur in association with the 761 deaths;

therefore, diabetes is counted more than once for the same death. The 3-digit code for diabetes contains only two 4-digit codes, but these may appear with each other and/or with other codes in seven unique combinations involving acidosis, coma, gangrene, nephropathy, neuritis, neuropathy and retinopathy. A given diabetes patient might have more than one and sometimes two or three of these conditions at the same time. Such multiple counting does not provide us with very useful information once all the counts are summed into the 3-digit code "250." Rather, it creates an exaggerated picture of the extent to which diabetes is reported. That is, the table provides a tabulation of *causes,* not *deaths.* The ratio of 3,198 to 761, or 4.2 to 1 merely describes the number of associated versus underlying diabetic syndromes present in patients with various causes of death, including diabetes, but it does not describe the number of deaths in which diabetes was present but *not* the underlying cause of death in comparison with the number in which it *was* the underlying cause. To accomplish the latter, all mentions of diabetes for a single death ought to be counted as a single mention, and counted once, either as an underlying cause or as an associated cause, but not in both categories.

In 1976, Manton and Associates used ACME data for North Carolina to analyze the role of associated causes in death. They experimented with what they called "cause elimination" and "pattern elimination", but these patterns overlapped because all deaths in which a disease appeared were considered part of the "pattern" of that disease.[3] Manton's group was aware of this overlap, and even demonstrated that it existed and had an effect.

In Wisconsin, Margaret Hollerman of the Bureau of Health Statistics and Shu Chen Wu, Research Assistant in the Department of Statistics at the University of Wisconsin, began additional multiple-cause mortality analysis this year with the intent of producing more useful summary tables for the State and for Health Systems Agencies.

Death data for 1973 through 1976 were retabulated using only 251 categories instead of the approximately 2,500 4-digit codes. All causes falling into any one category are combined into a single cause, classified either as underlying cause or as not underlying cause. The cause of death codes were placed into 15 fixed fields, while preserving the syntax of the original ACME tape. To make editing possible, each type of symbol or combination of symbols is assigned to a given part of the field. There is also a 35-column field on the reformatted record, in which the entries indicate how many causes of each type appear in each line and part of the cause certification, making it possible to address causes by type or by their place in the sequence. Editing for illegal codes or for illegal punctuation is carried out by an edit program applied to the reformatted tape.

Returning to the diabetes example, this approach produces a ratio of 2.75 mentions of diabetes when not underlying cause, to one mention as underlying cause. This is substantially lower than the ratio of 4.2 to 1 computed by using the earlier approach that generates the 78 x 78 table.

Essentially, our new tabulation is similar in form to that outlined in the Dorn paper published in a National Cancer Institute monograph.[4] Such tabulations are more useful than those that involve multiple counting because they unequivocally identify the number of deaths associated with a given type of associated or "contributory" cause. A cross tabulation using such unequivocal categories would be of even more interest, because it would identify the underlying causes with which associated causes were actually associated. We are now working on this tabulation. It is important that such a tabulation consist only of "prime cells"—cells which contain frequencies each of which represents only one death. If summary categories are desired, the data must be retabulated to count as a single cause all causes for a given death which fall within any one of the categories. Otherwise, the problems inherent in the earlier approach would reappear.

Before closing, a final comment on the significance of multiple-cause mortality analysis. The existence of other conditions of a serious nature in persons who are listed with a given underlying cause of death has a bearing on the construction of life tables. Taeuber pointed out that elimination of cancer would not extend life expectancy enormously, as others had previously assumed, because persons who did not die of cancer would be subject to other competing risks.[5] Various authors have developed the mathematics of this problem. Keyfitz calculated the exact increase in expectation of life at birth and at age 60 associated with a 1-percent decrease in mortality for each of 12 categories of disease which cover all death.[6] Overall, the increase in expectation of life amounted to only slightly over three-tenths of 1 percent at birth and less than seven-tenths of 1 percent at age 60, with the increments of each of the 12 categories running roughly at one-tenth or less of these values.

The multiple-cause data are very revealing of the fact that serious and often fatal conditions coexist with other fatal conditions. The mean age at death has increased over time. The number of persons who die of cardiovascular disease when they also have cancer or some other potentially fatal condition has increased accordingly. It is not merely that a person saved from a cancer death by a timely operation is subsequently exposed to other risks which are "out there." In many cases, cardiovascular disease, for example, may already be present in an early or late stage, so that the "competing risk" is already operating on the person in a direct way.

If we continue to pursue multiple-cause analysis with the energy it deserves, I am convinced we shall finally have "new numerators for old denominators"[7] and know more about causes of death as well.

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[1] This paper was written with Margaret Hollerman, Research Analyst, Bureau of Health Statistics, and is based on her research on multiple-cause mortality now being carried on under a grant funded by the National Center for Health Statistics, Project 230–7B–0587, Raymond D. Nashold, Principal Investigator. Computer programming was done by Shu Chen Wu, Project Assistant and graduate student in statistics at the University of Wisconsin.

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NATIONAL MULTIPLE CAUSE OF DEATH STATISTICS

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Multiple cause of death statistics represent a natural outgrowth and evolution of our basic mortality statistics program, drawing strength from the increased understanding and use of mortality data for health monitoring, planning, and research as well as from our current technological capabilities to process large quantities of complex statistical information. As a natural extension of our existing cause of death statistics program, multiple cause of death statistics will allow us, we believe, to provide better answers to the question that Harold Dorn and Iwao Moriyama raised, "Why do we want statistics on causes of death?"[1] Multiple cause of death data will maximize the use of available diagnostic information, allowing us to examine all of the conditions reported to be associated with a given death, where today we lose much information through our necessary selection of a single condition as the underlying cause of death. Multiple cause of death statistics should also allow us to deal with some of the long-standing objections to the concept of "underlying cause of death."

The growing interest in and demand for multiple cause of death statistics in the United States is partially a reflection of the changing health profile of the United States. As a modern industrialized nation, we have passed through what Abdel Omran described as the epidemiological transition that accompanies socio-economic modernization.[2] A major aspect of that transition to which we are witness in the United States is the increasing prevalence of mortality from chronic disease, in comparison with an earlier era when acute and infectious diseases dominated our mortality profile. In terms of our mortality data, therefore, we would expect to find increasing proportions of deaths to be due to chonic causes and therefore characterized by the coexistence of a number of conditions at the time of death. This would underscore the importance of augmenting our statistical characterization of death along more than the one dimension of underlying cause, and initiating a ongoing national program for the production of multiple cause of death statistics.

HISTORY OF NATIONAL MULTIPLE CAUSE ACTIVITIES

Never in the history of our vital statistics system in the United States has the opportunity been as great as it is now to implement an ongoing program of multiple cause of death statistics. We can take advantage of both our current capability to apply computer technology to the processing of complex mortality data, as well as our previous experience in this area. This history of our previous work in multiple cause data has been described in detail elsewhere,[3] so I shall just touch on some of the highlights.

Five times between 1900 and 1968, we coded more than just a single underlying cause of death. The underlying (or principal) cause of death and one associated cause were coded in 1917, 1925, 1936, and 1940; in 1955 up to five conditions were coded. A single table showing the cross-tabulation of underlying and contributory causes was published without comment for the data years 1917, 1925 and 1940 in the annual vital statistics publications of the United States for the years 1918, 1925, and 1940 respectively. A paper presented to the American Public Health Association in 1923 presented a brief analysis of the 1917 data and strongly recommended additional work on multiple causes of death.

Continued interest in multiple-cause tabulations was stimulated by the Fourth International Conference for the Revision of the International List of Causes of Death. International comparisons of the procedures for selection of the primary cause of death indicated that comparability of death rates could not be achieved on an international basis until there was more knowledge of the contributory causes of death. An extensive study of multiple causes of death was then undertaken for 1936. Two condensed reports arising from these data were published in 1939 and 1940 but they did not contain the full set of tables. Associated causes of death were again coded for 1940 and a table was included in the regular annual vital statistics volume for that year.

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[1] Harold F. Dorn and Iwao M. Moriyama, "Use and Significance of Multiple Cause Tabulations for Mortality Statistics," *American Journal of Public Health*, Vol. 54, No. 3, March 1964, pp. 400–406.

[2] Abdel R. Omran, "The Epidemiological Transition: A Theory of the Epidemiology of Population Change, "*Milbank Memorial Fund Quarterly*, Volume 49, No. 4, Part 1, pp. 509–538; "Epidemiological Transition in the United States," *Population Bulletin* (Population Reference Bureau), Vol. 32, No. 2, May 1977.

[3] Robert A. Israel, "Multiple Cause of Death Analysis," paper presented at the 98th meeting of the American Public Health Association, Houston, Texas, October 29, 1970; Robert A. Israel, Marvin C. Templeton, and Marshall C. Evans, "New Approaches to Coding and Analyzing Mortality Data," *Proceedings of the American Statistical Association*, 1972, pp. 20–24. (L. Guralnick) Division of Vital Statistics, National Center for Health Statistics, *Vital Statistics of the United States, 1955, Supplement: Mortality Data, Multiple Causes of Death*, "Introduction," 1965, pp. IX–XI.

One of the problems noted in the presentations of multiple cause-of-death data was the arbitrary method of selecting the underlying (or principal) cause of death used with the First through Fifth Revisions of the International Lists. The principles adopted under the Sixth Revision in 1948 provided a partial solution to the problem. Beginning with deaths in 1949 the cause of death which the certifying physician indicated to be underlying was the one selected for statistical presentation. The Sixth Revision Conference recognized, however, that the tabulation of multiple causes would still provide important information and recommended that multiple-cause coding be undertaken by those countries in a position to do so. A suggested form of multiple-cause tabulation was included in the Manual of the Sixth Revision but no coding or other instructions were provided.

Contributing greatly to national developments in the early years was work going on in some of our registration areas, notably in California, Tennessee, Illinois, and in New York City. The work in Illinois was reported in the 1952 and 1954 Public Health Conference on Records and Statistics; it included recommendations for tabulations of multiple causes of death, for which the Illinois State Vital Statistics Office had coded up to five causes of death in 1952. In 1956, in New York City, the vital statistics office prepared experimental tabulations based on multiple cause coding of about 5,000 deaths during January of that year. As a result of the analysis of these data a new classification of cardiovascular-renal disease according to etiology and anatomical involvement was suggested for future consideration.

At the national level there were concurrent developments. The National Office of Vital Statistics began coding, on a slow schedule, a sample of 1955 deaths; the coding was completed in 1959. The resulting tabulations were published by the Division of Vital Statistics in 1965 in a publication, the *Supplement on Multiple Causes of Death* to the 1955 *Vital Statistics of the United States.* This was a landmark publication representing the first time that we had incorporated a multiple cause volume into our regular publications. The 1955 volume, prepared under the supervision of Iwao M. Moriyama, represented a costly and time-consuming effort, because of our limited ability at that time to make extensive use of automated data processing equipment for the tabulation of multiple cause statistics.

There is general consensus that the single most important factor contributing to implementation of a full-scale multiple cause of death statistics program in the United States was modernization of the mortality statistics data system in 1968. The principal element of this change was the shift to coding all conditions on the death certificate, and the related introduction of an automated system for determining the underlying cause of the death. The modified NCHS mortality statistics data system was largely the result of work by Marvin C. Templeton and Marshall C. Evans of the Division of Vital Statistics.

The primary objective of coding the medical certification had been to derive a single code identified in the International Classification of Diseases (ICD) for the underlying cause of death (UCD) that represents the certifier's intent, while at the same time reflecting consistent application of the World Health Organization's conventions for determining the UCD. Prior to 1968, although the coder had to take all of the reported conditions into account in order to identify and classify the underlying cause, there was no need to explicitly assign an ICD code to each reported condition. Since 1968, the application of the UCD selection rules has been carried automatically by a computerized set of decision rules in a system known as the "Automated Classification of Medical Entities," of ACME. ACME uses input data consisting of the ICD codes for all reported conditions. Thus, the coder no longer selects the underlying cause but now assigns an explicit ICD code to each condition.

ACME, in effect, takes the determination of UCD out of the hands of nosological clerks and relies for this on the computer. Thus, the input to the ACME program consists of a magnetic tape image for each death certificate of *all* morbid conditions reported by the certifier.

The principal thrust in modernizing the NCHS mortality statistics data system was all condition coding from which multiple cause of death statistics could be produced. Indeed, experimental tabulations were prepared using 1968 data. Preliminary results of this work were reported to an international conference by Robert A. Israel and Robert Armstrong in 1973.[4]

More recently, in 1976, the National Center for Health Statistics sponsored a conference to examine approaches to developing national multiple cause statistics utilizing ACME.[5] The conference was organized by the Center for Demographic Studies at Duke University. Attending the conference were about 60 persons representing international vital statistics and the health research community, vital statistics and data systems from NCHS, State vital statistics agencies, public health environmental research agencies, and the academic health research community.

THE NCHS MULTIPLE CAUSE PROGRAM

For a very long time we at NCHS have had plans for the development and publication of data on multiple causes of death. We all have recognized the great and

[4] Robert A. Israel and Robert Armstrong, "An Alternative Procedure for Classifying and Analyzing Mortality Data," International Union for the Scientific Study of Population, Liege, 1973, pp. 231–242.

[5] National Center for Health Statistics, Multiple Cause of Death Statistical Data Development Conference, Washington, D.C., November 9–10, 1976.

growing potential of these data, relative to the traditional underlying cause approach. Yet, historically, a lack of resources, the technical complexities of these data, and, importantly, the catchup priorities and the ongoing requirements of our regular program including our implementing the Ninth Revision of the International Classification of Diseases, have slowed our implementing these activities. I believe that now, at long last, we are on the threshold of a new era in terms of our multiple cause statistics program.

I would like to describe the major features of the program that we are implementing:

1. In terms of data access, we are giving the very highest priority to the development and production of usable public data tapes. There is general concensus that the complexity and the richness of detail of multiple cause data together with the wide diversity of potential data applications make a public use data tape program the most flexible and practical approach to data dissemination. Of course, we plan to augment the tape program with other means of data access, as I will describe later. Our detail data tapes will provide three levels of medical data together with demographic and geographic information. The levels of medical detail are as follows:

a. The underlying cause of death;

b. The ICD codes for each medical entity and the placement of that entity within the cause-of-death portion of the death certificate; and

c. Those ICD codes that best describe the array of conditions on the certificate for an individual decedent. This array of codes would not retain the location within the certification and would not include duplicate codes.

Of these three levels, the detail in level b, which is on what we call an "entity axis" basis, would be used to meet the demand for pathogenically-oriented research, that is, for work that explores alternative etiological hypotheses or analyses in which there is a preference for certifier-reported as well as statistically-assigned underlying cause of death. Users in both groups require the originally-reported conditions as raw data.

Level c data, which is on a "record axis" basis, can be used to satisfy the need for information on the certificate without regard to reported etiological relations among conditions, after the application of rules that interrelate entities for which autonomous codes would be misleading. In the multicause record for individual decedents, the codes derived by the application of these rules would have no causal priority over other nonlinked entities also identified in the record axis data. The record axis data will be used by NCHS for tabulating multiple cause data in our published and unpublished materials. The record axis codes will meet the demand for prevalence-oriented information, that is, for information on conditions as disease prevalence indicators. The distinction between underlying cause and nonunderlying cause is thus irrelevant to the use of these data. The conversion from entity axis to record axis data serves the purpose of providing what we feel is better information than the original entity-based information from which these data are derived. Yet, the codes resulting from the axis conversion have co-equal status within the record with the codes that are not implicitly in those resulting from the conversion.

The detail data tapes will be at the 4-digit level of disease classification.

2. In developing the ACME tapes and adapting them for multicause purposes, we have given high priority to reformatting; for we have learned that the present formats of the ACME tapes, which do not have fixed formats, do not lend themselves to efficient processing nor are they compatible, in their present form, with many of the "canned" software packages for table generation and for statistical analysis. In the reformat of the ACME tapes we are undertaking the following:

a. Eliminating the parenthetical components for the entity codes that appeared under ICDA–8 to identify the components of combination codes;

b. Eliminating non-numeric processing symbols (ampersands, brackets, asterisks, etc.) for assigning the underlying cause of death. The ICD codes will be expanded to 5 digits in order to differentiate between nature of injury and external causes of injury that carry identical numbers in ICD. Additionally, the entity axis codes will carry a 3-digit indicator of placement and sequencing;

c. Placing entity codes in fixed format;

d. Assigning record axis codes where applicable in the decedents' records;

e. Merging into a comprehensive tape file the demographic data, underlying cause, entity codes, and record axis codes; and

f. Editing the multicause codes against the demographic variables and the rare cause lists.

The multicause system for release of our public use data tapes will be ready for our ICDA–8 tapes by the end of 1978. The first tapes that will be available are those for the most recent year of the ICDA–8 period, that is, data year 1976. We expect release of multicause data for the data year 1977 and subsequent years to be concurrent with the regular schedule for release of the underlying cause tapes. Other tapes of the ICD–8 period, namely for the years 1968–75, will be available, working backwards starting with 1975, as demand and resources dictate.

For ICD–9, we expect data for the 1979 data year to be available for public use tapes by December 1980.

3. Multicause lists are being developed that will serve as the basis for summary tapes. The summary tapes will be developed in 1979 to parallel the various cause lists.

4. Preliminary work has been undertaken toward development of a core of multicause tabulations for annual publication as well as for publication in our "Rainbow" series of analytical reports, for work tables, and for response to nonstandard data requests. For nonstandard data requests, we are developing a capacity to provide data on an interactive basis.

5. Our multicause program will initially focus on generating information at the national level. Soon thereafter, we will adapt the system for those States that currently utilize the ACME system for their own cause of death processing at the State level. Thus far, seven States—Iowa, Louisiana, Michigan, Nebraska, North Carolina, Virginia, and Wisconsin—use our ACME system for coding multicause data and for deriving the underlying cause. While some of these States, notably Nebraska and North Carolina, have been highly innovative in implementing their own multicause programs, they have done so without our assistance. Part of the NCHS multicause program will emphasize technical assistance to States in implementing their own program in conjunction with their use of ACME. In addition, we will mount an effort to get the maximum number of other States which desire to do so to participate in the multiple cause program, within resource constraints.

6. The development of the national multiple cause of death statistics program involves an enormous investment of time and resources by the National Center for Health Statistics, drawing on a wide range of expertise both within and outside the Center, both within the U.S. and from international experts. Recognizing that our multiple cause program will be looked to as a model, and recognizing as well the pioneering aspects of our program, we will place considerable emphasis on an ongoing program of research and evaluations to augment our operational activities. We see this as an integral aspect of the national program that will ensure continuing assessment and improvement of our program.

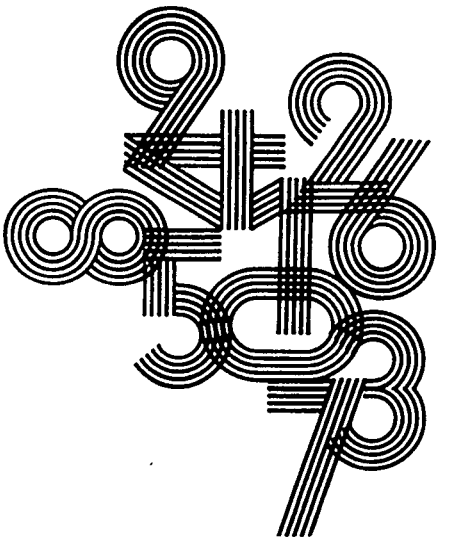
CONCLUSION

We have reviewed the history of national multiple cause of death activities in the United States. We have discussed some considerations in implementing a national program. And we have described some of the central features of the program that we at NCHS are now implementing.

We do not indend to abandon the underlying cause concept, for we view multicause data as an important supplement too but not as a replacement for underlying cause data. What we are attempting to do with the implementation of the Ninth Revision is bring these two approaches into closer alignment and to integrate them operationally within the context of our ACME system.

If multiple cause data are to realize their full potential and if the National Center for Health Statistics program in this area is to be valuable, then significant interaction between producers and consumers of the data must occur. For the immediate future, we are implementing a system that we feel will produce useful information published and unpublished, which will be highly amenable to tabulation and analysis. In the long run, continuing assessment, evaluation, and research should help us improve the system further.

We anticipate that the NCHS multiple cause of death statistics program holds great promise for statistical analysis, research, and planning. And we feel that it offers great benefits in terms of the medical knowledge that it will generate. We are giving high priority to the proposition that the decade of the Ninth Revision will also be the decade of U.S. Multiple Cause of Death Statistics.



CONCURRENT SESSION G

Mental Health Status Indicators— Current Status

IDENTIFICATION OF MENTAL DISORDER IN GENERAL POPULATION SURVEYS: CURRENT STATUS OF EPIDEMIOLOGICAL CASE FINDING TECHNIQUES

Jean Endicott, Ph.D., *Deputy Director, Biometrics Research, New York State Psychiatric Institute, New York, New York*

In the past, epidemiological surveys of large population groups have usually been considered sufficiently detailed if they were able to classify subjects as like "psychiatric cases" using relatively simple procedures. Smaller sample surveys have used one of a limited number of procedures designed to provide more specific data concerning the type of disorder or the degree of symptomatic or social impairment. This paper will discuss procedures which involve direct interview of the subject and which yield specific diagnoses rather than an overall score of "caseness."

A number of different instruments consisting of interview guides and items have been used in smaller epidemiological surveys. These have included the Present State Examination, the Psychiatric Status Schedule, the Current and Past Psychopathology Scales, the Renard Diagnostic Interview, and the Lifetime Version of the Schedule for Affective Disorders and Schizophrenia. I will give a very brief description of each instrument, then note problems that make them unsuitable for use in large scale surveys of the general population.

The Present State Examination (PSE) was developed by Dr. John Wing and his group at the Maudsley Hospital in London. It focuses upon the subject's mental status during the past month and has been used in a number of cross national studies. The coverage focuses primarily on traditional mental status symptoms (with limited coverage of alcohol and drug abuse and functioning in social roles). The output includes some summary scales and a computer diagnosis (CATEGO) and the interviewer is expected to make a clinical diagnosis after completing the interview.

The Biometrics Research group, headed by Drs. Robert Spitzer and Jean Endicott, has designed a number of different instruments which focus on diagnostic classification and social functioning. The Psychiatric Status Schedule (PSS) developed by Drs. Spitzer, Endicott, and their group at the New York State Psychiatric Institute, was the first such instrument. The PSS covers mental status, use of alcohol and drugs, as well as impairment in daily routine and in a number of social roles (mate, parent, housekeeper, wage-earner, etc.). The time period covered is the week prior to and including the interview. A computer diagnosis (DIAGNO I) can be obtained as well as summary scale scores of dimensions of psychopathology and functioning.

The Current and Past Psychopathology Scales (CAPPS) was also developed by Drs. Spitzer and Endicott and their group. It covers symptoms and functioning during the past month and during the period from age 12 up until the past month. The coverage is broader than that of any of the other instruments (more "personality" items are included). The output includes computer diagnoses (DIAGNO II) for the current condition and summary scale scores for both the current and past condition. The diagnosis (or diagnoses if multiple) is coded in DSM-II terms.

The Life-time Version of the Schedule for Affective Disorders and Schizophrenia (SADS-L) is the most recent interview schedule and guide developed by Drs. Spitzer and Endicott and their group. The time period covered is from early adolescence to the present. The coverage is appropriate for making the diagnoses contained in the Research Diagnostic Criteria, including some subtyping of the major disorders. At the end of the interview the rater reviews the material and makes both a current and a life-time diagnosis following the rules of the Research Diagnostic Criteria.

The Renard Diagnostic Interview, developed by Drs. Lee Robins, John Helzer, Jack Croughan, and others at the Washington University School of Medicine in St. Louis, has coverage appropriate for making research diagnoses using the Feighner, St. Louis, and the Clinic 500 research criteria. These diagnoses are made on a life-time basis, with notation of the date of onset.

All five of these instruments share a common problem. For the most part the diagnoses are not readily translatable into the diagnostic categories that will be included in the third edition of the American Psychiatric Association's Diagnostic and Statistical Manual (DSM-III), although some of the criteria within the SADS-L and Renard Interview are virtually identical. Most psychiatric epidemiologists now believe that any diagnostic data collected upon a large population should be related to the major categories of DSM-III if they are to have national generalizability.

In addition, the PSE, PSS, CAPPS, and SADS-L are not suitable for general use in a large population survey because they require interviewers with consid-

erable experience in interviewing and evaluating psychiatric patients. This experience should be obtained either prior to the use of the forms or acquired through a relatively lengthy training period. Many of the items to be judged use technical terms. (Although some definitions are given, the clinical distinctions are often subtle.) For some types of epidemiological studies there may be an advantage to these instruments. However, they are much too expensive to use in larger surveys. In contrast, the Renard Diagnostic Interview can be used by less highly trained personnel and thus is much cheaper to use when many interviewers are needed in a number of different locations.

In addition to the above deficiencies only two of the instruments yield diagnoses and dimensional scales for both the past and present (the CAPPS and the SADS-L).

The deficiencies of each of the instruments described above led to a decision to develop a new instrument, the Diagnostic Survey Schedule (DSS) under the sponsorship of Dr. Regier and the branch headed by him. It will use a combination of the approach followed in the Renard Interview and that of the SADS-L. The instrument is being developed by Drs. Lee Robins, John Helzer, Jack Croughan, Robert Spitzer, and Jean Endicott. Most of the developmental work is being done by Drs. Robins, Helzer, Croughan and their staff, in consultation with Drs. Spitzer and Endicott. It will be field tested in both centers. The DIS is being designed to meet the following requirements: (1) Whenever possible, the diagnostic output should be translatable into DSM-III terms; (2) The major diagnostic categories of DSM-III should be covered as well as possible, given the limitation of the data collection technique being followed; (3) The interview guide and items should be designed so that it can be reliably administered by interviewers similar in experience and training to those using other survey instruments utilized in large scale studies of the general population; (4) It should be possible to give adequate training and experience to interviewers within a 2 week period; (5) It should not take more than an average of 30 minutes to complete the interview; (6) The output should result in both current and life-time diagnoses; (7) The output should include summary measures of functioning and symptomatology in addition to the diagnostic categorization. This will include the Global Assessment Scale, a procedure now being used by many States and facilities in their health statistics reporting.

Work has begun on the development of the DSS and a version should be ready for use in the fall. The reliability and validity of the instrument and its output will have to be tested in a number of different settings. A major question will concern the degree to which the diagnoses made correspond to diagnoses made by psychiatrists using DSM-III criteria. If the correspondence is low, the usefulness of the data for health planning, anticipation of need for services, etc., will be greatly limited.

SERVICE UTILIZATION DATA AS A PROXY MEASURE OF INCIDENCE AND PREVALENCE

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Methods of measuring incidence and prevalence of mental disorders can be classified into three general categories as reflected in the presentations this morning:

1. Instruments for direct community surveys as described by Dr. Endicott in the first presentation today;
2. Indirect measures, an example of which will be described by Mrs. Rosen following this presentation;
3. Utilization data, which may be used as a proxy measure of the incidence and prevalence of mental disorders.

It is useful to differentiate utilization measures from indirect measures because they represent a separate methodological approach to estimating incidence and prevalence of mental disorders. In the indirect measures approach, a variable or variables having an assumed or demonstrated correlation with incidence or prevalence are measured in the community. An inference based on the correlation is then made about the incidence of prevalence of mental disorders in a community. In utilization data, however, one is actually measuring incidence or prevalence directly for part of the total population that would be defined as having a mental disorder.

Many years ago data on the number of persons using mental health resources might have been very close to the actual incidence or prevalence of mental disorders. Today this is no longer true except for possibly a selected number of severe disorders such as schizophrenia or severe mental retardation. Many questions have been raised about the use of utilization data as a proxy measure of incidence and prevalence. This paper explores the current state of the art and possible future directions for research in this area.

Many difficulties have been noted regarding use of utilization data as indicators of incidence and prevalence. Aside from the fact that utilization data per se represent *treated* incidence or prevalence rather than "true" incidence or prevalence, a short list of these difficulties would include at least the following:

1. A certain proportion of the persons using specialty mental health services do not have a mental disorder. These must be identified and deleted from the count if an appropriate estimate is to be made.
2. There often is incomplete coverage of the universe of facilities in the specialty mental health sector. The most notable exclusion is usually the private sector, primarily private office practice. Since a significant proportion of the persons with a mental disorder in a year are seen solely in private office practice, their exclusion from utilization data represents a significant omission and a serious bias in estimates of the total number and characteristics of persons with mental disorders.
3. Evidence derived from a recent study relating prevalence to utilization suggests that as many as 60 percent of the persons with a mental disorder during a year are seen as outpatients in the health sector, with only one-tenth of these also seen in the specialty mental health sector. Most studies using utilization data as proxy measures of incidence or prevalence of mental disorder cover the universe (or selected components of the universe) of specialty mental health facilities only and do not include the health sector.
4. Utilization data generally are in the form of counts of events rather than counts of persons. For example, number of admissions, episodes of care, or visits, are counted rather than the number of persons receiving services. The conversion of these "event" counts to "person" counts is often difficult and the conversion factors vary considerably for different types of settings and different subgroups of patients.
5. While it is becoming less and less true with increased coverage for mental disorders in various insurance plans, a problem that still remains is that many times a diagnosis of mental disorder, alcoholism, or drug abuse is not made on report forms submitted for claims because insurance coverage does not include such disorders. Therefore, utilization data based on insurance claims have a built-in underreporting bias, particularly with regard to general hospital or outpatient settings for particular disorders most frequently excluded from insurance plans.
6. There is inconsistency between the types of units counted in different surveys conducted for different types of settings by different types of data collectors. These inconsistencies

make it difficult to aggregate data according to geographic areas or to compare data over time between different surveys. Using as an example the national surveys conducted by Federal agencies, the National Ambulatory Medical Care Survey collects data from physicians in office-based practice and counts the number of visits, and the National Institute of Mental Health collects data from outpatient psychiatric settings, usually on admission to these settings. Therefore (aside from overlap of persons seen in both treatment sectors), it is difficult to estimate and add together the number of persons seen in specialty outpatient mental health clinics and the number of persons with mental disorders seen in general medical office-based practice to produce an overall estimate of the number of persons in ambulatory care settings with mental disorders. Similar problems exist at other Government levels and other settings.

If there are all these difficulties with using utilization data as a proxy measure for incidence or prevalence, and if direct measures of the community morbidity are on the horizon, one may well question why utilization data should be pursued as a proxy measure for incidence and prevalence at all. There are several reasons why this still remains potentially useful despite the difficulties. First, there are disorders which are difficult to pick up in a community survey because of their low frequency of occurrence. Utilization data provide a mechanism for obtaining a much more accurate count of these rare events (on the assumption that they come under treatment). Second, if the relationship of utilization to incidence and prevalence can be established it is relatively more economical to employ utilization data. Service statistics are generally kept by all facilities in some level of detail. Inasmuch as such data are collected as by-products of administrative systems, billing systems, or other mechanisms and, therefore, no additional primary data collection is required, the utilization measures are considerably more economical to obtain than those derived from a direct community survey.

In light of the above, it is therefore useful to assess what might be done to increase the potential use of these service data in the area of epidemiology.

(a) First, considerable progress has been made in studying the identification of mental disorders and the provision of mental health services to persons with mental disorders in health care settings. A few examples are illustrative. In a series of studies conducted in Monroe County, New York, over a number of years, we found that between 5 percent and 22 percent of adult patients seen by primary care physicians in these different types of settings were diagnosed with emotional disorder. Further, we found, on matching of the study populations to the Monroe County Psychiatric Case Register, that only 14 to 38 percent of patients judged to have an emotional disorder in these studies received care from specialty psychiatric settings. For the three groups of study patients, the estimated "annual diagnosed prevalence" of mental health problems, when including persons diagnosed in the nonpsychiatric medical settings, was at least 2½ to 10 times as great as that based solely on those who received care in psychiatric settings.

In a feasibility study of the office practice of pediatricians (also conducted in Monroe County), overall, 5 percent of their patients under 18 years of age were diagnosed to have a mental health problem. High rates were associated with children in the 7–14 year age group (9.9 percent), those on Medicaid (8.6 percent), children who were not living with a father (10.9 percent), those whose presenting complaint was a chronic physical condition (11.7 percent), and children diagnosed with a disease of the digestive system (16.7 percent) or with "symptoms, signs, and ill-defined conditions" (14.3 percent). Functional impairment was reported to be moderate or severe in 40 percent of the children with mental health problems. Also, the rate of mental health problems in study patients under 15 years of age was 5 times the annual rate of Monroe County residents in that age group contacting any inpatient or outpatient psychiatric setting.

These preliminary results illustrate the magnitude of the number of persons receiving treatment in the health sector, the dangers of using solely specialty mental health sector utilization data, and the potential of such studies to add to our knowledge of the incidence and prevalence of mental disorders.

(b) The second major activity that would improve the potential of utilization data is the conduct of methodological studies on the relationship of person counts to duplicated events. At least three different approaches should be pursued:

1. The development of conversion factors based on psychiatric case registers or special studies. There remain two psychiatric case registers in the United States which could be used for research in this area. In addition, special studies should be developed in which the relationship of the number of service events to the number of persons can be studied. The difficulties with these case registers or special studies is primarily the question of their representativeness; that is, using a factor derived from a small areas study for application to national data or data outside the

study area. Some limited comparison of ratios derived from the Monroe County Psychiatric Case Register with national data indicate an encouraging comparability.

2. Improve the capacity of routine management information systems to produce person data. This area perhaps has a limited potential. Certainly the capacity of public operated programs to produce person data could be greatly enhanced. The possibility of extension to the private sector is probably dependent upon the development of a national health insurance program in which case independent estimates of persons can be derived from the reimbursement system. Problems of confidentiality, privacy, and other factors inhibit accomplishing this at this time.
3. More intensive analysis of data files from insurance plans and prepaid group practice plans. While there are numerous difficulties in using data from such files, the potential information is considerable, particularly in those plans where the mental health benefit structure is such that most or all of the persons with mental disorders are receiving care within the plan. The potential of this information is illustrated by a set of recently completed studies dealing with the utilization of health and mental health services by persons with and without diagnosed mental disorder in four comprehensive health care settings, including two HMO's, a neighborhood health center, and a fee-for-service setting. Data obtained and analyzed include information about the health care setting, its available service benefits, population served, data on recent utilization of health and mental health services, including unduplicated counts of patients served and visits made separately for those with and without mental disorder, costs of services provided, data by families, and historical data on medical and mental health services. Time does not permit even a capsule summary of the multiple findings. However, the results will appear in a series of papers, some of which are near completion. A sampling will suffice for now. Between 3 percent and 12 percent of the enrolled populations in these settings were diagnosed as having a mental disorder. Departments other than mental health in those settings identified between 1 percent and 6 percent as having a mental disorder, some of whom were not identified by the mental health professionals. One of the consistent findings in these studies was that patients with mental disorder were higher users of health services than were other patients. To the extent that a national health insurance program will involve HMO's or similar comprehensive health care settings, the role of the primary health care provider and the related issue of the integration of health and mental health services will become of increasing importance. The primary difficulty in using existing files from insurance plans is that they are set up as billing and accounting systems, and, therefore, it is difficult to generate person data from them.

(c) The third major activity which will greatly improve the potential of utilization data is the promulgation and use of standard definitions and mental health data sets such as those being proposed by the Cooperative Health Statistics System and the Mental Health Statistics Improvement Program. The widespread use of uniform data sets, such as the Uniform Hospital Discharge Data Set, will enhance the potential of utilization data greatly by eliminating definitional differences and related problems.

(d) Finally, the relationship of use or demand for services to true incidence or prevalence should be studied further in the mental health area. The NIMH is hoping to fund epidemiological catchment areas in which community surveys can be conducted to generate a cohort of persons with identified mental disorders. This cohort can then be followed to identify use patterns. These areas will provide an ideal laboratory for studying the relationship between incidence or prevalence and use of services. The development and use of more sophisticated direct measures of mental disorders will enable much more comprehensive study of the relationship of incidence and prevalence to utilization and demand. Therefore, the continued development of direct measure will increase the potential of utilization data as a proxy measure of incidence and prevalence.

INDIRECT MEASURES OF MENTAL HEALTH STATUS—MENTAL HEALTH DEMOGRAPHIC PROFILE SYSTEM

Beatrice M. Rosen, *Assistant Chief, Applied Biometrics Research Branch, Division of Biometry and Epidemiology, National Institute of Mental Health, Rockville, Maryland*

The previous papers in this session have discussed various ways of detecting mental illness in the population either through the use of epidemiological studies or through the use of indicators reflecting utilization of psychiatric facilities. These might be termed direct measures of mental illness. Another method which has been used frequently in health and mental health planning particularly in the last decade is the use of social indicators of the general population. These are considered indirect measures and are chosen to reflect a variety of conditions in the community related to economic status, educational achievement, and social structure, to name a few, which are suggestive of mental health or illness in a community.

The National Institute of Mental Health has developed an extensive social indicator project, the Mental Health Demographic Profile System, a compilation of social and economic variables based on the 1970 Census of Population and Housing. This system contains data related to socioeconomic status (in terms of economic status, social status, and educational status), ethnic composition, household composition and family structure (including marital status and family life cycle), type and condition of housing, community instability, and specific high risk populations. Specific indicators were chosen because sociological and epidemiological literature show them to be highly correlated with both prevalence of mental illness and utilization of psychiatric facilities.

The overall purpose of the Mental Health Demographic Profile System is to provide social area data for needs assessment and evaluation of mental health programs in an individual catchment area and for comparison and ranking of catchment areas within a State, region and the total United States. More specifically, the Mental Health Demographic Profile System has been designed to: (1) identify and locate high risk populations in terms of their greater use of mental health services (these groups might include female-headed families, isolated individuals); (2) identify and locate target populations such as children, the elderly, the poor, and other groups who might be the subject of special health programs; (3) conduct a social area analysis, that is, to characterize the social and economic structure of the community; (4) and provide denominator data from which to compute rates of service utilization.

In contrast to some economic indicators which are based on economic theory, there is no appropriate theoretical basis upon which one might interpret social indicator data. As an example, given the value of a social indicator such as the percent of population in poverty, there is no way to directly relate that value to the number of persons in the population in poverty who might require psychiatric services or have a mental illness. Nevertheless, the research literature is replete with studies suggesting that populations who are poor, who are isolated, or who are suffering from divorce and separation have a far higher risk of being mentally ill or of using psychiatric services than those who are not subject to these conditions. Hence, the data in the Mental Health Demographic Profile System can be used to identify and rank high risk areas in the community or to locate underserved populations. Figure 1 contains a listing of some of the indicators in the system which reflect high risk populations and other target groups—populations in poverty, ethnic groups, children, the aged, and populations in social isolation and related conditions.

Data from the Mental Health Demographic Profile System are available for the following health areas: community mental health catchment areas, Health Service Areas, Professional Standards Review Organization areas, and Neighborhood Health Center Areas. Data are available also for the following census geographic units: counties, census tracts, minor civil divisions or county census divisions, States and the United States.

A number of products have been developed from the Mental Health Demographic Profile System which should prove useful in using the system and interpreting the data in it. Figure 2 (tables 5 and 6 of the system) represents one of the major tables generated from this system, a catchment area summary. It contains most of the social indicators in the system and in addition includes comparison data by county, State and the United States.

Another major product, shown in figure 3, is the display of subarea data for each catchment area. These include all the major variables in the system for each subarea included in a catchment area. Subareas of catchments may be counties, census tracts and/or minor civil division. In this particular example, this catchment area is comprised of a number of census tracts. In addition, such information is available for census tracts or minor civil division counties.

Population pyramids represent a third major output item (figure 4). They contain data by age, sex and race. These are available for all geographic areas in the system. The pyramids include absolute numbers as

FIGURE 1. MENTAL HEALTH DEMOGRAPHIC PROFILE SYSTEM

Examples of Indicators of Target Populations

Populations in Poverty	Table	Item No.
Families in poverty	5	8
Population in poverty	6	8
Median income of families and unrelated individuals	5	7
Female-headed families with children in poverty	6	105
Children in poverty	6	108
Children		
Youth dependency ratio	5	17
Children living with their parents	6	49
Fertility ratio	6	51
Child-bearing (only) families	6	61
Child-bearing and child-rearing families	6	62
Child-rearing families	6	63
Teenagers not in school	6	95
Children in poverty	6	108
Aged		
Aged dependency ratio, total	5	18
Aged dependency ratio, White	6	58
Aged dependency ratio, Negro	6	59
Aged persons living alone	6	99
Aged persons in poverty	6	100
Ethnic Population		
Percent White	5	5
Percent Negro	5	6
Percent household population Negro	5	12
Percent Spanish Americans	6	45
Percent southern or eastern European stock	6	44
Percent household population Nonwhite other than Negro	5	13
Percent foreign born or native born of foreign or mixed parentage	5	14
Social isolation and related conditions		
Small households (1 person households)	6	47
Household heads, primary individuals	6	69
Single males, females	6	71,72
Divorced or separated males, females	6	73,74
Widowed females	6	75
Female-headed households	6	76
Aged persons living alone	6	99
Median household size	6	46

well as a percent distribution by 5-year age groups. These pyramids have several uses; one is to provide denominator data for computing utilization rates in any of the areas in which data are available. In addition, they can show at a glance the population distribution within an area, that is, the relative composition of men and women, of children and older people, or of areas with unusual population distributions compared to standard family areas.

Another product of the system is a series of rank tables for each State in which catchment areas or perhaps counties are ranked for each variable in the system from the lowest value to the highest. For example, figure 5 shows a rank table for percent of families in poverty for the State of Maryland. The table contains the rank of each catchment area, the value of the indicator for each catchment area and the percent of catchment areas above or below a specific catchment area in terms of the value of the indicator. This information is particularly useful in assisting planners in the determination of which areas should have higher priority for funding or in developing needed services.

Data from the Demographic Profile System have been used in sophisticated ways as well as in simplified ways. For example, statisticians and planners have used regression analysis, multivariate analysis and factor analysis when coping with the large amounts of data in the system or in trying to isolate the most significant variables in a catchment area. However, planners may not have the equipment, training or time to use the system in such a manner, nor is it necessary. In an individual catchment area, all that may be needed is to determine the location and relative level of high risk populations. For such a procedure, mapping is a satisfactory and simple approach. Figure 6 illustrates a map which contains data on percent of population in poverty for census tracts in a catchment area in Montgomery County, Maryland. This map shows, for example, that the areas containing the greatest proportions of populations in poverty are clustered in the Southern part of the catchment area. This can be useful information, for example, for an agency in determining where outreach programs should be centered. If a social area analysis of the catchment area is needed, a workbook has been developed by the NIMH to assist in that task. This workbook, titled "A Typological Approach to Doing Social Area Analysis" is available on request.

Another tool which has been developed for use in analyzing the data from the profile system is the table containing information on the distribution of all catchment areas in the country according to the values of each variable, from low to high. This example, figure 7, is displayed for selected deciles. This table can be used, for example, to determine whether the value of a statistic in any particular catchment area is considered high, average, or low compared to other catchment areas in the country. Such a table is also available for metropolitan, non-metropolitan, and rural counties. Figure 8 shows a listing of variables selected from the system and their values for metropolitan and rural counties with the U.S. total for comparison. As you can see from this table, the median value for metropolitan

SAMPLE CATCHMENT AREA TABLE

TABLES 5 AND 6
TAK.PAPK-SS AREA II, MD.

MENTAL HEALTH DEMOGRAPHIC PROFILE SYSTEM : SELECTED INDICATORS FROM THE 1970 CENSUS, 100% AND SAMPLE TABULATIONS
DEVELOPED JOINTLY BY THE DIVISIONS OF BIOMETRY AND MENTAL HEALTH SERVICE PROGRAMS, N I M H

	STATISTIC DESCRIPTION	STATISTIC	DENOMINATOR	COMPARISONS TO STATISTICS FOR OTHER AREAS		
				COUNTY	STATE	U.S.
GENERAL POPULATION DATA						
5-01	TOTAL POPULATION	119154	....	522809	3922399	203211905
5-02	NUMBER OF MALES IN HOUSEHOLDS	55908	....	250460	1851019	95456663
5-03	NUMBER OF FEMALES IN HOUSEHOLDS	61358	....	266185	1966563	177748975
5-04	POPULATION IN GROUP QUARTERS (IN GQ)	1888	....	6164	104817	5812013
5-05	POPULATION WHITE	109208	....	493934	3194888	177748975
5-06	POPULATION NEGRO	7874	....	21551	699479	22580289
INCOME						
5-07	MEDIAN INCOME: FAMILIES & UNRELATED INDIV	$11203	45366	$14090	$ 9130	$ 7699
6-01	MEDIAN INCOME: WHITE FAMILIES	$14632	29090	$16993	$11635	$ 9961
6-02	MEDIAN INCOME: NEGRO FAMILIES	$ 104	1930	$10522	$ 7701	$ 6068
6-03	MEDIAN INCOME: UNRELATED INDIVIDUALS	$ 5478	13956	$ 5780	$ 3099	$ 2489
6-04	MEDIAN INCOME: WHITE UNRELATED INDIV.	$ 5656	12764	$ 6083	$ 3349	$ 2568
6-05	MEDIAN INCOME: NEGRO UNRELATED INDIV.	$ 3489	1009	$ 2587	$ 2325	$ 1937
5-08	% FAMILIES IN POVERTY	3.9	31410	3.0	7.7	10.7
6-06	% FAMILIES IN POVERTY: WHITE	3.4	29090	2.6	5.3	8.6
6-07	% FAMILIES IN POVERTY: NEGRO	9.7	1930	12.8	20.9	29.8
6-08	% POPULATION IN POVERTY	5.7	118296	4.2	10.1	13.7
6-09	% POPULATION IN POVERTY, WHITE	5.1	108324	3.6	6.9	10.9
6-10	% POPULATION IN POVERTY, NEGRO	12.4	7745	17.1	24.7	35.0
6-11	UPPER QUARTILE FAMILY INCOME	$21773	31410	$23627	$16674	$14042
VALUE OF HOUSING						
6-12	MEDIAN HOUSE VALUE: NON-NEGRO	$30121	16624	$32852	$19637	$17255
6-13	MEDIAN HOUSE VALUE: NEGRO	$31626	723	$27386	$11107	$10356
6-14	MEDIAN MONTHLY CONTRACT RENT: NON-NEGRO	$ 148	20596	$ 166	$ 121	$ 92
6-15	MEDIAN MONTHLY CONTRACT RENT: NEGRO	$ 148	1543	$ 139	$ 85	$ 69
EMPLOYMENT & LABOR FORCE						
6-16	% CIVILIAN LABOR FORCE 16+ UNEMPLOYED	2.2	56148	2.0	3.2	4.4
6-17	% CIVILIAN LABOR FORCE 16+ UNEMPLOYED: WH	2.1	51494	2.0	2.7	4.1
6-18	% CIVILIAN LABOR FORCE 16+ UNEMPLOYED: NE	2.9	3855	2.9	5.6	7.0
6-19	% EMPLOYED MALES 25-64 UNDEREMPLOYED	6.2	27010	4.3	6.3	8.5
6-20	% EMPLOYED MALES 25-64 UNDEREMPLOYED: WHI	5.8	24929	4.1	5.6	8.0
6-21	% EMPLOYED MALES 25-64 UNDEREMPLOYED: NEG	11.0	1696	8.7	10.4	12.8
6-22	% FEMALES 16 & OVER IN LABOR FORCE	50.3	47493	45.1	44.4	41.4
6-23	% FEMALES 16 & OVER IN LABOR FORCE:WHITE	49.3	43924	44.4	42.6	40.6
6-24	% FEMALES 16 & OVER IN LABOR FORCE:NEGRO	64.9	2936	61.6	53.1	47.5
SOCIAL STATUS						
5-09	LOW OCCUPATIONAL STATUS: MALES (%)	14.6	31939	13.7	30.3	36.0
5-10	HIGH OCCUPATIONAL STATUS: MALES (%)	50.2	31939	56.0	31.4	25.4
6-25	LOW OCCUPATIONAL STATUS: WHITE MALES (%)	13.0	29511	12.4	25.0	33.2
6-26	HIGH OCCUPATIONAL STATUS:WHITE MALES (%)	51.1	29511	56.9	34.7	27.0
6-27	LOW OCCUPATIONAL STATUS: NEGRO MALES (%)	34.8	1966	45.3	61.4	64.9
6-28	HIGH OCCUPATIONAL STATUS:NEGRO MALES (%)	36.8	1966	29.6	11.3	8.9

TABLES 5 AND 6 (CONTINUED)
TAK.PARK-SS AREA II, MD.

MENTAL HEALTH DEMOGRAPHIC PROFILE SYSTEM : SELECTED INDICATORS FROM THE 1970 CENSUS, 100% AND SAMPLE TABULATIONS DEVELOPED JOINTLY BY THE DIVISIONS OF BIOMETRY AND MENTAL HEALTH SERVICE PROGRAMS, N I M H

	STATISTIIC DESCRIPTION	STATISTIC	DENOMINATOR	COMPARISONS WITH OTHER AREAS COUNTY	STATE	U.S.
SOCIAL STATUS (CONT)						
6-29	LOW OCCUPATIONAL STATUS: FEMALES (%)	12.8	22995	13.7	28.8	36.3
6-30	LOW OCCUPATIONAL STATUS:WHITE FEMALES(%)	11.4	20910	11.9	22.5	32.7
6-31	MID OCCUPATIONAL STATUS:WHITE FEMALES(%)	56.9	20910	55.6	54.5	47.0
6-32	LOW OCCUPATIONAL STATUS:NEGRO FEMALES(%)	26.5	1778	42.1	55.1	62.4
6-33	MID OCCUPATIONAL STATUS:NEGRO FEMALES(%)	39.9	1778	30.7	29.7	24.8
EDUCATIONAL STATUS						
5-11	MEDIAN SCHOOL YEARS COMPL, 25+ YEARS OLD	12.8	68960	13.0	12.1	12.1
6-34	MEDIAN SCHOOL YEARS , AGE 25+: WHITE	12.8	64037	13.2	12.2	12.1
6-35	MEDIAN SCHOOL YEARS , AGE 25+: NEGRO	12.7	3991	12.1	9.9	9.8
6-36	LOW EDUCATIONAL STATUS, PERSONS 25+ (%)	12.3	68960	10.3	27.4	28.3
6-37	LOW EDUCATIONAL STATUS, WHITES 25+ (%)	12.0	64037	9.6	24.7	26.6
6-38	LOW EDUCATIONAL STATUS, NEGROES 25+ (%)	16.9	3991	30.0	42.1	43.8
6-39	% WHITES 18+ COMPLETED HIGH SCHOOL	75.4	78055	79.0	58.2	56.9
6-40	% NEGROES 18+ COMPLETED HIGH SCHOOL	67.7	5125	54.3	36.3	35.9
6-41	% WHITES 18-24 COMPLETED HIGH SCHOOL	71.0	14018	70.7	68.8	68.3
6-42	% NEGROES 18-24 COMPLETED HIGH SCHOOL	63.9	1134	59.6	52.6	53.3
6-43	HIGH EDUCATIONAL STATUS, PERSONS 25+ (%)	27.4	68960	33.2	13.9	10.7
ETHNIC COMPOSITION						
5-12	% HOUSEHOLD POPULATION NEGRO	6.5	117266	4.1	17.7	11.3
5-13	% HH POPULATION NON-WHITE & NON-NEGRO	1.8	117266	1.4	0.7	1.4
5-14	% POPULATION FOREIGN STOCK	26.2	119457	21.2	11.6	16.5
6-44	% PERSONS SOUTH OR EAST EUROPEAN STOCK	12.4	119457	8.9	5.3	6.6
6-45	% PERSONS SPANISH AMERICAN HERITAGE	3.9	113169	3.0	1.4	4.7
GENERAL HOUSEHOLD CHARACTERISTICS						
6-46	MEDIAN HOUSEHOLD SIZE	2.4	41311	3.1	2.9	2.7
6-47	% HOUSEHOLDS SMALL, ONE PERSON	20.5	41311	13.5	14.9	17.6
6-48	% HOUSEHOLDS LARGE, SIX OR MORE PERSONS	6.7	41311	10.7	11.3	10.4
6-49	% CHILDREN LIVING WITH BOTH PARENTS	86.6	35056	89.8	81.0	82.6
6-50	SEX RATIO (MALES PER 100 FEMALES)	91.0	61358	94.1	94.1	93.6
6-51	FERTILITY RATIO (UNDER 5 PER 1000 FEM 15-	354.1	26473	373.5	412.6	415.7
5-15	% HOUSEHOLDS HUSBAND-WIFE FAMILIES	66.3	41311	76.0	70.9	69.4
6-52	% HOUSEHOLDS HUSBAND-WIFE : WHITE	66.5	38317	76.3	73.8	71.3
6-53	% HOUSEHOLDS HUSBAND-WIFE : NEGRO	63.4	2384	66.1	54.9	52.6
FAMILY LIFE CYCLE						
5-16	MEDIAN AGE OF HOUSEHOLD HEADS	45.9	41311	45.3	45.7	48.2
6-54	MEDIAN AGE HOUSEHOLD HEAD: WHITE	46.9	38317	45.7	46.2	48.5
6-55	MEDIAN AGE HOUSEHOLD HEAD: NEGRO	35.6	2384	39.9	43.5	45.7
5-17	YOUTH DEPENDENCY RATIO	48.4	72387	63.4	63.4	63.4
6-56	YOUTH DEPENDENCY RATIO, WHITE	47.4	66518	63.0	59.8	60.8
6-57	YOUTH DEPENDENCY RATIO, NEGRO	62.0	4579	73.2	82.3	85.5
5-18	AGED DEPENDENCY RATIO	13.6	72387	10.2	13.1	17.4
6-58	AGED DEPENDENCY RATIO, WHITE	14.4	66518	10.3	13.6	17.9
6-59	AGED DEPENDENCY RATIO, NEGRO	4.2	4579	7.8	10.7	13.6
6-60	% FAMILIES WITH CHILDREN	51.5	31332	61.3	57.4	54.9
6-61	% FAMILIES CHILDBEARING ONLY	13.9	31332	13.1	13.4	12.7
6-62	% FAMILIES CHILDBEARING & CHILDREARING	10.6	31332	14.1	14.1	13.4

TABLES 5 AND 6 (CONTINUED)
TAK.PARK-SS AREA II, MD.

MENTAL HEALTH DEMOGRAPHIC PROFILE SYSTEM : SELECTED INDICATORS FROM THE 1970 CENSUS, 100% AND SAMPLE TABULATIONS
DEVELOPED JOINTLY BY THE DIVISIONS OF BIOMETRY AND MENTAL HEALTH SERVICE PROGRAMS, N I M H

	STATISTIIC DESCRIPTION	STATISTIC	DENOMINATOR	COMPARISONS WITH OTHER AREAS COUNTY	STATE	U.S.
FAMILY LIFE CYCLE (CONT)						
6-63	% FAMILIES CHILDREARING ONLY	27.0	31332	34.2	29.8	28.7
6-64	% FAMILIES CHILDREARING COMPLETED	34.4	27403	27.8	30.7	34.7
PERSONS NOT IN FAMILIES						
6-65	% POPULATION IN GROUP QUARTERS	1.6	119154	1.2	2.7	2.9
6-66	% GROUP QUARTERS POP INSTITUTIONAL GQ	25.7	1888	47.3	37.9	36.5
6-67	% GROUP QUARTERS POP IN MENTAL HOSPITALS	0.0	1771	1.6	8.6	7.3
6-68	% GQ POPULATION IN NON-INSTITUTIONAL GQ	1.1	119540	0.6	1.7	1.8
6-69	% HOUSEHOLD HEADS PRIMARY INDIVIDUALS	24.2	41311	15.7	17.3	19.7
6-70	% HH POPULATION NON-RELATIVES OF HEAD	2.5	117266	1.8	2.0	1.6
6-71	% MALES 25 + SINGLE	9.7	31717	6.6	9.1	8.9
6-72	% FEMALES 25 + SINGLE	8.9	36887	6.7	7.1	7.0
DISRUPTED FAMILIES						
6-73	% MALES 14 + DIVORCED OR SEPARATED	4.0	42722	2.9	5.0	4.3
6-74	% FEMALES 14 + DIVORCED OR SEPARATED	7.1	49277	5.3	7.0	6.2
6-75	% FEMALES 14 + WIDOWED	11.5	49277	9.2	11.0	12.3
6-76	% HOUSEHOLDS FEMALE HEADED	22.9	41311	16.8	19.9	21.0
6-77	% HH, FEMALE HEADED W/ OWN CHILDREN < 18	10.1	16151	7.2	11.2	10.7
HOUSING CONDITIONS						
6-78	% HOUSING UNITS VACANT	3.8	42948	2.9	4.8	6.2
5-22	% DWELLING UNITS W/ STANDARD FACILITIES	98.8	41311	98.7	95.4	93.4
6-79	% HOUSING UNITS STANDARD : NON-NEGRO	98.9	38927	99.1	96.6	94.6
6-80	% HOUSING UNITS STANDARD : NEGRO	97.2	2384	90.3	89.2	82.0
5-19	% DWELLING UNITS SINGLE DETACHED	46.0	42962	65.6	51.1	66.2
5-20	% DWELLING UNITS IN HIGH RISE APTS	21.2	42631	10.3	2.8	1.9
DENSITY OF HOUSING						
5-21	% HH POP IN OVERCROWDED HOUSING UNITS	6.5	117266	6.4	13.6	16.9
6-81	% HOUSING UNITS OVERCROWDED	3.3	41311	3.3	6.6	8.2
6-82	% POP IN OVERCROWDED HOUSING: NON-NEGRO	5.9	109729	5.6	9.7	14.3
6-83	% POP IN OVERCROWDED HOUSING: NEGRO	15.8	7537	24.6	31.3	38.1
6-84	% HH POP IN HIGHLY OVERCROWDED HOUSING	1.5	117266	1.2	3.0	5.0
TYPE OF HOUSING						
6-85	% HOUSING UNITS RENTER OCCUPIED	56.1	41311	38.6	41.2	37.1
6-86	% HOUSING UNITS TRAILERS OR MOBILE HOMES	0.1	42948	0.3	1.5	2.7
6-87	% HOUSING UNITS LARGE APARTMENTS-20 UNIT	28.7	42962	15.5	5.9	6.8
6-88	% HOUSING UNITS SINGLE DETACHED:NONNEGRO	47.8	39011	67.1	57.6	71.5
6-89	% HOUSING UNITS SINGLE DETACHED: NEGRO	35.5	2317	54.3	29.1	52.4
6-90	% POPULATION RURAL	6.6	119154	10.8	23.4	26.5
COMMUNITY INSTABILITY						
5-23	% POPULATION RECENT MOVERS	26.9	119457	23.3	22.6	23.5
6-91	% POP RECENT MOVERS (LAST YEAR): WHITE	25.2	109723	22.5	21.8	23.2
6-92	% POP RECENT MOVERS (LAST YEAR): NEGRO	48.8	7898	38.5	25.5	24.6
6-93	% POP MOBILE (MOVED SINCE 1965)	57.8	110108	54.6	48.5	47.0
6-94	% POP MIGRANTS (DIFF COUNTY THAN 1965)	37.2	102330	31.9	23.6	19.5

TABLE 7.1
TAK.PARK-SS AREA II, MD.
MENTAL HEALTH DEMOGRAPHIC PROFILE SYSTEM : SELECTED DATA FROM THE 1970 CENSUS, SAMPLE AND 100% TABULATIONS
DEVELOPED JOINTLY BY THE DIVISIONS OF BIOMETRY AND EPIDEMIOLOGY AND MENTAL HEALTH SERVICE PROGRAMS, N I M H

	GENERAL POPULATION DATA						ECONOMIC STATUS		SOCIOECONOMIC STATUS SOCIAL STATUS		EDUCAT STA
	TOTAL POPULATION (1)	MALES IN HOUSEHOLDS (2)	FEMALES IN HOUSEHOLDS (3)	POPULATION IN GROUP QUARTERS (4)	POPULATION WHITE (5)	POPULATION NEGRO (6)	MEDIAN INCOME FAMILIES AND UNRELATED INDIVIDUALS (7)	PERCENT FAMILIES IN POVERTY (8)	PERCENT EMPLOYED MALES IN LOW STATUS OCCUPATIONS (9)	PERCENT EMPLOYED MALES IN HIGH STATUS OCCUPATIONS (10)	MEDI SCHO YEA COMPL (11)
AREA TOTAL											
STATISTIC	119154	55908	61358	1888	109208	7874	$11203	3.9	14.6	50.2	12.8
BASE POPULATION	...	...	...	...	...	...	45366	31410	31939	31939	68960
TRACT 7014.01											
STATISTIC	3771	1890	1881	0	3644	51	$17376	1.6	6.5	57.6	12.9
BASE POPULATION	...	...	...	...	...	...	1015	981	997	997	1974
TRACT 7014.02											
STATISTIC	7934	3901	3936	97	6685	1181	$18316	4.4	11.1	61.9	13.6
BASE POPULATION	...	...	...	...	...	...	2004	1888	1920	1920	3998
TRACT 7014.03											
STATISTIC	4522	2230	2264	28	4164	347	$13822	5.1	19.2	40.9	12.6
BASE POPULATION	...	...	...	...	...	...	1266	1122	1226	1226	2415
TRACT 7015.01											
STATISTIC	12627	5979	6382	266	12016	405	$13517	2.4	8.5	62.4	13.4
BASE POPULATION	...	...	...	...	...	...	4836	3376	3679	3679	7212
TRACT 7015.03											
STATISTIC	6898	3419	3393	86	6480	336	$18819	1.5	11.0	57.5	13.4
BASE POPULATION	...	...	...	...	...	...	1651	1559	1670	1670	3457
TRACT 7016.00											
STATISTIC	7131	3418	3698	15	6863	151	$11549	3.2	16.6	49.9	12.8
BASE POPULATION	...	...	...	...	...	...	2387	1946	1949	1949	3565
TRACT 7017.01											
STATISTIC	4006	1888	1999	119	3505	413	$ 7886	3.9	25.7	23.8	12.4
BASE POPULATION	...	...	...	...	...	...	1612	977	1012	1012	2191
TRACT 7017.02											
STATISTIC	3376	1398	1616	362	3083	171	$ 6568	5.0	21.3	41.5	12.8
BASE POPULATION	...	...	...	...	...	...	1782	842	905	905	1729
TRACT 7018.00											
STATISTIC	5103	2325	2573	205	3735	1255	$ 9132	7.0	26.7	38.4	12.8
BASE POPULATION	...	...	...	...	...	...	2166	1268	1391	1391	2840
TRACT 7019.00											
STATISTIC	2717	1270	1438	9	2598	40	$ 6311	6.3	23.5	37.8	12.6
BASE POPULATION	...	...	...	...	...	...	1380	767	792	792	1595

Tables 7.2, 8.1-8.9 Similar to 7.1 with all items in Tables 5 & 6 listed as column headings. The stub consists of all subunits of the catchment areas - tracts and/or counties and for a few States, minor civil divisions.

TABLES 5 AND 6 (CONTINUED)

TAK.PARK-SS AREA II, MD.

MENTAL HEALTH DEMOGRAPHIC PROFILE SYSTEM : SELECTED INDICATORS FROM THE 1970 CENSUS, 100% AND SAMPLE TABULATIONS DEVELOPED JOINTLY BY THE DIVISIONS OF BIOMETRY AND MENTAL HEALTH SERVICE PROGRAMS, N I M H

	STATISTIIC DESCRIPTION	STATISTIC	DENOMINATOR	COMPARISONS WITH OTHER AREAS COUNTY	STATE	U.S.
.POPULATIONS OF HIGH POTENTIAL NEED						
6-95	% TEENAGERS (14-17) NOT IN SCHOOL	5.2	5352	2.5	6.8	7.4
6-96	% TEENAGERS (14-17) NOT IN SCHOOL,NEGRO	13.8	435	10.6	11.3	11.2
6-97	% MOTHERS OF CHILDREN UNDER 18 WORKING	45.0	16335	38.6	42.0	40.8
6-98	% MOTHERS OF CHILDREN UNDER 6 WORKING	34.2	7754	26.4	32.2	30.8
6-99	% ONE PERSON HOUSEHOLDS AGED (65 +)	5.8	41328	3.9	5.3	7.8
6-100	% AGED PERSONS IN POVERTY	12.3	10215	9.8	21.9	27.3
6-101	% HOUSING UNITS EXTREMELY CROWDED W/O PLU	0.0	41328	0.0	0.3	0.5
6-103	% HH, FEMALE HEADED W/ OWN CHILDREN:NEGRO	18.3	1233	17.6	29.1	30.6
6-104	% LARGE HOUSEHOLDS WITH LOW INCOME	8.1	2770	7.0	20.3	26.5
6-105	% FAMILIES W/ CHILDREN FEM-HEADED & IN PO	1.9	16785	1.5	4.7	5.1
6-106	% NON-INST POP 16-64 DISABLED	7.5	64956	7.0	9.9	11.2
6-107	% NON-INST POP DISABLED UNABLE TO WORK	2.1	64956	1.7	3.6	4.3
6-108	% CHILDREN UNDER 18 IN POVERTY	4.8	34996	4.1	11.5	15.1

POPULATION PYRAMIDS

TOTAL POPULATION OF CATCHMNT
TAKOMA PARK-SILVER SPRING MD
TOTAL POP 114154 MALES (56613) FEMALES (62541)

NUMBER	%	AGE	9 8 7 6 5 4 3 2 1	1 2 3 4 5 6 7 8 9	%	NUMBER
193	0.16	85+		F	0.42	496
323	0.27	80-4		F	0.65	770
658	0.55	75-9	M	FFF	1.06	1267
1153	0.97	70-4	MM	FFFF	1.53	1822
1571	1.32	65-9	MMM	FFFFF	1.84	2190
2555	2.14	60-4	MMMMMM	FFFFFFF	2.49	2967
3075	2.58	55-9	MMMMMMM	FFFFFFFFF	3.05	3631
3436	2.88	50-4	MMMMMMMM	FFFFFFFFF	3.32	3955
3505	2.94	45-9	MMMMMMMM	FFFFFFFFFF	3.46	4117
3406	2.86	40-4	MMMMMMMM	FFFFFFFFF	3.04	3621
3130	2.63	35-9	MMMMMMM	FFFFFFFF	2.74	3260
3736	3.14	30-4	MMMMMMMMM	FFFFFFFFF	3.03	3609
4976	4.18	25-9	MMMMMMMMMMM	FFFFFFFFFFFF	4.35	5182
5229	4.39	20-4	MMMMMMMMMMMM	FFFFFFFFFFFFFF	5.23	6227
4781	4.01	15-9	MMMMMMMMMMMM	FFFFFFFFFFFF	4.38	5213
4970	4.17	10-4	MMMMMMMMMMMM	FFFFFFFFFFF	4.12	4914
5105	4.28	5-9	MMMMMMMMMMMM	FFFFFFFFFFF	3.97	4732
4811	4.04	0-4	MMMMMMMMMMMM	FFFFFFFFFFF	3.83	4568

WHITE POPULATION OF CATCHMNT
TAKOMA PARK-SILVER SPRING MD
TOTAL POP 109208 MALES (51819) FEMALES (57389)

NUMBER	%	AGE	9 8 7 6 5 4 3 2 1	1 2 3 4 5 6 7 8 9	%	NUMBER
184	0.17	85+		F	0.45	490
313	0.29	80-4		FF	0.69	749
646	0.59	75-9	M	FFF	1.13	1238
1123	1.03	70-4	MMM	FFFF	1.63	1777
1526	1.40	65-9	MMMM	FFFFF	1.95	2133
2469	2.26	60-4	MMMMMM	FFFFFFF	2.64	2884
2955	2.71	55-9	MMMMMMM	FFFFFFFFF	3.20	3499
3291	3.01	50-4	MMMMMMMM	FFFFFFFFF	3.48	3800
3291	3.01	45-9	MMMMMMMM	FFFFFFFFF	3.55	3876
3119	2.86	40-4	MMMMMMM	FFFFFFFF	3.05	3329
2756	2.52	35-9	MMMMMM	FFFFFFF	2.62	2859
3278	3.00	30-4	MMMMMMM	FFFFFFF	2.88	3144
4423	4.05	25-9	MMMMMMMMMM	FFFFFFFFFF	4.17	4551
4794	4.39	20-4	MMMMMMMMMMM	FFFFFFFFFFFF	5.12	5595
4377	4.01	15-9	MMMMMMMMMMM	FFFFFFFFFFF	4.35	4746
4509	4.13	10-4	MMMMMMMMMMM	FFFFFFFFFFF	4.09	4468
4558	4.17	5-9	MMMMMMMMMMM	FFFFFFFFFF	3.88	4238
4207	3.85	0-4	MMMMMMMMMM	FFFFFFFFFF	3.67	4013

NEGRO POPULATION OF CATCHMNT
TAKOMA PARK-SILVER SPRING MD
TOTAL POP 7874 MALES (3755) FEMALES (4119)

NUMBER	%	AGE	9 8 7 6 5 4 3 2 1	1 2 3 4 5 6 7 8 9	%	NUMBER
8	0.10	85+			0.05	4
6	0.08	80-4			0.24	19
9	0.11	75-9			0.27	21
25	0.32	70-4		F	0.38	30
32	0.41	65-9	M	F	0.56	44
66	0.84	60-4	MM	FF	0.75	59
98	1.24	55-9	MMM	FFF	1.32	104
114	1.45	50-4	MMMM	FFFF	1.65	130
163	2.07	45-9	MMMMMM	FFFFFFF	2.49	196
220	2.79	40-4	MMMMMMM	FFFFFFFF	2.86	225
287	3.64	35-9	MMMMMMMMM	FFFFFFFFFF	3.99	314
339	4.31	30-4	MMMMMMMMMM	FFFFFFFFFFF	4.58	361
448	5.69	25-9	MMMMMMMMMMMM	FFFFFFFFFFFFFFFF	6.46	509
319	4.05	20-4	MMMMMMMMMMM	FFFFFFFFFFFFFFFF	6.41	505
336	4.27	15-9	MMMMMMMMMMM	FFFFFFFFFFFFFF	5.12	403
384	4.88	10-4	MMMMMMMMMMMM	FFFFFFFFFFFFF	4.70	370
427	5.42	5-9	MMMMMMMMMMMMM	FFFFFFFFFFFF	4.99	393
471	5.98	0-4	MMMMMMMMMMMMM	FFFFFFFFFFFFFF	5.47	431

FIGURE 5. M H D P S RANK PROGRAM
PERCENT OF FAMILIES IN POVERTY—STATE OF MARYLAND

Cumulative Frequency	Absolute Rank	Percent Above	Percent Below	Record Number	Data Value	Catchment Area Name
1	1	96.67	0.0	2579	2.203	Bethesda Area III, Md.
2	2	90.00	6.67	2595	2.722	Northern MHC, Md.
3	3	83.33	13.33	2594	2.989	Northwestern MHC, Md.
4	4	76.67	20.00	2580	3.459	Rockville-up County, Md.
5	5	70.00	26.67	2581	4.231	Comprehensive CMHC I, Md.
6	6	63.33	33.33	2596	4.458	Eastern MHC, Md.
7	7	56.67	40.00	2574	4.720	Area VII, Md.
8	8	50.00	46.67	2575	5.371	Carroll-Howard CMHC, Md.
9	9	43.33	53.33	2576	6.839	Harford-Cecil CMHC, Md.
10	10	36.67	60.00	2592	7.220	Anne Arundel Area II, Md.
11	11	30.00	66.67	2589	9.429	Western Md. Area II, Md.
12	12	23.33	73.33	2587	12.158	So. Maryland, Md.
13	13	16.67	80.00	2588	13.475	Western Md. Area II, Md.
14	14	10.00	86.67	2568	15.252	Inner City CMHC, Md.
15	15	3.33	93.33	2569	21.559	Provident Hosp CMHC, Md.

Total Number of Cases Ranked = 15
Total Suppressed Cases Skipped = 0
Cases Failing Selection Tests = 0

areas as compared to that for rural counties is substantially different for some indicators. For example, the median percent of population in poverty in metropolitan counties is 11 percent compared with 21 percent in rural counties.

One problem experienced by users of the system relates to the need to deal with 130 variables, far too many for most needs assessment tasks. Through the use of factor analysis, it is possible to reduce the list to only a few which are most representative of the components of the social and economic structure of the community. Such a list is shown in figure 9. Added to these variables are indicators representing high risk and other target populations in a catchment area. An adequate social area analysis and ranking of catchment areas in terms of "need" can be accomplished with the use of this greatly reduced list of indicators.

In summary, this system is a compilation of indirect measures of potential mental health service needs based on the 1970 census. Its use enables the characterization of the social structure of a community and the identification of high risk and other target populations. It can provide general population data useful for identifying such populations in an area but does not contain direct indicators of mental illness. In short, this system is primarily a tool, which can be and has been used extensively by planners and evaluators nationwide to develop a needs assessment of a catchment area, a Health Service Area or in ranking catchment areas within a State

One of the major gaps in knowledge in terms of using indirect indicators—and this reflects the state of the art of needs assessment, is the relationship between the level of an indicator depicting a high risk population and the kinds and amount of resources necessary to serve that population. As stated previously, this is due, in part, to the fact that there is no theoretical framework with which to interpret social indicators. Further, there are no standards of service delivery to indicate that there should be a specific number of psychiatrists, community mental health centers, psychiatric beds, and other resources, for a given number of persons in the population or a proportion of that population who are considered "high risk." Nevertheless, some work has been and is being done along this line to provide service utilization models. One model is demonstrated in figure 10. This figure describes how one might use national utilization data as a "norm" to estimate unmet needs in a catchment area. Another project is underway using the Monroe County Psychiatric Case Register and the Mental Health Demographic Profile System in which service utilization patterns are being related to different types of community structures.

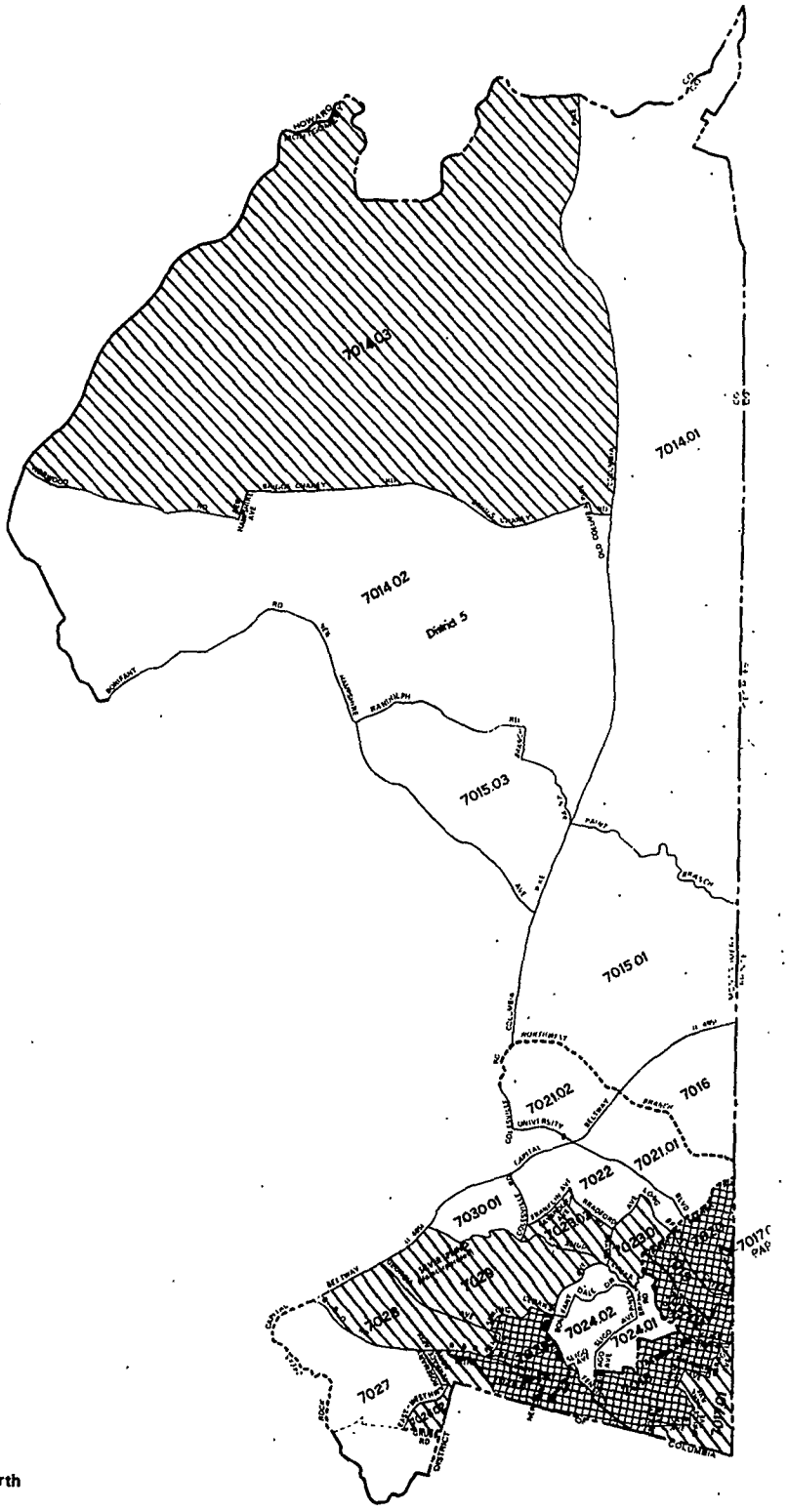
There are several limitations specific to the system which should be kept in mind. First, the system is based on 1970 census data. As we get further away from the 1970 data, some, but not all of the data will become relatively useless. For example, economic data may change considerably from year to year while social data, that is, information on family and household structure, housing data, etc., may not vary substantially even over a decade. Nevertheless, even if the economic status of a community changes over time, the distribution of a particular condition within a community may not be significantly different. For example, the median family income may rise, but the percent of population in poverty may not. Secondly, the data are subject to all the limitations described in census volumes, such as underenumeration, sampling errors, and data suppressions.

In terms of the future, we are planning to expand

Figure 6.

MAP: PERCENT OF POPULATION IN POVERTY

Census Tracts of the Takoma-Park Silver Spring Catchment Area II, Montgomery County, Maryland



PERCENT

0.0 - 4.9	
5.0 - 9.9	
10.0 - 14.9	

Source: U.S. Bureau of the Census, Second and Fourth Count Data, 1970 Census of Population and Housing

FIGURE 7. PERCENTILE DISTRIBUTION OF VALUES OF SELECTED DEMOGRAPHIC STATISTICS FOR ALL CMHC CATCHMENT AREAS IN THE U.S.

Statistics	Percentiles					
POPULATION DATA	10	20	40	60	80	90
(1) Total population	74,109	90,606	119,154	145,079	176,858	198,627
(2) Number of males (in households)	34,999	42,901	56,036	68,886	82,384	93,112
(3) Number of females (in households)	36,939	45,322	59,893	73,135	89,662	100,425
(4) Population in group quarters	706	1,098	2,000	3,347	5,573	8,079
(5) Population White	56,396	76,533	103,919	129,974	159,345	182,156
(6) Population Negro	175	527	2,268	7,565	25,269	46,743
SOCIOECONOMIC STATUS						
ECONOMIC STATUS						
(7) Income of families and unrelated individuals; median income of families and unrelated individuals	4,908	5,718	6,884	8,187	9,827	11,082
(8) Families in poverty; percent of all families below poverty level	4.0	5.2	7.7	10.7	16.5	22.5
SOCIAL STATUS						
(9) Low occupational status, males; percent of employed males 16 and over who are operatives, service workers, and laborers including farm laborers	24.9	29.6	35.2	39.8	44.1	46.9
(10) High occupational status, males; percent of employed males 16 and over who are professionals, technical and kindred workers and managers except farm	15.5	17.7	20.5	24.6	31.0	37.4
EDUCATIONAL STATUS						
(11) School years completed: median school years completed by persons 25 and over	9.8	10.7	11.8	12.1	12.3	12.5

FIGURE 8. MENTAL HEALTH DEMOGRAPHIC PROFILE SYSTEM
(Based on 1970 Census)
Comparison of Metropolitan and Rural counties for selected high-risk variables

Item #	Variable	U.S. Total	U.S. Median Metro Counties	U.S. Median Rural Counties
5–7	Median income of families and unrelated individuals	$ 7,699	7,988	5,659
5–8	Percent of all families below poverty level	10.7%	8.1	17.3
5–9	Percent employed males in low occupational statuses	36.0%	36.2	41.3
5–11	Median years of school completed (persons 25+)	12.1 yrs	12.1	10.6
5–12	Percent household population black	11.1%	4.9	2.2
5–17	Youth dependency ratio (persons under 18 per 100 persons 18–64 in households)	63.4	65.1	67.7
5–18	Aged dependency ratio (persons 65+ per 100 persons 18–64 in households)	17.4	15.6	23.0
5–21	Percent population in overcrowded housing units	16.9%	15.3	19.5
5–23	Percent recent movers (in migrants 1969–70)	23.5%	23.7	20.3
6–8	Percent population below poverty level	13.7%	10.6	21.0
	Measures of Urbanization			
6–87	Percent of housing units that are large apartment structures	6.6%	2.3	0.1
6–90	Rural population as percent of total	26.5%	22.8	81.5

the Demographic Profile System to include 1980 data. In our planning, we are soliciting input from health agencies other than NIMH within the PHS. These include NCHS, HRA, CDC, etc. We are organizing task forces within the PHS to update the 1980 system in terms of format and type of data to be included, but are interested in suggestions from users throughout the United States, as well. In addition, we are planning

FIGURE 9. INDICATORS FROM THE MHDPS MOST REPRESENTATIVE OF ECONOMIC AND SOCIAL CONDITIONS IN CATCHMENT AREAS
(Based on factor analysis and/or program relevance)

Economic status
- Median income of families and unrelated individuals
- Percent males 16+ with low occupational status: total, white, black
- Percent families in poverty
- Percent population in poverty: total, white, black

Social and education status
- High occupational status, males
- High school completion: white, black

Ethnic composition
- Percent population black
- Percent population Spanish heritage

Household composition and family structure
- Percent husband–wife households: total, white, black
- Families with children under 18

Residential life style
- Overcrowded housing and lacking plumbing facilities
- Percent units renter occupied

Community Instability
- Recent movers: total, white, black

High risk or target populations
- Working mothers with children under 18
- Female headed households with own children under 18: total, black
- Aged persons living alone
- Aged persons in poverty
- Aged dependency ratio: total, white, black
- Youth dependency ratio
- Group quarters excluding institutions

FIGURE 10. EXAMPLE OF USE OF DENOMINATOR DATA WITH UTILIZATION DATA

(Estimate of unmet needs, Takoma Park — Silver Spring Catchment Area, Montgomery County, Maryland)

		Estimated Needs Assuming:				
Age Group	1970 Population U.S. Census	A. 2 Percent of Population	B. U.S. Admission Rates*	Actual No. of Admissions**	Percent of Unmet Needs Assumpt. A	Assumpt. B
(column no.)	(1)	(2) col (1) x .02	(3)	(4)	(5) $\frac{\text{col (2)}-\text{(4)}}{\text{col (2)}} \times 100$	(6) $\frac{\text{col (3)}-\text{(4)}}{\text{col (3)}} \times 100$
All ages	119,514	2,383	1,554	1,009	57.7	35.1
Under 25 yrs.	50,550	1,011	519	319	68.4	38.5
25–44 yrs.	30,920	618	613	381	38.3	37.8
45–64 yrs.	27,241	545	355	268	50.8	25.1
65 yrs. +	10,443	209	64	41	80.4	35.9

*1971 Data
**1969 Data

SOURCE: Rosen et al, *Mental Health Demographic Profile System Description: Purpose, Contents and Sampler of Uses*, Series C, No. 11, NIMH,DHEW Publication No. (ADM) 76-263, 1975

to include data for 1960, where possible. With the inclusion of the 1960 data, it will be possible to develop longitudinal analyses as well as population projections for many small areas.

A number of reports and analytic tools have been developed for use of this system. A list of these publications are shown in figure 11.

In conclusion, I have discussed the development and use of a system of indirect social indicators selected to identify high risk and other target populations in terms of mental health needs. In spite of the limitations just described, these kinds of data can be very helpful in focusing on needed health as well as mental health services in a community. All too often these data are the only available information on the extent of potential mental health and other health problems in a community.

FIGURE 11. PUBLICATIONS RELATED TO THE MENTAL HEALTH DEMOGRAPHIC PROFILE SYSTEM

Division of Biometry and Epidemiology
NIMH, ADAMHA
5600 Fishers Lane
Rockville, Maryland 20857

*Analytical and methodological Reports**

Demographic Data to Improve Services: A Sampler of Mental Health Applications, Working Paper No. 33, June 1975, by Michele Gabbay and Charles Windle.

"A Demographic System for Comparative Assessment of Needs for Mental Health Services" *Evaluation,* Vol. 2, No. 2, 1975, pp. 73–76, by Charles Windle et al.

A Typological Approach to Doing Social Area Analysis, Methodology Reports, Mental Health Statistics, Series C, No. 10, DHEW Publication No. (ADM) 77–263, U.S. Government Printing Office, Washington, D.C., 1975, by Harold F. Goldsmith et al.

Mental Health Demographic Profile System Description: Purpose, Contents and Samples of Uses, Methodology Reports, Mental Health Statistics, Series C, No. 11, DHEW Publication No. (ADM) 76–263, U.S. Government Printing Office, Washington, D.C., 1977, by Beatrice M. Rosen et al.

1970 Census Data Used to Indicate Areas with Different Potentials for Mental Health and Related Problems, Methodology Reports, Mental Health Statistics, Series C, No. 3, DHEW Publication No. (ADM) 75–159, U.S. Government Printing Office, Washington, D.C., 1977, by Richard W. Redick et al.

A Model for Estimating Mental Health Needs Using 1970 Census Socio-economic Data, Methodology Reports, Mental Health Statistics, Series C, No. 9, DHEW Publication No. (ADM) 77–63, U.S. Government Printing Office, Washington, D.C., 1977, by Beatrice M. Rosen.

Mental Health Demographic Profile for Health Services Planning, National Center for Health Statistics, Statistical Notes for Health Planners, No. 4, DHEW Publication No. (HRA) 77–1237, U.S. Government Printing Office, Washington, D.C., March 1977, by Earl S. Pollack.

"Indirect Measures of Mental Health Status—Mental Health Demographic Profile System," *Proceedings of the Public Health Conference on Records and Statistics,* Washington, D.C., June 6, 1978, by Beatrice M. Rosen.

Demographic and Social Indicators from the U.S. Census of Population and Housing: Uses for Mental Health Planning in Small Areas, To be published in WHO Statistics Report, August 1978, by Beatrice M. Rosen et al.

"Mental Health and the Poor: Have the 'Nonpoor' Narrowed in the Last Decade?," *Medical Care,* Vol. XV, No. 8, August 1977, pp. 647–661, by Beatrice M. Rosen.

"The Mental Health Demographic Profile System: A Longitudinal Information System", *Journal of Social Indicators,* (in press), 1979, by J. Philip Shambaugh et al.

Working Papers: Short Analytic Reports (composed primarily of tabulations)

Geographical Descriptions of Community Mental Health Catchment Areas in Regions I–X: 1973 (10 Volumes), MHDPS Working Paper Nos. 1–10, National Institute of Mental Health, 1973, by Charles Windle et al.**

Catchment Areas with Unusually High Proportions of Some "High Risk" Groups: Region I–X, MHDPS Working Paper Nos. 11–20, National Institute of Mental Health, 1975, by Charles Windle et al.**

Demographic Norms of Community Mental Health Center Catchment Areas, MHDPS Working Paper No. 21, National Institute of Mental Health, March 1975, by J. Philip Shambaugh et al.

Demographic Differences Between Areas With and Without Federal CMHC Grants, MHDPS Working Paper No. 22, National Institute of Mental Health, May 1975, by Charles Windle et al.

Demographic Norms for Metropolitan, Nonmetropolitan and Rural Counties, MHDPS Working Paper No. 24, National Institute of Mental Health, July 1975, by Harold F. Goldsmith et al.

Geographic Relationships Between PSRO and CMHC Catchment Areas: Regions I–X, MHDPS Working Paper No. 23, 25–32, August 1975, by Charles Windle et al.

Technical Reports: Statistical Techniques for Analysis

Demographic Characteristics of Mental Health Catchment Areas: Factor Structure and Factor Scores Based on the Social Indicators in The Mental Health Demographic Profile System, MHDPS Working Paper No. 34, National Institute of Mental Health, August 1976, by Harold F. Goldsmith et al.

Demographic Structure of Mental Health Catchment Areas: Principal Component Factor Analysis with Varimax Rotation of 18 Factors, MHDPS Working Paper No. 35, National Institute of Mental Health, September 1976, by Harold F. Goldsmith et al.

Laboratory Papers: (Short Analytic Reports Focusing on Social Area Analytic Methodology)

*Some of the papers listed here are described in Series C, No. 11.
**Contains Individual reports for each Region. Some of the descriptions have been revised since these reports were prepared.

Differentiation of Urban Subareas: A Re-Examination of Social Area Dimensions, Laboratory Paper No. 35, Mental Health Study Center, National Institute of Mental Health, November 1970, by Harold F. Goldsmith and Elizabeth L. Unger.

A Technique for Classifying Population Age Profiles, Laboratory Paper No. 33, Mental Health Study Center, National Institute of Mental Health, May 1970, by Harold F. Goldsmith et al.

Social Areas: Identification Procedures Using 1970 Census Data, Laboratory Paper No. 37, Mental Health Study Center, National Institute of Mental Health, May 1972, by Harold F. Goldsmith and Elizabeth L. Unger.

Social Rank and Family Life Cycle: An Ecological Analysis, Laboratory Paper No. 43, Mental Health Study Center, National Institute of Mental Health, May 1972, by Harold F. Goldsmith and Elizabeth L. Unger.

"Social Area Analysis: Procedures and Illustrative Applications Based Upon the Mental Health Demographic Profile System." *Census Tract Papers,* Series GE-40, No. 9, U.S. Government Printing Office, Washington, D.C., 1973, by Harold F. Goldsmith and Elizabeth L. Unger.

Variations in Socioeconomic Status Among Metropolitan, Non-metropolitan and Rural Counties, Demographic Analysis: Working Paper No. 5, October 15–17, 1975, by Edward G. Stockwell et al.

**Contains Individual reports for each Region. Some of the descriptions have been revised since these reports were proposed.

THE INTEGRATION OF EPIDEMIOLOGICAL AND HEALTH SERVICES RESEARCH

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The research on which I shall report today utilizes the epidemiologic approach to determine not only the extent of psychiatric illness in the community but the utilization of mental health services as well. Specifically, we shall examine the use of health services for emotional problems and the relationship of this use to the individual's diagnostic status. The results are based upon the third round of interviews in a longitudinal community study in New Haven, Connecticut.

METHOD

In 1967, a longitudinal survey of a systematic sample of 938 adults (18 years of age or older) of a community mental health center catchment area in New Haven, Connecticut was undertaken. The catchment area has a population of approximately 72,000 which includes a changing inner-city section of 22,000 and a more stable industrial town of 50,000. It represents a cross-section of the community's population and includes all ethnic, racial, and socioeconomic groups. An in-person interview was conducted with each respondent in the study, and among the materials collected were data on socio-demographic characteristics, use of health facilities, and psychiatric symptoms. In 1969 and in 1975–76 the same population was reinterviewed.

Until recently community studies were forced to use symptom scales to define mental illness because of the lack of suitable diagnostic instruments for such large scale surveys. Recently, however, there have been developments in technologies for improving the reliability and the validity of psychiatric diagnoses in both clinical and community settings and there have been more precise descriptions of the psychiatric syndromes. One new diagnostic technique, a categorical approach, developed by Spitzer, Endicott and Robins (SADS–RDC) was employed, therefore, in the 1975–76 study. Today's presentation includes data collected on the 515 persons interviewed in 1975–76. Persons who died, moved out of the community, could not be located or refused to participate during the study did not differ greatly from those included in terms of sociodemographic characteristics or symptom status.

Diagnostic Assessment

Information for making diagnostic judgments was collected on the Schedule for Affective Disorders and Schizophrenia (SADS). The SADS is a structured interview guide with an accompaning inventory of rating scales and specific items. It records information on the subject's functioning and symptomatology. Although the name of the instrument suggests that it is specific only to affective disorders and schizophrenia, in fact it is an overall mental status inventory that contains the information necessary for making diagnostic judgments for all major psychotic, neurotic, and personality disorders. This method has been shown to reduce the portion of variance in diagnosis due to differing interviewing styles and coverage.

Based on the information collected on the SADS, the respondents were classified on the Research Diagnostic Criteria (RDC) which are a set of operational diagnostic definitions with specific inclusion and exclusion criteria for a variety of nosologic groups. These operational definitions were developed for reducing the variance due to differing criteria between clinicians. The criteria variance has been shown to account for the largest source of errors between clinicians. The RDC have evolved from a decade of research on diagnosis. The conditions included have the most evidence of validity in terms of clinical description, consistency over time, familial association, and response to treatment. The American Psychiatric Association, Diagnostic and Statistical Manual, Third Edition (DSM-III) will be based in part on the RDC.

Diagnoses on the RDC are made both for the current time period and for lifetime except for several diagnoses which are considered lifetime diagnoses only, whether or not the subject is currently manifesting symptoms.

Interviewers, Training, Reliability

There were two raters with Master- and Bachelor-level education and previous experience in clinical psychiatry and interviewing. Both raters, under the guidance of a doctoral-level person and with psychiatric consultation, received three months of training on the SADS and RDC, following which interrater reliability was tested and found to be excellent.

Results

During the year previous to the 1975–1976 interview, persons in the New Haven study were treated for emotional problems by a variety of sources as shown in table 1. The most common source was out-patient

Table 1. TREATMENT FOR EMOTIONAL PROBLEMS DURING THE PAST YEAR

	Percent
Psychiatric Hospitalization	1.6
Mental Health Professional (Out-Patient)	5.5
General Medical Professional	2.4
Other Professional (Clergy, non-psychiatric social worker, etc.)	1.8
Any treatment	8.9

N = 509

treatment by a mental health professional (5.5%) followed by a non-psychiatric physician (2.4%) and by other professionals (minister, non-psychiatric social worker, etc.) and hospitalization in a psychiatric facility. Since some respondents were treated in a variety of settings, the percentage of individuals who were treated was somewhat less than the above totals, 8.9%.

In table 2 the 8.9% of the population is broken down by the most clear-cut type of psychiatric treatment received, regardless of any other types. Thus, persons hospitalized for emotional problems may have received any or none of the other types—outpatient mental health professional, general medical professional, or other. As can be seen, the order of frequency of types of treatment remains about the same.

The data on treatment presented so far is for all respondents in the year prior to 1975–76 interview, regardless of their mental status. Since we would expect treatment to be related to psychiatric status, we next examined our data by diagnostic status. In 1975–76, 17.8% of the population studied had a psychiatric diagnosis according to SADS–RDC, and treatment was indeed related to diagnosis as seen in table 3: 31.1% of all persons with a diagnosis were treated, contrasted with only 4.1% of respondents without a diagnosis. The most common source of treatment for both groups is the mental health professional in an out-patient setting followed by a non-psychiatric physician.

Although only about one-third of respondents with a diagnosis were seen by a professional for a specifically emotional problem, a much higher percentage visited health professionals for other reasons. As can

Table 2. TREATMENT FOR EMOTIONAL PROBLEMS DURING THE PAST YEAR BY LEVEL OF TREATMENT

	Percent
Psychiatric Hospitalization	1.6
Mental Health Professional (Out-patient)	4.1
General Medical Professional	1.8
Other Professional Only	1.4
Total	8.9

N = 509

Table 3. TREATMENT FOR EMOTIONAL PROBLEMS DURING THE PAST YEAR BY DIAGNOSIS

	Diagnosis (percent)	No Diagnosis (percent)
Psychiatric Hospitalization	5.6	0.7
Mental Health Professional (Out-patient)	18.9	2.6
General Medical Professional	7.8	1.2
Other Professional	6.7	0.7
Any	31.1	4.1
	(N = 90)	(N = 419)

be seen in table 4, 91.1% of all persons with a diagnosis were seen by a health professional during the year, but only 82.6% of those without a diagnosis. These differences are decidedly more pronounced when we consider more than two visits to a health professional—66.7% with a diagnosis but only 46.4% without a diagnosis.

When we analyze our data for persons who had ever in their lifetime had a psychiatric diagnosis and who had ever been treated for an emotional problem, the treatment differences by diagnosis continue to be very substantial, as seen in table 5. In New Haven 41.4% of all respondents had sometime in their life received treatment for an emotional problem. However, 77.6% of persons ever diagnosed had received such treatment, but only 16% of these without a diagnosis. Note that the most common type of treatment was by a nonpsychiatric physician, followed by a mental health professional. Also note that 15% of these persons with a diagnosis were hospitalized some time during their life.

Having determined overall patterns of treatment for emotional problems by diagnosis, we next examined relationships by sociodemographic factors. In general such factors were relatively unimportant with one exception—sex.

In 1975–76, 16% of men and 19% of women in the study had a psychiatric diagnosis. However, as seen in table 6, about 2½ times as many women as men were treated for an emotional problem, with or without a diagnosis.

SUMMARY AND CONCLUSION

In summary, in our New Haven study we find a strong relationship between mental status and treatment of emotional problems: persons with a psychiat-

Table 4. PERCENTAGE OF RESPONDENTS SEEN BY A HEALTH PROFESSIONAL FOR ANY REASON DURING THE PAST YEAR

	Any Visit	More Than Two Visits	N
Diagnosis	91.1	66.7	90
No Diagnosis	82.6	46.4	419

Table 5. EVER TREATED FOR EMOTIONAL PROBLEMS BY LEVEL OF TREATMENT FOR PERSONS EVER DIAGNOSED

	Total (percent)	Diagnosis (percent)	No Diagnosis (percent)
Psychiatric Hospitalization	6.4	15.2	0.3
Mental Health Professional (Out-patient)	10.8	22.9	2.4
General Medical Professional	22.6	37.6	12.
Other Professional Only	1.6	1.9	1.3
Total	41.4 (N = 509)	77.6 (N = 210)	16.0 (N =299)

ric diagnosis are much more likely than those without to receive treatment for an emotional problem, both currently and during their lifetime. Thus, treatment is related to need. However, only about one-third of persons with a current diagnosis were were treated by a professional for psychiatric problems during the year prior to interview. Outpatient treatment by a mental health professional was the most frequent type of treatment, followed by treatment by a nonpsychiatric physician. If we include frequent treatment (seen more than two times) by a health professional for any reason, then an additional third of the diagnosed population were seen by a medical professional during the year prior to interview. Thus, the nonpsychiatric physician is the professional who most frequently treats the person with a current diagnosis of psychiatric illness. However, one-third of all persons with a current psychiatric diagnosis received little or no treatment from any source during the year prior to the 1975–76 interview—a significant proportion of persons with an emotional problem.

When we examine lifetime treatment patterns we also find that treatment by a general medical professional is the most common form, followed by outpatient treatment by a mental health professional. Although most persons who were ever diagnosed received some treatment for their emotional problems, over one-fifth (22.4%) had never received specific treatment for an emotional problem. Finally, it is clear that substantially more women than men receive treatment for their emotional problems.

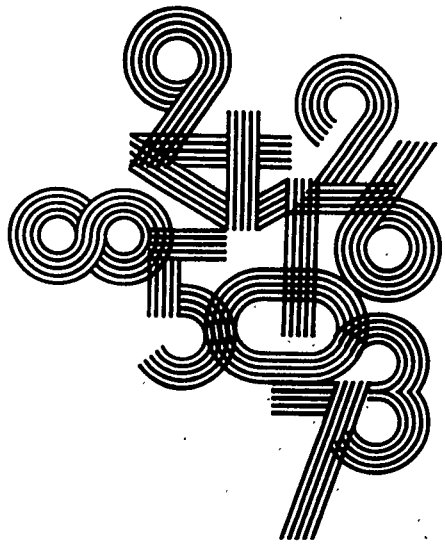
Because we have such a short time for presentation today, we have only been able to present a few major findings from our research. However, I believe they show the importance of epidemiologic research for health services.

Table 6. TREATMENT FOR EMOTIONAL PROBLEMS DURING THE PAST YEAR BY SEX AND DIAGNOSIS

With Current Diagnosis

Male—16% (Total N = 218)
Female—19% (Total N = 291)

	Any Treatment	
	Male	Female
With diagnosis	17.1%	40.0%
Without diagnosis	2.2%	5.5%



CONCURRENT SESSION H

Data Needs for Health Resource Policy

ON BEING WRONG ABOUT THE HOSPITAL: THE ROLE OF UTILIZATION MEASURES

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It is well known that the common measures of hospital use are not adequate to assess the outputs of the hospital. Although the concepts of total admissions, overall average length of stay, and total bed days are in universal use, it is obvious that they cannot capture the true nature of the hospital's product, for the simple reason that the hospital is a multiproduct firm. Different hospitals may produce different sets of products, and the same hospital may vary in the types of cases treated over time. All admissions to the hospital are not really homogeneous, nor are all days of a stay nor total bed days.

Nevertheless, in pragmatic applications we typically ignore these theoretical niceties. We usually interpret a change in total admissions as being distributed more or less proportionately over the various case types. Similarly, when we observe a change in the overall average stay, we tend to attribute it to a shift in physician policies of more or less rapid discharge of all cases, regardless of diagnosis, ignoring the possibility that the change in overall average stay could also have resulted from a shift in admissions mix. Similarly, we deal with changes in bed days as simple changes in total aggregate output, even though the level of bed days is the product of both admissions and overall average stay, so that its meaning—in terms of what the hospital is really doing—may be doubly obscured.

However, the use of a simplifying assumption which is known to be inaccurate is not necessarily wrong. In economic theory, much behavior can be predicted or explained by means of analyses which are built by assuming conditions which we know do not really exist; the simplifying assumptions nevertheless prove to be useful. In the case of hospital behavior, similarly, the assumption of a homogeneous product is clearly useful, and a problem arises only if it is shown that the unrealistic assumption causes us somehow to be misled. To date, there has been no overwhelming evidence that that is the case.

The main purpose of the present paper is to weaken that complacency. We examine a large volume of hospital use data, and we disaggregate the common use measures into their basic components. We then use these to examine the behavior of hospitals over the period 1964 to 1975, and also to compare hospital use across major census regions. We show empirically that the homogeneity assumption can in fact do us harm, particularly when we try to draw inferences about hospital use on the basis of the aggregate use measures. We find that there are substantial variations in admissions mix and in illness-specific lengths of stay in both time and place, that these variations, camouflaged by traditional aggregate measures, appear to respond to major policy actions, and that there is sufficient variation in these components of utilization to make any interpretation of the aggregate use measures highly suspect at best. In the process we also demonstrate how measurement of certain components of aggregate output can reduce the dimensions of the problem, although not eliminating it entirely.

In the next section we discuss the methods and the data employed. Sections II and III then examine the implications of assuming product homogeneity in evaluating the past effects of two major policy actions—the implementation of Medicare and the Economic Stabilization Program. In Section IV we apply these lessons to discuss probable difficulties facing policies for hospital cost containment, and the implications of the findings are discussed in the final section, in which alternative future courses for improved output measurement are compared.

I. METHODS AND DATA

Measures of Hospital Use

The aggregate patient care output of the hospital can be characterized along a number of different dimensions, including severity, complexity, necessity, acuteness, and so on. In this study, two particular aspects of output are emphasized because the measurement methodology has been developed and tested elsewhere, and, consequently, interpretation of the results is facilitated (Rafferty, 1972, 1975). These dimensions of hospital use are case mix necessity and illness-specific length of stay, each of which are measured by an aggregate index number defined over the various diagnostic groups.

Case mix is measured by a Laspeyre's index which uses average lengths of stay to weight the diagnosis-mix proportions (Rafferty, 1972). The index is

$$I_{cm} = \frac{\sum_{i=1}^{m} L_i^s p_i^h}{\sum_{i=1}^{m} L_i^s p_i^s} \cdot 100,$$

where $i = 1, 2, \ldots, m$ diagnostic categories, L_i^s is the average length of stay for case-type i for the hospital system, p_i^s is the proportion of case-type i in the total census of that hospital system, and p_i^h is the proportion

of case-type i in the census of the comparison hospital (or hospital subgroup). The denominator, or base, of the index is the sum of the products of the system-wide average length of stay in each diagnosis group (L_i^s) times the system-wide proportion of the total patient population in that diagnosis (p_i^s). This works out to be the overall average length of stay for all patients in the hospital system. The numerator is the sum of the products of average stay in each diagnosis (L_i^s) and the proportion of the patient-census of the given hospital (P_i^h) with that diagnosis. This produces the *theoretical* overall average stay for that hospital which would have prevailed if the patient stays in each diagnosis were similar to those for the overall hospital system, but with the unique case mix proportions prevailing in the comparison hospital. Thus, the value of the index will diverge from 100 to the extent that differences in case-mix proportions (and only in case-mix proportions) are distributed among longer (or shorter) stay case-types on average in the given hospital; that is, a rise in the index indicates a relative increase in longer staying case-types.

Note also that this index may be used either to compare the case mix of a given group of hospitals with that of the total patient population of the hospital system of which they are a part, or it may be used to compare the case mix of a hospital or group of hospitals with the case mix of the same group in a previous (base) time period. Also, the use of average stays as the weights for the proportions of admissions in each case type provide the basis for interpreting the index as a measure of the relative necessity of admission to the hospital. This is suggested on the basis of previous research (Anderson and Sheatsley, 1967) in which the longer staying case-types were found generally to represent those patients who most required the use of the unique facilities of a hospital for successful treatment.

In the second index, case mix is held constant in order to observe differences in overall average length of stay attributable to differences in lengths of stay for individual case type (Rafferty, 1972). The formula is

$$I_{LOS} = \frac{\sum_{i=1}^{m} L_i^h p_i^s}{\sum_{i=1}^{m} L_i^s p_i^s} \cdot 100,$$

where $i = 1, 2, \ldots, m$ diagnostic categories, and L_i^h is the average length of stay for case-type i in the comparison hospital. The denominator, again, is the overall average length of stay for all patients in the hospital system. The numerator produces the theoretical overall average stay that would have prevailed for the given hospital if the case-mix proportions were similar to those for the overall patient population but with the unique diagnosis-specific stays prevailing in the given hospital. The value of the index diverges from 100 to the extent that differences in case-specific lengths of stay (and only case specific lengths of stay) are longer (or shorter) on average in the given hospital; that is, a rise in the index indicates that the hospital is treating case-types via longer stays.*

In specifying the indices, we begin with the 4-digit H-ICDA diagnostic codes. However, age, the existence of single and/or multiple diagnoses, and the use of surgery are significant factors relating to hospital use which should therefore be taken into account in defining the types of cases treated by the hospital. For that reason we further disaggregate the 4-digit codes on the basis of age of the patient (0–19, 20–64, 65+), by whether or not the patient had multiple diagnoses explaining admission, and by whether or not the patient had surgery. That is, each diagnostic group is further subdivided into 12 groups by these dimensions.

Data

The data for this study were obtained from *Length of Stay in PAS Hospitals,* published by the Commission on Professional and Hospital Activities (CPHA) beginning in 1963–64 (CPHA, 1966). This was followed by a comparison of hospital stays before and after the implementation of Medicare (CPHA, 1969). Then, for 1969 through 1975 the volumes were published annually for the four major census regions and the United States overall.

Over the period 1964–1975, the diagnostic coding scheme was modified twice. In general, the changes represented disaggregation into finer reporting categories. Thus, comparisons across time required the merging of diagnostic categories in later years.

PAS is the largest discharge abstract system in the United States with respect to number of subscribers. In 1975, membership stood at 1,887 hospitals. Very small and very large hospitals are slightly underrepresented, as are hospitals in the Southern region. Also, the participation rate for teaching hospitals in the West is slightly below that for the rest of the country. However, the distribution of PAS hospitals by bed size, region, and teaching status shows that they are approximately representative of the distribution of all U.S. short-term non-Federal hospitals. These distributions are reported in Appendix I.

II. LONG RUN TRENDS AND MEDICARE

The objective of the Medicare program, which took effect in mid 1966, was to reduce the out-of-pocket price of hospital care to the elderly, primarily because

*Differences in length of stay *within* a given case-type could reflect either or both of two factors—differences in the discharge policies of the medical staffs, or differences in the severity/complexity of the cases admitted. In the absence of additional clinical information on the patients, we interpret illness-specific lengths of stay as reflecting discharge policy.

Table 1. CASE MIX, ILLNESS-SPECIFIC LENGTH OF STAY, AND OVERALL AVERAGE LENGTH OF STAY IN PAS HOSPITALS, UNITED STATES, 1964–1967

Year	Overall Average Length of Stay	Case Mix Index	Illness-Specific Length of Stay Index
1964		(Base)	(Base)
1965	7.3	102.36	109.15
1966	—	—	—
1967	7.6	111.93	102.50

of the higher need for care and the relatively low fixed incomes of that group. The data on aggregate use generally support the contention that Medicare achieved this purpose. It is well known that hospital use increased, and that the share of the elderly in hospital admissions rose from 12.4 to 16.8 percent (Rafferty, 1975). It is also well known that the overall average length of stay rose during the same period, from 7.3 days in 1965 to 7.6 days in 1967 (table 1). The fact that elderly patients typically stay several days longer than younger patients with the same illness would seem to explain the increase in the overall average stay, although the increase might also be attributable in part to relaxed discharge policies resulting from lower net price. However, our purpose here is to demonstrate that none of these reasonable expectations based on aggregate use data are actually entirely correct.

Analysis of the main components of aggregate use sheds further light on Medicare's effects. First, examination of the case mix index appears to support the argument that the increased hospital use by the elderly represented necessary rather than discretionary use. As shown in table 1, the case mix index rose from 102.4 to 111.9 between 1965 and 1967. This indicates that case mix did shift, moving dramatically towards a larger proportion of the types of illnesses typically requiring longer hospital stays. As noted above, these are generally interpreted as the more necessary hospital admissions. Thus, this index indicates that average necessity of admission increased at the same time that the proportion of elderly admissions rose. However, as we show below, this fact is very easily misinterpreted.

The length of stay index also offers further information (table 1). This index shows that, contrary to accepted belief, hospital stays—on an illness specific basis—were actually reduced after Medicare by roughly 7 percent. That is, the indices show that the case mix shift, in and of itself, would have increased overall average stay by approximately 10 percent, but that a reduction in illness-specific lengths of stay offset this by about 7 percent, resulting in the actual net increase from 7.3 to 7.6 days.

Thus, the combination of aggregate use data along with these indices reflecting components of use seem to describe the Medicare program as both effective and efficient—effective in terms of increased access for patients with greater needs, and efficient in terms of shortened stays on an illness-specific basis. However, both of these interpretations of the data are incorrect.

The inferences drawn above can be tested by further disaggregation of the data into that for patients under the age of 65 versus those over 65. These data results (table 2) offer a very different interpretation of how hospital care actually responded to the Medicare program.

First, while case mix for the overall patient census did change dramatically after Medicare, that change is not attributable to the elderly patients. In fact, case mix remained essentially unchanged for the elderly (100.6 vs. 101.3) but changed dramatically for patients under 65 (102.1 vs. 109.4). Apparently, beds were rationed to the younger group in order to make space for the expected surge of Medicare beneficiaries, and the shift towards a longer staying average case type was the result of reduced admissions of the shorter stay ill-

Table 2. CASE MIX, ILLNESS-SPECIFIC LENGTH OF STAY, AND OVERALL AVERAGE LENGTH OF STAY IN PAS HOSPITALS BY AGE OF PATIENT, UNITED STATES, 1964–1967

	Age 65 and over			Age under 65		
Year	Case Mix Index (1)	Illness-Specific Length of Stay Index (2)	Overall Average Length of Stay (3)	Case Mix Index (4)	Illness-Specific Length of Stay Index (5)	Overall Average Length of Stay (6)
1964	(Base)	(Base)		(Base)	(Base)	
1965	100.56	99.42	13.1	102.12	99.12	6.5
1966	—	—	—	—	—	—
1967	101.27	105.88	14.1	109.43	89.33	6.8

nesses for younger patients.

Second, while illness-specific lengths of stay did decline for the patient census overall, table 2 shows that these stays did in fact increase for the elderly (from 99.4 to 105.9). What table 2 shows, however, is that the longer stays for the elderly were more than offset by shortened stays for non-elderly patients (from 99.1 to 89.3).

In brief, the effects of Medicare on hospital use patterns were less interesting in terms of the direct effects on elderly patients than they were in terms of the indirect effects of increased elderly admissions upon both the case mix and length of stay for the non-elderly group. But this very basic information on how hospitals actually behaved in response to Medicare is in no way even remotely suggested by the common measures of use. Rather, this analysis illustrates how readily those aggregate data are likely to be misinterpreted.

III. THE ECONOMIC STABILIZATION PROGRAM

A second major policy initiative which affected the hospitals was the Economic Stabilization Program (ESP). There still exists some disagreement on the degree to which ESP actually achieved its goals, and we do not attempt to resolve that issue here. However, we do show that the assumption of product homogeneity in evaluating ESP precludes identification of how hospitals actually responded to the controls, and actually leads to erroneous conclusions about that behavior. In the process of illustrating that point, we can shed some new light on how hospitals actually behaved.

The Council on Wage and Price Stability (1976) points out that health care prices did rise during the ESP period, but they did so more slowly than other prices. On the other hand, Ginsburg (1978) observes that the actual control variable was revenues per unit of output, and that by that criterion the controls did not succeed. But if price was relatively constant and revenues per unit rose, it is apparent there must have been some counteracting effect from quantity produced—some shift towards a more costly average product or output mix.

It is obvious that such a product change cannot be discovered via analyses that assume the existence of a single homogeneous product. Rather, it is necessary to disaggregate output into its relevant components. Although it is not the perfect measure in this context, the case mix index used above is instructive. As shown by table 3, the case mix index reveals that, throughout the control period (August 1971 to April 1974), there was a continuing case mix shift towards larger proportions of those illnesses which typically require the longer hospital stays. Thus, since it is likely that such cases involve higher costs, this case mix shift explains some or all of the discrepancy between revenues and price.

The data on OALS are also pertinent. During Phase III of the control period it was recognized that the controls inadvertently provided an incentive for hospitals to lengthen patient stays (because output was measured in terms of patient days). The need to reverse this incentive was suggested by a perceived interruption of the downward trend in overall average length of stay (OALS) which appears in 1972, when the controls began. For this reason a major objective of Phase IV was to reverse this incentive toward longer stays by changing the output unit from patient days to number of patients.

However, the data in table 3 reveal that this seemingly reasonable interpretation of hospital behavior was in fact quite incorrect. Although the decline in OALS may have been slowed in 1972, the index numbers for the period provide a very different picture. That is, in spite of the ESP incentive to lengthen stays, actual illness-specific stays continued declining throughout the period, but their obscured

TABLE 3. CASE MIX, ILLNESS-SPECIFIC LENGTH OF STAY, AND OVERALL AVERAGE LENGTH OF STAY IN PAS HOSPITALS, UNITED STATES 1964–1965

Year	Overall Average Length of Stay	Case Mix Index	Illness-Specific Length of Stay Index
1964		(Base)	(Base)
1965	7.3	102.36	109.15
1966	—	—	—
1967	7.6	111.93	102.50
1968	—	—	—
1969	7.7	108.63	107.77
1970	7.5	101.03	97.29
1971	7.4	103.60	93.90
1972	7.3	107.01	90.38
1973	7.1	108.07	88.20
1974	7.1	110.66	85.42
1975	7.0	112.41	83.62

effect on the more readily observed OALS was more than offset by the equally obscured effects of changing case-mix. That is, despite the ESP incentive to lengthen stays, hospitals were in fact continuing to shorten stays throughout the period; it was the case mix change which lengthened the overall average and produced misleading indications of hospital behavior. The point, again, is that the assumption of product homogeneity can in fact be very damaging: in this case it not only precludes identification of how hospitals actually responded, but it leads to conclusions about hospital behavior that are clearly erroneous.

IV. CROSS-SECTIONAL ANALYSIS

Growing awareness that different hospitals produce different products is being reflected in the current debate on cost containment policies. Attention to the problem is reflected in concern about techniques for classifying hospitals. The rationale is to apply either hospital controls or reimbursement incentives on the basis of appropriate hospital groupings, with the objective of establishing the groups of hospitals so that within each group the average product is essentially the same. That is, product homogeneity would not be assumed for the entire hospital population, but only for hospitals within each given group.

The effectiveness of such a classification methodology depends on the choice of variables used for grouping the hospitals: to be useful, they must actually be relevant to the product-mix variations which occur. We have seen in the previous sections that these variations can be misleading and problematic. This leads us to concern about the adequacy of hospital classification techniques, since product-mix variations still remain essentially unexplored. Thus, in this section we use the experience from the preceding analyses to begin such exploration. While we do not attempt any comprehensive analysis of hospital classification methods, we do demonstrate that the limited within-group homogeneity assumption still creates problems, and that satisfactory classification methods may have to be very complex. These points are demonstrated via comparison of hospital use across the four main U.S. census regions.

As indicated in table 4, the most dramatic regional differences are in OALS. The nature of this disparity is also striking: in the foregoing analyses, case mix was the critical factor affecting OALS, but here this is not so; rather, here the regional disparities in OALS are almost entirely attributable to differences in illness-specific stays.[1] In addition, it is also noteworthy that the relative interregional differences remain constant over the years, even though case mix and length of stay variables on a national basis were changing dramatically over the same period; that is, temporal changes in case mix and illness-specific length of stay were relatively uniform across regions. See tables A and B in appendix II.

The most notable single disparity is the divergence in OALS between the Northeastern versus the Western Regions—with 7.9 days in the Northeast and only 5.7 days in the West. The indices show that this disparity is accounted for almost in its entirety by a difference in illness-specific lengths of stay. Clearly, such a disparity as this would have to be accounted for in hospital classification, because it reflects either differences in the average within-diagnosis case severity, or differences in the average pattern and/or intensity of care per patient day; either would imply a product-mix difference, with implications for costs. However, it appears that such differences are not very readily accounted for.

The literature on hospital utilization lists many factors which are known to affect length of stay. We make no attempt here to analyze these comprehensively. However, we can examine the role of a number of variables which are prominent determinants of hospital use patterns (especially length of stay) and which also are relatively easy data to obtain. They are the most likely factors to be employed in a classification technique. These variables are the age structure of the population, the degree of surgical versus non-surgical treatment, the complexity of illness as indicated by presence of multiple diagnoses, hospital bed size, and teaching status, and the per capita supply of inpatient beds. In addition, we also examine the extent of HMO enrollment and the availability of nursing home beds. However, our analysis shows that this fairly extensive set of variables is still not adequate to explaining the regional differences in OALS.

First, age variations do not account for the disparities. In the Northeast, illness-specific stays are shown to be particularly long relative to the average for aged patients. As shown by table 5, the proportions of aged persons in total admissions is approximately the same across the regions, and thus is not associated with length of stay. The index numbers are recalculated for aged and non-aged patients in table 6. They show that, even within age groups, stays in the West are consistently short.

Tables 7 and 8 present data which show that surgical versus non-surgical treatment patterns do not explain the disparity. Again, the proportion of surgical versus non-surgical hospital treatments varies little across the regions, and for each group, illness-specific stays is dramatically shorter in the West.

Tables 9 and 10 present data on single versus multiple diagnoses, which may provide a rough index of case severity. However, the proportion of patients with multiple diagnoses is approximately the same across regions. Within single diagnosis patients, the

[1] In comparing regional differences in length of stay, it is also interesting to observe cross-national differences. In Canada, the overall average length of stay in PAS hospitals in 1975 was 7.8 days, as compared with 7.0 days in the United States. The index numbers show that this is due to differences in illness-specific lengths of stay, since the value of the case mix index was 91.5 and that for the illness-specific index was 138.1.

Table 4. CASE MIX, ILLNESS-SPECIFIC LENGTH OF STAY, AND OVERALL AVERAGE LENGTH OF STAY IN PAS HOSPITALS BY GEOGRAPHIC REGION, 1975

Region	Overall Average Length of Stay	Case Mix Index	Illness-Specific Length of Stay Index
Northeast	7.9	102.92	120.83
South	6.8	98.80	105.41
North Central	7.3	99.67	112.13
West	5.7	100.59	84.89

Table 5. DISTRIBUTION OF DISCHARGES FROM PAS HOSPITALS BY AGE AND GEOGRAPHIC REGION, UNITED STATES, 1975

			Region							
	U.S.		Northeast		South		North Central		West	
Age	No.	%	No.	%	No.	%	No.	%	No.	%
0–19 yrs.	3,629,574	25.3	751,054	25.4	900,589	25.3	1,414,877	25.6	563,054	24.3
20–34	3,396,239	23.7	690,628	23.4	840,090	23.6	1,310,252	23.7	555,269	24.0
35–49	2,177,031	15.2	434,479	14.7	564,208	15.8	838,244	15.2	340,100	14.7
50–64	2,450,063	17.1	507,131	17.2	602,556	16.9	937,717	17.0	402,659	17.4
65+	2,698,658	18.8	571,249	19.3	653,864	18.4	1,017,043	18.4	456,502	19.7
Total	14,351,565	100	2,954,451	100	3,561,307	100	5,518,133	100	2,317,584	100

SOURCE: Commission on Professional and Hospital Activities, *Length of Stay in PAS Hospitals by Diagnosis, United States, 1975; Western Region, 1975; Northeastern Region, 1975; Southern Region, 1975; North Central Region, 1975.* Ann Arbor, Michigan, C.P.H.A., 1976.

Table 6. CASE MIX, ILLNESS-SPECIFIC LENGTH OF STAY, AND OVERALL AVERAGE LENGTH OF STAY IN PAS HOSPITALS BY GEOGRAPHIC REGION AND BY AGE GROUP, 1975

	Aged Patients			Non-aged Patients		
Region	Overall Avg LOS	Case Mix Index	Ill.-Spec. LOS Index	Overall Avg LOS	Case Mix Index	Ill.-Spec. LOS Index
Northeast	13.6	102.27	115.95	6.5	96.13	92.72
South	10.9	98.11	96.48	5.9	99.52	98.85
North Central	11.8	99.80	102.77	6.2	100.04	104.40
West	9.1	100.30	78.73	4.9	100.30	63.19

Table 7. DISTRIBUTION OF PATIENTS IN PAS HOSPITALS BY OPERATED/NOT OPERATED BY GEOGRAPHIC REGION, UNITED STATES, 1975

	Operated		Not Operated		Total	
Region	No.	%	No.	%	No.	%
Northeast	1,444,211	48.9	1,510,330	51.1	2,954,541	100
South	1,643,943	46.2	1,917,364	53.8	3,561,307	100
North Central	2,503,694	45.4	3,014,439	54.6	5,518,133	100
West	1,138,703	48.7	1,178,881	51.3	2,317,584	100
Total	6,730,551	46.9	7,621,014	53.1	14,351,565	100

Table 8. CASE MIX, ILLNESS-SPECIFIC LENGTH OF STAY, AND OVERALL AVERAGE LENGTH OF STAY IN PAS HOSPITALS BY GEOGRAPHIC REGION AND BY OPERATED/NOT OPERATED, 1975

Region	Operated Patients			Not Operated Patients		
	Overall Avg LOS	Case Mix Index	Ill.-Spec. LOS Index	Overall Avg LOS	Case Mix Index	Ill.-Spec. LOS Index
Northeast	7.9	101.89	111.37	7.8	101.41	116.56
South	7.2	96.50	98.48	6.5	99.00	95.51
North Central	7.6	99.42	103.62	7.0	98.52	102.33
West	6.1	103.81	80.46	5.4	103.75	79.03

Table 9. DISTRIBUTION OF PATIENTS IN PAS HOSPITALS BY SINGLE/ MULTIPLE DIAGNOSIS BY GEOGRAPHIC REGION, UNITED STATES, 1975

Region	Single Diagnosis		Multiple Diagnosis		Total	
	No.	%	No.	%	No.	%
Northeast	1,421,547	48.1	1,532,994	51.9	2,954,541	100
South	1,733,513	48.7	1,827,794	51.3	3,561,307	100
North Central	2,597,529	47.1	2,920,604	52.9	5,518,133	100
West	1,113,025	48.0	1,204,559	52.0	2,317,584	100
Total	6,865,614	47.8	7,485,951	52.2	14,351,565	100

Table 10. CASE MIX, ILLNESS-SPECIFIC LENGTH OF STAY, AND OVERALL AVERAGE LENGTH OF STAY IN PAS HOSPITALS BY GEOGRAPHIC REGION AND NUMBER OF DIAGNOSES, 1975

Region	Single Diagnosis			Multiple Diagnosis		
	Overall Avg LOS	Case Mix Index	Ill.-Spec. LOS	Overall Avg LOS	Case Mix Index	Ill.-Spec. LOS
Northeast	5.3	98.15	111.53	10.3	102.31	115.12
South	4.9	100.56	98.51	8.6	97.84	96.30
North Central	5.1	98.73	103.85	9.2	98.95	102.59
West	4.0	104.72	79.99	7.3	102.72	79.58

Table 11. AVERAGE LENGTH OF STAY FOR PATIENTS DISCHARGED FROM SHORT-STAY HOSPITALS, BY GEOGRAPHIC REGION AND BED SIZE OF HOSPITAL, UNITED STATES, 1975

Region	Hospital Size		
	6–99 Beds	100–499 Beds	500 Beds or More
Northeast	7.5	8.9	10.2
South	6.2	7.2	8.3
North Central	6.9	7.9	9.0
West	5.3	6.6	7.0

SOURCE: Abraham L. Ranofsky, *Utilization of Short-Stay Hospitals: Annual Summary.* Data from the National Health Survey: Series 13, No. 31, DHEW publication no. (HRA) 77–1782, 1977, p. 43.

Table 12. OVERALL AVERAGE LENGTH OF STAY IN VOLUNTARY HOSPITALS AFFILIATED WITH MEDICAL SCHOOLS BY GEOGRAPHIC REGION, 1975

Region	Overall Average Length of Stay
Northeast	9.2
South	7.8
North Central	8.6
West	6.9
Total U.S.	8.4

SOURCE: American Hospital Association, Hospital Statistics, 1976 Edition. Chicago: American Hospital Association, 1976, pp. 176–7.

Table 13. HOSPITAL BEDS PER 1,000 POPULATION BY CENSUS REGION: 1973

Region	General Medical and Surgical Beds Per 1,000 Population
Northeast	4.8
North Central	5.2
South	5.0
West	4.4
All United States	4.9

SOURCE: Department of Health, Education, and Welfare National Center for Health Statistics, *Health Resources Statistics, Health Manpower and Health Facilities, 1975* DHEW publication no. (HRA) 76–1509, p. 352.

Table 14. PROPORTION OF POPULATION BELONGING TO HMO'S IN UNITED STATES BY REGION, 1975

Region	Percent Belonging to an HMO
Northeast	4.4%
South	0.5
North Central	1.4
West	8.8
United States	3.1

SOURCE: National Center for Health Statistics, unpublished data.

Table 15. AVERAGE LENGTH OF STAY FOR PATIENTS BELONGING TO A PREPAID GROUP PRACTICE PLAN BY GEOGRAPHIC REGION, UNITED STATES, 1975

Region	Average Length of Stay for Prepaid Group Practice Patients
Northeast	8.0
South	8.8
North Central	7.0
West	5.5

SOURCE: National Center for Health Statistics, unpublished data.

West has a longer staying case mix than the Northeast, but substantially shorter illness-specific lengths of stay; for multiple diagnosis patients, the case mix does not vary much across regions, but the illness-specific lengths of stay are still much shorter in the West.

Table 11 presents data pertaining to hospital size, and reflects the fact that OALS is longer the larger the hospital. However, the data also show that OALS would still be shorter in the West even if the West had only the large hospitals and all the hospitals in the Northeast were small; hospital size distribution cannot explain the Northeast-West disparity. Also, as shown by table 12, even for teaching hospitals stays are shorter in the West.

Another factor of interest is the per capita supply of hospital beds, especially in view of the fact that bed supply in the West is very low. That is, a relative shortage of beds might lead to shorter than normal stays. However, as shown by table 13, this relationship of bed supply to OALS does not hold up when the other regions are included; we cannot use bed supply to explain the OALS disparity.

Finally, two other factors likely to affect OALS were examined—the existence of HMO's, and the availability of nursing home beds. As shown by table 14, the West has the largest percentage of population belonging to HMO's (8.8%). However, while that is in fact higher than in the Northeast (4.4%), the Northeast is still higher than the national average and is very far above the South (0.5%). Also, even within prepaid group practice, the regional differences in length of stay are maintained (table 15). Clearly, therefore, HMO enrollment does not explain the regional variations in length ot stay. With regard to nursing home beds, it is of interest that the Northeast has relatively few nursing home beds compared to the West (table 16), but the association between nursing home bed supply and length of stay does not hold up when the Southern and North Central regions are included.

Although the above analysis is preliminary and limited in scope, certain conclusions are clear. We have focused on just one strong and persistent disparity in average product among hospitals—the dramatically shorter hospital stays in the Western region. The indices of case mix and length of stay did provide much information beyond that supplied by the aggregate use measures, but the length of stay index reveals variations that we are not able to explain, even after examining the most likely explanatory variables. First, this underscores the central point of this paper—that interpretations of the aggregate-use measures are dangerous at best. Second, the failure to find any association to explain regional differences in length of stay leads us to further consideration of problems and alternatives involved in hospital utilization measurement. These are discussed in the next section.

V. DISCUSSION

The problem of defining and measuring hospital output is particularly difficult and persistent. But until the problem of assessing the marginal contribution to health status of various medical care services is solved, various measures of the intermediate outputs of the hospital will have to be employed as proxies. In the context of hospital classification for the purpose of control or reimbursement, this requires the sorting of hospitals into homogeneous product groups. In this study, relevant dimensions of the product were postulated to include diagnosis, performance of surgery, age, presence of multiple diagnoses, and length of stay. It was demonstrated, however, that even with the rather narrowly-defined categories established by these factors, there still appeared to be a great deal of heterogeneity in the treatment output. This suggests that acceptable hospital classification may prove to be much more complex than expected, and that definition and measurement of case mix still requires much work. We conclude, therefore, that the assumption of homogeneous output will continue to be misleading and troublesome. Moreover, any adjustments for case mix using the current state of the art are likely to be arbitrary and, therefore, insufficient for the purposes of public policy.

Since we cannot satisfactorily assess the final product that is relevant to the patient (i.e., changes in health status), then as an alternative we might employ an implicit approach. We can measure the inputs used to

Table 16. NUMBER OF NURSING HOME BEDS PER 1,000 POPULATION 65 AND OVER AND PER 1,000 POPULATION BY CENSUS REGION, UNITED STATES, 1974

Region	Nursing home beds per 1000 population age 65 and over	Nursing home beds 1000 population
Northeast	45.1	4.9
South	44.6	4.5
North Central	62.2	6.4
West	59.3	5.4

SOURCE: Department ot Health, Education, and Welfare, National Center for Health Statistics, *Health Resources Statistics, Health Manpower and Health Facilities, 1975* DHEW publication no. (HRA) 76–1509, 1976, p. 370.

produce hospital output, and if these are assumed to have a positive association with outputs, then we have the basis for one such approach. This association is provided by the production function, which describes the relation between inputs and outputs available to the hospital, and by the assumption of cost minimization (or output maximization) by the hospital. That is, we assume that the hospital is a rational, efficient organization which seeks to maximize an objective function defined over the outputs (successful treatments of various illnesses), subject to a budget (resource) constraint. Under this framework, if the hospital employs a different bundle of inputs to treat a given group of patients, or even a specific patient, then we conclude that a different output is being produced. Then we need only measure length of stay and ancillary service use to capture the output of the hospital; any two cases which use identical bundles of resources are assumed to be identical outputs. Case mix, under this approach, should be assessed in terms of iso-resource groupings.

Although it is eminently feasible, this "hedonic" approach to output measurement has the conceptual weakness of assuming away the issue of efficiency. Any differences in input use represent valid differences in outputs. However, we know intuitively that some degree of inefficiency is bound to occur, and, more important, adoption of the hedonic approach in reimbursement policy provides strong incentives to raise the level of inefficiency. In order to reduce this incentive, a different approach to output assessment would be required.

Alternatively, instead of assessing how each patient is actually treated, those clinical attributes of the patient on which the physician bases his decisions might instead be assessed. The production function describes how to achieve a successful outcome to the illness episode, given the nature of the illness and the patient's general physiological and psychological condition. Assuming that this production function is known, then it provides a mapping from clinical attributes through input requirements to outcome. Further, the assumption of output maximization would then allow us to measure output implicitly, via groupings of the clinical characteristics. Since the production function is know, the efficiency issue is solved because we know how much and what mix of inputs should be used to treat a given case-type (as defined by some bundle of clinical characteristics). Thus, for example, a simple fracture of the femur in a 75 year-old female would require x days of hospital care, y radiological procedures, and z hours of orthopedist's services. This efficiency-ideal, or criteria-optimal set of services can then be used to evaluate the care that was actually delivered to the patient.

The crucial assumption in this "input requirements" approach is that the production function is known. In fact, the real world of medicine is characterized by a great deal of uncertainty, both in general terms regarding the best method of treating some diseases, and in specific terms regarding the appropriate way of treating an individual patient. This uncertainty presents a serious obstacle to implementation of this approach. However, it can be argued that such uncertainty can be handled analytically by specifying a range of inputs required (e.g., length of stay of from ten to fifteen days), with future research aimed at obtaining greater precision on these input coefficients. Further, a considerable number of diseases are not characterized by much uncertainty, and so it is presently feasible to actually begin implementing and experimenting with this approach to case mix measurement.

Discharge abstract systems already collect a considerable amount of clinical information which can be used to begin development of new case mix classification systems. Examples of the types of variables collected by CPHA include primary discharge diagnosis, secondary diagnoses, sex, age, source of admission, type of admission, temperature, blood pressure, hemoglobin or hematocrit, white blood cell count, and urinalysis. These represent attributes of the patient that are not under the control of the physician.[2] Research is needed to establish classes of illnesses that are deemed sufficiently similar from a medical, and hence, resource use viewpoint to be considered a homogeneous product, a task which must involve physicians. The issue is to achieve some level of aggregation, because no purpose is served in defining each patient as a unique case. The purpose for which the case mix measure required must be kept in mind—here, to establish an incentive reimbursement system that rewards efficiency and punishes inefficiency in the production of hospital care of established and acceptable quality.

In sum, it is our recommendation that we begin to define case mix in terms of the clinical attributes of those patients that are relevant to the physician in diagnostic and therapeutic decision-making. Case mix should not be measured in terms of actual resource use, since this is under the control of the physician and assumes away the efficiency issue. Therefore, it is not appropriate to use length of stay and/or ancillary service use to derive case mix categories. Resource use patterns may be examined in addressing the issues of validity and reliability of a given case mix classification system. That is, a high intra-class variation in length of stay would lead to a suspicion that all of the relevant clinical characteristics of the patient have not been addressed. On the other hand, it may also mean that the technology is very uncertain at present so that the reliability of the classification scheme is not as high as it should be. The ultimate objective of any case mix classification is not to minimize the within group variation on resource use because there are differences in effi-

[2] We realize, of course, that their reporting is, so that the problem of "input inflation" still exists under an incentive reimbursement scheme using this approach to case-mix measurement. Independent clinical audits of samples of hospitalized patients and their medical records could be conducted to minimize this problem.

ciency across hospitals. On the other hand, a good case mix measure will account for a great deal of variation in utilization.

It is not known whether additional information on the clinical characteristics of patients in the Northeastern and Western regions of the country would fully explain the disparities in length of stay described above. It is clear that the CPHA List A diagnostic classification scheme is not an adequate mapping of patients onto homogeneous case-type categories. Integration of an expanded "staging" approach (Gonnella and Goran, 1975; Garg, et al., 1978) and the CPHA List A diagnostic groupings is probably the next feasible development in case mix measurement.[3]

The efficiency problem can be dealt with by either of two methods, or some combination. For one, the input coefficients can be derived in an empirical fashion, by adopting the lowest use of service observed not associated with an adverse outcome. For another, panels of physicians can be employed to specify the "optimal" pattern of treatment for a given case type. Either method reduces the overall endogeneity of efficiency determination with respect to the individual practicing physician and places more control in the hands of the physician, which is the immediate operational objective of our research on policy instruments.

[3] The Diagnosis-Related Groups (DRG) approach to case mix measurement (Mills, et al., 1976) relies too heavily on empirical resource use patterns in defining case types.

APPENDIX I

Distribution of PAS Hospitals Compared with Distribution of All Short-Term Non-Federal Hospitals in the United States, 1975, by Bed Size, Region, Census Division, and Teaching Type.

Table A. BED SIZE, REGION, AND CENSUS DIVISION: PAS HOSPITALS COMPARED WITH ALL SHORT-TERM NON-FEDERAL HOSPITALS[1] IN THE U.S.
JANUARY–DECEMBER 1975

	Short-Term Non-Federal Hospitals			*Beds*		
Hospital Class (1)	Total[2] (2)	Number in PAS (3)	Percent in PAS (4)	Total[2] (5)	Number In PAS (6)	Percent in PAS (7)
ALL U.S.						
Bed Size						
1. Less than 25 beds	465	26	5.6%	7,779	509	6.5%
2. 25–49	1,342	161	12.0	48,186	6,227	12.9
3. 50–99	1,640	384	23.4	118,266	28,657	24.2
4. 100–199	1,441	541	37.5	204,328	78,203	38.3
5. 200–299	684	334	48.8	166,755	81,599	48.9
6. 300–399	394	213	54.1	133,928	72,485	54.1
7. 400–499	224	127	56.7	98,940	55,863	56.5
8. 500 or more	276	101	36.6	191,623	67,539	35.2
Total	6,466	1,887	29.2%	969,805	391,082	40.3%
Region and Census Division						
Northeast	1,027	327	31.8%	226,605	88,218	38.9%
New England	302	95	31.4	53,016	22,098	41.7
Middle Atlantic	725	232	32.0	173,589	66,120	38.1
North Central	1,862	724	38.8	292,541	153,060	52.3
East North Central	1,002	526	52.5	194,922	115,246	59.1
West North Central	860	198	23.0	97,619	37,814	38.7
South	2,332	479	20.5	301,966	93,144	30.8
South Atlantic	894	309	34.6	142,845	60,823	42.6
East South Central	525	60	11.4	64,203	13,688	21.3
West South Central	913	110	12.0	94,918	18,633	19.6
West	1,245	357	28.7	148,693	56,660	38.1
Mountain	402	106	26.4	38,522	17,356	45.0
Pacific	843	251	29.8	110,171	39,304	35.7
Grand Total	6,466	1,887	29.2%	969,805	391,082	40.3%

[1] Excluding psychiatric hospitals
[2] SOURCE: 1974 Annual Survey of Hospitals, magnetic tape, National Center for Health Statistics

SOURCE: Commission on Professional and Hospital Activities, *Length of Stay in PAS Hospitals, by Diagnosis, United States, 1975.* Ann Arbor, Michigan: CPHA 1976, p. 7.

Table B. TEACHING TYPE, REGION, AND CENSUS DIVISION: PAS HOSPITALS COMPARED WITH ALL SHORT-TERM NON-FEDERAL HOSPITALS[1] IN THE U.S.
JANUARY–DECEMBER 1975

Region and Census Division (1)	*Hospitals with Residencies* Total[2] (2)	Number in PAS (3)	Percent in PAS (4)	*Hospitals with Medical School Affiliation* Total[2] (5)	Number in PAS (6)	Percent in PAS (7)
Northeast	315	146	46.3%	211	89	42.2%
New England	72	36	50.0	59	30	50.8
Middle Atlantic	243	110	45.3	152	59	38.8
North Central	305	172	56.4	180	99	55.0
East North Central	220	137	62.3	114	70	61.4
West North Central	85	35	41.2	66	29	43.9
South	253	92	36.4	187	73	39.0
South Atlantic	130	60	46.2	97	51	52.6
East South Central	50	18	36.0	37	11	29.7
West South Central	73	14	19.2	53	11	20.8
West	138	55	39.8	103	39	37.9
Mountain	40	21	52.5	27	13	48.1
Pacific	98	34	34.7	76	26	34.2
Grand Total	1,011	465	46.0%	681	300	44.0%

[1] Excluding psychiatric hospitals
[2] SOURCE: *American Hospital Association Guide to the Health Care Field,* 1975

SOURCE: Commission on Professional and Hospital Activities, *Length of Stay in PAS Hospitals, by Diagnosis, United States, 1975.* Ann Arbor, Michigan: CPHA, 1976, p. 8.

APPENDIX II

Case Mix, Illness-Specific Length of Stay and Overall Average Length of Stay in PAS Hospitals, United States, by Geographic Region, Annually, 1969–1975.

Table A. CASE MIX, ILLNESS-SPECIFIC LENGTH OF STAY, AND OVERALL AVERAGE LENGTH OF STAY IN PAS HOSPITALS BY GEOGRAPHIC REGION, ANNUALLY, 1969–1975

		Region											
		Northeast			South			North Central			West		
Year	All U.S.	Case Mix	Ill.-Spec. LOS	LOS	Case Mix	Ill.-Spec. LOS	LOS	Case Mix	Ill.-Spec. LOS	LOS	Case Mix	Ill.-Spec. LOS	LOS
1969	Base	105.09	119.41	8.4	98.55	104.64	7.3	98.49	112.72	7.8	104.42	89.16	6.6
1970	Base	100.55	119.10	8.2	98.92	104.38	7.1	98.88	113.86	7.7	103.91	87.66	6.3
1971	Base	100.26	119.27	8.0	98.40	105.68	7.0	99.37	112.98	7.6	103.74	86.18	6.1
1972	Base	100.57	119.76	8.0	98.00	106.83	7.0	99.79	112.96	7.5	102.42	85.58	5.9
1973	Base	100.10	119.98	7.8	98.23	106.58	6.9	99.75	113.05	7.4	95.32	85.62	5.9
1974	Base	100.05	120.52	7.8	98.77	106.57	6.9	99.67	112.65	7.3	102.47	85.31	5.8
1975	Base	102.92	120.83	7.9	98.80	105.41	6.8	99.67	112.13	7.3	100.59	84.89	5.7

Table B. CASE MIX, ILLNESS-SPECIFIC LENGTH OF STAY, AND OVERALL AVERAGE LENGTH OF STAY IN PAS HOSPITALS BY YEAR, REGIONALLY, UNITED STATES, 1969–1975

	Region											
	Northeast			South			North Central			West		
Year	Case Mix	Ill.-Spec. LOS	LOS	Case Mix	Ill.-Spec. LOS	LOS	Case Mix	Ill.-Spec. LOS	LOS	Case Mix	Ill.-Spec. LOS	LOS
1969	Base	Base	8.4	Base	Base	7.3	Base	Base	7.8	Base	Base	6.6
1970	94.67	105.67	8.2	105.51	105.97	7.1	100.55	107.83	7.7	99.68	100.06	6.3
1971	96.23	102.21	8.0	101.81	103.75	7.0	102.90	103.63	7.6	101.49	95.05	6.1
1972	98.97	98.59	8.0	103.93	101.05	7.0	105.85	99.84	7.5	102.65	90.84	5.9
1973	99.62	95.99	7.8	105.23	98.30	6.9	106.82	97.37	7.4	94.20	88.02	5.9
1974	101.67	93.68	7.8	108.05	96.24	6.9	109.01	94.94	7.3	105.66	85.82	5.8
1975	117.00	91.87	7.9	109.87	93.43	6.8	110.79	92.67	7.3	104.89	83.66	5.7

Table C. CASE MIX, ILLNESS-SPECIFIC LENGTH OF STAY, AND OVERALL AVERAGE LENGTH OF STAY IN PAS HOSPITALS BY GEOGRAPHIC REGION, ANNUALLY, AGED PATIENTS ONLY, 1969–1975

		Region										
		Northeast			South			North Central			West		
Year	All U.S.	Case Mix	Ill-Spec LOS	LOS	Case Mix	Ill-Spec LOS	LOS	Case Mix	Ill-Spec LOS	LOS	Case Mix	Ill-Spec LOS	LOS
1969	Base	102.40	109.88	15.7	98.20	95.72	13.1	99.42	102.90	14.3	99.88	82.46	11.5
1970	Base	102.55	110.43	15.3	98.40	95.11	12.7	99.35	102.98	13.8	99.69	80.67	10.9
1971	Base	102.52	111.01	14.8	98.33	95.96	12.3	99.36	103.26	13.3	100.03	79.27	10.3
1972	Base	102.48	112.45	14.3	98.18	97.30	11.9	99.41	103.10	12.7	100.23	78.54	9.8
1973	Base	102.27	113.44	13.9	98.18	97.57	11.5	99.53	103.24	12.4	100.38	78.10	9.5
1974	Base	102.29	114.88	13.8	98.43	97.67	11.3	99.71	103.29	12.1	100.07	78.39	9.2
1975	Base	102.27	115.95	13.6	98.11	96.48	10.9	99.80	102.77	11.8	100.30	78.73	9.1

Table D. CASE MIX, ILLNESS-SPECIFIC LENGTH OF STAY, AND OVERALL AVERAGE LENGTH OF STAY IN PAS HOSPITALS BY GEOGRAPHIC REGION, ANNUALLY, NON-AGED PATIENTS ONLY, 1969–1975

		Region										
		Northeast			South			North Central			West		
Year	All U.S.	Case Mix	Ill-Spec LOS	LOS	Case Mix	Ill-Spec LOS	LOS	Case Mix	Ill-Spec LOS	LOS	Case Mix	Ill-Spec LOS	LOS
1969	Base	100.31	109.36	7.0	99.46	97.25	6.3	98.62	103.52	6.6	104.14	82.60	5.6
1970	Base	99.71	107.55	6.8	99.52	97.16	6.2	99.14	105.05	6.6	103.76	81.47	5.4
1971	Base	99.39	107.68	6.7	99.00	98.41	6.1	99.64	104.20	6.5	103.61	80.34	5.2
1972	Base	99.61	107.99	6.6	98.93	98.95	6.0	99.94	104.71	6.5	102.19	80.05	5.1
1973	Base	99.00	108.13	6.5	99.29	98.57	6.0	99.96	104.71	6.4	102.10	80.35	5.0
1974	Base	98.77	109.14	6.5	99.61	99.34	6.0	99.93	104.64	6.3	102.23	80.51	5.0
1975	Base	96.13	92.72	6.5	99.52	98.85	5.9	100.04	104.40	6.2	100.39	63.19	4.9

Table E. CASE MIX, ILLNESS-SPECIFIC LENGTH OF STAY; AND OVERALL AVERAGE LENGTH OF STAY IN PAS HOSPITALS BY GEOGRAPHIC REGION, ANNUALLY, 1969–1975, OPERATED PATIENTS ONLY

		Region											
		Northeast			South			North Central			West		
Year	All U.S.	Case Mix	Ill-Spec LOS	LOS	Case Mix	Ill-Spec LOS	LOS	Case Mix	Ill-Spec LOS	LOS	Case Mix	Ill-Spec LOS	LOS
1969	Base	102.77	107.81	8.7	98.34	96.41	7.8	96.37	103.07	8.2	106.27	84.56	7.1
1970	Base	102.11	107.41	8.4	99.24	96.73	7.7	97.28	103.48	8.1	104.66	83.14	6.8
1971	Base	102.03	108.15	8.1	98.02	97.80	7.5	97.72	103.75	8.0	105.31	81.71	6.5
1972	Base	102.76	108.90	8.0	96.34	99.01	7.4	98.78	103.57	7.8	103.32	81.11	6.3
1973	Base	101.73	109.46	7.8	96.28	98.94	7.3	98.70	103.64	7.7	105.25	80.78	6.2
1974	Base	101.58	110.53	7.9	97.00	99.39	7.3	99.12	103.78	7.6	104.04	80.68	6.1
1975	Base	101.89	111.37	7.9	96.50	98.48	7.2	99.42	103.62	7.6	103.81	80.46	6.1

Table F. CASE MIX, ILLNESS-SPECIFIC LENGTH OF STAY, AND OVERALL AVERAGE LENGTH OF STAY IN PAS HOSPITALS BY GEOGRAPHIC REGION, ANNUALLY, 1969–1975, NOT OPERATED PATIENTS ONLY

		Region											
		Northeast			South			North Central			West		
Year	All U.S.	Case Mix	Ill-Spec LOS	LOS	Case Mix	Ill-Spec LOS	LOS	Case Mix	Ill-Spec LOS	LOS	Case Mix	Ill-Spec LOS	LOS
1969	Base	101.33	110.20	8.1	99.11	95.31	6.9	98.69	103.10	7.5	104.23	82.02	6.2
1970	Base	101.54	111.31	8.0	99.13	94.29	6.7	98.23	102.59	7.4	104.25	80.53	5.9
1971	Base	101.00	111.69	7.9	98.65	95.25	6.7	98.82	102.83	7.3	104.09	79.48	5.7
1972	Base	101.40	113.05	7.9	97.75	96.42	6.7	99.15	102.72	7.3	103.61	78.47	5.6
1973	Base	101.49	113.74	7.8	97.93	96.72	6.6	98.97	102.83	7.2	103.83	78.28	5.5
1974	Base	101.69	115.22	7.8	98.71	96.91	6.6	98.51	102.78	7.1	103.84	78.75	5.4
1975	Base	101.41	116.56	7.8	99.00	95.51	6.5	98.52	102.33	7.0	103.75	79.03	5.4

Table G. CASE MIX, ILLNESS-SPECIFIC LENGTH OF STAY, AND OVERALL AVERAGE LENGTH OF STAY IN PAS HOSPITALS BY GEOGRAPHIC REGION, ANNUALLY, 1969–1975, SINGLE DIAGNOSIS PATIENTS ONLY

		Region											
		Northeast			South			North Central			West		
Year	All U.S.	Case Mix	Ill.-Spec. LOS	LOS	Case Mix	Ill.-Spec LOS	LOS	Case Mix	Ill.-Spec LOS	LOS	Case Mix	Ill.-Spec. LOS	LOS
1969	Base	98.98	108.41	5.9	101.85	96.20	5.4	98.39	103.57	5.7	105.00	83.26	4.8
1970	Base	98.23	107.87	5.7	101.70	96.84	5.3	98.06	103.37	5.6	106.74	82.58	4.6
1971	Base	97.72	107.94	5.5	100.98	97.74	5.2	98.44	103.97	5.5	107.27	81.64	4.5
1972	Base	97.93	108.70	5.5	100.19	99.18	5.2	99.07	103.50	5.5	105.24	80.67	4.3
1973	Base	97.61	109.10	5.3	100.61	98.90	5.1	98.97	103.80	5.4	105.17	80.42	4.2
1974	Base	97.63	110.24	5.3	100.98	99.41	5.0	98.75	104.10	5.2	104.54	80.23	4.1
1975	Base	98.15	111.53	5.3	100.56	98.51	4.9	98.73	103.85	5.1	104.72	79.99	4.0

Table H. CASE MIX, ILLNESS-SPECIFIC LENGTH OF STAY, AND OVERALL AVERAGE LENGTH OF STAY IN PAS HOSPITALS BY GEOGRAPHIC REGION, ANNUALLY, 1969–1975, MULTIPLE DIAGNOSIS PATIENTS ONLY

		Region											
		Northeast			South			North Central			West		
Year	All U.S.	Case Mix	Ill.-Spec. LOS	LOS	Case Mix	Ill.-Spec-. LOS	LOS	Case Mix	Ill.-Spec. LOS	LOS	Case Mix	Ill.-Spec. LOS	LOS
1969	Base	105.89	109.89	11.7	100.98	95.41	9.8	98.35	102.77	10.6	101.98	82.78	8.8
1970	Base	103.09	110.38	11.4	98.10	94.68	9.5	98.61	102.80	10.4	101.28	81.27	8.3
1971	Base	102.87	111.07	11.1	97.60	95.79	9.3	99.14	102.91	10.1	101.06	79.96	7.9
1972	Base	103.22	112.23	10.8	96.68	96.91	9.0	99.48	102.94	9.8	100.99	79.24	7.6
1973	Base	102.70	112.90	10.5	96.91	97.25	8.9	99.07	102.95	9.6	102.65	79.01	7.6
1974	Base	102.55	114.14	10.4	97.84	97.53	8.8	98.86	102.91	9.3	102.60	79.41	7.4
1975	Base	102.31	115.12	10.3	97.84	96.30	8.6	98.95	102.59	9.2	102.72	79.58	7.3

Table I. AVERAGE LENGTH OF STAY FOR PATIENTS DISCHARGED FROM SHORT-STAY HOSPITALS, BY SEX, AGE, GEOGRAPHIC REGION, AND BED SIZE OF HOSPITAL: UNITED STATES, 1975

(DISCHARGE FROM NON-FEDERAL SHORT-STAY HOSPITALS. EXCLUDES NEWBORN INFANTS)

Sex and Age	Total	Northeast			North Central			South			West		
		6–99 Beds	100–499 Beds	500 Beds or More	6–99 Beds	100–499 Beds	500 Beds or More	6–99 Beds	100–499 Beds	500 Beds or More	6–99 Beds	100–499 Beds	500 Beds or More
Both Sexes						Average Length of Stay In Days							
All Ages	7.7	7.5	8.9	10.2	6.9	7.9	9.0	6.2	7.2	8.3	5.3	6.6	7.0
Under 15 Years	4.6	3.8	4.8	5.8	3.9	4.4	5.7	3.6	4.4	5.7	3.5	4.2	5.2
15–44 Years	5.7	5.1	5.9	7.3	4.9	6.0	6.9	4.4	5.4	6.8	4.1	4.9	5.4
45–64 Years	9.0	7.9	10.4	12.5	7.3	9.2	10.8	6.6	8.6	9.7	6.0	7.4	8.4
65+ Years	11.6	12.0	14.0	15.9	10.0	12.2	13.5	9.3	11.0	11.7	7.8	9.9	9.5
Male													
All Ages	8.2	7.6	9.5	11.5	7.0	8.4	9.8	6.2	7.9	9.4	5.4	7.0	7.7
Under 15 Years	4.6	3.7	4.8	6.3	4.1	4.4	5.9	3.4	4.6	5.9	3.5	4.2	5.5
15–44 Years	6.8	6.1	7.1	10.2	5.3	7.3	8.7	4.4	6.3	8.8	4.2	5.8	6.8
45–64 Years	9.0	7.7	10.6	12.6	7.6	9.0	10.5	6.5	8.9	9.9	6.3	7.2	8.8
65+ Years	11.3	11.2	13.5	15.1	9.1	12.0	13.3	8.8	11.0	11.7	7.3	9.9	8.9
Female Including Deliveries													
All Ages	7.4	7.5	8.5	9.3	6.8	7.6	8.5	6.3	6.8	7.7	5.2	6.3	6.4
Under 15 Years	4.5	4.0	4.8	5.1	3.6	4.5	5.5	3.8	4.2	5.4	3.6	4.3	4.9
15–44 Years	5.2	4.6	5.5	6.0	4.7	5.5	6.2	4.4	5.0	5.9	4.1	4.5	4.8
45–64 Years	8.9	8.2	10.3	12.4	7.0	9.3	11.1	6.8	8.4	9.5	5.8	7.6	8.1
65+ Years	11.8	12.5	14.4	16.5	10.7	12.3	13.7	9.6	11.0	11.7	8.2	9.8	10.2
Female Excluding Deliveries													
All Ages	8.0	7.9	9.2	10.0	7.1	8.1	9.3	6.8	7.4	8.5	5.6	6.9	7.1
Under 15 Years	4.5	4.0	4.8	5.1	3.6	4.4	5.6	3.8	4.2	5.5	3.6	4.2	4.9
15–44 Years	5.8	4.9	6.0	6.5	4.8	5.9	6.9	6.0	5.6	6.9	4.6	5.1	5.5
45–64 Years	9.0	8.2	10.3	12.4	7.0	9.3	11.1	6.8	8.4	9.5	5.8	7.6	8.2
65+ Years	11.8	12.5	14.4	16.5	10.7	12.3	13.7	9.6	11.0	11.7	8.2	9.8	10.2

SOURCE: Abraham L. Ranofsky, *Utilization of Short-Stay Hospitals: Annual Summary.* Data from the National Health Survey: Series 13, No. 31, DHEW publication no. (HRA) 77-1782, April 1977, p. 43

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DEFINING PROBLEMS AND ACQUIRING INFORMATION FOR HEALTH PLANNING—ONE APPROACH FOR HSA'S

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Ten minutes is a substantial constraint, so my comments will be sketchy but I hope that any particularly vague statemements will be a source of question or challenge.

This paper argues that planning agencies, after reviewing existing sources of statistics for characterizing the health system and health status, should give special attention to:

1. The development of a data base with information on health care expenditures in the form of health expenditures profiles, and charges for hospital care, nursing home care, physicians care and prescription drugs;
2. The accumulation of the data required to determine where an area stands in relation to the national guidelines (standards and goals) recently promulgated by HEW; and
3. The development of skills and/or access to technical resources which would greatly enhance the capability for, and quality of, special studies, especially population based surveys.

On the latter point, it is obvious that the data requirements of HSA's and SHPDA's are large and growing. The best way to cope with them would be to maintain as little information routinely as possible but to do or commission special surveys or studies identified as being highly important and needing more detailed or timely investigation than existing data could give.

The functions of the agencies include restraining increases in the cost of providing health services and preventing unnecessary duplication of health resources. One of the criteria on which the effectiveness of the agencies will be assessed is "the extent to which it may be demonstrated that...increases in costs of the provision of health care have been restrained." For example they have been given a major role in, or responsibility for: (a) controlling and rationalizing capital expenditures; (b) identifying and reducing excess facilities and services; (c) promoting alternatives to inpatient care; (d) fostering regionalization of health services; (e) modifying provider and consumer behavior, attitudes and use of services; (f) promoting cost-effective self and preventive care; (g) assessing and modifying environmental and occupational effects on health.

In order to do this and document what is happening, agencies need to know among other things what the total investment is for health services, what the various proportions are for different services, and the sources of the dollars. Aggregate data on the level of consumption and investment spending on health care goods and services categorized by type of service and categorized by source of funds is essential for health planning.[1] Such data accounts permit planning agencies to answer questions such as: How fast are expenditures growing in our area?

What are health funds spent for? How is it distributed among components of care: hospitals, physicians, nursing homes, dentists, drugs? How much goes for prevention, diagnosis, treatment, rehabilitation, custodial service? How much goes for primary, secondary, tertiary care? How much is ambulatory, how much for institutional? How much for mental health and illness, how much for addiction?

How much is spent for personal health care rendered to individual patients, how much for environmental protection, research, construction, manpower training and education?

How do expenditures for health compare with dollars allocated for other human services? And finally, what does information of this kind tell us about what the levers are and where they are located, by which society, whether at the local level or in Wasington, and can they undertake to control and direct the amount and purposes to which these expenditures are allocated, and the ways in which the benefits of these expenditures are distributed in the population?

In addition or as part of developing health expenditures profiles, agencies should have a few indicators to monitor changes in the hospital industry (or nursing homes), in particular. The same data or the same sources of data needed for the Health Expenditures Profiles for the area will make this possible when augmented by a few utilization statistics. Trends over a few years can be quite useful. In fact, it will be more helpful to compare a hospital's (or nursing home's) experience over time with itself, than to compare hospitals. Commonly used and relatively available indicators include:

[1] Piore, N. "Health Accounts: Social Indicator, Performance Measure Policy Tool," Proceedings of the Public Health Conference on Records and Statistics, June 1976, National Center for Health Statistics, HRA-77-1214.

1. Total hospital expenditures per capita (for the area)
   Percent change over time.
   Per capita expenditures and percent change in comparison with other geographical areas.
2. Average cost per person or per case.
   Average cost per patient day.
   Charges for inpatient day, and the 10 most common ancillary charges.
   Charges for nursing homes.
   Charges for different visits to physicians, dentists, etc.

Also, some States have found it useful to make comparisons among the statistics mentioned above with changes in the Consumer Price Index and its medical care component, and other indicators such as percentage increases in insurance premiums, amounts paid by Medicaid and for different services.

These financial data should not, of course, be examined in a vacuum. The most important questions to planners, as contrasted with rate setters and cost commissions, are concerned with cost-effectiveness of the *system* and the benefits or lack of them of utilization of health services for improving health. Highly specific investigations of costs within hospitals require, according to many experts, enormous staff resources and can be a "bottomless pit" which will drain agencies' resources away from the system planning questions which no other entity will address. In short, there must be a balance.

In general such information properly arrayed and used in an intensive local campaign to educate the community could be most helpful in building knowledge of, and support for, planning agency activities. Aggressive campaigns to help personalize, or bring home to the governing body and the citizens of the area the pocketbook effects of cost-conserving or cost-inflating decisions would assist agencies particularly when the tougher, less popular decisions have to be made.

It is difficult to make the value of cost control evident at local levels, although proper statistics could help to elucidate the cost consequences of failures to act to tighten the health system.

Unfortunately, there remains a disparity between the expectations of the national level, HEW and the Congress, the State level, and what is desired or perceived as being desirable at the local level. That is, while cost containment has become quite rapidly a major, if not the major goal, of the Administration, it is obvious that this interest in controlling cost becomes less potent as one moves down from Federal to State and then from State to local levels. Although there are States with large generous Medicaid programs where increased costs are gobbling up State budgets, there may be as much or more interest in cost control at the State level as at the Federal level. In any event, it is rare to find an emphasis on controlling costs per se at the local and most State levels.

On the other hand, a major function of the agencies is to contribute to the control of the cost spiral. If they do not begin to have an effect of that sort, indeed if they are perceived as ineffective as cost moderators or as redirectors of the system toward better resource allocation, they are not likely to be supported over time. Health planning at the local level might be viewed as a luxury or at least an expendable item.

At least three factors or forces on the horizon should make such efforts more worthwhile even from the local perspective.

Indeed, even if planning agencies gave no priority to development, good data, or expenditures and charges, for the previously cited reasons, there is cause for preparing for some new roles and activities. There is likely to be some kind of grant program for voluntary conversion and closure of hospital beds, and the planning agencies would play a major role in it.

Much more detailed and technical knowledge will be needed by planning agencies to ferret out significant facts and help them to work with the community and providers: to systematically and sensitively redirect the health system while closing and converting services and facilities.

Any cost containment legislation would also have a role for planning agencies, although it would be more in the direction of monitoring changes in utilization patterns to ensure that hospitals are not unduly penalized or rewarded for significant shifts in case mix.

Finally, under national health insurance, in whatever form, planning agencies would undoubtedly have a role which would require a strong data base and good technical skills, especially in the area of financial and economic information.

Because of time constraints I won't go into the data requirements triggered by the national guidelines—the standards and goals—and the needs in general are not new ones. However, the significance of the national guidelines themselves gives much greater importance to the associated data items than ever before. The same methods, orchestrated with the State, to complete medical facilities and services inventories should provide much of the information needed for assessing the conditions in the area relative to the standards.

The large and growing demands for data for planning and regulation suggest that planning agencies should have, or have access to, quantitative skills to do special studies on a problem oriented basis. They should use existing data from other sources to help decide which subjects need attention and which topics should be pursued in depth. Data acquired and stored should be as parsimoniously selected as possible.

Patient origin data, studies of long term debt and equity, utilization of health services, measures of health status, access, availability and continuity can only be obtained by special studies. The way to learn

about the community's desires and perceived barriers to care and what the residents would like to pay for would be through surveys.

Another session here covered, in considerable detail, new developments in survey research and the breakthroughs which are being made at the National Center for Health Statistics to substantially alter the Center's orientation toward surveys and the Center's relations with local and State agencies. With some financial backing from BHPRD a technical assistance capability to be offered to local and State planning has been instituted. While surveys have been avoided in the past because of costs and limited number of technicians, innovations on use of telephones, random digit dialing, etc. could well revolutionize data collection at least for finding out what the people want and feel they need, as well as measure health status. It may well be that such population-based surveys would collect the most pertinent and useful data, give the agency much essential information for planning, and need to be repeated only every 3–5 years, if planned properly, and thus be cheaper and most satisfying than the less direct measures garnered from existing data systems.

In between larger surveys, planning agencies may be able to obtain selected data by attaching key questions to surveys by other State and local organizations.

Many, including the Congress, have some fears about planning agencies' engaging in primary data collection. The quality of the survey and the pertinence of the questions will be most important to ensure that the dollars invested have the greatest benefit. With assistance from the Centers for Health Planning, local experts, and the new Survey Intelligence Service at NCHS for local and State planning agencies the quality of health surveys using low cost innovative techniques should be guaranteed. A committed planning agency staff and governing body can help to make certain that the questions needed for decisionmaking are asked of the public.

There can be a careful balance of exploiting existing low cost data sources, acquiring essential data concerned with the most urgent problems and issues—including health costs and the national standards and goals—and the use of good technical skills to do a number of special studies.

Over several years, planning agencies could develop a richer, more detailed data base which covers multiple, high priority topics and thus be able to plan with the pertinent, direct measures needed, in contrast to previous experience.

AN ECONOMIC PERSPECTIVE ON HEALTH POLICY ANALYSIS AND DATA NEEDS

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Health policy analysis and its data needs stem from the appropriate questions of policy. Useful answers and sound policies presume that the "right" questions are being asked and the capability exists to answer them. While economic analysis is being employed more frequently to address the issues of health policy, to one of this persuasion the "right" questions are still infrequently asked. The development of data also shows little recognition of the need for a capability to answer such questions in the future.

For present purposes, the preparation of sound health policies might be said to involve first, relating possible policies to some clear overall health care goal and related objectives; second, determining which policies can be expected to have the most overall beneficial effect on the objectives; third, assessing the risks from uncertainty associated with the policies; and fourth, evaluating the limits of a useful market role. While seemingly reasonable, these aspects of policy development are honored more in the breach than the observance, largely because the capability is lacking.

Policies are seldom related directly to health care goals and objectives. Discussion is commonly in terms of "shortages" and "surpluses," which have little to do with the health care system we would want. A minimal listing of health care objectives might include consideration of the amount of care it is desirable to provide, what type of care it should be, how equitably it should be distributed, and what is an acceptable cost. As these objectives are not completely compatible, a policy reflects an overall goal which compromises to some "most-desired" balance between objectives. A problem here is that we cannot say how a program to increase the equity of care distribution affects care costs. This leaves us with no basis for discussing or disputing what our overall goal should be.

Commonly today some standard is set as a desirable "requirement" and then programs are measured against this standard to obtain "shortages" or "surpluses." In health manpower, such typical standards are visit or manpower-population ratios derived from existing conditions or ideal need judgements. Unfortunately, this type of analysis must assume what is a desirable balance (between care cost, equity, type, and amount) in the chosen standard—and generally these assumptions are buried and inexplicit. The effect is to assume the important policy decision in the choice of a standard and to direct attention to rather meaningless "shortage" numbers.

> The "right" policy question here is, "What is a desirable balance between possible social objectives in health care, and how do alternative programs relate to that balance?"

The extension of this is to look at the overall beneficial effect of alternative policies on health care objectives. It is clear that equity policies to make care more available to the poor also affect care costs, for example. And similarly, cost containment policies for hospitals will affect care delivery in other sectors also. Particularly with multiple policies, it is possible to have a number of indirect secondary effects, often unintended and unanticipated. But, since the desirability of one or more policies must lie in the total effect on all objectives in all sectors, the evaluation of policies' desirability involves the measurement of all these causes and effects. This type of causal analysis is very different from the descriptive analysis of health care frequently encountered. But without an ability to anticipate the changes that will occur and to understand their causes, it is impossible to judge the overall desirability of the policy or to judge which other policies would minimize undesired secondary effects.

> The important "right" health policy question is "What causes change in care cost, volume, type, and distribution, and what results can be anticipated from alternative policies once the more important interactive effects are accounted for?"

Because we are far from this level of understanding, another element enters into policy evaluation. Uncertainty as to causation of changes introduces serious risk to policy selection. The appropriate response is strategies to minimize the vulnerability of policies to uncertainty. While the technical methods for this exist (the problem can be thought of as gaming theory with a non-maximizing opponent), even this requires approximation of the range of possible causal relationships between policies and health objectives. Our understanding is close to the point where this might be possible—on a tentative basis.

> The appropriate policy question proposed here is, "What strategy of policies provides the most desirable balance between minimizing the risks from uncertainty and maximizing the benefits from policy effectiveness?"

A submerged question in health policy discussion is that of, "Who decides the appropriate amount and type of care to provide, the desirable level of equity in its distribution, and the acceptable level of total health care costs?" Years ago, when health care was more

similar to other goods and services, these decisions were made by individual consumption preferences, through the mechanism of the health care markets. Particularly in the past quarter century, however, the market mechanism has become less effective. Two key elements of any classic market are the free entry of new providers and the effectiveness of price to translate consumer preferences into the appropriate production of different goods and services. In health, these have both become distorted by licensure limitations requiring graduation from an accredited school and by health insurance inflating care demands by making health consumption cost much less than the full cost of producing care. Other unique features of health care delivery have undoubtedly also contributed to the present situation where the market is generally seen as not functioning desirably.

Policy decisions are increasingly turning to regulation as a "second-best" alternative to an ineffective market. The reason for regulation to be termed "second-best" is that it is less efficient than an effective market in translating individual preferences into the production of goods and services. Economists can show this with the complex mathematics of utility theory, but a simpler way of thinking about it is to think of it as an extension of the logic of local health planning. Just as local health planning can better allow for local circumstances and more effectively meet the desires of the area's population than national-level health planning, so too can individuals better know their own values and preferences than any governmental decision process can. Regulation has to constrain individuals from choices they would make in an unregulated, effective market and this cumulative loss of first choices is an inefficiency in translating preferences into care production. Other costs of regulation include the inefficiency of paperwork and the slow process of regulatory decision. This is not to say that regulation is undesirable compared to an ineffective market; rather it is to say that regulation has inherent direct and indirect costs that need recognition.

The pertinence of this to policy decision is that identifying the extent to which the market mechanism is or could be effective permits restriction of regulation to those areas where the market cannot perform well. Without this, regulation can lead to lesser satisfaction with care delivery and unnecessary costs. The role of regulation also calls for better knowledge of causation because such policies work better when they redirect strong market forces rather than oppose them.

> From the economic perspective, then, the "right" questions are, "How and why are health care markets not performing desirably, and what regulations can correct this while retaining as much market efficiency as possible?"

These "right" questions sharply differ from the traditional, and they call for a quite different analysis. In the place of descriptive analysis which assumes the various aspects of the care system to be rather unrelated to each other, the causal analysis needed to answer these questions assumes that nearly all of the aspects of the care system we see are closely related to each other. There is a mass of evidence to support this view. But the complexity of causal analysis is greater—by orders of magnitude—than the traditional descriptive analysis. The measurement of the causal relationship between two variables becomes dependent upon the accurate measurement of the relationships of both variables to other variables once multiple interactions are thought to exist. Descriptive analysis is largely concerned with measurement error. Causal analysis has this concern also, but has the greater concern with specification error—the omission of an important variable can lead to major misestimation of the causal relationships being examined. Where measurement errors are thought to be serious when they are as large as 10 or 20 percent, specification errors quite easily can be much larger. To meet the needs of causal analysis, the development of data must be as concerned with specification error as measurement error.

Unfortunately, many of the relationships and variables which need to be addressed in causal analysis are difficult to measure. While far from complete in any sense, the attached figure serves as an illustration of the extent of the variables and relationships thought to be important in the medical office sector. Without dwelling on this illustration, there are two useful observations. First, there are large numbers of variables involved, and many interrelationships, even without considering the other sectors and their effect on provider and consumer behavior in the physician care market. Second, many of the variables have almost no data available on them that can be combined with other data in multivariate analysis. A few of the most glaring data lacks are the lack of insurance payment data, physician practice cost and income data, visit content, and non-dollar costs. Each of these variables affects the amount, type, distribution, and cost of care quite clearly, and they need to be introduced to analysis if other variables and relationships are to be properly measured. Causal analysis needs data on many more variables—variables often difficult to measure. It also needs these data in a form where they can be combined into a single analytic data set.

Another requirement of causal analysis is that there be enough data points that statistical inferences can be drawn. The approach where national data are used to look at changes over time is greatly restricted by the number of past years for which comparable data exist. Alternatively, differences between areas for the same year can be analyzed. This provides somewhat more data points but it requires that the data be estimated for the same areas at about the same time. A regrettable feature of most data collection efforts is that each effort has its own unique sample areas. This means that area analysis can only be done for those areas which just happen to coincide, generally the number

of SMSA's in the data set having the fewest. Often this is very few because, in the interests of economy, most surveys do not contain many areas with an adequate sample to provide self-representing estimates.

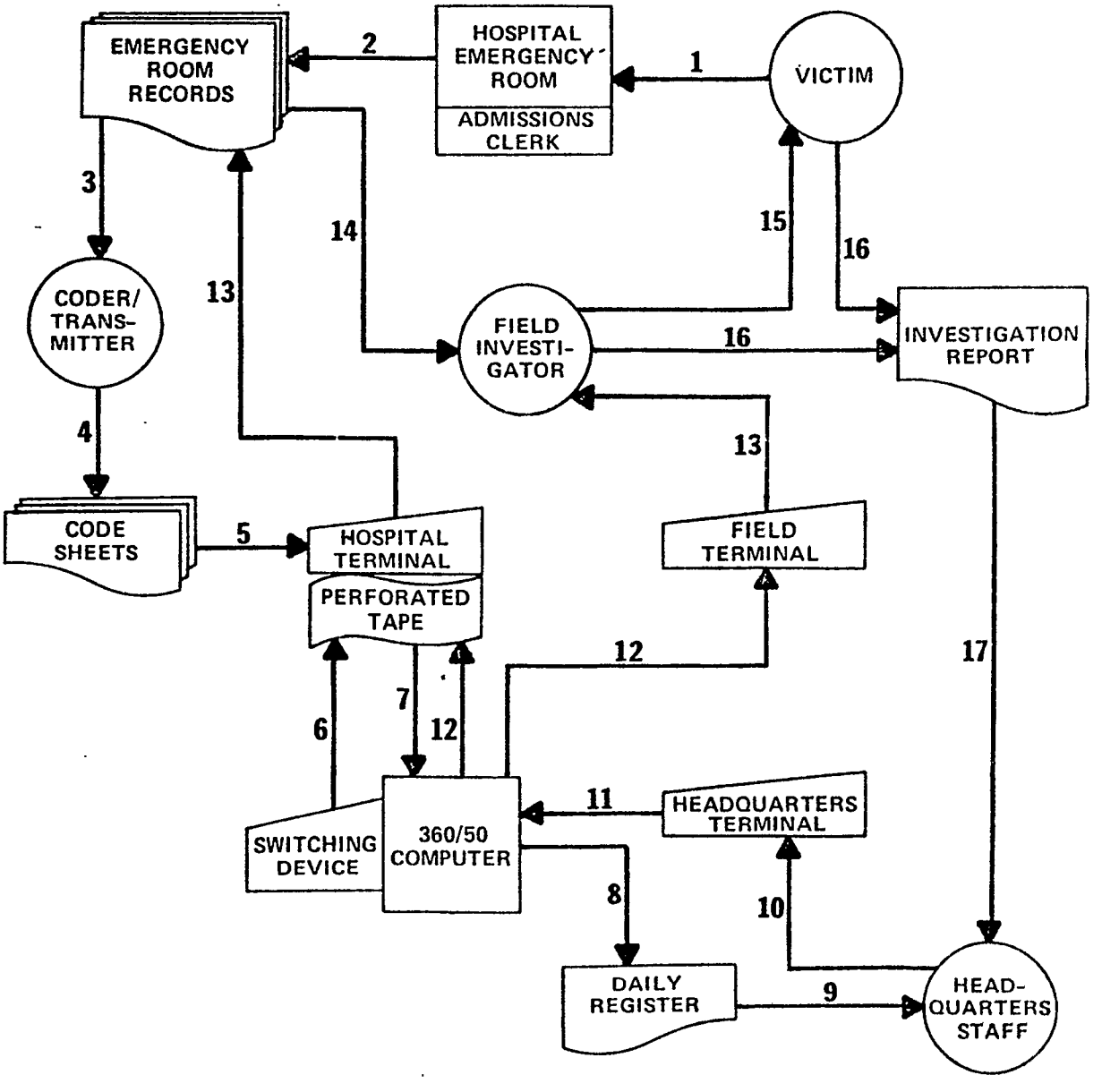
A third approach is to use individual record data, which normally provides an adequate number of data points. But individual record data are only available for some of the variables that need to be considered. This means that the other variables to complete the analysis must be represented by area data—again raising the need for consistent sample areas. In addition, there is the problem of confidentiality. It appears that disclosing a respondent's location down to the level of one or a few counties is deemed to violate confidentiality, and once the other variables for the area are appended to the individual record the possibility of location identification exists.

Thus, to summarize, the argument here is that the important questions for the development of health policy are too infrequently asked and largely cannot now be answered, as they rest on an analysis of causation. Even now, most of the concerns of health policy (like the effects of NHI, the causes of cost inflation, and the importance of physician-generated demand) can be addressed only through causal analysis. And the importance of causal analysis will intensify because it is the only way to answer the basic questions of policy decision.

This must lead to a redirection of analytic activities, but even more so it will call for new directions in the collection of data. Very little of presently available data is readily adaptable to causal analysis, and a large part of it is nearly irrelevant to the questions proposed here. Some of the changes needed for data collection to meet the more stringent demands of causal analysis are: 1) An orderly development of data on all important variables, with less preoccupation with measurement error and a greater recognition of specification error, 2) the coordination of surveys to have an adequate number of self-representing sample areas for the same time period and locations across surveys, and 3) the development of new ways of ensuring confidentiality of respondents which do not hinder serious research unduly. While this does not sound like an ambitious prescription, it is. The data requirements of causal analysis are diverse and difficult. More than this, they are founded upon the heretic presumption that data collection follows from analysis and the uses of analysis, rather than the reverse order.

In concluding, it is only fair to note that causal analysis, and particularly the data collection needed to support it, will be very costly over a number of years before any firm general understanding exists as to the workings of our care delivery system. But by now the total expenditures for health care must exceed $150 billion per year and it is unlikely that anyone familiar with our care system would contend that it is fine-tuned within even 20 percent of whatever might be optimum. The investment of a minute fraction of $30 billion per year in the purposeful development of an "Owner's Maintenance Manual" for our health care system is prudent and necessary in this perspective. It is time we did somewhat less in order to know more of what we are doing.

Figure 1. DATA FLOW IN THE NATIONAL ELECTRONIC INJURY SURVEILLANCE SYSTEM (NEISS)



DATA NEEDS FOR HEALTH RESOURCE POLICY: A LOCAL VIEW

Frank C. Dorsey, Ph.D., *Executive Director, Cooperative Health Information Center of Vermont, South Burlington, Vermont*

My predecessors on this program have outlined some of the broader issues in health resource planning, particularly as they impact on the role and function of Health Systems Agencies and in manpower planning and health expenditures data. I would like to describe at a more detailed level some of the historical and current uses of data in Vermont for health resource planning and allocation. In the course of this admittedly local report, I hope to suggest

- essential data elements both currently available and needed,
- viable uses of existing data,
- possible improvements in data communications flows, and
- impact of data on resource allocation decisions.

I should begin with a brief catalog of the health planning and regulatory milieu in Vermont and the data resources available.

Vermont's population of 483,000 resides primarily in towns of less than 2,500. The State is served by seventeen acute care institutions in the State and two referral institutions in bordering States. Vermont has a single HSA and a single PSRO. Vital records are maintained in the Public Health Statistics Section of the Vermont State Health Department. The Statistics Section is currently applying for a manpower component and has a facilities component of the Cooperative Health Statistics System of the National Center for Health Statistics. Since 1969, acute care hospital abstracts for nearly all Vermonters have been maintained by the Cooperative Health Information Center of Vermont or its predecessor in the Regional Medical Program. CHICV is a private nonprofit organization created in response to a perceived need for a credible, non-regulatory, non-provider data broker whose analyses would be available to providers, regulators, researchers, planners, insurers, and the public. CHICV is the data processor for the Vermont PSRO and has provided data and analyses to the HSA and the other types of parties described above.

Uses of the data for resource allocation and planning decisions can be categorized in many ways. Crudely, an historical approach divides the data use into pre- and post-HSA designation time frames. This time split also demarks two distinct approaches to resource decisionmaking. In the pre-HSA period, while a Comprehensive Health Planning Agency existed, there was not a statewide plan, so decisions tended to be made on an institutional basis—a process in which, generally, a provider proposed creation, expansion or modification of a resource or program and the 1122 agency determined the appropriateness of that proposal as an isolated event. Since the designation of an HSA, (the Health Policy Corporation), the data sought by planners and regulators has been more often focused on broader areas, availability of comparable resources in nearby settings and the relationship of the proposed resource to a statewide picture. While we do not yet have an approved Health Systems Plan or Annual Implementation Plan, the more holistic view mandated by P.L. 93–641 has been evident in the types of data requested both by the HSA and by institutions.

A few examples may serve to illustrate the difference in approach as well as to identify some viable uses of available data.

Pre-HSA, several facilities requested renovation and expansion permits. The data provided generally reflected only institutional utilization. As a consequence, decisions were made which added facilities, equipment, and manpower at particular sites without regard to the availability of similar resources in nearby communities. The HSA has requested an extensive data set, due to be delivered this week, which tabulates the rates of utilization of health resources not by institution, but by subgroups of the population. Such information, reflecting consumption of resources by where people live rather than by where they are served will be the basis for development of the Vermont Health Systems Plan. As many of you know, the classic small area analysis work by Drs. Wennberg and Gittlesohn reflects marked differences in utilization by adjacent populations who show little or no difference in sociodemographic profile. The use of such data in resource allocation decisions will add a dimension to the planning and regulation process, which will address over- and underutilization by *populations* as well as the usual question of whether the institutional utilization warrants augmented or modified resources.

The imminence of this planning and regulatory approach has already led several neighboring hospitals into joint planning efforts. The new approach has also led several other institutions to request data for analyzing where their patients come from, where people in their vicinity seek particular services and fairly detailed information about the surgical and diagnostic groups being handled locally versus remotely. Recent individual hospital data requests have been not for tabulation of how much X did *we* handle

last year but for how many of X came from our *area* last year.

This changing approach argues strongly for the availability and for the utility of *population based data*—both with respect to utilization and with respect to resource availability. Population basing requires addressing a critical methodological issue—definition of service areas for various types of health care resources. Provided encounter forms with various types of providers include the patient's place of residence, historical patterns can be used to establish such service areas. In developing the HSA's population based rates, two approaches were taken:

1) An exhaustive tabulation of the State by planning region, without regard to the fact that many border communities receive a significant portion of their services in neighboring States. Consequently, for border regions, the apparent rates of utilization are incorrectly low.

2) A selective approach, which defined hospital service areas on the basis of contiguous aggregations of towns from which a majority of hospitalized patients went to the local institutions. Border towns were excluded if their recorded rate of utilization was markedly lower than nearby towns closer to the Vermont institution serving the area, or if vital records indicated that a significant portion of local residents' births or deaths occurred out of State. Other towns were excluded if their hospitalizations were divided among several Vermont institutions, none of which received a majority of total inpatients.

The definition of these areas for the purpose of population based planning thus required

- residence information on acute care encounters and
- vital records.

To generate *rates* for these areas, now defined, additionally requires small area population estimates. To make appropriate comparisons between areas further requires age/sex adjustment so detailed age, sex information is required on encounter forms and detailed population age/sex distributions of small areas are also needed.

While Vermont's nearly unique availability of hospital utilization data and the use of common geocoding by us and by the Health Department's Public Health Statistics Section and their provision of town specific population estimates permits population-based data to be used in the hospital resources policy area, several other kinds of data are not currently available—notably ambulatory encounter data. Thus, if PSRO succeeds in reducing hospital utilization through admission certification or continued stay review, it will be impossible to monitor whether outpatient care levels are consequently increased. It will be equally difficult to ascertain, without a control group, whether the reductions are due to PSRO or part of a general trend. This particular example indicates that much more extensive data than is generally available would be useful in developing resource policy and in monitoring the consequences of particular interventions.

In summary, essential data elements for resource policy development and monitoring are

- encounters summaries with *geo-codes,*
- resources by *geo-codes* including charges and capital cost information, and
- detailed population profiles by *geo-codes.*

To the extent that these elements are missing, in whole or in part, planning cannot be holistic.

Before closing, I would like to make one more plea. In addition to the nonavailability or lack of completeness of data in many areas, significant barriers to rational, data-based resource allocation policy are imposed by the difficulty of communicating extensive numerical data to non-numerate audiences—not only consumer members of HSA's but professionals as well. We have had some success in broaching this barrier through the use of graphic displays. I encourage those of you who are data providers to develop graphic techniques and those of you in analysis and planning to demand graphics from your data sources.

Figure I is an end product of the various data sets and methodologies previously described. For the 3-year period 1974–1976, for each of the 21 hospital service areas of the State, hospital abstract data was used to calculate statewide and area age/sex specific rates of hospital utilization for several categories of disease. The two displayed represent an aggregation of respiratory diseases and inguinal hernias. Using the statewide age/sex specific rates, *expected* disease specific utilization is calculated for each area. These expected rates are then divided into the *observed* utilization to obtain an *observed/expected ratio* for each area. These are then plotted on the graph, one asterisk for each service area. The vertical bar is plotted at 1, the other meets at 2, 3, etc. As you can see, the disparity in utilization rates across areas for hernia is much less than the spread for respiratory disease. The wide spread in the distribution of O/E ratios suggests that there is considerable elasticity in utilization of acute care facilities, and that study of usage pattern by HSA's is warranted in the context of either cost containment or resource planning.

The key elements for defining appropriate resource policies and for implementing and monitoring revised programs are *geo-based data* across the spectrum of health services, *graphic modes of data presentation* and

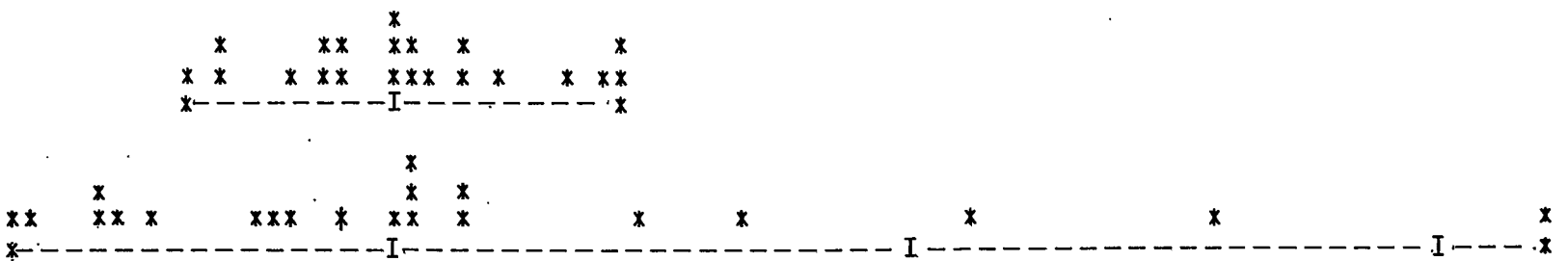
population-based analyses. We have found in Vermont that the availability of some such information can materially shift the nature of the questions asked in resource policy formulations by regulators and also induce a change toward holistic planning on the part of providers.

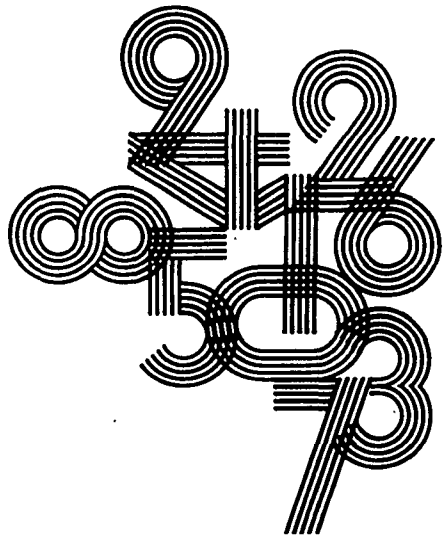
Figure I.

1974-1976
21 Hospital Service Areas
Observed/Expected Ratios

Abdominal Hernia - 3664 Cases
High Ratio - 1.45
Low Ratio - .63

Respiratory Infections - Acute RI, Influenza, Pneumonia, Bronchitis - 5902 Cases
High Ratio - 3.23
Low Ratio - .28





CONCURRENT SESSION I

Health Status Indexes—Methods and Concepts of Application

HEALTH STATUS INDEXES: DISEASE SPECIFIC VS. GENERAL POPULATION MEASURES

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Introduction: The purpose of this paper is to describe to you a project where the quality of care (QOC) a patient receives is being evaluated within the context of a clinical trial. Health status indexes (HSI's) are used both as outcome measures for health service evaluation, and as a process variable for quality of life (QOL) assessment. We will argue, in contrast to Bush, Blischke and Berry (1973) and Thorner (1971), that the controlled clinical trial is the ideal context for evaluating quality of care, and that maximum progress can be achieved in optimizing the quality of care by intensive study of treatment regimens at the time that treatment options are established-namely, the clinical trial.

Our model can be described as a "building block approach" to identifying optimal health services. We start with a specific disease, we compare within a clinical trial various treatment regimens, we include QOC and QOL assessment and we have the ingredients for defining within a very limited and specified context, "better" care (i.e., one treatment regimen will have less morbidity and mortality than another). We recommend that this be done for each clinical trial and soon sufficient information will be accumulated that these data can become available for the general medical public. In contrast, the current approach to evaluating health services tends to evaluate current practice by studying isolated aspects of what is, in fact, an interdependent system (i.e., structure, process, or outcome measures); tends to evaluate services across care sites; and can even consist of a comparison of very diverse treatment regimens (as occurs on occasion in an ambulatory care setting). Thus, what we are proposing and will discuss in this paper is really a research strategy, a strategy which we feel offers a viable addition to current approaches to evaluating health services.

Dimensions of Health Care: Simply stated, health care (fig. 1) involves a provider and a patient interacting in a particular social setting (e.g., a hospital or clinic). QOC is a measure of the provider's contribution to the care process; QOL measures the effect of care on the patient, while the social context of care includes all those factors that can modulate the care process. Access to care, continuity of care and social support arise from the vast number of social factors that patients and providers bring into the care process. Each of the major dimensions of care can be assessed separately and as simple and complex interactions.

Figure 2 illustrates the fact that health care is a process that develops over time. For example, the relationship between the patient and the provider almost always starts with the patient's accepting judgements of the physician, can evolve to where the patient is conforming to what is being asked of him/her, and may even develop to where a treatment regimen is negotiated. The developmental nature of this sequence of events emphasizes that health care is an interpersonal event, with identifiable tasks and objectives for each participant. The optimal result of this process is the development of self-care behaviors on the part of the patient.

In this model, QOC and QOL are measures while the social context functions as weighing factors. Thus, one can write the following conceptual equation:

$$HC = s\,QOC + s\,QOL + sk$$

where
- HC = health care
- s = social factors
- QOC = quality of care
- QOL = quality of life
- k = a constant, or adjustment factor

Health care will be measured in arbitrary units. The most important part of this equation is that it makes explicit that QOC and QOL are measured separately. Whether they are related in an additive or multiplicative manner remains a matter of conjecture. Thus, as we conceive of it, HC is not a simple function of QOC but also involves an independent assessment from the perspective of the patient—a QOL assessment. The relationship between QOC and QOL is illustrated in figure 3.

Some writers, most recently Donabedian (1978), have stated that QOL is functionally dependent on QOC. To quote Donabedian (1978, p. 857):

> "More precisely, the quality of care is proportional to the extent to which possible improvements in the quality of life are attained as a result of that care, with the assumption that cost is no object."

In other words, the value of QOC is in its improvement of QOL. As we see it, QOC and QOL are indeed related, but because what is an outcome measure for one construct is a process measure for the other. Health status, as classically conceived, is an outcome measure of QOC, but we suggest it is also a process measure for QOL. Thus, the health state that results from the treatment of disease has utility or usefulness for the patient, and it is the utility of their health state that determines the patient's satisfaction or well being,

Figure 1.

DIMENSIONS OF HEALTH CARE

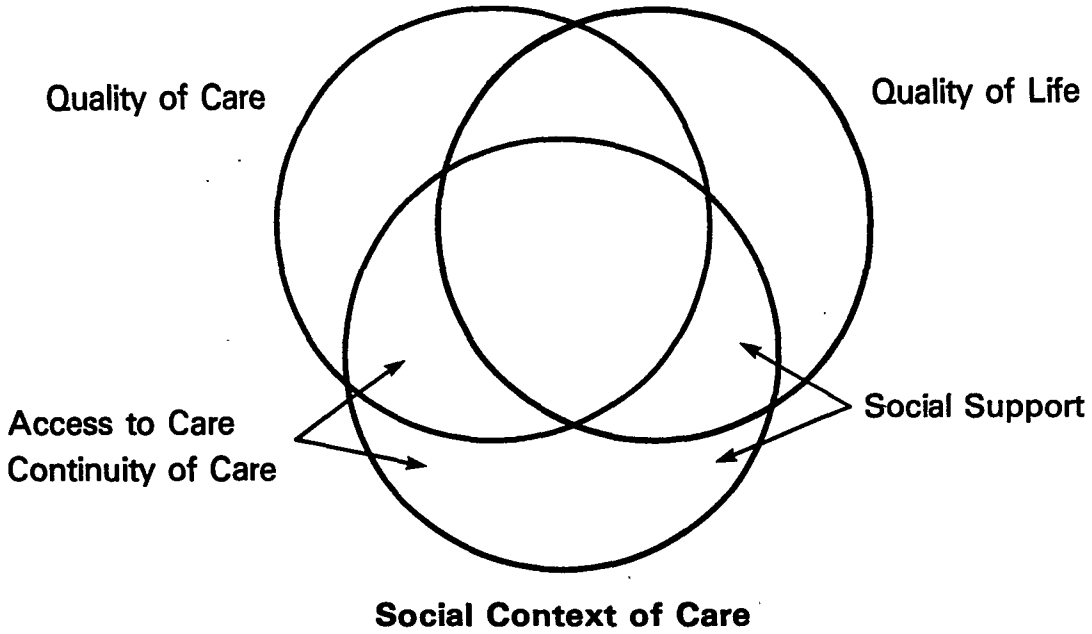
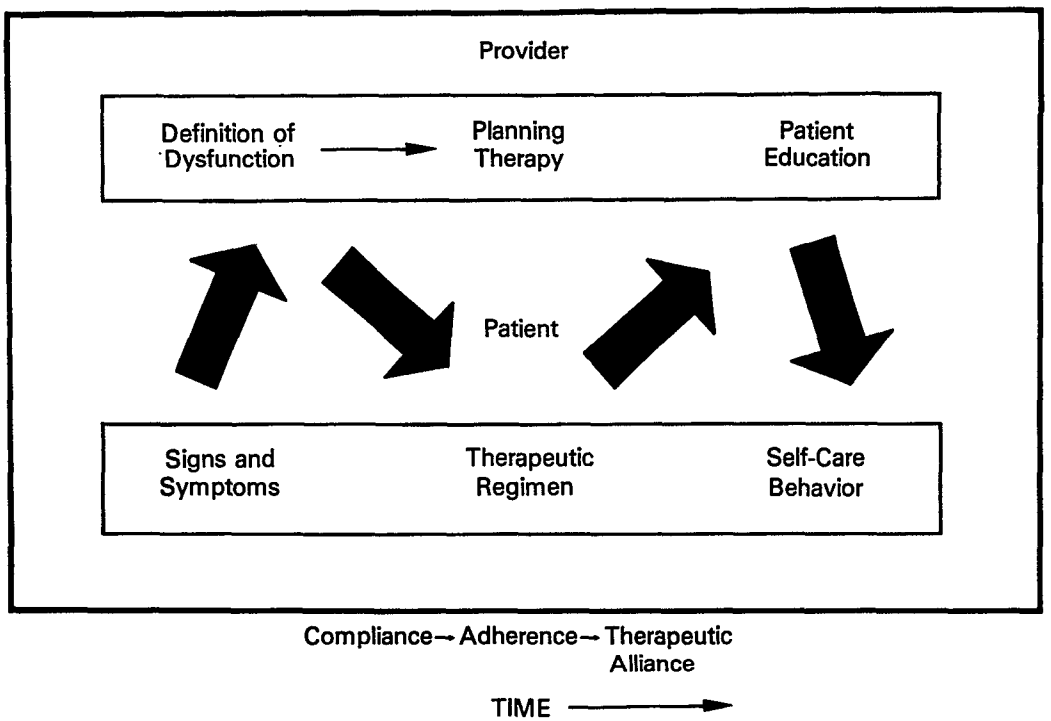


Figure 2.

SOCIAL CONTEXT OF CARE



or determines the impact of treatment (loss of function). The same is true for education: knowledge is an outcome measure of the health care process, while the usefulness of knowledge is a process measure that effects the impact of treatment, satisfaction, etc.

Gilbert, McPeek and Mosteller (1977), in contrast, appear to suggest that QOL should be assessed after the cessation of treatment. While we agree with their

Figure 3.

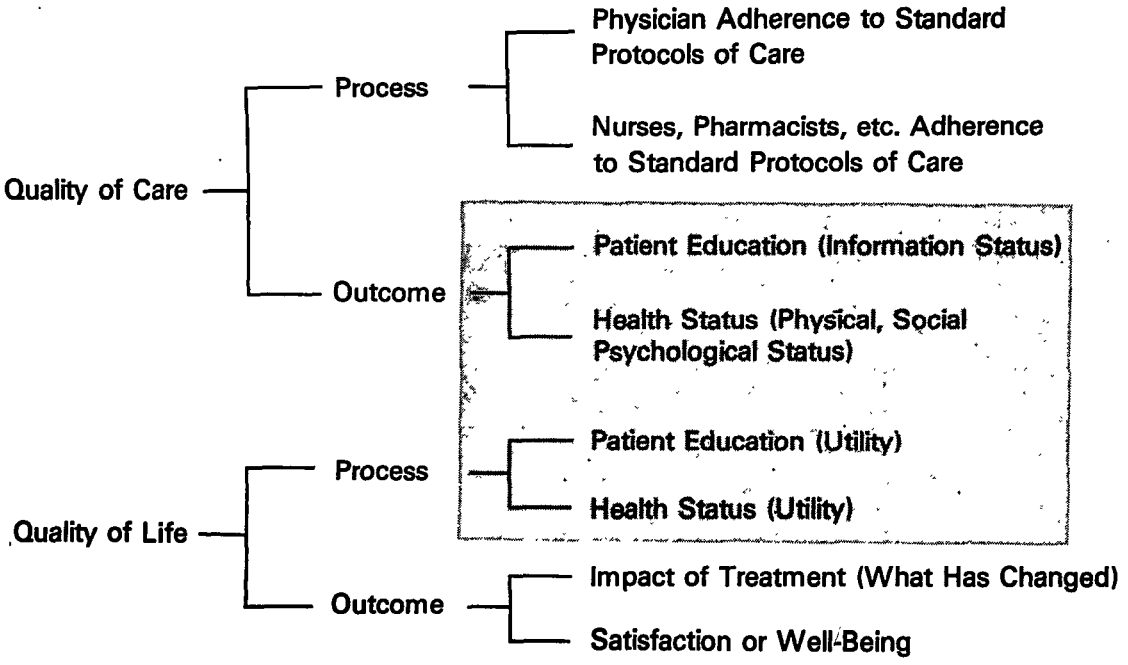
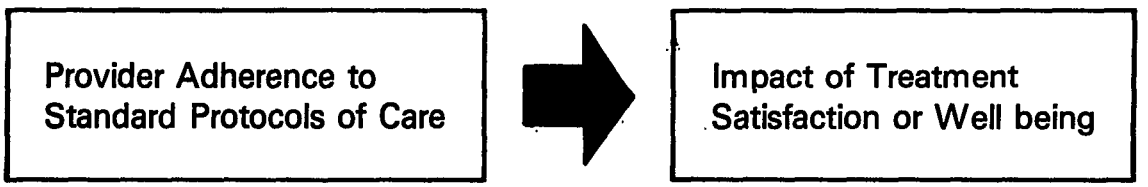


Figure 4.



suggestion, we also feel that QOL should also be measured during treatment. In fact, it is because we believe that QOL can be assessed repeatedly during treatment that we see its being used as a quality control device.

Many other writers interested in QOC, HSI's, QOL, etc. have written about the issues we are discussing. All we have done is to rearrange the topics in what we consider to be a more logical and empirically useful format. Consider Bush's work (Patrick, Bush and Chen, 1973) for example, on generating a health status index. He sees his long term goal as helping to define health, and his immediate task as operationalizing functional status and measuring the social preferences of various functional states. Functional state and social preferences, of course, are similar to what we would measure, but we would not necessarily combine them together in a single composite or HSI. The reason for this is that we do not see our long-term goal as defining health, but rather as providing optimal care. Clearly, this is a more limited but maybe also a more obtainable goal. The next question, therefore, is how we anticipate achieving this goal.

If you accept our argument that health status and patient knowledge are measures common to QOC and QOL then you should accept the inference implied by figure 4.

What figure 4 suggests is that the process of care, how the patient is cared for, determines the QOL outcome. This is a complex issue, but of the various determinants of the outcome of care, treatment-related characteristics appear to be the most important to the patient and certainly the most readily managed.

Table I summarizes some of the determinants of the outcome of care. Provider characteristics, such as socioeconomic background, personality, or the philosophy of care of providers (e.g., physicians who rely on drugs, or do not) may or may not affect the outcome of care but clearly they are not easily modified. The same can be said for patient and disease characteristics. Only, the treatments a patient receives and how he receives them can be readily modified. In fact, we feel so strongly about this issue that we are willing to state that the adverse psychosocial consequences of treatment can be minimized if not prevented by appropriate attention to treatment-realted variables. How do we do this?

Table I. MAJOR DETERMINANTS OF OUTCOME OF CARE

Provider Characteristics
Patient Characteristics
Disease Characteristics
Treatment Characteristics

First, we should note that any clinical trial consists of specified and "standard care" (i.e., nonspecified) procedures. Both can impact on the patient and our task is to *describe* both types of effects. In addition, when and how to rehabilitate the patient is often not a specified aspect of a protocol (usually because the impact has not been documented) although it is well known that the earlier this occurs the more likely it is that the patient will resume pre-illness functions. Our experience, in fact, has taught us (see below) that we should start rehabilitating the patient while he is receiving treatment. For example, we encourage patients to return to work while they are receiving their chemotherapy. We also deal with the adverse sexual and psychological consequences of treatment. We deal with these issues not by reconstructing a patient's personality, but by making the linkage between the provider's delivery of care and the adverse consequence of treatment to the patient as explicit as possible so that psychosocial interventions can be justified. In other words, we feel that much, but clearly not all, of the psychosocial burden of cancer treatment can be minimized by the selection of appropriate treatment regimens. Only when we have eliminated treatment-related variables do we feel we can go on to other possible contributors to the psychosocial burden of cancer treatment. To appreciate this approach I have to describe to you the NIHQOLA project (NIH-Quality of Life Assessment).

The QOL Assessment Project: It is probably not generally realized, but a large proportion of the clinical trials designed to evaluate alternative surgical treatment regimens are explicitly or implicitly asking QOL questions. An example of this is the soft-tissue sarcoma trial on the Surgery Branch of NCI. In this trial the *standard* treatment of radical surgery plus chemotherapy is being compared to the *innovative* treatment of conservative surgery, radiation, and chemotherapy, with or without immunotherapy. Thus, the core question in this clinical trial is whether a patient is better off, both in mortaility and morbidity terms, with a limb-sparing plus radiation treatment regimen than if he or she had his or her limb removed. The NIHQOLA was developed to assess the obvious QOL question in this clinical trial.

Table II summarizes the components of the NIHQOLA. We are still analyzing the data from our first administration of the NIHQOLA (approximately half the subjects were still receiving chemotherapy and half had finished all treatments), but what we have learned so far is that most standard instruments are of little value in identifying differences between patients who receive radical or conservative surgery. For example, only 2 of 12 subtests of the *Sickness Impact Profile* (Bergner, Bobbitt, Pollard, Martin and Gilson, 1976) were able to distinguish between surgical treatments. The *Barthel Index* (Mahoney and Barthel, 1965), a functional assessment, failed to reveal any difference between treatment groups, as was also true for the Holmes and Rahe's *Recent Life Change Scale* (Holmes and Rahe, 1967). The *Psychosocial Adjustment Illness Scale* (Derogatis, 1975) consists of seven subscales, and only one of these subscales was able to distinguish between amputees and non-amputees. In a more recent supplementary evaluation we found that a standard clinical pain and mobility assessment also failed to show differences between the groups, although both groups reported reduced mobility and

Table II. SCOPE AND COMPONENTS OF PHASE I NIHQOLA

DIMENSIONS		COMPONENTS
I.	Predictor Variables:	
	A. Sociodemographic	Socioeconomic Status Questionnaire
	B. Adverse Life Experiences	Aversion Questionnaire
		Recent Life Change Scale
II.	Treatment-Related Variables:	
	A. Economic	Economic Cost of Cancer and its Treatment
	B. Psychological	Treatment Trauma Scale Vomiting Assessment
	C. Behavioral	Sickness Impact Profile (SIP) Barthel Index
	D. Psychosocial Adjustment	Psychosocial Adjustment to Illness Scale (PAIS)

measurable pain. We also administered the Katz *Activities of Daily Living* assessment (Katz, Ford, Moskowitz, Jackson and Jaffee, 1962) and found a significantly greater incidence of reports of functional impairment among the conservative surgery patients. The Katz and Barthel Index differ in that the Katz ADL scale reflects a patient's assessment of function, while the Barthel Index reflects a provider's assessment (the test was administered by the Rehabilitation Medicine Department) of function.

Probably the most important observation that we made with the NIHQOLA–I was that the conservative surgery patients reported a greater frequency of incidences of sexual impairment than the radical surgery patients. This, of course, was unexpected, and was especially impressive since we were comparing just 9 radical surgery patients with 13 conservative surgery patients. Our observation, however, had some interesting effects. The observation that conservative surgery patients commented more about sexual dysfunction focused practitioner attention on how the patients were radiated. We had made explicit an adverse psychosocial consequence of treatment and we hoped it would lead to a reevaluation of medical practice for future modification of the protocol. I cannot tell you what changes, if any, in the radiation procedures will occur for future patients since the radiation dosage of 6—7,000 rads is quite close to the toxic level and may alone be a sufficient reason for the reports of sexual dysfunction. What I can tell you is that we may have had an impact on the QOC these patients received by alerting the medical staff to the consequences of treatment well before mortality and morbidity measures were completed. I should state that after nearly 3 years of this project, there is no difference in mortality rate between treatment regimens, and all 22 patients interviewed were disease free. Only 2 of 26 patients in the sample have died.

You may be interested in NIHQOLA–II, a tentative form of which is summarized in Table III. Please note that we have narrowed our scope both in terms of assessing specific functions and in terms of linking treatments to specific functions. We will be using NIHQOLA–II in a new protocol that also compares patients who will or will not receive chemotherapy.

An Experimental Approach to Measuring QOC and QOL: What I have been describing to you is an experimental approach to QOC and QOL assessment. It contrasts with the descriptive-survey approaches currently in use. What makes these QOC and QOL assessments experimental, of course, is the fact that the treatment consequences and health services being evaluated are embedded in an experimental format—the clinical trial. We are literally comparing different treatment plans for the same disease. In addition, by feeding back the consequences of care to the physician, we are, over the long run, also trying to optimize the care the patient receives. Thus, our goals are to evaluate and then intervene.

This procedure provides the surgeon with data that can also be used to evaluate and improve the conduct or management of a clinical trial, as well as generating a body of knowledge of the psychosocial consequences of treatment plans that can be used for individual patient medical decisions. It provides those interested in health services research with empirically and comparatively defined treatment plans. It gives the patient the opportunity to have an input into the definition of treatment plans at the time these regimens are being established. All of this occurs by QOL assessment, a

Table III. SCOPE AND COMPONENTS OF PHASE II NIHQOLA*

DIMENSIONS		COMPONENTS
I.	Predictor Variables:	
	A. Social Support	Socioeconomic Status Questionnaire
	B. Adverse Treatment Response	Adversion Questionnaire
II.	Treatment-Related Variables:	
	A. Economic	Economic Cost of Cancer and its Treatment
	B. Psychological	Pain Assessment
		Sexual Function Assessment
		Anticipatory Vomiting Assessment
		Treatment Trauma Scale
		Accommodation Scale
	C. Behavioral	Functional Assessment

**This is a tentative statement.*

procedure which can be simply and repeatedly administered throughout the care process.

What relevance does all of this have to health status indexing? Indexing, of course, is a theoretically neutral process, and although it has been used almost exclusively by those interested in developing a definition of health there is nothing in the indexing process itself that says it cannot be used for other purposes. We feel that our QOL assessment constitutes a somewhat different use of indexing since we are using it as a monitoring device to characterize different treatment regimens.

What we are doing also differs from others in that the HSI's we are generating require no mortality component. This, of course, is accidental of the fact that the death rate for the soft-tissue sarcoma protocol is quite low, and no different between treatments—at this time. Thus, we are free to assess morbidity independent of mortality. All of our patients are rendered disease free by the treatment regimen I have described. So we have the added advantage of being able to assess the same patients during treatment and after treatment.

Measuring health status during a clinical trial, as we are doing, has some distinct advantages, especially for those who are interested in using HSI's to

Table IV. ADVANTAGES OF MEASURING HEALTH STATUS DURING CLINICAL TRIALS

1. Disease Control:	Uniform Diagnosis of Disease —Optimal Staging —Disease Categorization
2. Treatment Control:	Specifiable Treatments —Uniform Treatment Regimens —Measures of Provider Compliance —Measures of Patient Compliance
3. Statistical Control:	Minimization of Systematic Bias —Randomization —Blocking Procedures
4. Functional State Control:	Separation and Specification —Ill/Recovered —Treatment/Maintenance/Terminal State
5. Design Control:	Evaluation by Comparison —Minimization of Variability in Quality of Care —Linkage Between Process and Outcome

operationalize health. The advantages come from the degree and kinds of control that result from doing an evaluation during a clinical trial. The resultant control cannot but help improve the quality of the data upon which an HSI is based. Improvement comes from the fact that health status can be measured for individuals with uniform diagnosis of disease, where treatment regimens are specified, provider-patient compliance monitored, and where systematic bias can be minimized. Probably the most important improvement in the quality of data will come from the fact that a clinical trial permits you to measure health status easily when your sample is in a particular portion of the health care process—in treatment, after treatment, chronically ill, terminally ill, etc. Too often, especially in the ambulatory care setting, attempts at measuring health are confounded by the heterogeneity and variability of the data, and the clinical trial provides some control over these sources of variance.

In contrast to this approach, Thorner (1971) has argued that randomized clinical trials in health services research are not feasible and usually not worth the effort. We, however, are not suggesting the specific creation of clinical trials comparing health services, but that researchers recognize the fact that clinical trials are already comparing different health services because they are comparing different treatment regimens for specific diseases.

As was stated, the nature of a clinical trial is that a comparison is being made between health care systems (i.e., treatment regimens). By measuring health status during a clinical trial, therefore, you are comparing resultant health states. This will permit you to define "health" in a comparative sense; that is, which treatment regimen has lead to a better state of health. Who, for example, is "healthier," the amputee or the patient whose limb was spared and who received radiation? Using an iterative process in which pairs of treatment regimens are compared it should be possible to progressively approximate the ideal health state for the soft-tissue sarcoma patient. In this approach, "health," for the ill patient, is defined as that state in which a change in a new treatment regimen leads to *no* improvement in function or well-being as compared to standard care. This is clearly a medical, or disease-oriented definition of health, but is consistent with our goal of providing optimal care. We feel justified in taking this approach because we are convinced that a patient's experience with different diseases is not the same. Thus, a person's concept of health will vary as a function of their past and present experience with a specific illness and its treatment. Stated differently, health will not be defined in the same way by a diabetic, hypertensive or cancer patient. It is only those individuals whose primary concern is the allocation of resources who are willing to make such an assumption.

Since we are also not at all convinced that the emergent phenomenon known as "positive health" can exist, we are perfectly content to define health in specific disease contexts. Like the biologist, we hope to use comparative techniques to gain insight into principles—in this case, principles of health. We, as outsiders to the health service evaluation field, would suggest that the comparison of treatment regimens in a clinical trial be considered as an appropriate object of study and an appropriate application site for HSI's. To this end we would like to encourage you to join us in our attempts to make QOL assessment an integral part of every clinical trial at NIH.

Acknowledgment: I would like to thank Ms. P. Erickson for inviting me to this meeting and for tutoring me in the area of HSI's. If I remain ignorant it is not because she has not tried.

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THE GROSS NATIONAL HEALTH PRODUCT—A PROPOSAL*

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A population health status index designated The Gross National Health Product (GNHP) is proposed as a general measure of health of nations or population groups. The GNHP integrates mortality and disability data into a single number in units of disability-free life years lived per 100,000 population. It is primarily based on mortality ratios and the life expectancies of component age groups of the population, modified by their respective disability experiences. A computational example with currently available data from publications of the National Center for Health Statistics is furnished. Problems of using the index for cross-cultural or cross-national studies are discussed with a view to the prevention of bias in the results.

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REACTIONS TO FOUR PAPERS ON HEALTH STATUS INDICATORS

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Let me begin by announcing that I am not an expert on health status indicators. Such a denial, at a meeting on health status indicators, is suspiciously humble; you have a right to expect the speaker to say nothing intelligent. In fact, I've planned dutifully to say nothing stupid and rather hope that some remarks will be helpful. My expertise lies in methodology and evaluative research generally rather than in HSI's in particular, so the criteria exploited in commenting on these papers will differ a bit from those used by a specialist.

Dr. Barofsky has introduced us to a particular type of health status indicator and to his strategy of using the device in clinical trials to understand both the properties of the indicator and the character of the program examined in the trial. The work is admirable in the first instance for focusing on the sensitivity of indicators. That is, his work is consistent with a small but high quality tradition of using the indicator in a variety of experimental tests to establish that it does what it's advertised to do, e.g., discriminate between two groups in the experimental tests of health service regimens. That tradition of self-critical research on scales, fostered by Sid Katz and others, adds greatly to our understanding by empirically verifying theoretical links between what is done in a program and what is measured by such scales. Similar enterprise is crucial in other social sectors, if we may judge from chronic problems in using indices of unemployment in the United States, for example. Despite their general use, such indices are often misleading surrogates for actual unemployment in evaluations of specific manpower training programs. Barofsky's theoretical framework for structuring the health care delivery process and response is nicely explicit and has some intuitive appeal. It also has an analogue in other areas. So-called "evaluability assessment," developed by Joe Wholey and others, similarly tries to clarify how a social program works, before actually evaluating it, to establish causal chains between program action and program outcome, and to identify the typically few causal linkages which are in fact testable. Barofsky's stress on randomized tests puts him into a much better position to make sound judgments about those causal chains, however.

One of the technical issues implicit in Barofsky's use of the indicator as both outcome and process measure concerns the way the statistical analyst might use it in planning and evaluating social programs. Clearly if it can be used as a blocking or stratification variate or as a covariate, then one might improve the precision of estimation notably. Perhaps more important, the use of an indicator to register degree of imposition of treatment can increase the statistical power of experimental tests of the programs notably (Boruch and Gomez, 1977). The paper might be improved by making that explicit.

Two less complimentary observations on the use of NIHQOA in the soft-tissue sarcoma trial are warranted. The first is that sample size in the trial is exceedingly small. On the one hand this makes more remarkable the finding that there are notable group differences in reported sexual impairment. On the other hand, the small sample size also implies that the experiment has little statistical power, and consequently the finding that "standard clinical pain and morbidity assessment failed to show differences" is virtually meaningless. Null findings mean almost nothing with small samples: to make the finding more meaningful, statistical power ought to be reported. To assure power, sample size ought to be increased. The problem of assuring adequate statistical power in experiments has persisted in medical research of course (see Bunker, Barnes, and Mosteller (1977) for example). Irrespective of sample size, the number of tests of hypotheses ought to have been reported. It's not uncommon to do 10 or so such tests and find one significant difference; that difference of course may be spurious, a function of the number of such tests done. The second remark bears on the patients' reported "sexual impairment." It is not clear from Dr. Barofsky's presentation how valid the reports are and in what sense such reports are biased. Patients do not furnish blind ratings and so we expect distortion in ratings to be the rule rather than exception. If patients think performance has waned, that is important of course. But it would be nice to have some data or side theory on corruptibility of the indicator to understand the result.

Dr. Chen stated that his objective is to build an informative health status index which (a) is simple, (b) exploits existing data, and (c) recognizes both survival and disability. He has succeeded in doing so: the index is indeed simple and economical, and does put the two constructs together in a reasonable way. Linder's original suggestion reflects a spirit of thoughtful simplicity too rarely emulated, and Chen's extension of the idea is consistent with that spirit. To his credit, Chen recognizes that Gross National Health Product, like any gross indicator is crude by definition. Where he may sell his indicator short is in recognizing that it may be crude by fiat as well. We recognize that many of the principle uses of GNP and the like are rhetorical—a political and economic device which helps shape dialogue. It's not unreasonable to argue that despite technical shortcomings, the public's interest in coarse information on health status makes Chen's device an important vehicle for communicating

between the public and the government. The role is legitimate and it's regrettable that we don't know more about broad classes of rhetorical indicators of the sort, their use, and their value to the lay public. The analogous phenomena here are public use and understanding of literal rather than quantitative concepts. Words like "survey," "sample," and "experiment" are at once technically precise and, for the public, often imply a variety of activities not implied by the statistician. The use of such terms by the lay public has only recently become a topic for thoughtful, more systematic analysis (Kruskal's (1978) is a nice beginning). The point is that the popular use of concepts such as these, despite their technical implications, is a natural, perhaps essential, part of public interest in social science: analogues of the sort Chen suggests are consistent with that point.

Chen is conscientious in recognizing precedent, such as Chiang's index and his own earlier inventions. We understand that this new index is simpler and computationally more tractable than these. Chen also recognizes that Sullivan's work is related closely to the GNHP, but it's difficult to see where the comparative merits lie. More generally, it may be possible to better understand the usefulness of the GNHP with a bit more work. For we have at hand an embarassingly large array of health status indicators, each purported to have merit. Chen does take the trouble to examine his index against informal theory: his regional comparisons and the possible reasons for them are appealing. But if the indicator could be tied to a coherent theory of health care, and moreover can be shown to fit the theory or illuminate it better than its competitors, that would help make a better case for its utility. If one could show that the index was more sensitive than its competitors to the introduction of health interventions (fiscal, managerial, or whatever), then we'd have a stronger case for adopting it. Chen rightly points out that "disability" is a misleadingly static term—definitions may change or vary over regions. But to decide whether the index is more reasonable than others, we should be furnished with information about stereotypical forms of distortion in definition or reporting and an analysis of whether that distortion is crucial in policy development. The simplicity and economy of Chen's index are very attractive. What remains now will take not a little effort in structuring criteria for the index's evaluation and creating some informative tests—simulated, in the field, or analytic—to understand how well it meets those criteria.

Dr. Berg, you'll recall, presented an account of his group's adaption of an evaluation system to the requirements of a new maternal care program at the Papago Indian Reservation. Estimates of effects of the program on actual participants and on the target population of eligible women are, we learn, an important product of the system, in helping us to understand whether and how well the program does what it's supposed to do. Berg's oral testimony is based partly on papers by Nutting, Barick, and Logue (1978) and Nutting, Shore, & Berg (1977), distributed before this meeting; I rely on this material as well to identify three counts on which their reports are admirable and several shortcomings.

First, the Tucson group has taken the trouble to *design* the evaluation prior to program implementation. The design, a before-after plan, is rudimentary to be sure; it is far more helpful in understanding program effects than are the post mortems generally labeled as outcome evaluations by some of our colleagues. It provides less equivocal information than evaluations relying on after measures only, or on preexisting archive records whose validity is unkown, or on normative national or regional HSI standards whose pertinence to the actual site are unknown. More generally, we recognize that no health status indicator can be exploited meaningfully to estimate a program's effect without the conscious creation of a baseline or standard engendered by the evaluation design. It's partly for the sake of other evaluators that technical features of the evaluation plan—statistical design power, reliability or validity of indicators, and the like, should be made more explicit. The second admirable feature of the work is the adaption of an existing theory of reporting, developed by Kessner, to the program's needs. This stands in contrast to the tedious reinvention of reporting systems, and their relabelling with clever acronyms, or the creation of toxonomics, diagrams, and structures which are byzantine in character and do virtually nothing to refine earlier work on the same topic. It is not clear from the papers, however, how well the system worked, by what criteria it might be fairly judged, and what the quality of reports under this system is (e.g., validity), and how robust the system is to incompetence or indifference. Finally, the program is treated in the evaluation as considerably more than a pious promise, a label, or black box. That treatment is partly a function of adopting Kessner and others' work: it facilitates making clear linkages between specific aspects of a program and specific outcome variables so that the linkages can be tested empirically. And though fundamental, the notion of establishing the degree to which programs are implemented, giving some numerical flesh to the literal spirit, has been chronically ignored in both health related evaluations and other areas. It's not really possible to specify, for example, what happened in hundreds of preschool programs such as Headstart over the past ten years, simply because local evaluators collected systematic information on output alone and ignored process. The same is true of programs mounted under Comprehensive Employment and Training Act, many law enforcement programs, and a good many new social welfare programs. To improve the Tucson Group's contribution, some explicit structure for incorporating process information into analysis needs to be created.

What is less laudable about the presentation concerns analysis. First, it's clear that making two classes of

comparisons (high and low risk) on 13 outcome variables is bound to yield more spuriously significant results than are advertised in the tables. Consider, for example, the high and low risk groups and only one response variable. The probability of obtaining a statistically significant result is .05 in each considered independently but $1-(.95)^2=.10$ taken together (Tukey, 1977). This is still a small probability, but it is not misleading: the table and text fail to recognize that with an increasing number of interesting classes (even two), the probability of spurious differences increases for the combination. The use of multiple response variables is rather more crucial. To be sure, one *ought* to assay as many as possible to characterize treatment effects well. But simply laying out 13 tests of hypotheses, each advertising the .05 level of significance, is misleading. In fact, if each of the tests was conducted on an independent sample and the same response variable, the level stated would be accurate for that particular group. But with 13 such groups, the probability of finding at least one significant difference even when there are none is high: $1-(.95)^3=.51$. In fact, because 13 tests are conducted on the same group, rather than on independent groups, the probability of coming up with at least one spurious result is higher. The point is that the .05 level advertised for each test within class is badly misleading. A discrete multivariate analysis with the high priority variables would, I think, be more appropriate. And indeed, one of the finest recent books on this topic has a variety of pertinent illustrations; see Bishop et al. (1975).

The second important concern stems from the design of the evaluation. It is well known that before-after designs are susceptible to a wide variety of "threats to validity" in estimating program effects (see Riecken et al. (1974) or Sechrest (1977)). An increase in (say) the number of women receiving nutritional counseling may be part of a trend initiated before the program, it may be part of a stable cycle, it may be induced by incidental newspaper coverage of topics in nutrition, and so on. Similarly, no change at all might be attributable to a variety of influences irrelevant to the program. The logical problem is that "significant" increase, decrease, or no change at all may be induced by factors which cannot be disentangled from the program's influence. Generally speaking, randomized control groups, and in a few cases nonrandomized comparison groups, and in still fewer cases long time series will eliminate many of these competing explanations. But they are not feasible here evidently. The responsibility of the evaluator then seems to me to be to identify plausible competing explanations for the finding of a program effect. Further, I expect the work could be improved by first considering those response variables *least* likely to have been affected by changes in factors outside the program, and reporting them along with the judgment (or data) that the extraneous factors are negligible. The response variables more likely to be affected by seasonal variations and other factors would be considered separately to make a strong case to the outside judge for the author's contention that the program is effective.

Since no paper was distributed with Dr. Kisch's remarks, it's necessary to rely partly on his oral testimony and partly on the final report, by Harris, et al (1977) for the project he has described. As I understand it, the algorithm's main purpose is to structure local health planning. It does so by making explicit and routine the processes of exploiting simple vital statistics, identifying problems and tentatively specifying causes of the problem and options for solution. The algorithm uses four mortality indices as raw material for action: infant mortality, heart attack mortality, breast cancer mortality, and high blood pressure.

This effort is interesting on several counts. It is a worthy attempt to encourage higher quality planning, where quality is indexed here by coherence and explicitness. The latter is essential for public understanding, in general, presuming of course the public wishes to understand, and for competing analyses by community groups and outside scholars, in particular. It is, as Kisch points out, an approximate solution to a chronic problem. Statutes requiring "planning and evaluation" are created with alarming frequency and rarely provide either fiscal or technical support or guidance to any interested principal. Though this Congressional activity helps democratize the state of the art in planning and evaluation in the long run, statutes consistently fail to recognize our collective ignorance about the process for new programs. This instant ignorance by statute can be satisfied only partly by rigorous efforts of the U.S. General Accounting Office to specify minimal standards, because these must be oriented toward national rather than regional capabilities.

What is admirable too is the researchers' examination of five sites to ascertain the availability of health indicators data. That some data, on emergency care, for example, is unavailable, is not surprising; but the general lack of morbidity information, and the absence of uniformity among sites in information maintenance is unnerving. It would have been nice to have had a better understanding of the quality (completeness validity) as well, for the recent work on the topic suggests that despite the advertisements about the existence of data systems, they are often not particularly well supported by conscientious local reporting. In any event, such a pilot study is a helpful if small increment to the resources needed to build better national statistical policy.

What is less clear and possibly misleading about the product turns partly around its use and partly around its composition. For example, Mr. Kisch announced that the algorithm is being adopted by numerous health organizations and that it "appears to be helpful." Most of you recognize, far better than I, that adoption of systems like this may range from exacting use by a trained and well informed staff, through well-intentioned but barely competent forms of generation, to honorific employment characterized less by

real use than by interest in avoiding Federal scrutiny. Especially in the early stages, the latter two events are more probable. And, of course, health is not the only sector with such problems: guidelines for Model Cities planning were assiduously ignored by all but a few; the same was true during the early 1970's for guidelines issued under CETA. "Adoption" here has as yet no meaning. And of course, it is no substitute for a field test which would show that improvements do indeed emerge as a consequence of adoption. That randomized field tests using institutions as the unit of analysis are sometimes feasible is clear. Some good randomized tests have also been mounted to test alternative devices for encouraging adoption, once the evidence on effectiveness is obtained (Riecken & Boruch, 1977).

The second concern lies with the algorithm's composition. In particular, the report contains numerous phrases which imply estimation of program effects: "measuring progress toward goals...effects of health care gauged by agencies..." and so on. Yet nothing in Mr. Kisch's remarks or in the report assure that the algorithm or other reports sustain this process of estimation well. It's not clear that the last 10 years of design work in understanding how to avoid biased estimation, competing explanations, and the like has been recognized. Yet we know judgments about progress toward goals are dubious at best for cancer and hypertension research in the absence of clinical trials. The subroutines of the model depend heavily on new information; the utility of the model hinges on the fit between model and appropriate data. This suggests that the algorithmic approach will foster more bad "evaluation" despite its usefulness in structuring the planner's thinking about steps prior to evaluation. But again, some follow-up research on adoption would be helpful to determine whether indeed this is a problem.

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RAPPORTEUR REPORT

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Abstract of Kisch Presentation

Arnold Kisch outlined the five algorithms for health planners which were developed under contract from BHPRD. Four of the algorithms were based on data from the birth and death certificates: 1) infant mortality, 2) mortality from breast cancer among women 45–64 years, 3) mortality from heart attack among men 45–64 years, and 4) preventable deaths based on the work of Dr. David Rutstein. The fifth, on hypertension, is the only algorithm which uses primary data.

Each algorithm has four steps: 1) problem recognition, 2) problem analysis, 3) problem solution, and 4) problem assessment. These differ from the basic elements of health planning in that each algorithm has standards; statistical tests can be done at each step, and especially within the problem recognition step, to determine if the cause of the problem has been found.

Since their development in 1976, Kisch reported not only that the algorithms have been used in the five target HSA's but also that they have been adopted by other HSA's and by State agencies. Thus, the methodology appears to be "doable" and helpful; in fact, the use of the algorithms is expected to expand in the future. However, Kisch expressed concern that a field test is needed to a) evaluate the real cost, b) settle some of the statistical questions surrounding the possible use of small numbers, and c) determine how the algorithms are best used at the HSA level.

The passage of the National Health Planning and Resource Development Act, P.L. 93–641, has helped focus attention on health indicators and health indexes as policy tools. While indicators, such as mortality and life expectancy, are familiar and their construction well documented, composite health status measures, such as the Sickness Impact Profile and the Index of Well-Being, have only recently begun to be reported on in the literature. These reports emphasize methodological aspects for measuring complex constructs and for collecting reliable data. However, a number of studies being conducted throughout the United States have begun to explore the policy potential of already developed indicators and indexes.

This session focused on four such applications: the first two related experiences with measures which assess the health status of individuals rather than groups. Lawrence Berg incorporated traditional health outcome indicators with those of process and structure into a systems approach aimed at identifying high risk individuals. A behavioral approach to monitoring patient outcome in a clinical trial was presented by Ivan Barofsky. The last two presentations described measures for assessing health status for population groups. Aggregate measures for small geographic regions, the algorithms for health planners, were described by Arnold Kisch; these algorithms are disease specific and have been designed to assess health status in response to P.L. 93–641. Martin K. Chen described a new index, the Gross National Health Product (GNHP), which uses data from the National Center for Health Statistics (NCHS) to assess health status at the national level; estimates of the GNHP can also be obtained for the four geographic regions used in the National Health Interview Survey conducted by NCHS.

Issues and problems in measuring health status with existing data and analytic techniques dominated the discussion which followed the formal program. Most of the questions from the audience focused on fulfilling the mandate of P.L. 93–641. Specifically, the speakers were asked to suggest ways of making the most use of existing data, especially vital statistics, and of linking changes in health status to the health system, to consider that rules such as the algorithms might be too rigidly employed and to comment on the possibilities of new algorithms and/or modifications of the existing ones based on feedback received from review and use.

In responding to concerns about maximizing the use of existing data, Arnold Kisch pointed out that the five specific conditions for which algorithms have been developed were chosen because they represent significant health problems at the Health Systems Agency (HSA) level. Also, data, comparable over time and space, were likely to be available in most planning areas for these conditions. However, more algorithms are needed; by expanding the number to 20–25 such algorithms, the developers estimate that the majority of the conditions which cause excessive mortality in planning areas would be covered.

Increasing the number of algorithms would make increased use of vital statistics, which serve as the standards used in the problem recognition stage of the algorithms as currently formulated. The use of a well-defined standard, one which is clear to everyone using the algorithm, is the main point of the algorithms.

HSA's were urged to look beyond the issue of need and to assume responsibility for the use of medical technology. For example, HSA may be wondering about pressing mammography on women over 50 years. Given the state of the evidence and having an algorithm for breast cancer, the HSA would have the responsibility not only to deal with whether the technology should be introduced into the community

but also to do something about its use.

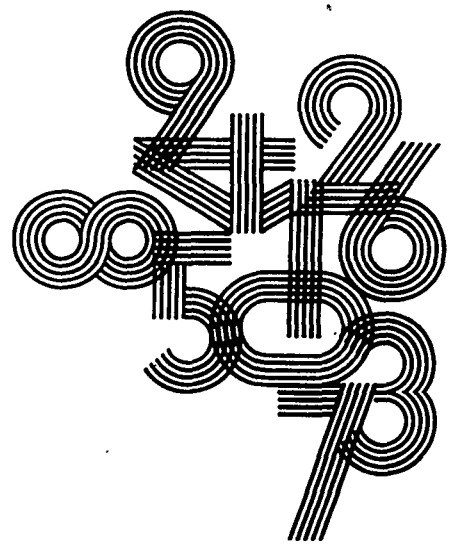
With respect to linking changes in the health system with changes in health status, the HSA is limited in what it can do. Standards for resource allocations have tried to document where quantitatively having the resource will impact on the process and determine outcome. However, this cannot be done in all places.

Limitations imposed on the HSA's also mean that most will have to use the algorithms already developed. However, some HSA's may be about to develop their own algorithms for conditions which are health problems in their areas and for which algorithms do not yet exist. As the algorithms approach to decision making becomes more widely applied, these experiences should be collected and used to improve existing, as well as to develop new algorithms. The initial five algorithms were developed in a short period, 1 year, and without field testing. Also, not all comments on early versions of the algorithms have been incorporated into the versions currently being used. Thus, they should not be considered to be in their final form.

Incorporation of analysis, solution, and assessment of the problem, steps 2–4, into the algorithms has broadened the concepts of health status indicators from simple group measures into decisionmaking tools. However, each algorithm provides a measure for a single condition rather than for an aggregated set of conditions. Since the algorithms do not provide a global health status measure, the decision to pursue the solution of specific problems, i.e., whether to focus on infant mortality or breast cancer, is highly subjective.

It is totally unrealistic for an HSA to attempt to deal with the global concept of today given all of the constraints which they are under. However, the weighted life expectancy, a measure of disability-free or quality-adjusted life years, may be useful to the HSA's in the near future; since the methodology is familiar, the results should be more easily interpreted, and some of the necessary data, including vital statistics, should be readily available. The GNHP fits into this broad category since it is life expectancy modified by the amount of time the population has disability days. While its current formulation is restricted to disability forms of morbidity, it should be possible to weight other information collected in the National Health Interview Survey to obtain additional gradations in morbidity. Other investigators have used data on physical, social and mental functioning to develop measures of health, rather than disability, based on the weighted life expectancy concept.

While additional conceptual development is still needed, there now exists a body of health status measures, composite indexes as well as single indicators, which can be used to assess health outcomes. These measures are being increasingly used for decisionmaking both at the individual, local, State and national levels of health planning.



CONCURRENT SESSION J

Environmental Factors and Measures of Health

FIELD STUDIES IN AREAS OF THE U.S. AT HIGH RISK OF CANCER

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Abstract

A series of etiologic clues have been generated from the geographic patterns of cancer in the United States. This review describes how leads to the determinants of three cancers (tumors of the lung, bladder, and nasal cavity and sinuses) have been identified through cancer mapping and correlation studies, and focuses on their pursuit by analytical epidemiologic studies in the field.

Introduction

The occurrence of "case clusters" of cancer may signal the excessive exposure to environmental agents which may be carcinogenic. Thus the discovery that vinyl chloride and diethylstilbesterol could induce hepatic angiosarcoma and adenocarcinoma of the vagina was brought about by the observation, by alert clinicians, of these rare tumors in a short period of time over a limited goegraphic area. Clustering of excess cancer, particularly for more common tumors, might also be gleaned by examination of routinely collected mortality and incidence statistics. The resulting geographic patterns of cancer may then be used to develop clues to cancer etiology. Considering tumors of the lung, bladder, and nasal cavity and sinuses as examples, this review describes how we've employed county mortality data in the United States to generate hypotheses to the determinants of cancer and outlines how these leads have been evaluated by analytic epidemiologic studies in areas of the United States where mortality patterns for these cancers are unusual.

Cancer Maps and Correlation Studies

From National Center for Health Statistics' computer listings, the number of deaths in the United States attributed to cancer during the 20-year period 1950–69 were identified. Using age-, sex-, and race-specific county population estimates available from the decennial censuses of 1950, 1960, and 1970, it was possible to calculate mortality rates for the 3,056 counties of the United States. Age-adjusted rates of mortality for 35 cancers for the individual counties were published in tabular form in 1974.[1] The relative distributions of these rates were then plotted in a series of computer-generated color maps published in two atlases for the white and nonwhite population.[2,3] A number of surprising patterns emerged, suggesting that cancer was not randomly occurring across the country, but rather was related to varying environmental determinants. The cancer maps provided the means for identifying high-risk areas where further research might pay off.

We next conducted a series of correlation* studies linking the county mortality rates with demographic, socioeconomic, industrial, and environmental data at the county level. These studies have provided additional leads that were not visually evident from the maps, and have helped to refine and narrow the hypotheses suggested by the geographic patterns of various cancers. Both of these techniques have been used to help set priorities to determine where and how to conduct analytic epidemiologic studies, where detailed information on the characteristics of individual cancer patients could be obtained and hypotheses about cancer risk factors tested.

The distributions of mortality rates 1950–69 differed for cancers of the lung, the nasal cavity and sinuses, and the bladder among white males.[2] The lung cancer map shows high rates in metropolitan areas of the Northeast and Great Lakes region, but the highest mortality clustered in coastal areas of the South. Mortality was elevated in counties along the Gulf of Mexico from Texas eastward to the Florida panhandle, with high rates especially concentrated in southern Louisiana, and along a strip of counties on the Atlantic coast from below Jacksonville, Florida, northward.

Cancers of the nasal cavity and sinuses are much rarer than those of the lung—mortality rates were more than 80 times less—and show no strong geographic patterns, except for some clustering of high rates in Louisiana and Texas. Bladder cancer, on the other hand, shows a strong northeastern excess, with high rates particularly evident in New Jersey and with low rates in most counties in the South.

To seek explanations for the unusual distributions of lung and bladder tumors* in the United States, we

*We use the term "correlation" very loosely to refer to "ecologic" analyses which attempt to measure the association of county mortality rates with demographic and other variables. The statistical method most often employed to measure and test association is weighted linear multiple regression, supplemented by more robust techniques such as ridge regression analyses.[4]

*Nasal cancer deaths were so few that a meaningful analysis could not be conducted at the county level.

Table 1. AGE-ADJUSTED MORTALITY RATES (DEATHS/YEAR/100,000 POPULATION), 1950–69, AMONG WHITE MALES FROM CANCER OF THE LUNG AND BLADDER BY REGION AND POPULATION CLASS

		Population (1000's)			
Lung cancer	Region	<25	25–99	100–249	250+
	Northeast	32.7	34.7	37.6	44.1
	South	30.0	35.1	41.9	48.1
	North Central	24.4	29.5	35.8	43.6
	West	26.4	31.9	34.0	40.0
Bladder cancer					
	Northeast	7.6	7.6	7.9	8.6
	South	3.8	4.5	5.6	6.9
	North Central	5.0	5.9	7.2	8.2
	West	5.0	6.0	6.0	7.2

correlated the county rates with a variety of county indices.[5 6] Mortality from both cancers increased with urbanization throughout the country (table 1). Lung cancer tended to be inversely related to socioeconomic status as measured by median education level, median income, or a linear combination of both,[5] but a mild positive link with income level was observed for bladder cancer.[6] Demographic influences, however, did not account for the striking geographic variation in these tumors. Classifying each county as to its relative involvement in each of 18 major industrial categories (defined by 2-digit standard industrial classification codes) as of 1963, the earliest year county level data were available on tape, we sought to determine whether the geographic clustering in lung and bladder cancer might be related to occupational factors. Positive correlations between lung cancer and the chemical, petroleum, and paper and pulp manufacturing industries were observed (figure 1) as was an association between the county bladder cancer rates and the presence of chemical manufacturing industries.[5 6] The findings thus suggested a role of industrial exposures in the geographic variation in these tumors. Indeed a substantial part of New Jersey's bladder cancer excess may be occupational in origin; over 300 cases have been reported in one chemical manufacturing plant in the New Jersey county with the highest bladder cancer mortality rate.[7] Occupational exposures may also contribute to the clustering of lung cancer. The petrochemical industry is concentrated along the Texas-Louisiana coast, and the paper industry is the major employer along the Georgia-northern-Florida coast, where lung cancer rates are elevated.

Leads to possible occupational components to nasal cancer have come from correlation studies comparing mortality rates from a variety of cancers in counties with and without heavy concentrations of particular industries. Thus, nasal cancer mortality rates were found to be high in furniture-industry counties, whereas rates for almost all other tumors were at or below expected levels.[8] Examinations of rates in counties where the petroleum [9] and chemical [10] industries are concentrated also showed evidence of a nasal cancer excess. Such studies of cancer in counties with particular industries also revealed additional links to lung cancer. Lung cancer during 1950–69 was found to be elevated in counties with large shipyards during World War II, especially in the South,[11] as well as in the U.S. counties where nonferrous smelters were located.[12]

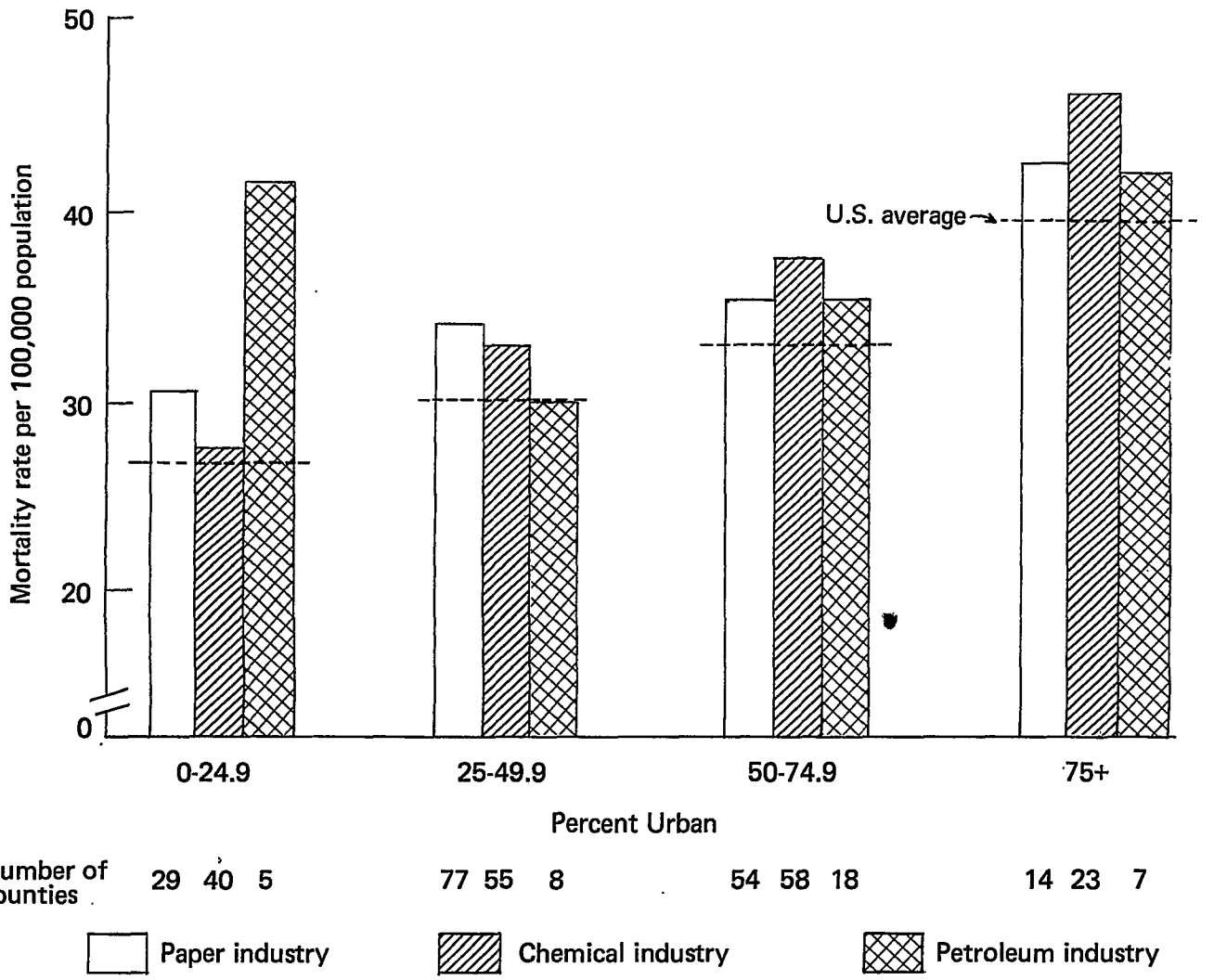
Whether or not the associations uncovered by these correlation studies reflect specific industrial hazards remains to be determined. The cancer maps and correlation studies raise questions about the causes of cancer rather than answer them. Steps being taken to resolve these etiologic issues through analytic epidemiologic studies in areas of the United States at high risk of cancer will be outlined in the following section.

Field Studies in Areas Where Cancer Rates Are High

The leads produced by the cancer maps and correlation studies can be pursued by cohort (prospective) studies, if the cancer pattern appears to be strongly influenced by the experience of a particular, identifiable group, such as the work force of a certain industry. However, it is usually more appropriate to carry out case-control (retrospective) investigations, obtaining information, usually by personal interview, on the detailed characteristics of cancer patients and controls. Case-control comparisons with respect to lifetime histories of residence, occupation, smoking, drug usage, and other factors can then quantify risk factors related to the area's high rates.

As an intermediate step, a comparison of death certificates of persons who died of cancer relative to those who died of other causes is often a quick and inexpensive means of bringing the analysis from the aggregate (county) to the individual level. In particular, the death certificate statements on occupation and industry may be scanned for case-control differences. Although

Figure 1. Average Annual Age-Adjusted Mortality Rates for Lung Cancer Among White Males, 1950-69, According to Urbanization for Counties with "High" Concentrations of Paper, Chemical, or Petroleum Manufacturing Industries.[1]



[1]Adapted from Blot and Fraumeni (ref. 5).

they represent only a crude description of the decedents usual work, with no information as to detail, variety, or duration of employment, a comparison of the statements can help test, or at least sharpen, hypotheses about occupational factors, and thus aid in the decisionmaking process of whether to invest in more costly and time-consuming studies in the field.

Lung Cancer Studies

To investigate the excess of lung cancer in coastal Georgia, we obtained copies of death certificates of approximately 1700 white male residents of the area who died during 1961–74, half due to primary lung cancer, half to other causes. Comparison of the occupational statements showed a higher proportion of lung cancer than control certificates mentioning work in the wood-paper industry, but the excess was limited to residents of rural coastal counties and not found among residents of the three major cities in the area.[13] The lack of uniformity suggested that a single explanation for the area's high rates was unlikely. Nationally, the lung cancer rates in paper mill counties were also inconsistent: high in the East and South, but unremarkable in the North Central States and Far West.[5]

Concurrently with the death certificate analysis, we began interviewing recent lung cancer cases and controls (or their next-of-kin in the event they had died) in coastal Georgia. The response rate was exceptional, with refusals running less than 3 percent of those contacted for interview for information on their, or their next-of-kin's, lifetime history of residence, occupation and smoking.

The interview data uncovered a significantly increased lung cancer risk associated with work in area shipyards during World War II.[14] The excess was seen in blacks and whites and in both Savannah and Brunswick where the shipyards were located during the war. The association was not accounted for by other occupations or by cigarette smoking, although a synergistic relationship between shipyard employment and smoking was apparent (figure 2). The findings suggest that asbestos exposures during wartime employment in shipyards may be responsible, at least in part, for the excessive mortality from lung cancer in coastal Georgia.

Our review of the "usual" occupations listed on the death certificates in the same areas of coastal Georgia [13] revealed no association with shipbuilding. However, the shipyards in Brunswick and Savannah, which together employed over 35,000 persons in late 1943, closed down after the war. Although over 20 percent of the lung cancer cases in the interview study reported working in shipyards at some time during their careers, hardly any listed this as their usual industry of employment. Indeed, from a peak of 1.7 million employees in 1943, the shipbuilding industry work force in the United States rapidly declined to under 200,000 by 1950 and has not changed much since.

The findings of the Georgia interview data, together with reports of asbestosis among shipyard workers elsewhere in the United States [15] and mesothelioma among shipyard workers in Europe,[16] prompted the initiation of a case-control interview study of lung cancer in the Norfolk-Newport News area of Virginia, the site of large Navy and private shipyards. This region also shows an excess mortality from lung cancer among white males.[2] The shipyards employed over 70,000 workers during the war, but unlike the situation in Georgia, continue to be a producer of large naval ships today. Results from this investigation should be available early next year. We have also examined hospital records in a county in coastal Maine where the oldest shipbuilding company in the United States is located and where lung cancer rates are high. Preliminary analyses indicate a higher frequency of shipyard employment listed on the records for lung cancer compared to other discharge diagnoses.

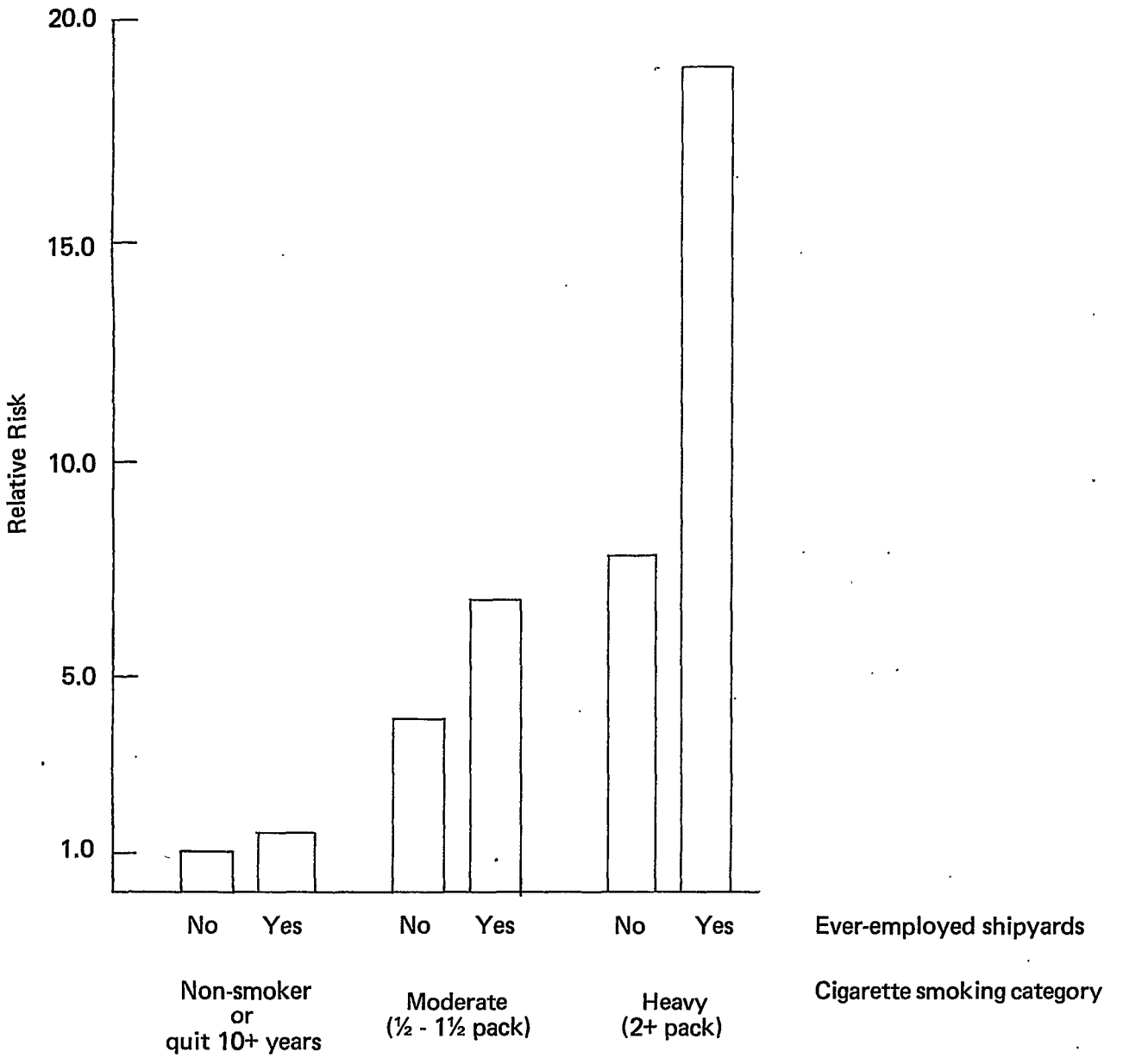
Analytic studies in other areas of the United States where lung cancer mortality rates are high are in progress. Over 6,800 death certificates (3,400 where death was attributed to primary lung cancer, 3,400 to other causes) in southern Louisiana are now being scanned for case-control differences with respect to occupation, residence, and Acadian ancestry (as judged by family surname), with interview surveys to begin this fall. Death certificates from 10 copper, lead, or zinc smelter counties are now being examined. A case-control interview study in eastern Pennsylvania, site of a large zinc smelter, will begin soon, and will complement investigations of cancer and other disease risk associated with copper and lead smelters currently being conducted by other Federal and State agencies. An increased respiratory cancer risk has been documented among copper smelter workers,[17] but whether the risk extends to the community or to smelters of other nonferrous ores should be ascertained from these studies. The higher lung cancer rates observed in counties with petroleum and chemical industries [5 9 10] provided an additional clue to occupational effects that is being pursued in the Louisiana study, as well as in a proportional mortality analysis now being conducted among members of the Oil, Chemical, and Atomic Workers' Union in this country.

Hence, although cigarette smoking is the major cause of lung cancer in the United States, the field studies, correlation analyses, and cancer maps seem to be suggesting that other environmental determinants (especially industrial exposures) may be involved to an extent greater than previously thought.

Bladder Cancer Studies

Bladder cancer is a disease associated with cigarette smoking, occupational exposure to certain chemicals (principally aromatic amines), and perhaps the consumption of artificial sweeteners such as saccharin.[18] To evaluate the roles of these risk factors, a massive case-control interview study is under way in 10 areas of the United States, about half of which show elevated

Figure 2. Relative Risk of Lung Cancer According to Usual Cigarette Smoking Category and Employment in Shipyards During World War II.*



*data from reference 14.

mortality rates for this tumor. Approximately 3,500 incident bladder cancer cases who will be diagnosed during a 1-year period which began this spring, and 7,000 population controls of similar sex, race, age, and area of residence, will be interviewed for lifetime histories of residence, occupation, smoking characteristics, diet (including beverage consumption and saccharin use), and other factors. Areas in the survey include New Orleans, Detroit, and the entire States of New Jersey and Connecticut—all regions where mortality rates are high. The large size of the study will enable the detection of a small increase in risk associated with saccharin use as well as the quantification of possible interactions between different risk factors.

Also beginning this year is a case-control interview investigation of bladder cancer in rural New England, where mortality rates among females as well as males are exceptionally high.

Nasal Cancer Studies

Cancer of the nasal cavity and sinuses is rare, but has been reported among several occupational groups.[19] A strong link between nasal adenocarcinoma and furniture-making has been documented in numerous areas of the world, but the correlation study examining cancer rates in counties with furniture manufacturing industries was the first indication of a similar association in the United States.[8] To follow up on that analysis, we obtained copies of certificates for deaths attributed to cancer of the nasal cavity and sinuses and to other causes for the residents of counties in North Carolina where the furniture industry is heavily concentrated. A fourfold excess risk was found among those whose usual trade, as indicated on the death certificate, was furniture manufacturing.[20] We are presently conducting an interview survey, by telephone, since many of the cases are geographically scattered, to elicit details of work in this and other industries, as well as to obtain tobacco consumption histories of recently diagnosed cases.

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ENVIRONMENTAL FACTORS AND HEART DISEASE

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Prospective studies have produced methods for accurately identifying individuals at high risk of developing coronary heart disease (CHD). Using multivariate equations and readily obtained clinical information, one can classify members of the population in such a way that many of the new cases over the next few years will occur among the persons at the top of the list. The probability of developing CHD among persons in the top 10 percent of risk may be 10 times that of persons in the bottom 10 percent of risk. Equations developed in various long term prospective studies have now been verified by the demonstration that they can predict CHD in new populations (Keys, 1972; McGee, 1976).

Measurement of only a few risk factors is needed for prediction with this degree of accuracy. Blood pressure, serum cholesterol, cigarette smoking, glucose intolerance and electrocardiographic evidence of heart enlargement are five of the frequently used factors. Addition of other factors known to be associated with CHD has done little to improve the prediction based on these five (Gordon, 1971; Brand, 1976). A question which naturally arises is whether there is much more to explain. Does the success of prediction based on these few factors indicate that there are few if any undiscovered factors of importance in this disease?

In practical terms our prediction capability is far from ideal. In the Framingham Heart Study, approximately 70 percent of the new cases of CHD in 10 years in middle-aged men developed among the 50 percent of them identified at higher risk (McGee, 1976). If a preventive program were directed at this half of the population, an enormous effort, and its risk were lowered to that of the half at lower risk, only 40 percent of the CHD in the population would be prevented. But if prediction could be improved, we could identify a smaller number of persons among whom most of the new cases would occur. Intensive preventive measures would be efficient in this group. And if most of the potential new cases occurred in this small identified group, the incidence in the remaining population would be quite low. Predictability to this degree implies that CHD is not an inevitable consequence of aging. Prevention then would have a forseeable goal of removing most of the disease in the population.

Is this a real possibility or only a theoretical one? Perhaps predicting the occurrence of CHD is like predicting exactly where a stone bouncing down a hill will arrive at the bottom. The laws of mechanics are well understood, but the net effects are unthinkably complex. Similarly, the occurrence of CHD in a person may involve only a few basic laws involving blood flow and the chemistry of the coronary vessel walls. But the net effect of a chain of simple events may be so complex that our present mode of prediction, based on the recognized risk factors, may be rapidly approaching a limit. Speculation, however, may be of little value. We will know there are undiscovered factors only when we discover them. If, however, groups of people are identified among whom CHD seldom occurs, the search can proceed with anticipation. In fact, the magnitude of the change in mortality from CHD which has taken place in Western societies during this century suggests the possibility that undiscovered factors may be important in the etiology of CHD. The types of factors suggested may be those present in the shared environment of Western man. Because of changes in diagnoses and death certification practice, official records going back to the year 1900 are of limited value, and yet a review of the trends is instructive.

One approach is to start with the broader definitions of cause of death to minimize the effect of classification error. For U.S. middle-aged white men, death rates for the category "major cardiovascular-renal diseases" rose during the 20th century, reaching a peak in the mid 1940's. By 1960 the rate had declined somewhat but was still higher than in 1920 (Moriyama et al., 1971). Concurrent with these changes were substantial declines in death rates from specific cardiovascular-renal diseases. In 1920 half of the cardiovascular-renal deaths were attributed to chronic nephritis and stroke. By 1960, mortality rates from nephritis had declined 94 percent and from stroke, nearly 50 percent.

After the introduction of the Fifth Revision of the International Classification of Diseases in 1939, trends for several more specific cardiovascular causes could be examined. Moriyama (1971) presented U.S. trends for the period 1940–1960 using age, color, and sex specific comparability ratios to adjust for the two ICD changes. The impressive declines from hypertensive and rheumatic heart diseases were already well underway in 1940. CHD in this 20-year period rose about 30 percent for middle-aged white males. Since 1960 mortality from CHD has declined (Gordon, 1975).

Summarizing the U.S. vital statistics evidence for middle-aged white males, mortality from cardivascular-renal diseases as a group rose from 1920 until the middle 1940's, while rates for stroke and nephritis declined rapidly throughout the century. When other major components could be studied after 1940, such as hypertensive and rheumatic heart diseases, these were found to be declining rapidly as well. CHD was the

only major cardiovascular disease seen to be rising, though its rise after 1940 was of a modest amount. A larger, unrecorded rise in CHD prior to 1940 seems plausible.

If, as seems likely, coronary disease was already increasing prior to that time in developed countries, the observations of astute diagnosticians may provide better clues than vital records. Morris (1951) cites the impressions of a number of clinicians of the increasing prevalence of the disease. Just how large this increase may have been is indicated by the experience of the pathology department of London Hospital. During 1907–1914 the director of the department was making a special study of atherosclerosis, but there were only 12 cases of coronary thrombosis or myocardial infarction which were seen among the 2,000 autopsies done in those 8 years. Similar numbers were seen at Guy's Hospital.

Paul Dudley White's recollections (1971) of his early experience as a cardiologist are relevant. The classical symptoms of angina pectoris were known to Dr. White and to his professors of medicine at Harvard when he was graduated in 1911, but they were rarely encountered in practice. The occasional anginal symptoms encountered at the Massachusetts General Hospital were likely to be the result of syphilitic disease of the aorta rather than CHD. Among the first 100 papers Dr. White published spanning the years 1913–1926, only 2 dealt with CHD, and these were written in the 1920's. Dr. White writes, "certainly if coronary heart disease had been as common as it is today, I would have been forced to study it and write about it earlier in the century, since I was trying to cover the entire field of cardiology in those early days."

One can only make educated guesses about how much of an increase in CHD incidence has occurred in Western countries during this century. If the disease had been rare, as Morris, White and others suggest, the increase has been enormous. But even a more conventional vital statistics analysis suggests that CHD mortality rates have doubled since the disease was first classified appropriately in 1939 and that larger changes may have preceded that date.

Several lines of evidence support the impression one gets from the vital records. Anderson (1973) uses the ratio of male to female deaths to circumvent problems related to diagnosis and recording of cause of death. Among U.S. middle-aged whites, the male and/or female ratio for deaths of all causes rose markedly after 1920. This phenomenon was confined to the category "diseases of the heart," where the ratio increased from near unity in 1920 to 3.3 in 1968. The one prevalent heart disease which, with modern diagnoses, shows a high enough male to female mortality ratio to cause this phenomenon is CHD. There was no compensatory fall in sex ratio for non-heart disease categories, so the trend was not a diagnostic artifact. Anderson and LeRiche (1970) sampled death certificates from the Province of Ontario for census years going back to 1901 and reclassified them according to uniform criteria. Deaths from causes recorded on the certificates as due to myocardial infarction, angina, or any synonymous term were rare in 1901. Rates in middle-aged men increased tenfold by 1931 and a hundredfold by 1961. But this surely represents to some extent the failure to diagnose and correctly classify the disease in a uniform way over that interval. To avoid this problem the authors devised a category called "possible CHD," which included CHD so designated, and chronic nephritis, rheumatic heart disease, asthma, indigestion and other diseases which have signs or symptoms resembling CHD. Death rates of "all possible CHD" remained fairly stable from 1901 to 1931. Within that category there must have been compensating trends for subcategory causes as in the U.S. vital statistics data. But by 1951 the death rate for CHD so designated exceeded the 1931 rate due to "all possible CHD" by 50 percent. By 1961 the excess was 90 percent. Of course, if any of the non-CHD deaths in the category "possible CHD" were correctly diagnosed in 1931, and they surely were, the real CHD increase was greater than that. Anderson guessed, based on supportive evidence he gathered from both sudden deaths and coroner's records, that the 1931–1951 increase in Ontario was more than 100 percent.

The other obvious approach to estimation of the net effects of environment on CHD occurrence is geographic. Reliable CHD incidence data is lacking in societies without modern vital statistics systems. But unlike the case with historical study, modern data can be obtained with special surveys.

A 1972 report (Burns-Cox) from the Aborigine Hospital in Kuala Lumpur claimed that CHD had never been seen in West Malaysian Aborigines, but their electrodardiographic survey of 73 adult men was too small to provide adequate documentation, though no abnormalities suggestive of CHD were found in this group. A larger electrocardiographic survey was conducted in six Solomon Island societies in which diet, occupation, and family structure had been almost entirely unaffected by contact with Western culture. Anthropologists who had spent 18–24 months in each area were able to obtain valid information on the age of the examinees. Q waves were found in 7 of 1,267 examinees (page 1974). This was about two-thirds the prevalence which would be expected at sex- and age-specific rates seen in the U.S. Health Examination Survey (Gordon, 1965). But only 1 of these 7 Q waves was deep and wide (Minnesota class 1–1), diagnostic of coronary heart disease, that one occurring in a woman in her 60's. Also, the distribution of the abnormalities was unlike that seen in coronary disease in the West. The prevalence was equal in men and women and was unrelated to age. Only 1 Q wave was found among the 300 men over 40 examined compared with 7.4 expected at U.S. rates, but the prevalence in women and in young adults was nearly twice the expected rate. A separate study of Mariana Islanders showed the expected gradient of increasing Q wave abnormalities with Westernization: a prevalence

of 0.5 percent in the isolated island of Rota, 1.5 percent in Guam, and 5 percent among those who had migrated to California (Reed, 1970). Thus in all three studies in Pacific populations, middle-aged men showed a prevalence of electrocardiographic evidence of coronary disease that was a small fraction, perhaps one-fifth of the U.S. prevalence. The Solomon Island study, however, suggests that there may be another common disease, or a coronary disease of a unique etiology, affecting women and young adults.

In Nigeria (Brockington, 1972), among nearly 7,000 necropsy records reviewed over a 12-year period at University College Hospital in Ibadan, only eight cases of myocardial infarction were found, and four of these were not atherosclerotic, but secondary to emboli from infected heart valves. In a 12-month survey of all clinic visits and admissions to the hospital, only one new case was found.

The Inter-American Investigation of Mortality, which was conducted in 12 major cities whose registration of adult deaths was thought to be virtually complete, indicated large differences among cities in mortality rates from CHD (Puffer, 1967). Death certificates were obtained and classified and verification of cause of death was accomplished by independent medical reviewers in cases where relevant information could be obtained from hospitals or attending physicians. Compared with San Francisco, male age-adjusted CHD mortality rates were approximately 50 percent for cities in Venezuela, Brazil, and Argentina; 30-40 percent for cities in Chile, Columbia, Peru, and Mexico; and 14 percent for Guatemala City.

These reports of areas of the world with very low CHD prevalence or mortality are made more believable by the findings of the International Atherosclerosis Project, which documented a low prevalence of atherosclerosis in autopsy material from Latin American cities compared with cities in the U.S. and Norway (McGill, 1968), and by a number of risk factor surveys. Serum cholesterol, in particular, seems to have far lower levels in some areas of the world, with average levels of 150 mg or lower (Burns-Cox, 1972; Golubjatnikov, 1972), at about the 5th percentile level for U.S. adults (Abraham, 1978).

Risk factor levels are not as low in Yugoslavia or Puerto Rico, or among Japanese migrants to Honolulu as they are in societies lacking modern vital statistics systems. But in these areas prospective studies conducted jointly with the Framingham study staff permit an evaluation of some of the reasons for the CHD incidence differences. Even after adjustment for differences in serum cholesterol, blood pressure and cigarette smoking (Gordon, 1974), CHD age-specific incidence and mortality rates in Puerto Rico and Honolulu were only half as great as in Framingham. Rates in Yugoslavia were approximately one-third those in Framingham after risk factor adjustment (Kozarevic, 1976).

Among these countries, then, where CHD is not rare, though it occurs at a half or a quarter the rate seen in Framingham, standard risk factors explain only a fraction of the difference in rates. But these are risk factors at levels measured a few years before follow-up ceases. In changing countries risk factor levels may be rising, and newly elevated cholesterol or a recently acquired cigarette habit will not convey the risk of a life-time of high cholesterol or smoking. It is conceivable, then, that standard risk factors measured over a lifetime would explain most or all of these differences for developing countries. Whether or not they could explain the lower rates of less developed areas of the world can only be guessed at the present state of our knowledge.

Large secular trends within Western countries cannot be explained by non-environmental factors. Migration patterns are not large enough to offer genetic shift in the population as a reason for them. Even if there were enough migration, from what part of the world might the migrants have come to raise the rates in western countries?

International comparisons do permit genetic explanations. Migrant studies, which I have not reviewed here, offer a rebuttal to the genetic explanation if the effect of selective migration can be assumed to be small. Some of the international differences are explained by risk factor differences. These in turn need explanations.

Taken together, the trend and the geographic data seem to indicate that CHD is not an inevitable consequence of aging and that the prospect for prevention may be better than a narrow view of contemporary Western prospective studies indicates. Much more is potentially explainable beyond what we know about the disease, and much of that explanation may involve undiscovered environmental factors.

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THE AIR POLLUTION-HEALTH RELATIONSHIP: DATA OPPORTUNITIES AND DATA NEEDS

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Introduction

In order to make intelligent public policy decisions concerning desired air quality levels, it is not enough to answer the qualitative question, "Does air pollution cause ill health?" We must also address the quantitative issue, "What are the dose-response relationships?" For a number of reasons, these questions are inherently difficult to answer. The purpose of this paper will be to discuss some of the opportunities that currently exist for addressing these questions and to point to areas in which future effort should be directed. In doing so, we will specifically focus on problems associated with available data and we will suggest approaches for dealing with these difficulties.

As philosophers since Hume have reminded us, it is impossible to prove causality empirically.[1] A causal relationship exists only as a theoretical construct, not as a set of empirically verifiable propositions. This follows because the hypothesis concerns the relationship between one or more causal variables and the dependent variable (or set of dependent variables), and it is assumed, at least implicitly, that other factors are held constant. But even in a laboratory, all other factors cannot be held constant. For example, there are forces, such as the movement of the earth, outside one's control. Other factors, such as the time of day, if relevant, can be varied randomly by the experimenter. Thus, in the laboratory we look for replications by independent investigators.

Where possible, laboratory experiments are often superior to observations on natural experiments. In examining the hypothesized relationship between air pollution and mortality, laboratory studies are particularly useful in uncovering the biological-physiological mechanisms at work. For example, toxicological evidence suggests that sulfur dioxide is less harmful than acid sulfates and that particulates of 0.5 to 5.0 microns are more damaging to the lower respiratory tract than are larger particles.[2] Such evidence suggests the specific air pollutants to be investigated.

However, since the health effects of long-term exposure to low concentrations of air pollutants are hypothesized to be subtle (for example, shortening life expectancy), laboratory methods are of limited use. Rather, epidemiological and clinical studies are needed to explore the association. They help to specify the important factors affecting mortality. For example, in table 1 we have classified some of the factors affecting the mortality rate for a given geographical area. These include physical, socioeconomic, and personal characteristics such as age, sex, race, income, smoking habits, exercise habits, genetic history, nutritional history, and medical care as well as other environmental factors such as climate. In order to estimate the effect of any one of these factors on health, the others must be held constant experimentally or controlled statistically.[3]

An ideal investigation of the association between air pollution and mortality would control for all of the above factors. Unfortunately, many of these factors are difficult to measure conceptually (for example, genetic history), while others are poorly measured in existing statistics (for example, medical care). Since we do not know all the relevant factors, the practical difficulty is to control for as many factors as possible, either experimentally or statistically, explicitly or implicitly. Furthermore, because data for statistical analyses are limited and independent replication is not possible unless the natural experiment repeats itself, a long exploration of alternative hypotheses and data sets is needed.

Statistical Modeling

When a study finds a statistically significant correlation between air pollution levels and mortality rates, there are four possible implications: (1) it was a random occurrence; (2) air pollution indeed causes mortality; (3) mortality causes air pollution; or (4) there is some other variable (or set of variables) causing both air pollution and higher mortality rates; hence, the significant association is spurious.

We can rule out the first possibility; an enormous volume of collected evidence indicates that there is a close association between air pollution and increased mortality. We conjecture that the second possibility is correct, but we must rule out the third and fourth in order to prove it. Few would give serious credence to point (3), although one undergraduate noted that in Pittsburgh emissions standards do not apply to crema-

[1] See, for example, Blalock (1964).

[2] See Amdur (1977).

[3] Only in the remote case in which a particular factor was uncorrelated with all the others could one uncover the "true" effect of that factor using a univariate approach.

Table 1. FACTORS AFFECTING MORTALITY

Physical	Socioeconomic	Environmental	Personal
Age distribution	Income distribution	Air pollution levels	Smoking habits
Sex distribution	Occupation mix	Radiation levels	Medical care (quality and quantity)
Race distribution	Housing density or crowding	Climatological characteristics	Exercise habits
	Differential migration	Domestic factors (home-heating equipment, heating fuels, etc.)	Nutritional history
			Genetic effects

SOURCE: Lave and Seskin (1977), p. 10.

tion! The real difficulty, then, is ruling out possibility (4), that is, that the association is spurious.

One need not control for all of the factors listed in table 1 to convince an investigator that the association is not spurious. Consider the path analysis illustrated in figure 1. Mortality is hypothesized to be related to factors in the diagram, as described by the "causal" arrows. For example, both home-heating (equipment and fuels) and occupation-mix characteristics are assumed to affect both the level of air pollution and the mortality rate.[4] Genetic factors, personal habits (such as smoking and exercise), and precipitation are assumed to have a direct effect on mortality, without having significant effects on the other factors in the model. Finally, other factors such as wind speed are assumed to affect the level of air pollution without noticeably affecting the mortality rate.

The path analysis makes it apparent that a simple correlation between air pollution and the mortality rate will reflect not only the hypothesized causal relationship between the two, but also the systematic influences of occupation mix and home heating, as well as the random influences of the other variables (for example, genetic effects). Although a number of replications in different settings will reduce these random influences, they will not disentangle the interdependencies among home heating, occupation mix, air pollution, and the mortality rate.

A solution to this problem is a multivariable analysis that controls statistically for the confounding factors. Strictly speaking, if items such as genetic factors, personal habits, wind speed, and precipitation were orthogonal to air pollution, there would be no need to control for them if one is interested only in estimating the effects of air pollution on mortality. (If they were orthogonal, they would exert effects independent of the effects from air pollution.) However, note that in any given data set one or more of these factors could be closely associated with air pollution. Thus, if one had measures of these factors, one would presumably insert them in the regression, since this would more accurately predict variations in mortality. By including these factors whenever possible, one minimizes the chance that the estimated relationship between air pollution and mortality reflects a spurious association.

Must we then include all variables related in any way to both mortality and air pollution? While strictly speaking, the answer is "yes," there are important costs associated with this strategy. The introduction of dozens of variables into the analysis may give rise to multicollinearity problems, since observed variables of this sort are seldom orthogonal to one another. This, in turn, will cause the estimated standard errors associated with our variables to rise and will, in general, adversely affect the precision of the resulting estimates.[5] Thus, one must balance the benefits and costs associated with being comprehensive in this type of analysis.

Analysis and Results

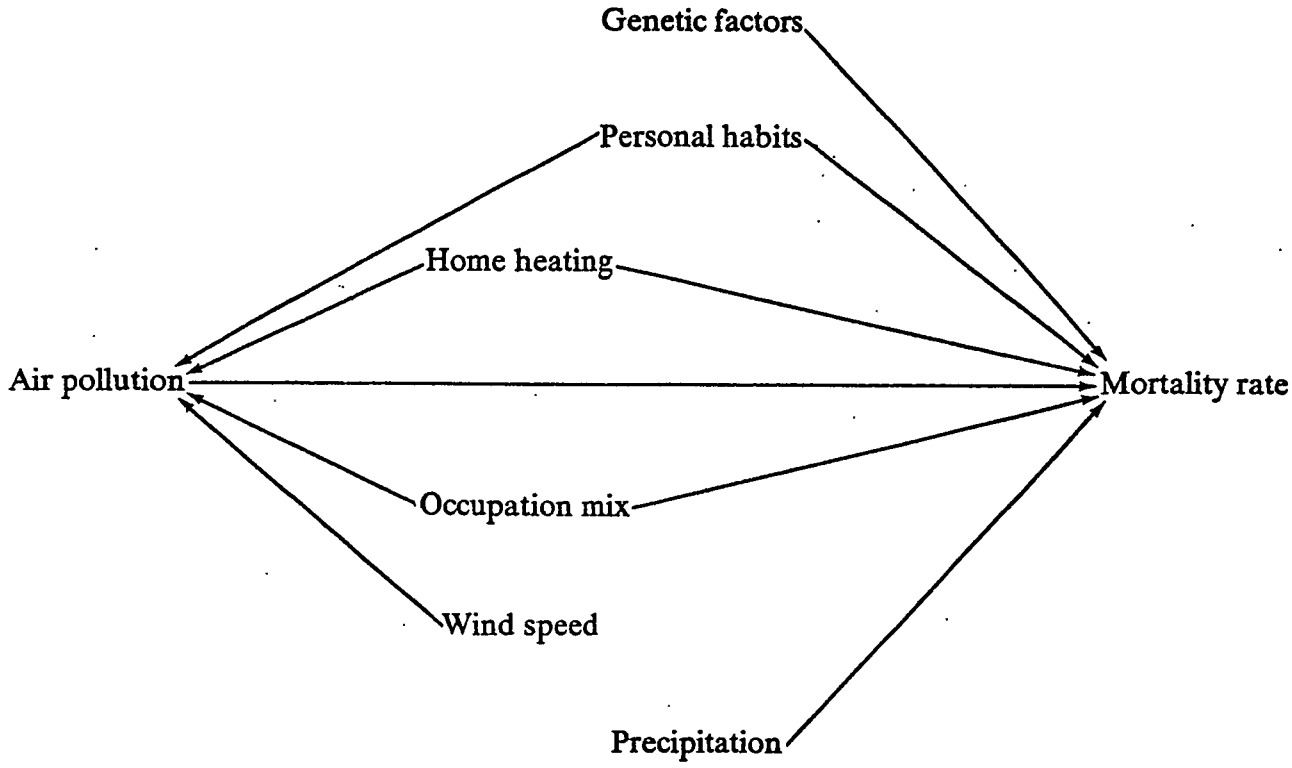
In our research, we used data for 3 different years to explore the association between specific measures of air pollution and mortality rates across more than 100 U.S. Standard Metropolitan Statistical Areas (SMSA's).[6] The initial work was done with 1960 data, and this was later replicated using both 1961 and 1969 data. Specifically, the 1960 total mortality rate across 117 SMSA's was analyzed and the effect of air pollution (as measured by sulfates and suspended particu-

[4] Home heating usually makes a direct contribution to air pollution and may also directly affect the mortality rate if it is inadequate, not properly vented, or nonexistent. Similarly, the occupation mix of an area will describe the industrial composition and thus be directly related to the types of pollutants emitted into the air. In addition, occupational accidents and exposures will directly affect the mortality rate.

[5] In addition, attempting to control for all possible factors could conceivably use up all the degrees of freedom in the analysis.

[6] See Lave and Seskin (1977).

Figure 1. Path Analysis of the Air Pollution-Mortality Rate Model



lates) was estimated using a simple linear model; socioeconomic variables were used to control for population density, racial composition, age distribution, income, and population. We concluded that the measures of air pollution were significant factors in explaining the variation in the total death rate across areas of the United States. In addition, various statistical procedures indicated that the estimated relationship was not sensitive to "extreme" observations. A series of alternative functional forms were also examined. While some had greater explanatory power than the linear model, we decided to continue relying on the linear form because of its simplicity and ease of interpretation. To corroborate our findings, we performed a partial replication using 1961 data; the results were similar, especially with regard to the estimated effects of air pollution.

We extended our 1960 analysis by examining infant and other age-sex-race-adjusted total mortality rates, age-sex-race-specific mortality rates, and 15 disease-specific mortality rates. The results of these analyses supported the earlier findings. In general, the measures of air pollution were significantly associated with mortality even after the total death rate was disaggregated, or adjusted, by age, sex and race.

It was still conceivable that a number of omitted factors might have been the "true" cause of the relationships we observed. To test this possibility, additional sets of variables were added to the original socioeconomic variables in order to control for occupation mix, climate, and home-heating characteristics in each area. Even with sets of these additional variables, the estimated pollution effects suggested that the measures of sulfates and particulates were significant factors explaining variations among most of the mortality rates. Thus, incorporating the new variables did not invalidate the previously estimated associations. While viewing these results as giving qualified endorsement to the hypothesis of causality, spurious correlation remained a possibility since important factors were still missing from the analysis.

We conjectured that a major source of omitted factors might have been related to "urbanization" since air pollution levels tend to be higher in larger urban areas. To test this possibility, we analyzed rates for suicide, venereal disease, and crime—social ills presumed to be associated with many of the same urban factors as mortality, but *not* with air pollution. We were relieved to find that air pollution did not cause venereal disease! We concluded that the air pollution measures were not merely acting as surrogates for other variables correlated with urbanization in explaining these rates. Hence, this finding lent confidence to the previous evidence that the relationship between our air pollution measures and mortality was not spurious.

Next, we performed a replication of the 1960 work, using 1969 data. In general, the results were comparable to the earlier analysis. We were also able to analyze 1969 air pollution data for nitrates, nitrogen dioxide, and sulfur dioxide. We found that our original pollutants, sulfates and suspended particulates, were still the most important; sulfur dioxide and nitrogen dioxide were occasionally important, while measures of nitrates were never important. Furthermore, when interactions between the five pollutants were examined, in spite of our expectations, no evidence of synergistic effects was found.

Further demonstration of the air pollution-mortality relationship was seen when we analyzed cross-sectional time-series data. First, ten sets of annual observations (1960–69) from twenty-six SMSA's were pooled in an attempt to determine whether a component of the yearly death rate was associated with annual changes in the air pollution measures. The basic model was similar to the cross-sectional formulation used in the earlier work. Taken as a whole, the cross-sectional time-series analysis provided additional evidence that measures of air pollution were associated with mortality.

We also investigated whether daily mortality was affected by daily air pollution levels. Specifically, we examined the effect of five air pollutants (carbon monoxide, nitric oxide, nitrogen dioxide, sulfur dioxide, and hydrocarbons) in five cities (Chicago, Denver, Philadelphia, Saint Louis, and Washington, D.C.). In only one of these cities—Chicago—was there a significant relationship between the daily air pollution levels and daily mortality, when both climatic and day-of-the-week effects were controlled. We conjectured that this was due to the relatively large number of daily deaths and to the relatively high air pollution levels in Chicago. Furthermore, when we compared the daily estimates for Chicago with those obtained from the previous analyses, we concluded that air pollution does not simply "harvest" the deaths of susceptible individuals but seems to reduce life expectancy in general. Both the cross-sectional time-series analysis and the daily study added further evidence to support the close association between measures of air pollution and mortality.

Thus, an elaborate statistical analysis of the effects of air pollution on mortality rates across the United States was added to the existing literature on air pollution and health. Viewing the accumulated evidence, we found considerable consistency and corroboration. We concluded that the levels of certain pollutants in the air (as they prevailed in U.S. cities during the period 1960–69) caused increases in mortality, and therefore morbidity too.

If one regards the relationship as causal, a few implications can be stated. Using our most conservative estimates, a 50 percent reduction in the levels of sulfates and suspended particulates in urban areas would be associated with a 4.7 percent decrease in the total mortality rate. (Table 2 summarizes this result as well as similar computations based on our other findings.) In terms of longevity, we estimated that this reduction would be associated with an increase in an individual's life expectancy at birth of approximately eight-tenths of one year.

Table 2. ESTIMATED EFFECT ON MORTALITY OF A 50 PERCENT REDUCTION IN SULFATES, SUSPENDED PARTICULATES, AND SULFUR DIOXIDE

Data base	Air pollutants	Total mortality rate (% decrease)	
		Unadjusted	Age-sex-race-adjusted
1960 annual cross section (117 SMSA's)	Sulfates and Particulates	4.7	4.8
1969 annual cross section (112 SMSA's)	Sulfates and Particulates	5.8	5.0
1969 annual cross section (69 SMSA's)	Sulfates and Particulates	5.3	4.8
	Sulfur dioxide and Particulates	6.3	5.5
1960–69 annual cross-sectional time-series (26 SMSA's)	Sulfates and Particulates	4.7	5.1
1962–68 annual cross-sectional time-series (15 SMSA's)	Sulfates and Particulates	5.9	6.3
	Sulfur dioxide and Particulates	5.3	5.7
1963–64 daily time-series (Chicago)	Sulfur dioxide	5.4	

SOURCE: Lave and Seskin (1977), p. 218.

Data Problems

Our investigation into the air pollution-health relationship was an extensive one involving many data sets and a large number of analyses. Both the nature of the data available for the statistical analyses and the inherent methodological problems raise an important question: How can health status best be measured in this type of examination?

In some sense, the only unequivocal measure of health status is death. Most other *measures* are difficult to define, let alone implement. For example, the morbidity rate (or absence rate) from work due to illness will depend upon such factors as the number of paid sick days, the individual's general job satisfaction, the exact type of work (including the level of physical and mental activity involved), an individual's perception of pain, and the value placed on leisure. Unfortunately, any measure of morbidity, whether it be its associated pain, reduction in life expectancy, or resulting disability, will be related to such factors. Even an "objective" measure such as vital capacity depends upon the individual's cooperation.

While death is unambiguous, death rates are not. To construct the total mortality rate for a geographical area, the total number of people dying in that area are counted, and this number is divided by an estimate of the population at risk. The census attempts to obtain a complete enumeration of all residents in a given area. However, even the census has been criticized for missing substantial numbers of people, particularly the poor in large cities. Thus, an error of measurement is introduced into the population at risk.[7] In addition, it is important that deaths be recorded according to the deceased's place of residence rather than the place of occurrence. If this were not done, the population at risk would be incorrect. But even if the actual place of residence is recorded, the statistics may still be misleading. For example, if someone moves to a new location shortly before death, the death would be associated with the new residence. In those cases where no permanent residence is known, the death is usually associated with the place of occurrence.

In addition to the total mortality rates, age-sex-race- and disease-specific mortality rates are important to analyze. Analyses of age-sex-race-specific rates allow estimation of the change in life expectancy, while analyses of disease-specific rates shed light on the effects of air pollution in terms of the physiological mechanisms by which they work. However, where the age-sex-race category is small or where the cause of death is relatively rare, the variability inherent in a small sample confounds the analysis and impedes our ability to isolate the factors associated with the death rate.

To illustrate the problem, consider a disease-specific mortality rate averaging one death per 10,000 persons per year. In a population of 10,000 there might be no deaths from this disease in 1 year,

[7] One indication of the magnitude of errors in observation is that in the 1960 age-sex-race-specific mortality rates for the 117 SMSA's we analyzed (a total of 40 different rate categories), there were a number of observations in which the number of deaths was greater than the population at risk.

two deaths in another year, and one death in a 3rd year. Assume that the occurrence of such deaths is modeled as a Poisson process whose mean is the mortality rate. Then, observing the annual number of deaths from this disease in many different populations of 10,000, one would find that in approximately 36.8 percent of the population, no deaths occurred during the year, in 36.8 percent one death occurred, in 18.4 percent two deaths occurred, in 6.1 percent three deaths occurred, and so on. There is a great deal of variability in the number of deaths among the populations since the standard deviation is one death. For a larger population, the variation in observed deaths would be much smaller: in a population of 100,000, the average number of deaths from the disease would be 10, and the standard deviation would be 3.16; for a population of one million, the average number of deaths would be 100, and the standard deviation would be 10.

Another difficulty with disease-specific mortality rates concerns the fact that their reliability depends upon how accurately the the cause of death is determined. Unfortunately, only a small and varying proportion of deaths are verified by autopsy, and not all physicians determine the cause of death with equal skill.

Finally, a problem that is particularly relevant to analyses of disease-specific deaths concerns the fact that we do not have measures of many of the factors affecting the incidence of disease (see table 1). Thus, an unknown amount of variation in rates occurs because of uncontrolled factors such as personal characteristics. For example, variation in cigarette smoking across geographical areas should have a greater effect on lung cancer death rates than on total mortality rates, since lung cancer deaths make up only a small portion of total deaths. Even if such factors were uncorrelated with the air pollution variables, our inability to measure them would hamper our efforts to explain the variation in disease-specific mortality across areas.[8]

Despite the limitations associated with mortality data, the available figures are useful when looking at specific types of health effects from air pollution. In particular, one would expect that mortality data would be especially relevant for ascertaining chronic, long-term health effects. At the same time, one would expect that morbidity data would be especially useful in determining the acute, short-term health effects that cause illness but perhaps not death.

Data Needs

As mentioned above, there are a host of problems associated with gathering valid morbidity data. One approach to some of these problems involves selecting a group (or groups) of people to be monitored closely for changes in their health status. While such data are likely to be expensive to gather, they are likely to be extremely useful in sorting out the health effects of various pollutants. For example, a potentially rich data source consists of daily (or less frequent) observations of morbidity rates within a given geographical area. Such data control implicitly many of the unmeasured factors that are difficult to include explicitly. For instance, whatever the factors (for example, genetic factors, smoking habits, or medical care) that cause morbidity and mortality rates to be lower in Dallas than in New York City, they should be relatively constant over time within each city.

In part, the six-city study described in Speizer, Bishop, and Ferris (1977) represents such an approach. In each of the cities, both air quality and general health status will be assessed. The cities were selected on the basis of their historic levels of air pollutants; essentially, the areas can be divided into high, medium, and low exposure levels. Within each community, the health assessment includes a standard questionnaire on respiratory symptoms as well as simple measures of pulmonary function. The subjects assessed represent two groups—adults and children—each of which adds important controls to the study.

The six-city study represents a major undertaking, requiring the continued cooperation of State, city, and local school officials, as well as several thousand participants located thousands of miles apart in six different States. A somewhat similar study of comparable magnitude was the Community Health Evaluation Surveillance Study (CHESS) organized and conducted by the Environmental Protection Agency. That study involved many design problems, and reviewers of the work found the findings both controversial and questionable. It is hoped that the six-city study will be more successful in uncovering important new information on the air pollution-health association.

The present author analyzed health-care utilization, air pollution, and weather data for 1973 and 1974 in examining the association between air pollution levels in metropolitan Washington, D.C., and health effects.[9] Using multivariate discriminant and regression analyses, the only association found to be consistent and statistically significant for both 1973 and 1974 was between daily unscheduled ophthalmologic visits and levels of photochemical oxidant pollution. In addition, a relationship between urgent clinic visits and photochemical oxidant levels during 1974 was noted. Isolated positive and significant associations were also found between photochemical oxidant levels and unscheduled pediatric visits, carbon monoxide levels and both unscheduled ophthalmologic and unscheduled pediatric visits, and sulfur dioxide levels and both un-

[8] Respiratory diseases are particularly subject to this problem because of our lack of information on smoking habits.

[9] See Seskin (1977).

scheduled internal medicine and unscheduled ophthalmologic visits. The magnitude of the associations suggested that air pollution levels in Washington, D.C., had a very limited effect on the health-care utilization of the sample population. We now hope to replicate the Washington study using data from Los Angeles.

Conclusion

The costs of abating air pollution are considerable, whether measured in higher prices, lower corporate profits, unemployment, or greater use of scarce resources. In order to make intelligent judgments about the degree of air pollution abatement necessary for benefits such as improved health to exceed costs, it is essential that we learn more about the exact nature of the air pollution-health relationship. For epidemiological investigations of the sort reported here, more and better data are the key to improved knowledge.

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THE STATE USE OF RECORDS FOR ENVIRONMENTAL RESEARCH

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Abstract

The State use of records for environmental research is examined utilizing the New York State Cancer Registry as an example. This Registry currently has important uses for descriptive studies, as a general population control, for analytic studies, for surveillance, and for case finding to identify study groups or to follow up groups with common exposures. Registration of exposed individuals is recommended, with linking to disease registries. This would be particularly useful in the occupational health area. Further study is needed on the efficiency of research methods, on methods for studying common exposures which may be associated with low relative risks, and on the translation of environmental research findings to beneficial public policies.

In discussing the State use of records for environmental research, I will draw on examples from one record resource—the New York State Cancer Registry. Vital and other types of health records obviously can be used in similar ways. Highlighted will be the strengths of our current system for epidemiologic research on environment, the importance of exposure registration, and the need for further research on the efficiency of our research methods and on the translation of epidemiological findings into public benefits.

By way of background, the New York State Cancer Registry collects case reports from hospitals, laboratories and physicians on 65,000 newly-diagnosed cancer patients each year. Demographic information, site of cancer, histologic type, stage and reporting hospital are noted on the 3 ½ x 6" reporting card. The annual cost to the State is $269,000 or about $4.10 per case. The registry itself is but one component of a program of cancer epidemiology and control, located within our Division of Epidemiology.

Uses of Present System

Cancer epidemiology has provided us with the first suspicion of most known human carcinogens and the possibility of preventing lung and several other types of cancer. Cross-cultural differences in incidence of other cancers suggest that their causes are environmental, as opposed to genetic in origin, and have led to many environmental studies. The Cancer Registry is a basic data source for such investigations. The epidemiologic uses of cancer registries are listed in table 1. These are:

1. *Descriptive Studies*—This is the most common epidemiologic use of a cancer registry. The value of such descriptive information recently was brought to public attention through the Atlas of Cancer Mortality for U.S. Counties, prepared by Mason et al.[1] of the National Cancer Institute. High mortality rates from bladder and other sites of cancer were noted in industrial counties. Through this Atlas, added impetus was given to focusing our national research effort on environment, especially occupational exposures.
2. *General Population Control*—This is the second most common epidemiologic use of registry data. It has been used to study groups with specific exposures where matched controls would be difficult to obtain, in studies of multiple primaries, and of cancer associations with other diseases. As an example, when Hemplemann and his associates [2] wanted to see if children treated with X-rays for thymic enlargement had an increased cancer risk, as part of their analysis, they compared the cancer rate among exposed children to expected rates calculated by applying the registry age-specific rates to their population over time. While the registry can serve as a useful control group, the investigator must have knowledge of completeness of registry data and be aware of the risk of better ascertainment in the study group than in the registry or vice versa.
3. *Analytic Studies*—We refer here to testing hy-

TABLE 1. Epidemiologic Uses of Cancer Registries

1. Descriptive studies
2. General Population Control
3. Analytic Studies
4. Surveillance
5. Case Finding to identify study group
6. Case Finding for follow-up of groups with common exposures

potheses by manipulating registry data, or examining it in relationship to data from other sources. A frequent approach is to look for similarity in time trend between measures of a suspected cause and cancer incidence. MacMahon and Pugh [3] refer to this as the "method of concomitant variation."

The New York State Department of Health has used this method to see if the incidence of cancers of liver, bladder, brain and other organs had risen during the time when pesticide use was rising.[4] No significant association was found. The Registry makes this type of study possible at low cost. Without accurate statistics collected from previous years, such studies might not even be possible.

Another example of an analytic use is the time-space clustering analysis of leukemia to study possible transmissibility. Here sophisticated mathematical manipulations have been used for hypothesis testing.[5-6]

4. *Surveillance*—Systematic examination of registry data, augmented by alerts from key physicians, have led to detailed field study of apparently unusual situations. Thus, as a follow-up to surveillance identification, we studied several Hodgkin's disease clusters.[7] We also could quickly spot in the registry the occurrence of a rare type of vaginal cancer among teen age girls, and confirm the causal association with the maternal use of diethylstilbestrol (DES).[8]
5. *Case Finding to Identify Study Group*—The registry can be used to identify a large number of persons for study without the biases of other methods of ascertainment.
6. *Case Finding for Follow-up of Groups with Common Exposures*—A registry can be used to augment other methods of follow-up. As an example of both of the above case finding methods, we used the cancer registry to test the admittedly speculative hypothesis that a factor involved in the etiology of human leukemia and lymphoma may be transmitted by blood transfusion prior to the clinical onset of illness in the donor.[9] This hypothesis derives directly from analogy to virus-induced leukemias in animals. Leukemia and lymphoma patients, ascertained through the registry, were matched against blood donor lists in order to determine who had donated blood prior to developing one of these cancers. The recipients of the blood then were traced, in part with the aid of the registry. We have now traced over 130 recipients and followed them for an average period of more than 7 years, in this continuing study. No recipient was found to have developed a leukemia or lymphoma following receipt of blood from a pre-leukemic or pre-lymphomatous donor.

It must be evident from these examples that the registry serves only as a tool or take-off point in many of these studies. To obtain full value, a research team must apply many different methods in utilizing the registry. Interpretive effort is as essential as accuracy and completeness of data, and full exploitation requires a willingness to delve far beyond one data source.

Exposure Registration

In our State use of records for environmental research, we are utilizing data systems that were largely not developed for the study of environment. We tend to have birth, death and disease records, but few records about exposure. Our ability to use these records for environmental research depends largely on how well these records lead us to identify causally related exposures. Consider these three examples:

1. *Exposure leads to rare disease* —In 1971, when we confirmed the relationship between adenocarcinoma of the vagina and maternal use of DES,[8] the rarity of this type of tumor made the cancer registry very useful for identifying this unique situation. It was easy to spot the five young girls with vaginal cancer, since no young women with this type of tumor had previously been reported. Acknowledging the problem that rare conditions may more frequently be misclassified, it is evident that unusual conditions should readily be spotted in good surveillance systems. These serve as useful leads for focusing intensive environmental studies.
2. *Exposure leads to common disease* —It is well known that bladder cancer can result from occupational exposure to beta-naphthylamine or benzidine. Goldwater et al.[10] studied a chemical plant in Buffalo, New York in 1965. They found that 96 of 366 (26 percent) male coal tar dye workers developed bladder cancer. The case number now has increased to at least 101, 47 of whom died from this disease. Company employment and medical records were used as the initial bases of case ascertainment in this study. With these data on a known "epidemic" in hand, Dr. Irwin Bross,[11] with our assistance, analyzed cancer registry data to determine if, in retrospect at least, it would be possible to clearly detect this known occupational hazard. The result: the "noise" in the system made it almost impossible to read the "message." The fact that the bladder cancer with its long induction period had been diagnosed over a period of many years among workers at one plant in this large population of Buffalo obscured detection.

We concluded that better identification of exposure is necessary in order to be able to pinpoint environmental hazards that may explain only a proportion of common diseases. Thus, we now have added occupation to the State Cancer Registry and are searching for ways of linking exposure records to disease records.

3. *Disease under study is common and likely to be related to diet or lifestyle* —Most investigators now suspect environment as the predominant factor for the vast majority of human cancer. While occupational exposures or synthetic additives may contribute to risk, the ultimate answers may be largely related to diet or life style. For diet and life style, we do not have adequate study methods. This creates problems for epidemiologic surveillance.

   As an example, we noted from the State Cancer Registry a high colon cancer incidence in the Watertown, New York area. A hospital survey confirmed this high rate, showing a sizable annual number of cases (111 in Jefferson County, including the city of Watertown and 145 in the three comparison counties). Thus, further study was warranted. Unfortunately, attempts to categorize these populations ethnically, socioeconomically, or medically; examination of local industries and water supply; and a small case-control study of patients added little insight. We also know of a population at low risk for rectal cancer: residents of our State mental institutions.[12] (Although the relationship between rectal and colon cancer is uncertain, this has led some of us to speculate about the diet in these hospitals being similar to that in developing countries where colon cancer incidence also is low).

   In this situation, where little is known about etiology and where our record systems do not tend to categorize people into subclassifications related to the general area of suspected etiology—such as diet or lifestyle—the usefulness of the record systems for studying environment have major limitations. The studies of international variations have provided useful leads. We probably can build on these by using our own within-State data systems to look in our own backyards. However, we suspect that it will require very intensive field studies by persons specializing in these types of diseases before we have significant progress.

Future Perspectives

Several areas related to the use of records for environmental research deserved increased attention. Among these are work on methods to add efficiency to epidemiologic research; methods for studying common exposures that may be associated with low relative risks; further examination of allocation of resources—particularly those for cause and prevention versus treatment and, within cause and prevention, funding for data collection versus funding for the teams of investigators who utilize these data; and finally, studies of how best we can translate our findings into public policies and health actions, with continuous evaluation of these policies and actions.

As for methods, we are faced with a list of nearly 2,000 chemicals suspected of inducing cancer on the basis of tests in animals. This list rapidly grows larger. Fewer than 50 of the chemicals have been studied in humans. Each study of an exposed human population requires knowledge of a suitable group and generally takes 2 to 3 years. This time requirement represents a bottleneck in the effort to prevent and control disease. Thus, we[13] have developed a method called "epidemiologic screening" which will reduce the study time to 2 or 3 months and provide us with the statistical likelihood of there being a true problem, should we carry the investigation through to completion in a standard manner. Further efforts such as this in the occupational health area and additional work methods to study such things as water supplies or sweetening agents to which there is an extremely wide exposure and perhaps a very low, if any, relative risk, require further investigation of the methods themselves.

As with any good data systems, we have been continually improving reporting. However, these improvements make time series analysis for unusual changes quite difficult, since it is difficult to tell if a significant increase is due to reporting or a real change. Thus, there is a need for retrospectively assessing the completeness and accuracy of reporting.

On the question of allocation of resources, we[14] have examined the use of the New York State Cancer Registry data and concluded that the chief value lies in the extensive use by those collecting the data. Over a period of 6 years, we reviewed all articles which cited as a reference one of our major publications of incidence and mortality. For our registry at least, the use by others could not justify its cost. As a rule of thumb, we suggest that expenditures for analysis and use of data should at least equal the combined total for data collection, storage and routine tabulations. I might suggest to this audience that the National Center for Health Statistics examine themselves in this regard and give special attention to whether there are close enough ties to the complimentary discipline of epidemiology.

Finally, let us not forget that the translation to beneficial public policy and health action is the ultimate objective of our work. Here are two last examples: Strong epidemiologic evidence indicates that endometrial cancer is being induced by menopausal use of estrogens. Six carefully designed[15-20] studies are consistent in suggesting a cause-and-effect relation-

ship. What are we doing about it? In considering this question, we found that our usual data systems, while useful for providing hints about etiology, did not tell us what would be the most effective actions. In New York State we thus have done a special population survey in order to determine who takes estrogens, why they take them, where they get their medical information, what physicians they go to, what might motivate them to stop, and what physicians we would have to address in order to alter prescribing habits.

As another example, consider occupational health. Must we study every chemical and its potential for harm before taking preventive action? Why not follow the accepted public health approach used with water supplies or restaurants: Clean them up first, as a matter of policy. Then maintain surveillance to identify any remaining problems.

The process of translation of environmental research findings into action should itself be an area of greater research emphasis.

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ISSUES IN INFERENCE FROM CORRELATIONAL STUDIES

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Abstract

The association between geographic and temporal distribution of disease rates and demographic, socioeconomic, and environmental exposure characteristics of populations can provide important clues to etiology. Strengths and weaknesses of correlational studies are discussed in the context of current examples.

Correlational studies are simple in concept but complex in application. They have proved traps for the unwary who, seeing an association between the geographical distribution of environmental and health variables, assumed a causal relationship. Despite their pitfalls, however, correlational studies are useful as sources of hypotheses to be tested in more highly focused studies whose results may lead to a deeper understanding of etiology.

MacMahon and Pugh discuss correlational studies in their epidemiology text in a chapter on strategies in epidemiology.[1] Hypotheses, they state, "are commonly formed by relating observations from several different fields." Among the types of evidence which can serve as hypotheses are statistical associations between the temporal or geographic distribution of disease and putative causes. Several parallel observations among different populations in various geographic areas can serve to strengthen and clarify such hypotheses.

Several terms—"demographic," "geographical correlation," "observational ecologic"—are used to describe correlational studies. The term "ecologic" is only indirectly related to the biological sciences, originating with sociologists who developed many current techniques while studying the relationship of human groups to their geographical environment. The ecologic approach has developed into a specialty within sociology, and methodologic issues have received extensive attention.[2]

The approach implies comparison of geographic characteristics such as the association of colon cancer morbidity and mortality with national statistics on consumption of various foods,[3] of bladder cancer mortality rates with drinking water quality,[4] of lung cancer mortality rates in U.S. counties with and without nonferrous smelters.[5] In most cases, a multivariate approach is used to adjust for population characteristics or exposures not of prime interest in the study.

When evaluating correlational studies, one must consider the strength and consistency of associations, the homogeneity of exposure within various subpopulations, and the attributable risk percent (the proportion of the disease due to a particular exposure). Other factors are the dilution of population subgroups by (1) the fraction of unexposed persons or (2) in-or outmigration, as well as whether a dose-response relationship is observed. In addition, several statistical issues must be considered, among them the weighting applied in multivariate equations and the specification of regression models. The correlation coefficient is often dependent on the size of the geographic area chosen for analysis. Intrinsic to correlational studies is the possibility that individuals with disease are not necessarily the most highly exposed. Moreover, the exposure factor may not be causal, but may be statistically linked to one that is.

In a study of international differences in environmental and dietary factors in relation to cancer incidence and mortality, Armstrong and Doll [3] demonstrated a strong correlation between per capita meat consumption and colon cancer. The correlation coefficient between colon cancer incidence and per capita meat consumption 0.85 in males and 0.89 in females, a rather impressive observation. But there were also high correlations of colon cancer morbidity with per capita GNP (0.81 for males and 0.82 for females), national energy consumption (0.68 and 0.67), egg consumption (0.69 and 0.71), total fat consumption (0.74 and 0.78), and several other characteristics. Many of them, as might be expected, are highly correlated with one another. The strong correlations between these variables make it difficult to draw any but the most general conclusions. Correlations with diet are indeed suggestive, but industrial factors were not included in the analysis, and these might have led to hypotheses of occupational etiologies. These variables, too, are likely to be highly correlated with GNP and meat consumption.

The Environmental Epidemiology Branch at the National Cancer Institute is analyzing the geographic distribution of cancer mortality in U.S. counties in the period 1950–1969 [6] with respect to environmental, demographic, industrial and other factors.[5,7-10] Maps showing the distribution of cancer rates in whites by sex and site have been published in an atlas of cancer mortality.[11] The maps for colon cancer mortality in males and females show high rates in the Northeast and upper Midwest and low rates in the South and West. Several types of industries, among them the fabricated metal products, electrical machinery, and other machinery industries have similar geographic distributions,[12] being heavily concentrated in areas with high colon cancer rates—the Northeast and upper Midwest.

TABLE 1. Colon cancer mortality rates in white males in U.S. counties grouped by activity level in three industrial groups.[1] [2]

	Percent County Population Employed				F (for industry)
Industry	*0*	*0.1–0.9*	*1.0–2.0*	*2.1+*	
Fabricated metal products	12.9	14.4	16.1	16.0	76.2
Electrical machinery	13.1	15.0	15.5	15.3	61.6
Machinery, non-electrical	12.8	14.1	15.6	15.9	66.4

[1] Mean county rate: 13.90/100,000
[2] 3,056 counties

Using analysis of covariance, we calculated the correlation between average colon cancer mortality rates in U.S. counties and the proportion of the county population employed in these industries, after adjusting rates for several other county characteristics—percent urban, population size, school years completed, and foreign parentage. Results shown in table 1 reveal a highly significant association of each of these industrial groups with the colon cancer mortality rate. The F statistic is greater than 60 in each case, indicating a p-value of less than 0.0001, and the gradient of increasing rates with higher levels of activity is apparent. For the non-electrical machinery industry, for example, the average county rate was 12.8 male deaths per 100,000 in counties with no activity, increasing to 15.9 per 100,000 in counties with more than 2.1 percent of their popluation so employed. Similar but less uniform gradients are seen for the other two industrial groupings. We began to question the validity of this association when similar correlations for females were also observed. Little or no association would be expected, since females have had but limited employment in these industries.

To pursue this issue further, we repeated the calculation, limiting the analysis to the 647 counties in the Northeast and North Central parts of the country. Results are shown in table 2. Average colon cancer mortality rates were greater in this part of the nation—17.75 per 100,000 versus 13.90 per 100,000 for the whole United States. Within these counties there was no gradient of rate with industrial activity. For the non-electrical machinery industry, adjusted rates were 17.9 in low activity counties and 17.5 in high activity counties. The association of a predictor variable (industry) with the independent variable (colon cancer rate) might have been suggestive had further analysis not been performed. The lack of association in the within-region analysis does not disprove the earlier result, but it greatly decreases the probability of its truth, and suggests that the prior observation suffered from an "ecologic fallacy." Several ecologic studies of colon cancer are reviewed in a recent paper by Stavraky.[13]

Weaknesses in a correlational study may derive from inadequacies in data or statistical techniques or may be related to intrinsic problems of such investigations. In cancer studies the effect variable is commonly a site- and sex-specific age-adjusted cancer mortality or incidence rate. Mortality is an inadequate indicator of differences in incidence for cancers which have long survival times or which respond well to therapy after early diagnosis. When this occurs, geographic differences in rates may indicate as much about local medical care systems or the socioeconomic status of patients as

TABLE 2. Colon cancer mortality in white males in Northeast and upper Midwest U.S. counties grouped by activity level in three industrial groups.[1] [2]

	Percent County Population Employed				F (for industry)
Industry	*0*	*0.1–0.9*	*1.0–2.0*	*2.1+*	
Fabricated metal products	17.8	17.6	17.9	17.9	0.6
Electrical machinery	17.6	17.7	18.1	17.7	1.3
Machinery, non-electrical	17.9	17.8	17.8	17.5	0.5

[1] Mean county rate: 17.75 per 100,000
[2] 647 counties

the environmental or industrial characteristics of the areas. For malignancies with a poor prognosis and where there is little reason to suspect major differences in diagnosis or treatment, this issue is of little concern.

For results to be meaningful, there must be uniform reporting on death certificates of the underlying cause of death. Differential misdiagnosis across regions, or systematic inadequacy in the reporting of underlying cause can lead to a faulted study. Mortality is used in correlational studies as a substitute for direct knowledge of incidence rates. When available, incidence rates are preferable, but they too can suffer from incomplete reporting by physicians or pathologists, or may not include cases of residents who leave the tumor registry area for diagnosis and treatment, and are therefore not enumerated.

The long latent period between exposure and diagnosis for most cancers, ranging to several decades, poses special problems in ecologic studies of cancer, including the diluting effects of migration and the difficulties of estimating area-wide exposures many years in the past. Between 1955 and 1960, 17 percent of the U.S. population moved from one county to another, ranging among States from 10 percent in Pennsylvania to 36 percent in Nevada.[14] High geographic mobility in the U.S. population can impose restrictions on interpretation. More detailed information on age-specific migration rates would be most helpful in deciding how to better interpret results.

Estimates of exposure many years ago often can be derived from industrial surveys, census information, or maybe reconstructed from knowledge of past engineering practices and data such as historical drinking water treatment technology and water plant records. Reliable study results often depend on the accuracy of such estimates. There are many county-level characteristics including cigarette smoking levels, consumption of various foodstuffs, and beer and liquor consumption estimates which would be of great value in our studies, but which are not presently available for all U. S. counties.

Several statistical issues surround correlational studies. Robinson [15] in a classic paper on ecological correlations and the behavior of individuals pointed out that associations between group properties need not closely represent the underlying associations of individual characteristics and, in fact, usually do not. He emphasized that the ecologic correlation coefficient is generally of greater magnitude than the individual correlation. His observations were restricted to examples of common population characteristics. A site specific cancer is a rare occurrence, however, and many exposure variables used in correlational studies affect only a small proportion of the population, such as percent of the population employed in a given industry. It is not clear that Robinson's warnings are appropriate for studies of rare events. In addition, the dilution of causal associations by migration, misdiagnosis, and incomplete reporting may result in underestimation, rather than overestimation.

Multivariate methods such as multiple regression call for care in the weighting and specification of the regression model. Weighting is commonly used to correct for differences in statistical stability of rates among geographic units having populations of different size. A common practice in many mortality studies is to weight county mortality rates by a factor proportional to the square root of the population [7,8] and hence proportional to the inverse standard error of the mortality rate. Others prefer to weight directly by population, which in theory is proportional to the inverse variance of the rate.[16] In our experience, a strong consistent association usually retains its significance under several different weighting schemes.[17]

A more important issue, in our experience, is the correct specification of the model, i.e., the choice of appropriate variables to be included in the regression equation. Over-correction of rates can occur when using a multivariate model if a demographic factor covaries with the exposure index and the health measure, masking an exposure-effect association. On the other hand, if important exposures are omitted from the regression model, spurious associations with noncausal variables may result. Table 3 presents data developed during our recent study of the association of cancer mortality and trihalomethanes in drinking water supplies.[17] The bivariate correlation coefficients between county cancer rates in males, after adjustment for several demographic factors, and trihalomethane levels in drinking water, are shown. Rates were adjusted in two ways, that is, with two different sets of "independent" variables in the regression model. In one case (I) variables for the percent foreign stock for each of 10 ethnic groups were included and in the

TABLE 3. Correlation coefficients between residual mortality rates in white males and total trihalomethane levels in drinking water in 76 U.S. counties.

Residuals calculated with:
I Foreign stock predictor variables included in the regression model.
II With these variables excluded from the model.

	Anatomic Site		
	Stomach	Colon	Lung
Model I	−0.02	0.14	0.07
Model II	−0.12	0.20	0.16

other model (II), they were excluded. Dramatic differences in the correlation coefficients resulted. For stomach cancer, which shows very different patterns among certain foreign born and U.S. ethnic groups,[18] there is good *a priori* reason to expect such differences, but this is not so for colon and lung cancer. Did inclusion of these variables in the analysis of lung and colon cancer mask a real association? Data from other studies will be necessary to address this issue.

If disease rates were randomly distributed, with little or no clustering based on geographic, environmental, industrial, or other characteristics, we would be faced with an uninteresting situation. But there are differences, and we are enticed to explain them. Given the many drawbacks of ecologic studies, their intrinsic weaknesses, inadequate data bases, and numerous statistical problems, it is fair to say that statements of cause and effect cannot properly be inferred from ecologic correlations. In addition, risk estimates derived from correlational studies should be avoided if at all possible. In a paper on methodological problems in quantitative sociologic research, Deutsch [19] outlines the three major tasks of quantitative studies: elaboration and specification of existing theories, hypothesis generation, and hypothesis testing. Correlational studies can make important contributions in the first two areas. Hypotheses generated in correlational studies are strengthened when similar patterns of association emerge from several studies, when increasing rates are observed with increasing exposures, and when, in addition, the associations have biologic plausibility. Several ecologic studies of drinking water contaminants have pointed to increased risk of bladder, colon, rectal, and other cancers.[4] In this case, it appears that correlational studies have reached their limits to contribute to our understanding, and the hypotheses they helped formulate must be evaluated in more highly focused analytic studies. Correlational studies may be rapidly performed; they are relatively inexpensive and usually rely on readily available data. They can be valuable assets in guiding decisions for future research direction.

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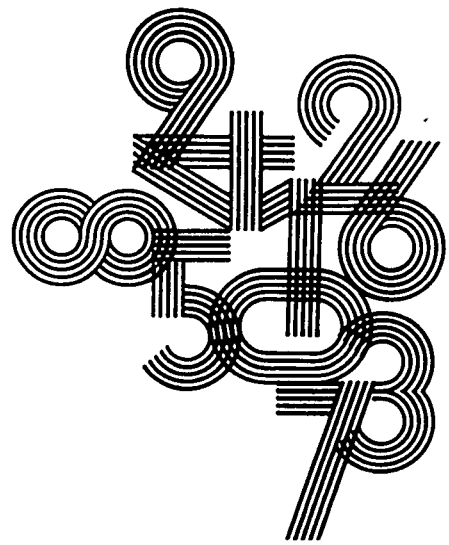

CONCURRENT SESSION K

Local and State Resource Planning

RESEARCH, DEVELOPMENT AND DEMONSTRATION PROJECTS ON DATA UTILIZATION

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I have been asked to present to you some of the activities to date of the research and development efforts of the Cooperative Health Statistics System (CHSS). Historically these efforts intially concentrated upon the development of data systems at the local or State level. This followed the authorizing legislations which placed much attention upon local area planning, management, and evaluation of the health care system. The trend toward local area responsibility in this area was in fact the initiative for establishing the CHSS. Since those initial research and development efforts, many States have implemented health resources statistical systems and vital statistics systems. This has paved the way for more concentrated or focused effort in developing "subject matter" applications for resources statistics.

Those of you who have followed the legislative enactments regarding health services management will, I think, agree that the general focus has been towards

1. Providing equitable accessibility to health care,
2. Containing the costs of health care and,
3. Assuring quality health care.

Many approaches have surfaced in recent years, all of which are aimed at accomplishing those desired effects. These approaches range from complex multivariate analyses of the health care system as a whole to essentially "univariate analyses" of small parts of the system. Unfortunately the predominating effort is toward the latter. I feel that this is unfortunate because the subobjectives (1–3 above) are so intertwined that a change in one causes unmeasured changes in the others when handled independently. For example, let us examine the objectives 1 and 2, i.e., equitable accessibility and cost containment. First treat item 1—equitable accessibility. The usual process throughout this country is to compare the health professional or health resource-population ratio among service areas or some geographic or population subsegment to either the national average or State average. By the very nature of this process, each iteration requires an increase of some resource for a subset of States, counties, or localities. The net result, while possibly achieving better accessibility, is increased costs. Of course, by providing resources in areas where there were formerly "inadequate" resources may only partially alleviate the accessibility problem. We are finding more each day that constraints other than resource availability predominate as identified barriers.

I favor a "whole system" approach to analyzing data for possible resource problem identification. Of course, this approach is only possible where data from the "whole system" is available, which is a rare place. So we're mostly stuck with making do with resources and population data in trying to fulfill our mission to 1, 2, and 3. Incidentally, I'll try to describe a "whole system" approach later if there is time.

There are five basic areas which we have become involved with over the past several years. These are obviously overlapping when applied but are separated here for my purposes of describing our efforts.

1. *Descriptive*—Nearly every State in CHSS produces manpower and facilities data broken out by the various descriptors in the minimum data set. Early R&D helped define the need and utility for most of these items in the specific applications which follow.
2. *Rate Review*—One of the problems in this attempt at cost containment is the process by which institutions are classified into similar clusters for rate monitoring, a fact of law in many States. The customary practice is to simply cluster upon bed size and treat similar sized institutions as homogeneous with regard to operating costs and revenue. Because this led to much confusion, NCHS contracted with Washington State Hospital Commission to come up with a classification system which would offer a better way of clustering institutions. This was completed in 1976 and has gained widespread use in the area of rate review. The variables determined to be of value were a mixture of endogenous and exogenous variables to the institutions. I think it's interesting to look at the final list of variables so I'll list them for you.

    a. Endogenous variables
        1. Number of available beds
        2. Type of ownership
        3. Accreditation
        4. Service Index (based on 48 services)
        5. Physician mix index (number of specialties)
        6. Number of interns
        7. Number of residents

8. Number of intern specialties
9. Number of resident specialties
10. Number of Medicare days per total inpatient days
11. Number of Medicaid days per total inpatient days.

b. Exogenous variables
1. Number physicians per 1,000 population
2. Number beds per 1,000 population
3. Percent of population female 15–44
4. Percent of population 65 and over
5. Percent Urban
6. Medium income of population

3. *Certificate of Need*—The usual data exercise associated with certificate of need determination involves simply a determination of the proposed resource vs. population size and utilization rate for the given area—with population projections thrown in for good measure. We have found that this is not enough. The determinations are very sensitive to choice of area, and since no one can put a strict definition upon area selection, the problem then becomes one of competing various strategies for greatest utility given certain constraints. For example, if a facility is built here, will it rob the facility over there of customers, and will they both become wards of the State or fold? Furthermore, in building a new facility where there is demonstrated need—for example, a new maternal and child health center where the birth rate and infant mortality rate is extreme and where a large percent of the population is of child bearing age—what should be the service mix and expected utilization of these services?
4. *Shortage definitions*—As you know there are guidelines for determining manpower shortage areas and an index or formula for determining medically underserviced areas. The manpower shortage area is defined by a manpower to population ratio. Here the choice of area is critical. The medically underserved area is defined by a four variable index weighted according to expert opinion. The variables are
1. primary care physician per population ratio,
2. infant mortality rate,
3. percent population below poverty level, and
4. percent population over 65.

We have endeavored to contrast shortage areas with nonshortage areas in a State where much health data about the whole system is available. I would like to read for you a summary of this study prepared by Dr. Alan Gittelsohn who did this study in Vermont.

> "In Vermont hospital and physician utilization measures do not distinguish physician shortage areas from communities amply served on a medical basis. Rather, variation in service rates between communities appear to be related to practice differences between physicians. A major factor characterizing the shortage areas is hospital and physician distance which seems to be no barrier in attaining access to care, at least for the distances encountered within the State. The entire issue of physician shortage thereby becomes moot. Health status indicators such as perinatal mortality and life expectation do not vary between the high technology areas served by University Hospital and the low technology areas served by small community hospitals. The measurement of population morbidity is in a primitive state and we can say little about health needs....
>
> Simple counts of physicians and population are dearly necessary but insufficient for the purpose [shortage area definition]. All available health data should be brought to bear on the question..." The "whole system" or epidemiological model has been introduced by the remarks of Dr. Gittelsohn. Simply stated the model is
>
> *needs assessment*—system cap—current load differentials
> *needs assessment*—vital statistics
> interview surveys
> examination surveys
> population based information
> *system capacity*—resources statistics amplified to identify services availability (*FTE* study)
> *current load*—hospital care statistics
> ambulatory care statistics
> long-term care statistics

In summary, I have tried to show that resources statistics play an important part in achieving objectives 1, 2, and 3 but used independently of other health information can lead to contrary results. Resources data are the fulcrum over which we must balance the lever of needs and capabilities.

DATA COLLECTION FOR FACILITY PLANNING AT THE STATE AND LOCAL LEVEL

Elliot M. Stone, *Director, Division of Health Statistics, Department of Public Health, Boston, Massachusetts*

Since the passage of the National Health Planning and Resource Development Act (P.L. 93-641), health planners have had to seek out data sources to describe the availability, accessibility, quality, acceptability and cost of health resources in each community.

Massachusetts is rich with health resource information primarily as a result of four years of development and implementation of the manpower and facilities components of the NCHS' Cooperative Health Statistics System (CHSS). Because these resource data systems are already in place, the approach in Massachusetts has been to bring the data collectors into the same organizational structure with the health policy makers and planners in order to coordinate data collection with data use. This organizational approach maximizes the collectors' and the users' understanding and appreciation of each other's needs and problems. Thus while the health planners were "discovering" the wealth of CHSS data collected over the last 4 years, the data collectors were simultaneously becoming initiated into the politics, processes, and broad, complex issues of health planning.

In Massachusetts, there are four major autonomous State health agencies—public health, mental health, rate setting, and public welfare—that were included in a human services cabinet office primarily for budgetary purposes.

In 1975, the Secretary of Human Services organized a subcabinet unit called the "Health Policy Group" (figure 1) consisting of each Commissioner to discuss programs and resolve interagency conflicts. This approach to managing the issues led to the creation of three interagency subcommittees: Acute Care, Long Term Care, and Ambulatory Care. Data collectors from the Division of Health Statistics and health planners in the SHPDA attend the biweekly subcommittee meetings and they also staff similar subcommittees of the Statewide Health Coordinating Council (SHCC). As a result, the health statistics staff who collect manpower and facilities resource data have a pragmatic understanding of timely issues from both the internal government and "outside" perspectives. This interagency coordination has placed additional reliance on centralized rather than fragmented data collection. Numerous agency surveys have been eliminated by the inclusion of questions on the annual CHSS inventories. In addition, the Governor signed a bill to allow the State agencies to extend their coordination by participating with other public and private agencies in the formation of a consortium to collect and analyze uniform hospital discharge data.

The "bottom-up" approach of these subcommittees has enabled staffs from each of the four major State organizations to coordinate their activities, eliminate duplicative procedures, clarify policy for the providers, and create a critical mass of support for research, long range planning, and data collection. Morever, the inclusion of health planners has enhanced the value of data collected since the planners can specify their data needs and the collectors can instruct planners in data applications.

In long term care, the Health Policy Group has studied the mix of institutional and community-based services, intensity of care needs, developing alternative services, improving placements from acute and mental health facilities to nursing homes, developing quantitative criteria for quality ratings, and compared staffing patterns.

In acute care, the Health Policy Group has studied underutilized hospital capacity, service area methodologies, excessively utilized hospital capacity, case mix methodologies, and multi-institutional planning.

In ambulatory care, the Health Policy Group identified areas in need of primary ambulatory resources; primary care programs were defined; HMO's were proposed for the Medicare and Medicaid population. They clarified the role and availability of nurse practitioners and physician's assistants and determined uniform data needs on cost, physician and patient characteristics, services, staffing utilization and finance.

Summary

As a result of these activities, the CHSS minimum data sets have been greatly expanded to meet the needs of these ongoing studies. (figure 2.)

From the Massachusetts experience, the recommendations to improve the quality, availability, timeliness, and utility of resource data are:

1) Locate data collection in the planning structure.
2) Include the data collectors in the regular health policy-making strategy sessions.
3) Maintain communications with the health regulators and service delivery staffs at the senior and operational levels.
4) Develop SHPDA and/or HSA data agreements with the data collectors which enumerate required services and expectations of both parties.
5) Train planners, regulators and service deliv-

Figure 1.

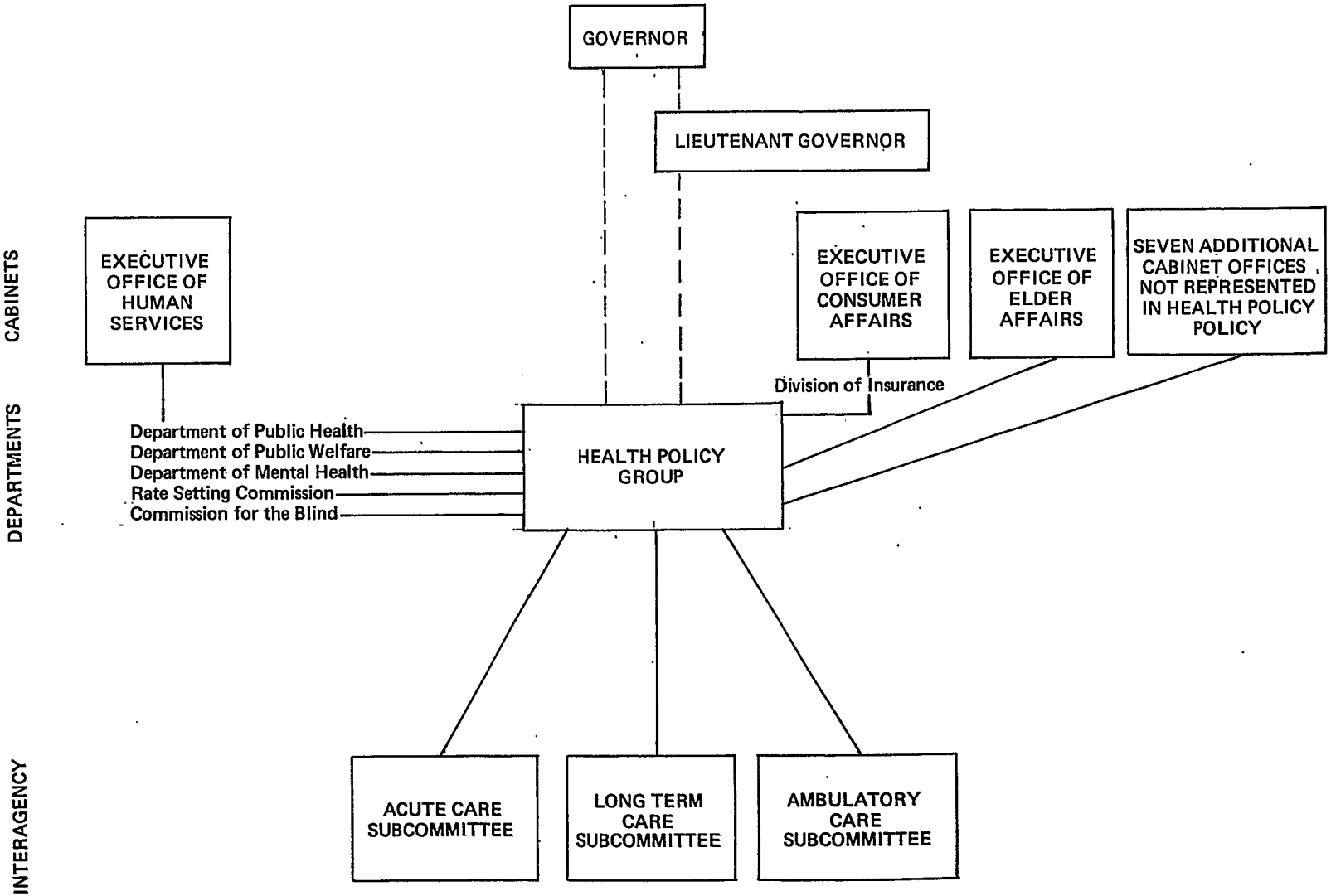
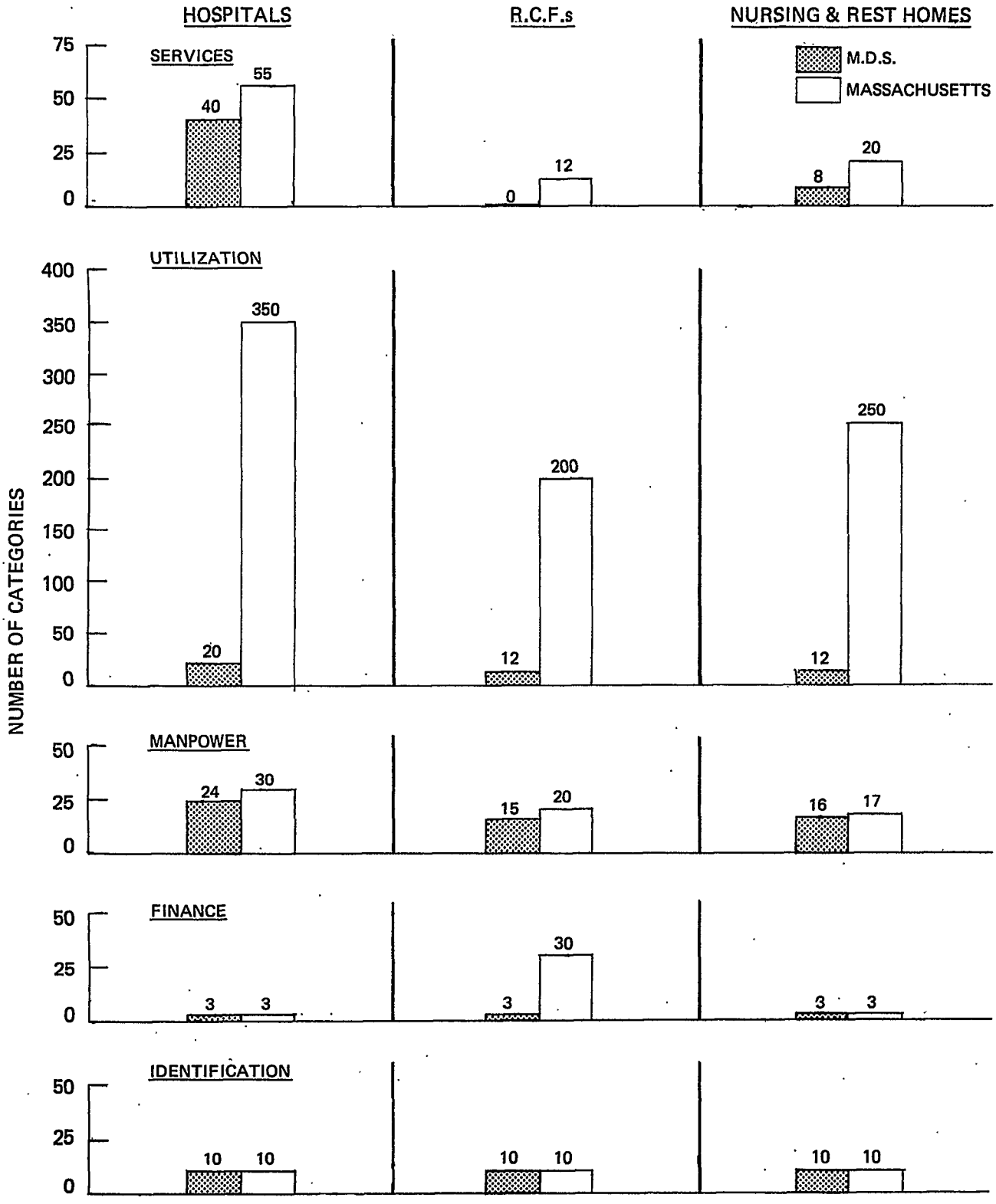

GOVERNOR
LIEUTENANT GOVERNOR
CABINETS
EXECUTIVE OFFICE OF HUMAN SERVICES
EXECUTIVE OFFICE OF CONSUMER AFFAIRS
EXECUTIVE OFFICE OF ELDER AFFAIRS
SEVEN ADDITIONAL CABINET OFFICES NOT REPRESENTED IN HEALTH POLICY POLICY
Division of Insurance
DEPARTMENTS
Department of Public Health
Department of Public Welfare
Department of Mental Health
Rate Setting Commission
Commission for the Blind
HEALTH POLICY GROUP
INTERAGENCY
ACUTE CARE SUBCOMMITTEE
LONG TERM CARE SUBCOMMITTEE
AMBULATORY CARE SUBCOMMITTEE

Figure 2.


HOSPITALS
R.C.F.s
NURSING & REST HOMES
M.D.S.
MASSACHUSETTS
NUMBER OF CATEGORIES
SERVICES
75
50
25
0
40
55
0
12
8
20
UTILIZATION
400
350
300
250
200
150
100
50
0
20
350
12
200
12
250
MANPOWER
50
25
0
24
30
15
20
16
17
FINANCE
50
25
0
3
3
3
30
3
3
IDENTIFICATION
50
25
0
10
10
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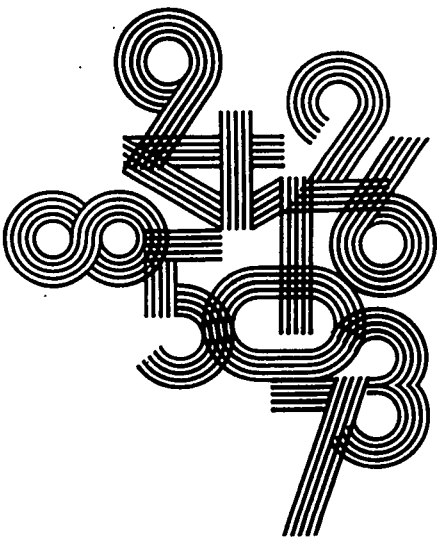
10
10
10

ery program staff on how to use data reports.

6) Anticipate problems and confusion among users who perceive health resource data collection as solely a data processing function; meet regularly with the computer managers to avoid overlap in function.
7) Data collectors should avoid self-pity! Rather than ask "why don't the users use our data?" instead make themselves a part of the planner's world by understanding the complexities of the health planning process; propose data sets that can quantify the issues in acute, long term, and ambulatory care, among others.



CONCURRENT SESSION L

Status and Effects of the Uniform Reporting and Classification System

WHY UNIFORM REPORTING SYSTEMS

Sheldon Fishman, *Office of Assistant Secretary for Planning and Evaluation, Washington, D.C.*

It is my pleasure to serve as Chairman of this session on uniform reporting systems. This session presents a rare opportunity to hear from knowledgeable speakers who have extensive practical experience with alternative approaches to achieving uniform reporting. The first presentations will highlight the Federal perspective on *what should happen* when uniform systems are widely implemented. Then executives associated with prototype model systems will describe *what is happening*. After these presentations and your questions, a better vision of *what will happen* may become clearer.

Before formally introducing today's speakers and discussants and launching the discussion of the status of a uniform reporting system, I would like to say a few words on *why a uniform reporting system.* Not everyone agrees we need a uniform system.

In part the argument against uniform systems is based on the usual definition of uniform. The dictionary says uniform means constant and unchanging and that the antonym of uniform is diverse. Unfortunately in this specific instance the alternative to a uniform reporting system can better be characterized as ineffective, inconsistent, inaccurate, and wasteful.

Effectiveness

While each deficiency of the present non-system will be disucussed, the first and most important issue is how *effectively* the needs of users can be met without a uniform reporting system. Clearly the information needs of some users are met adequately without a uniform system. For example, medical bills are processed and medical records are maintained. However, the lack of uniform reporting precludes the effective performance of some important activities. This unmet need can be illustrated by several examples from National Health Insurance and payment policies.

The long run method of paying providers under a hospital cost containment law will undoubtedly include an adjustment for severity of the cases treated by each provider. Without uniform reporting by all payers, it is impossible to establish an index for the case mix for each hospital. Payment of providers under National Health Insurance will require similar case mix information. Even more sophisticated information will be required if NHI pays providers on the basis of diagnosis at the time of admission. Today case mix indices are generally infeasible because information is collected by different payers or not collected. In addition, some individual providers have uniform information on all patients treated in their facilities; discharge information is not routinely collected by all providers. Since case mix indices and payment on basis of diagnosis require data from a representative sample of patients from each provider and all payers, gaps in information renders the present set of data systems ineffective for these purposes.

Consistency and Compatability

Problems with gaps in information are severely exacerbated by the consequences of incompatibility and inconsistency between existing data systems, particularly information on identifiers and diagnosis.

Common identifiers are needed to match records from different payers. This matching is needed to properly handle the data for people who are covered by more than one health insurance plan. Without this linkage, it is impossible to distinguish between two episodes and a single episode which is paid from multiple sources.

Information on diagnosis presents severe problems of compatibility because of the multiplicity of diagnostic coding systems and definitions. For example, different coding systems use different rules for deciding on principal diagnoses including the diagnosis that accounts for procedures performed, the diagnosis which best explains admission, the most severe diagnosis, or the diagnosis listed first. The adverse consequences of differences in definitions are compounded by differences in levels of aggregation such as coding systems with three digits and five digits.

Accuracy

Two recent studies by the Institute of Medicine on the validity of information from hospital discharge services and Medicare bills raise very serious concerns about the accuracy of data now collected, particularly if they are used for new purposes. For example, only 57 percent of the Medicare claims forms contained the correct principal diagnosis. Since Medicare pays hospitals on the basis of incurred costs, inaccuracy in the coding of diagnosis does not have an adverse effect on the operation of the program. However, it is highly unlikely that acceptable case mix indices can be constructed utilizing a data base with the wrong diagnosis half of the time.

Efficiency

The inefficiency and wastefulness of the present situation can be illustrated by examining the duplica-

tion in data collection for a typical Medicare beneficiary treated in a hospital.

- The bill sent to the Medicare intermediary will contain most basic patient information such as name, attending physician, date of admission, procedures received, diagnoses, and date of discharge.
- Since 10 percent of the Medicare beneficiaries are poor enough to receive Medicaid, a bill containing essentially the same information will be submitted to the Medicaid fiscal agent.
- The local Professional Standards Review Organization (PSRO) will review that patient's care and usually will prepare an abstract with essentially the same information.
- Another abstract of this same record will be prepared in those hospitals that either subscribe to a hospital abstract service or maintain an in-house automated abstracting system.
- Yet another abstract containing this same information may be prepared and sent to the National Center for Health Statistics as part of the National Hospital Discharge Survey.

This epitome illustrates the waste in the present system; a macrosomic view of data systems reveals that the duplication is growing at an alarming rate. For example, as of today only a minority of the 135 operating PSRO's have data systems, but eventually all 195 PSRO's will be operational and collecting information on the utilization of every Medicaid and Medicare beneficiary. Simultaneously the number of operational Cooperative Health Statistics Systems (CHSS) funded by the National Center for Health Statistics is less than 20 today but is expected to grow substantially. Based on the experience to date these systems might increase the duplication with PSRO's.

Better Questions

Perhaps the best reason for uniform systems is the least obvious reason. Uniform information systems are likely to raise more and better questions, and the resolution of those questions will lead to improvements in the delivery system. For example, data from Maryland indicates that a simple appendectomy costs the Medicaid program $383 more than Blue Cross and $464 more than other insurance plans. The pattern of average length of stay and total charges for specific diagnosis raises similar questions. The data displayed in table A indicates that for acute myocardial infarction treated in Johns Hopkins Hospital the average length of stay is slightly shorter than the average for Maryland hospitals but the charge is 462 percent higher than the average in the State. The same condition treated at Mercy Hospital, which is also located in Baltimore, requires a longer stay but costs substantially less. The pattern of length of stay and charges in another hospital in Baltimore, Union Memorial, is essentially halfway between Johns Hopkins and Mercy. While this information is for the same diagnosis, in the same city, for the same time period, using the same data system, there may be good reasons for this wide variation. On the other hand, these data do raise questions that would not be asked without a uniform system. The answers to these questions may lead to improvements in the delivery system.

TABLE A. Charge and average length of stay for Blue Cross patients with acute myocardial infarction in selected Maryland hospitals

	Average length of stay Days	Average charge		
		Variance from Md. average	Amount	Variance from Md. average
Johns Hopkins Hospital	15.95	+0.4% (+ .07)	$20491	+462% (+$16847)
Mercy Hospital	19.18	+ 21% (+3.30)	$3550	− 3% (− $94)
Union Memorial Hospital	16.94	+ 7% (+1.06)	$4289	+18% (+$645)
All Maryland Hospitals	15.88	—	$3644	—

Source: Maryland Health Services Cost Review Commission, February 1978 Statistical Report for the period October 1976 through June 1977.

UNIFORM REPORTING SYSTEMS—A FEDERAL PERSPECTIVE

James M. Kaple, Ph.D., *Actg. Assistant Administrator for Demonstration and Evaluation, Health Care Financing Administration, Baltimore, Maryland*

This is a particularly exciting time to be involved in the health data policy scene. Many basic and far reaching decisions regarding Federal health data policy and health data collection are being made these days. The creation of the Health Care Financing Administration (HCFA), bringing together the major operating programs (Medicare, Medicaid, and HSQB), has resulted in the colocation of the major Federally financed health insurance programs. The colocation of these major programs has resulted in a unique opportunity to consolidate, coordinate, and improve health statistics data through the leverage and financing of these programs.

Clearly, HCFA, the National Center for Health Statistics, the Public Health Service, and the highest levels of the Department of HEW are committed to capitalizing on these opportunities to improve the quality, timeliness and comparability of health data. The commitment to improved data has grown out of the recognition that the data necessary to drive more sophisticated reimbursement systems, cost containment, and national health insurance are not currently available. The data needed by planners, PSRO's, State governments, legislators and policy makers are frequently not available at all, or if available, only in a fragmented, hard-to-access, difficult-to-link fashion.

Probably the single most important piece of legislation related to the collection of cost, utilization and medical data on institutional health care providers is Section 19 of P.L. 95-142. Although I think all of you are familiar with the legislative history surrounding this issue, I would like to take a few minutes to review, from my perspective, how Section 19 of P.L. 95-142 came to be. The push for improved financial and statistical data has clearly grown from Federal, State, and local government, and the Nation's concern over health care costs. In the early 1970's, we got into the business of controlling institutional costs through select rate regulation demonstrations *and* peer group limits on rates of increase in institutional expenditures. We soon discovered that we did not have adequate data to make equitable decisions. Congress recognized this, and in 1974 passed Section 1533(d) of the National Health Planning and Resources Development Act (P.L. 93-641). This act required the establishment of a number of uniform systems, including uniform accounting, uniform cost reporting and uniform statistical systems for institutional health care providers. Subsequently we pushed for legislation to require adoption of a point of entry accounting system to support uniform reporting.

In October of 1977 Congress passed P.L. 95-142—generally known as the Fraud and Abuse Bill. Section 19 of this law requires the Secretary to establish, by regulation, a uniform system for reporting cost and volume data for the various functional activities in health services facilities which receive payments under Titles V, XVIII and XIX. Uniform reporting systems are also required for discharge and bill data.

Let me spend a few moments on the cost reporting system. Rather than mandating that hospitals record expenses at point of entry by functional cost centers, Section 19 requires that hospitals employ the chart of accounts, definitions, principles, and statistics specified by the Secretary in order to reconcile (or reclassify) its own internal accounting system to the specified functional cost centers in the specified reporting system.

I think Committee Reports of the Senate Finance Committee, House Committee on Ways and Means, and House Committee on Interstate and Foreign Commerce on P.L. 95-142 are enlightening. They include the following statements:

> "A persistent problem under the Medicare and Medicaid programs, as currently structured, is the presence of variations in the information contained in the Medicare and Medicaid cost reports."
>
> "The committee(s) believes it is necessary to correct the deficiencies in the present reporting system under these programs."
>
> "The existence of comparable cost and related data is essential for:
>
> —Effective cost and policy analysis
>
> —Assessment of alternative reimbursement mechanisms
>
> —Identification and control of fraud and abuse."
>
> "Each institution...performing a function ...should be required to report on...functions in the same way, e.g.,...x-ray costs."

Current Medicare reporting requirements allow great flexibility and freedom with regard to accumulation and distribution of costs. The new reporting requirements will limit some of those options. The costs accumulated and reported in the new system will flow directly into the Medicare trial balance and cost reports. These cost reports will continue to be submitted to the fiscal intermediaries. The law requires that Section 19 cost reporting system for hospitals *and* long-term care facilities be promulgated by October 1978. We know we will not meet the October deadline

for long-term care facilities.

We are currently assessing the timing related to the hospital cost reporting requirements. In addition to providing vastly improved cost data, by functional cost center, this new reporting system will also specify and require the reporting of common, carefully prescribed utilization statistics for each functional cost center. Soon we will, for the first time, be able to compare nationally-detailed institutional utilization and cost data. The potential for making better informed planning, cost containment, and institutional health care management decisions should take a quantum leap.

I have talked primarily about the cost reporting. Let me say a word about institutional bill and discharge reporting. In both of these areas (discharge and bill data) there are still numerous short- and long-run decisions to be made.

These decisions regarding billing and discharge data must be carefully coordinated with HCFA and Departmental decisions about integration of fiscal intermediaries, operations of PSRO's, specification of common coding systems, careful quality control, and decisions to adopt more sophisticated reimbursement systems that may require specific medical and bill data to drive them.

Numerous options are currently under consideration in these areas and I want to stress that no final decisions have been made. However, I do want to review with you our thinking in this area and give you an idea of the direction we are headed for in the short run. One of the basic assumptions on which we have been working in this area is that it is both necessary and desirable to be able to link discharge billing and cost data in order to make determinations about diagnostic specific case costing. In the short run, this objective could be met by adding billing data to the discharge abstract. This short-run approach will avoid adding significantly to the discharge and billing burden and still allow us to merge discharge and bill data.

This approach is not necessarily the optimal approach. We will be undertaking a careful assessment of long range alternatives including

- assessment of joint or integrated billing and discharge systems,
- assessment of alternate data flow and processing models, and
- assessment of feasibility of centralized data processers that would centrally
- collect and disseminate data to all users (e.g., planners, PSRO's, rate regulators, etc.).

As these decisions are made we will be careful to coordinate within the Department in order to avoid redundant data collection that increases reporting burden unnecessarily. At the same time we want to be sure that we get the data necessary in comparable, timely, and high quality fashion.

As I said in my opening remarks, this is an exciting time to be involved in data policy decisions being made today. These decisions are critically important to developing readily accessible, comparable institutional data bases as we move toward reimbursement reform, cost containment, and national health insurance.

UNIFORM REPORTING SYSTEMS—COOPERATIVE HEALTH STATISTICS SYSTEM

Garrie J. Losee, *Deputy Director, DCHSS, NCHS, Hyattsville, Maryland*

This is the 17th National Meeting of the Public Health Conference on Records and Statistics, as you all know. What some of you may not remember is that the Cooperative Health Statistics System was first discussed with the Public Health Conference on Records and Statistics at its 13th National Meeting in June of 1970, 8 years ago. Ted Woolsey, then Director of the National Center for Health Statistics (NCHS), was the moderator of a panel consisting of NCHS staff members Bob Israel, Phil Lawrence, Ossie Sagan, and Andy Lunde who discussed the topic "Toward a Cooperative System of Health Statistics."

The motivation for scheduling that panel in 1970 was an amendment to the PHS Act which authorized the Secretary to "...undertake research, development, demonstration, and evaluation, relating to the design and implementation of a cooperative system for producing comparable and uniform health information and statistics at the Federal, State, and local levels." That was it. The authority has been strengthened since then, but surprisingly, the basic concepts presented by the panel are still those that underpin the Cooperative Health Statistics System (CHSS).

Dr. Lawrence described the statistical information the then leaders of NCHS felt were needed at the State and local levels. He included information on the size and demographic characteristics of the population; information about the health of the people; information about the availability of health resources, both facilities and manpower; and the utilization and financing of health care services. After remarking that the Nation already had a Vital Health Statistics System capable of producing small area statistics, he noted that the Nation needed a system for collecting and maintaining inventories to produce data on health care facilities, services, and manpower, and a system for utilizing records of facilities and other providers of health care services to produce data on health care utilization and kinds of health services received by patients.

By what was said in 1970, it was clear that the Cooperative Health Statistics System was to be a comprehensive, shared statistical system which included hospital, long-term, and ambulatory care utilization components.

That brings me to the title of this discussion—"Uniform Reporting Systems—Cooperative Health Statistics System." The two terms, URS and CHSS, convey very different concepts to me. A uniform reporting system conveys to me a system of compulsory provision of uniform information to determine whether the individual or facility required to report is in conformance or not, and, accordingly, whether penalties (or possibly benefits) will be levied or not. The uniform information in such systems could follow the concept of uniform minimum data sets, but usually imply the use of the same reporting form.

The Cooperative Health Statistics System, on the other hand, is a voluntary system in which the collectors, users, and respondents cooperate in the development of the comparable and uniform health statistics needed to attain the goal of resolving the Nation's health problems.

Decisions regarding the definition of the System and its administration—and the data it produces—are shared among the System producers at the Federal, State, and local levels and the community of users it serves. Uniformity is attained by adopting the uniform data sets developed by expert panels of the United States National Committee on Vital and Health Statistics, such as the UHDDS, and applying uniform standards for quality and standard definitions and classifications.

The System operates under a system of principles which include the protection of confidentiality of identifiable information for individuals and processes which permit the sharing of information among legitimate users consistent with the purposes for which the data was supplied.

I would now like to review the progress and problems encountered in implementing the CHSS. Indications of progress are:

1. An increased willingness to accept common terms, data sets, and classifications—i.e., to accept "uniformity."
2. An increased acceptance that data systems which require full coverage or large proportional sample size must be decentralized to be operated at the State-local level.
3. An increased recognition that comparability required for many purposes necessitates that these State-local operated systems must
   - meet minimum data set requirements,
   - uniformly process data,
   - meet defined standards for timeliness and quality, and
   - meet legitimate data needs of users to the degree possible without violating assurances of confidentiality.
4. An increased development of "shared"

CHSS data systems' organizational arrangements, including the development of private-nonprofit data consortia, of State Centers for Health Statistics, and stronger working relationships between private and public agencies.

5. A reduction of costs and burden on respondents by building on existing administrative, regulating, and statistical data sources.
6. The development of improved authorities for the voluntary and mandatory collection of data and for assuming the proper balance between protection of sensitive data and legitimate access by users. The Model State Health Statistics Act provides such authorities.

Balanced against these indications of progress are certain problems, including:

1. The inability or unwillingness of selected organizations and agencies to make commitments to full shared data systems.
2. The initial unwillingness of most agencies and organizations to share control and resources.
3. The lead time required to establish a decentralized system which conforms to uniform standards of quality of data and timeliness.

The Cooperative Health Statistics System, through its health facilities statistics component and its health care utilization components, can effectively produce timely and accurate information for the monitoring and control of health care costs and utilization. It can do so effectively since with decisions regarding the definition of the System and its administration—and the data it produces being shared among the System partners—there is a greater likelihood that relevant data will be collected, that the data will be used in decisionmaking, and that the data itself will not be an issue.

It can produce timely and accurate information because it has a single purpose, namely to provide data for research and statistical purposes. It does not have to be delayed to meet other purposes, such as payment of claims. Also, since the information supplied by an individual or facility will not be used to make any determination directly affecting the rights, benefits, or entitlements of that individual or facility, a major cause of incompleteness or inaccuracies of data is removed.

Advocates of "uniform reporting systems" may doubt that such a cooperative statistical system can provide data for the monitoring and control of health care costs and utilization. It does so through statistical analyses—that is, by describing the group characteristics of individuals or facilities and permitting the analysis of interrelationships among the various characteristics of individuals or facilities. Consequently, CHSS data can be used at the national, State, and local levels to formulate policy, such as on rates, regarding specific grouping of individuals or facilities; to monitor the characteristics of such grouping over time; and to serve as a benchmark against which the characteristics of specific individuals or facilities can be compared.

By sharing data and building on existing data sources, unnecessary duplication of data collection can be avoided under the CHSS concept with resulting reductions in the cost to the public of data collection activities and in respondent burden. However, there are circumstances where duplication of data collection from an individual or a facility may be necessary.

When the data is required by a user for a purpose other than the purpose for which it was voluntarily supplied by the provider, an independent collection of the data for that individual or facility may be called for.

In many situations the data may be available outside the Cooperative System's file, but from data maintained separately by the State Center for Health Statistics, data consortium, or data broker in the State, provided that such an organization has the authority to release data for other than research or statistical purposes. This has been a source of considerable misunderstanding between users of CHSS data and the producers of the data. "Certificate of Need" data, for example, might best be obtained by an HSA from a source other than a CHSS file. CHSS statistics for similar facilities then can serve as a benchmark against which the characteristics of the specific facility can be compared.

An issue in implementing the CHSS has been the locus of the System in a State. Although most of the CHSS activities are now conducted at the State level by official State agencies, particularly within the State's department of health, several States have chosen to implement some or all components through a health data consortium or data broker. NCHS's policy has been to allow the decision as to the locus of the System to be made in the States, as long as the concepts and standards of the CHSS will be followed. Congressman Rogers introduced a Bill in the House of Representatives containing authorizing legislation for the NCHS. If it is enacted, States participating in the CHSS will be required to designate a State agency to implement the CHSS. We believe that such an agency should be a neutral body which embodies the concepts contained in the Model State Health Statistics Act.

In summary, the Cooperative Health Statistics System, being a statistical system, has many advantages to recommend it as eventually becoming the Nation's system for collecting the UHDDS. These advantages are effectiveness in use, timeliness, and quality of data.

UNIFORM HOSPITAL REPORTING: THE NEW YORK EXPERIENCE

Joanne M.J. Quan, *Director, DSDP, NYS OHSM, New York, New York*

It is fitting that attention be focused on New York State during today's discussion of uniform reporting and classification systems. For indeed, New York has a long history of progressive leadership in State health care regulation, not the least of which has been in the area of uniform hospital reporting.

Our State has experienced a series of "firsts" in health care regulation. New York was the first State to institute a Certificate of Need program. New York was the first State to develop a prospective reimbursement formula system. New York has been a national leader in controlling health care costs, dropping from the fifth most costly State for hospital care in 1975 to eighth in 1976. Whereas hospital costs grew on the average of 13.4 percent for the Nation as a whole during that same 2-year period, they were contained to 8.5 percent increase in New York.

One of our most consistent efforts has been in the area of uniform reporting systems. The New York State Public Health Law provides the State Department of Health with wide latitude in developing programs and regulations "in order to provide for the protection and promotion of the health of the inhabitants of the State...." It is within the framework of this broad statutory authority that New York mandates regular annual reporting by hospitals of financial and statistical information.

Concentration on uniform reporting systems in New York is not new; rather, such efforts date back to the 1960's. In 1968, the mandated hospital Uniform Financial Reports and Uniform Statistical Reports were the first statewide documents to combine such reporting across all third party payors. Also, the New York State Hospital Accounting and Reporting Manual not only preceded the HEW System for Hospital Uniform Reporting (SHUR) but served as one of the basic models for the Federal manual.

New York's regulatory history, clear and broad statutory authority, and public commitment with regard to hospital reporting were ideally suited to HEW's plans for uniform reporting under Section 19 of Public Law 95–142; the State received Federal endorsement in October, 1977, when the Office of Health Systems Management was awarded approximately $1.1 million by the Health Care Financing Administration of DHEW to establish "Model Health Care Financing Data Systems Development Project."

Briefly, the overall goal of this project is to establish a statewide, centralized and comprehensive health care data system to support the functional integration of planning, rate setting, and budgeting in New York. As part of the data collection process, three uniform and comparable documents will be implemented on January 1, 1979, in all New York hospitals. These documents include annual hospital financial reports, inpatient bills, and discharge abstracts on all patients, regardless of source of payment. In addition, a report generating system is already under development to produce management information reports which will link all these data together for use by the State, institutions, regulatory agencies, and other health care organizations.

Before going into the data system in detail, it is necessary to highlight the fundamental need for such a system. New York, most particularly under the leadership of Governor Hugh L. Carey, has publicly reaffirmed its commitment to providing high quality, accessible and cost-effective health care to the residents of this State. In order for the Office of Health Systems Management to carry out this broad, comprehensive mandate, a set of basic yet vital information must be available.

There is broad agreement between both Government and the health care industry on the desirable features of this basic data system. These include

1. Uniformity of reporting—to provide comparability of information across institutions;
2. Comprehensiveness of data sets—to provide sufficient data for multiple programs and agencies;
3. Systemwide reporting on all providers and patients—to establish a data base capable of broad-based application and to enable comparative studies;
4. Quality controls—to insure accurate, consistent and complete data;
5. Timeliness of data submission—to alleviate constraints on the usefulness of the information by ensuring that the data bank is complete;
6. Consolidated data collection—to relieve reporting burdens on hospitals by collecting data only in each institution;
7. Centralized information repository—to eliminate fragmentation and facilitate dissemination of similar information to multiple programs in a cost-effective manner;
8. Accessibility—to make data available to all qualified users upon request within the bounds of confidentiality;
9. Use of existing resources as much as possible

to establish a system in a cost effective manner.

In a nutshell, what we need as an agency with complex regulatory responsibilities is uniformity of information, timeliness of data submission, quality standards, and across-the-board submission by all providers.

New York's legal responsibilities, as well as its legal authority, set the State apart as a unique and prime user of the data system. The appropriate and timely discharge of State duties with regard to reimbursement, certificate of need, surveillance and utilization review, to mention only a few, hinge on the accuracy and completeness of the data system.

There is, quite obviously, no argument as to the State's need for access to the data system. The only question was, who should run the system in New York?

The State's experience with uniform billing under the HCFA grant presents a strong case for State control of the system. We have established an advisory group with representation from and strong participation by Blue Cross Plans, the Health Insurance Association of America, commercial carriers, the State Departments of Insurance, Social Services and Public Health, Health Systems Management, hospitals throughout the State, and Federal representatives from the Medicaid Management Information Systems implementation in New York City; uniform billing activities under the auspice of the Department of Insurance; review of information needs of all payors; and review of existing billing forms, including UB-16, SSA-1453 and SUBNY-77 (a uniform bill recently pilot tested in lower New York State).

Already these activities have resulted in a remarkable event—the endorsement of the OHSM inpatient bill, entitled UBF-1, by all Blue Cross plans in the State, the Hospital Association of New York State, the Greater New York Hospital Association and all involved State Medicaid agencies. Moreover, there has been an interest expressed in a voluntary statewide pilot test of UBF-1 by hospitals, Blue Cross plans and commerical carriers—completely unsolicited by the State.

It must be noted that our discharge abstract data set is virtually identical to that proposed by the NYS Data Consortium. It must also be noted that the State is quite committed to receiving active advisory input from the members of the Consortium. The bottom line, once again, remains, who is going to manage the system?

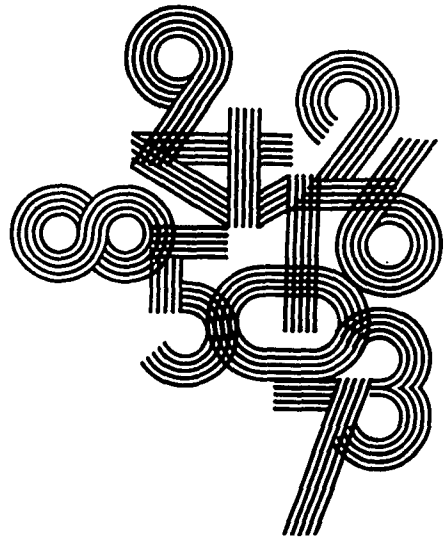
The Office of Health Systems Management firmly believes that its management of the approach to hospital reporting is the most effective way in which to establish a statewide data base system. Indeed, the UBF-1 is a clear manifestation of the State's ability to coordinate data collection policies and information needs of multiple users.

There is another strong advantage to having the State as the centralized repository for the information system. The utilization of existing State resources provides the most economical vehicle to enable the establishment of a centralized data system. Available hardware, software and personnel for existing State programs can be built upon. We can capitalize on the developing MMIS system as well as assure complete interface with this major statewide program. More importantly, the centralized State system will include not only a patient medical abstract, but patient billing information and institutional financial and statistical reports as well.

New York's activities should not be misconstrued as an endorsement of a mandated approach in all States. However, given our experience, it is our strong feeling that the State efforts represent the most efficient and effective means by which to implement the desirable objectives of a data base system in our State.

No other State in the country has mounted such a major and ambitious effort to implement a systemwide health care data base. Our commitment to this effort is based upon our sensitivity to the pressing need for a uniform and comprehensive data system to support *all* phases of our health care system. We realize that many difficulties in addressing the issues of planning, cost containment, and financing are due, in great part, to the lack of existing information regarding the system itself.

The problems encountered in New York are not unique. However, we are committed to solving these problems, and our experience to date under the HCFA grant provides strong support for the State's approach. We believe that the New York Data Systems Development Project, as it continues to evolve, will serve both national and State interests in the establishment of a model health care data base and information system.



THIRD PLENARY SESSION

Information Needs for National Health Insurance

OVERVIEW OF BASIC PRINCIPLES FOR NHI INFORMATION SYSTEMS

Paul M. Densen, Sc.D., *Director, Harvard Center for Community Health and Medical Care, Boston, Massachusetts*

DR. DENSEN: Good morning and welcome to this third plenary session on the information needs for national health insurance.

This morning we would like to present to you some of the thoughts with regard to the information needs for national health insurance. I have been asked to begin the program by presenting to you a statement of principles which a task force of the U.S. National Committee on Vital and Health Statistics has developed.

Before discussing the individual principles, I would like to give you a little background on how this came about. It was a serendipitous kind of development which occurred both in the old advisory committee to the Cooperative Health Statistics System, which as you know no longer exists as a result of Presidential order reducing the number of advisory committees, and a simultaneous concern with the problem in the U.S. National Committee itself.

At the next to the last meeting of the advisory committee to the Cooperative Health Statistics System, it was suggested that instead of waiting, as has been the case in the past, to develop the principles on which the information for national health insurance should be based, that we ought for once to try to anticipate the need and begin working on it now so that we could get the problem in front of both the Administration and the Congress before the law is passed, whenever it will be passed, on national health insurance and whatever form the law happens to take. We felt that the time to start is now instead of waiting until after the law is passed and then trying to put together in a hurry an information system for national health insurance.

A somewhat similar discussion took place at the same time in the U.S. National Committee on Vital and Health Statistics. As a result, when the advisory committee to the Cooperative Health Statistics System was abolished, the U.S. National Committee set up a task force concerned with the development of the information needs for national health insurance.

I think you have available to you the current statement of the principles as the task force has so far developed them. I would like to emphasize at this point, at this stage of the work of the task force, that these principles are not yet engraved in stone. We would like very much for you to study them carefully and give us your comments and suggestions so that at the next meeting of the task force we can modify them further.

The first principle, and in some ways the most important one in relation to reporting systems of any kind, is that the information system must have the capability to count the number of persons enrolled, the number served, and the services used. It must also be able to link these measures to available resources, national health insurance revenues, expenditures, and health status. The most important point in this principle is the idea of counting people. To an audience like this, that may seem so obvious that it does not need statement. I can assure you that if you have ever looked at reporting systems in general in the country, you find that this principle is honored more in the breach than in actual operation. The ability to count people, not just services, is extremely important.

For example, in a national health insurance system, it would be possible to count claims and not people. But unless you are able to count people and have an enrollment base, it becomes impossible to develop probability kinds of statements regarding the operation of the national health insurance system.

The second principle is that data on the size, demographic characteristics and health services received by the whole population should be available to the information system for assessment of national health insurance adequacy and to project the impact of possible changes in eligibility. This principle is also extremely important. They are all important obviously, but I would like you to think about the implications of that statement for a moment.

As you go back over the history of the development of statistical systems at the national level and also at State and local levels, there has been an evolution with reporting systems on the one hand over here and survey mechanisms on the other hand over there. This is not exactly true, but the system tends to operate like that at times. If we are going to have an effective national health insurance information system, it is essential to think about the system as a whole, so that the survey mechanism and the ongoing management reporting system are integrated in a systematic fashion. This is one of the things that we will be giving quite a bit of thought to. We will hear a little bit more about this this morning. If you look at your program, you will see that it is organized so that the next speaker, Mr. West, will tell you a little bit about some of the lessons to be learned from a reporting system which has been in existence for some time, the Medicare reporting system. Dr. Wilensky will follow him with some discussion of a survey mechanism which is closely related to some of the concerns of the national health insurance program, which has to do with health expenditures. So, we have planned the program so that reporting systems

and surveys will be integrated a bit, even today. We hope that they will continue to be integrated as the information system begins to move forward.

At the next meeting of our task force, we will be addressing in some detail how you make use of existing information systems in the development of the national health insurance information system itself. For example, without suggesting that this is the way it should be done but merely to give you some idea of the kind of discussion which we shall engage in, if we have all of the population of the United States enrolled in one way or another in the national health insurance system or if we have very clearly defined parts of that population enrolled in the national health information system, one could visualize that the present survey mechanisms of the National Center for Health Statistics draw their samples from the enrollment file of the national health insurance system. That is not necessarily the best way to do it. We have not thought the thing through, but it gives you an example of some of the kinds of thinking that we need to engage in, in order to build on what we have at the present time.

The third principle is clearly one that will have to be articulated in detail. It concerns the privacy and confidentiality of data on individual patients. Confidentiality and privacy must be safeguarded while providing access by responsible users to information required for health planning, evaluation and monitoring.

As one thinks about this principle, one has also to give thought to the relationship between the way in which the data are gathered at the source and how they move on up from the local area to the national level, in order to preserve privacy and confidentiality.

The fourth principle again is one that sounds obvious, but if you just take a look at the present statistical system of the United States Government, you will find it is honored more in the breach, just like the first principle. That is that there should be clear designation of authority and responsibility for the statistical system activities. We hope that as we send forward our final report, we will be able by that time to have discussed that principle, not only with persons within the various units of the Federal Government, but also with members of Congress who are concerned with the legislation, so that the legislation itself will make it very clear where the responsibility for the information system lies.

The fifth principle is that the reporting requirement should minimize the burden on data suppliers and processors while assuring sufficient amounts of types of data to serve national health information needs. That principle is again one that relates to the present organization of the statistical systems. One might expect the Cooperative Health Statistics System to play a considerable part in the implementation of this principle since CHSS is concerned with developing statistical data not only at the national level but also at the local level, by various mechanisms that you have probably been hearing about in the other sessions of this meeting.

If one can really put that principle to work, I think it is going to be the most important principle in making any information system which has been devised work. Nobody likes paper work. If we can devise a mechanism which minimizes the paper work, we are much more likely to get on with the job.

Hidden within this principle, there is a corollary. If you want to minimize the burden, then the data that you collect must be useful to the people who provide the information. If they have no interest in its use, not only are they not likely to give you the data in a form which is reliable, but its timeliness will also be in question.

The sixth principle is that the data items and sources needed for planning and evaluation research, as well as management, should be clearly defined, taking into consideration existing data systems. I have mentioned that already. It also relates to the seventh principle, which is that uniform minimum data sets, such as those currently available, should be established and promulgated by the national health insurance authority to assure comparability and completeness of reporting.

The reporting mechanisms should accommodate multiple uses and minimize duplicate or repeated reporting of invariable data. That eighth principle clearly links up with the fifth principle of minimizing the burden.

The mechanisms must be built into the information system to assure accurate and timely collection, processing and retrieval of data. That principle is one that we have heard about several times as we circulated the previous drafts of the principles to various members of Congress and the Administration. The one comment that we keep getting back is to make sure that whatever comes out of the information system is timely so that we can use it at the time when we have the problem in front of us. That means that mechanisms such as those developed by the National Center for Health Statistics in response to the report of the committee to evaluate the National Center for Health Statistics some years ago, which emphasized the importance of this timeliness, will be very important in this connection. These mechanisms should probably be reviewed as one goes ahead with the development of the information system for national health insurance.

The tenth principle is that the emphasis should be placed on meeting the information needs of providers and consumers of care as well as national health insurance managers and policy analysts. Again, this is an effort to bear in mind, that the national health insurance program is a program designed for all of the people of the United States. How efficiently it works and how it meets the needs of the people should be made known to them as well as to those responsible for managing the system.

These principles are not yet fixed. They have gone through several drafts and will probably go through several more. We would be delighted to have your suggestions about them. What you have in front of you is just a page listing the principles. There will be a

considerable discussion of each of these principles in a more lengthy document which is currently being prepared by Maura Bluestone as a result of discussions of the task force.

We have been discussing the information needs for national health insurance both with members of the Administration and with a number of the members of Congress and their staffs who are concerned with the development of national health insurance legislation. One of the problems which the task force faces is the question of how we shall work the legislation so that these ideas are incorporated in the legislation.

It has occurred to us to take a lesson from the Planning Act which requires an annual report to the Congress on the state of the health of the Nation, which the National Center for Health Statistics prepares. I think this is Jack Feldman's responsibility. If one required something of that type in NHI legislation, Congress would have a report once a year, and the development of the national health insurance information system would not be left entirely to the whim of whoever happens to be the administrator of the national health insurance system.

We have not thought that through yet. That is one of the issues that lies before the task force. We would again welcome suggestions.

We hope to have a completed report sometime toward the end of this calendar year. This report will go before the U.S. National Committee on Vital and Health Statistics for comments and suggestions. It will probably be circulated widely in draft form for comments and suggestions. Once it has been approved by the U.S. National Committee—as you know, the U.S. National Committee is a statutory committee—it goes forward to the Secretary. But we will also see that Congress is aware of that report at that point in time, so that we hope that it will have an impact on the development of the national health insurance program.

I would like to stop at this point and ask if you have any questions before we move on to the rest of the program.

DR. LUNDE: I am a consultant to the National Center for Health Statistics and for the American Statistical Association. In several of these principles, I notice reference made to persons and personal records, record linkage from various sources, and so on. I wonder if you could tell us what the technical consultant panel has done about this question of identity and linkage from various systems and whether or not consideration has been given to the use of personal identification numbers in the population. As you know, person numbers have been assigned for the purposes of health and welfare and other administrative reasons to the populations of Norway, Sweden, Denmark and Israel, among other countries.

The assignment of a person number, of course, facilitates computer application in this whole process. I am just asking, although I know that the Federal Government on at least two occasions has indicated that this should not particularly be pursued, and it is a sensitive issue. What has the task force decided on this matter?

DR. DENSEN: The task force was split up into two subcommittees initially, one of which was concerned with what information is needed in the national health insurance information system. The second was how to relate that information to present existing systems.

As we went on with these two subcommittees, we found that they got closer and closer in their discussions to each other. So we have combined them into one subcommittee. One of the items which the subcommittee is concerned with is the point which you raise of the identification number. We expect to have considerable discussion of that.

One of the problems that we face is how much detail to go into. At this point we have to identify the classes of information which are required, including the problem of an identification number of some kind and its relationship to confidentiality. We will not attempt to lay out in detail each particular way in which the information is to be gathered because, obviously, whatever unit is set up in the national health insurance program concerned with the information system will have to do that—that is, the systems development part of the program. But the issue you raise is very much under discussion.

DR. GOLDSMITH: I am from the California Health Department. I would like to ask if there is provision in the review, by the panel, of the analysis of data. The word "information" is used as though it were synonymous with "data." Unfortunately, as we all know, that is often not the case. The question I am concerned with is whether the data information linkage will include the competence and resources for analysis, comparative statement, and interpretation within the data information network; whether this will be something which will be left in the gap; or whether this will be a responsibility that is assumed by the managers of the national health insurance.

It seems to me that one of the lessons we should be learning is that the value of data provided is conditioned on the analysis that will yield information and that we ought to make sure in these plans that this analysis is allowed for and supported.

DR. DENSEN: I am very glad you raised that question because it gives me a chance to do a little advertising. Some 2 or 3 years ago, I was asked by the Regional Medical Program in New York City to develop a White Paper on measuring the impact of national health insurance, in this case in New York City. It really does not matter if you are talking about New York City or someplace else; the basic principles remain the same. ("Measurement of the Impact of National Health Insurance—A Conceptual Framework" on the impact of National Health Insurance on New York, Marvin Lieberman, editor: Prodist, N.Y. 1977) It has served as a framework for the discussion of the task force.

One of the major concerns of the task force is not just data, but information. What kinds of questions should be answered by the information system? How

will you use these kinds of data? It is expected that the report will emphasize strongly the issue of analysis. This is one reason why we want to have the legislation make it very clear that analysis is required and reports to Congress are required, so that you do not wind up with reams and reams of numbers but no information. That is a very critical point that is very much in front of the task force.

MR. GEOFFREY: I have spent the last 4 years working to try to help to get PSRO's set up in Virginia. This morning I was amazed at the lack of any reaction or sensitivity to the point that was made by the gentleman who is a consultant. I know of no single issue that I have dealt with in the last 4 years that stirred up more upset and even paranoia to a certain extent than the issue of individual identifications and the flow of that information into some monstrous computer system in Baltimore or someplace where it can then be linked with other information, perhaps having nothing to do with the purposes for which the data were originally collected. This particular feeling was warmed up quite a bit when HEW released data which involved the purported earnings of physicians.

They also released, unsolicited, the 20 percent Medicare sample, which was sent, as I said, unsolicited, to the PSRO's and to the HSA's, which in effect makes it completely public information. These data were thought to have been collected for a particular purpose, namely, management of the Medicare-Medicaid program. Here they were again put forth to further what seemed to be purposes not related to those for which they were collected.

I think, to carry this to perhaps an absurd extreme, we might wind up with more efficiency if we had our names or numbers stamped on our forearm and every suit had a hole cut in it, so that you could see a person's number very easily.

I think that this is something easy for this particular group, which is more statistically oriented and interested in efficiency, and I have been in that field myself for most of my life. But there are factors which far transcend the interests of this type for efficiency and effectiveness and get down to some fundamental gut issues. I do think that this has got to be considered, or the statistical fraternity is going to be labeled as the black hats, the bad guys. That is not what they have been accustomed to being recognized as.

DR. DENSEN: Thank you very much. As I said earlier, one of the reasons for organizing this session today was to get your views at this early stage of the deliberations of the task force, so that we can incorporate them in the program. We do have on the task force a physician who is very much concerned with some of the issues which you are speaking of.

I hope that those of you who are working with PSRO's would let us have the benefit of your experience in these areas so that we can incorporate them in the final report.

We are going to have to cut the questioning short at this point. There will be some time at the end for some other questions.

I would now like to ask Howard West to pick up at this point with some discussion that proceeds to some degree from the last question. What are the lessons which have been learned from the Medicare program?

THE MEDICARE DATA SYSTEM—DESIGN CONCEPTS AND SOME LESSONS LEARNED

Howard West, *Senior Associate, Moshman Associates, Inc., Washington, D.C.*

As a onetime bureaucrat and a sometime participant in considerations about the information needs for national health insurance, I welcome the opportunity to bring to this forum some of the considerations and some of the experiences that are reflected in Medicare's statistical program.

I will try to do this by describing very briefly the program itself and go on to identify the major record systems that are required to administer the program. Next, I will explain the concepts that guided the design of the Medicare data system. And finally, I will tell you about some of the data that has been available, and some of the things we learned.

The Medicare program is our first national health insurance program. When it began on July 1, 1966, it covered almost all persons over 64 years of age. Disabled persons became eligible for the program on July 1, 1973 and were entitled to cash benefits for at least two years, because they were disabled. At that time a special category of patients, those having end stage renal disease, also became eligible. Medicare now includes slightly over 11 percent of the total population—the aged and the disabled—those in our society most likely to need medical care services. Medicare enrollees account for 25 percent of the discharges from U.S. short-stay hospitals, and for almost 35 percent of the days of care provided by these short-stay hospitals.

The Medicare program is directed and controlled by a Federal agency, currently the Medicare Bureau of the Health Care Financing Administration. The same benefits are available to each person no matter where in the United States that person may go to obtain medical care services. The law and its regulations apply equally to all eligibles and to all providers of services, as appropriate, whether they are institutions, physicians, or other health professionals.

The program is in two parts, covering hospital insurance and supplementary medical insurance. It is operated on a day-to-day basis by intermediaries and Carriers. Intermediaries serve the hospital portion of the program and each hospital selects its own intermediary. Ninety percent of hospitals selected a Blue Cross Plan as their intermediary.

However, intermediaries are contractors to the government for the performance of specified functions. A primary function is the receipt and payment of hospital bills based on the Medicare share of hospital costs.

Carriers serve the medical portion of the program and were selected on essentially a State-by-State basis by the Government. The carrier functions are served by Blue Shield Plans and by health insurance companies under contract to the Government. The primary function of carriers is to pay medical bills based on the Medicare Customary and Prevailing Charge concept.

The use of intermediaries and carriers to receive, adjudicate, and pay for hospital and medical care services received by enrollees throughout the country requires centralized administrative records. These records serve key needs in the operation of the program and form the basis for the statistical system that was designed to provide data to measure and evaluate program operations.

The key program needs derive from the specifics of the laws establishing and defining the Medicare program.

There are four related computer records that are essential to the administration of the program. There is an enrollment record; a provider record; a utilization record for hospital insurance; and a payment record for medical insurance.

The Enrollment Record

The enrollment record identifies each aged or disabled person eligible for health insurance benefits and indicates whether he is entitled to hospital insurance benefits, to supplementary medical insurance benefits, or to both.

This record is used to create a health insurance card that is sent to each insured person. The card contains the individual's claim number (the number used for OASDI or railroad retirement programs). It indicates the entitlement of the individual for each of the two parts of the Medicare program. The entitlement record also contains information about each individual's age, sex, race, and State and county of residence.

The entitlement records provide the population data for each part of the program, thus serving as the base for the computation of a variety of utilization rates.

Provider Record

Every hospital, home health agency, skilled nursing facility, independent clinical laboratory, supplier of portable X-ray or outpatient physical therapy services and dialysis or transplant center must apply for participation in the Medicare program. Data on the application forms are stored in the central provider record and are updated as facilities are certified periodically,

as new ones apply for participation, or as some leave the program. When the information in this provider file is combined with utilization data, it serves to relate the characteristics of institutions and facilities furnishing care to the kinds and amounts of service used by persons insured under Medicare.

Utilization Record for Hospital Insurance

The administration of the hospital insurance (HI) program requires that two items of information be known about each person at the time of his admission to a hospital—his entitlement under the program and the extent to which he has used the benefits available to him.

When the patient is admitted to a hospital, the admission section of the inpatient hospital admission and billing form is completed by the hospital and forwarded through its intermediary to the Social Security Administration's central record. As soon as the record is checked, normally in less than 24 hours, the intermediary is informed of the patient's benefit status and of the number of days of inpatient care to which he is entitled during his current "benefit period."

This information is then forwarded to the hospital. At discharge, the hospital completes the billing section of the form and sends it to the intermediary for payment. When payment is approved, the intermediary forwards the claim to the Social Security Administration for inclusion in the central record. As part of the later process, information on diagnoses and surgical procedures are coded for a 20-percent sample of beneficiaries selected on the basis of specific combinations of digits in the health insurance claim number.

Admission and billing forms are handled in a comparable manner by home health agencies and skilled nursing facilities. The outpatient billing form is also transmitted to the Social Security Administration for entry in the central record after payment by the intermediary. Diagnoses and surgical procedures are also coded for samples of beneficiaries using such services. The samples vary by type of service. For example, the sample is 40 percent for home health services and 5 percent for outpatient hospital services. For skilled nursing care, all bills are coded.

All the information on utilization experience in hospital and skilled nursing facilities that is needed to administer the "benefit period" provision is centrally recorded. This information includes stays in certain nonparticipating institutions that meet the definition of a hospital or skilled nursing facility under the law and days of care not covered or reimbursable under the program.

Each admission and billing form contains both the beneficiary's claim number and the provider's identification number. The resulting record can be readily matched to the beneficiary files and the provider files. By this process, a statistical tape record is created for the sample of insured persons that contains all the available information needed for tabulation from the three files related to HI utilization.

Payment Record for Medical Insurance

Reimbursement under the SMI program is made only after receipt by the carriers of bills with allowed charges in excess of $60 (the deductible amount) during a calendar year.

For the enrolled population, carriers need to know from a central source the amount of deductible that has been met; thereafter, during the remainder of the calendar year, the only additional information required from the Social Security Administration for reimbursement or payment purposes is whether the person is still enrolled under the SMI program.

For administration and operation of the SMI program, the Social Security Administration must have accurate and complete information on the amounts paid by the carriers for physician services and for other services and supplies under this part of the program. To meet these needs, carriers furnish a payment record consisting of tape, punched card, or other machine-readable form of each bill paid. A "bill" is defined as a request for payment from or on behalf of a beneficiary as the result of services provided by a single physician or supplier.

The payment record also contains the beneficiary's claim number. Thus, it can be linked with the records for other types of services used by the beneficiary and with the entitlement record to provide a summary of each individual's utilization and reimbursement under Medicare.

Prior to 1973, another record was part of the statistical system. This record contained information on the utilization of and charges for specific physician and other services covered under the supplementary medical insurance program. The information was obtained from bills paid by intermediaries to or on behalf of a continuous 5 percent sample of persons enrolled for SMI. This sample was temporarily suspended for services provided after 1972.

Design Concepts

The Medicare Data System was designed to conform entirely to the administrative record system. The enrollment record contains the modified Social Security Number assigned to each enrolled person. This record provides both a population base and the information that allows all use of medical care services to be linked to each enrollee. Information (bills) on utilization of hospital and other institutional and related services provided under Part A identifies both the enrollee and the provided and can be linked both to the enrollee record and to the institutional record. Information (bills) on utilization of physicians and other services provided under Part B identifies both the enrollee and the physician and can be linked to both.

Since information about selected characteristics of each provider and each enrollee is kept centrally and remains relatively fixed, only information (name and

number) sufficient to identify enrollees and providers in the respective tape records needs to be captured from the bill records.

Given these record systems and their linkages, the design of the statistical system was calculated to make efficient use of the administrative record systems for the production of data to measure and evaluate the program. One significant problem was to assure that the billing forms included the basic information needed for these purposes. A key innovation was the requirement that the patient's diagnosis or condition be reported on the Part B billing form for each medical or surgical procedure for which charges were made.

The specification of samples of a size appropriate to the specific cluster of information was a major factor in achieving efficiency in statistical operations. All samples are samples of enrollees and are based on the health insurance claim number. The smallest sample, a 5 percent sample of enrollees for whom Part B bill summary records are processed, is a subsample of the 20 percent sample of enrollees for whom hospital discharge information is coded and tabulated. Thus it is possible to link all of the data available for each type of covered service to a 5 percent sample of enrollees.

Another basic design concept was that all data would be derived from individual records of services provided and that all statistical processing of these data would be centralized. Thus all coding can achieve controlled maximum levels of inaccuracy. And since all information in the system derives from individual records, it is possible to combine and manipulate these data in an almost infinite number of ways to meet unanticipated needs.

The underlying design concept, as you surely have recognized, was to implement a statistical system that provided medical care data about individual persons over time. This was and remains a unique concept in this country. With rare exception, data systems in the United States focus on the experience of providers over time, and information about people is cross-sectional.

Information about people over time can provide us with a markedly expanded understanding of medical care needs and of the responses of the medical care system to these needs. A paper by Marion Gornick in the Social Security Bulletin in June 1977 [1] dealt in part with multiple stays by the aged in short-stay hospitals. I quote:

> "The number of discharges for each patient was computed for 1972. The data showed that 73 percent had one stay only and 27 percent had two or more hospitalizations in that year. Persons with multiple stays accounted for 48 percent of all discharges. Similar percentages were found for 1973. When the data were merged for the 2-year period 1972–73, the rate of multiple hospitalization and the proportion of all discharges attributable to those with multiple stays increased substantially.
>
> The data for that period indicate that repeated hospitalization of the Medicare population is a significant factor in the use of hospital services. About 36 percent of all hospitalized enrollees had two or more hospital stays during the 2-year period, and these patients accounted for more than 61 percent of all discharges."

In an earlier article, Gornick [2] examined the number of times people aged 65 and over and enrolled for SMI continuously from July 1, 1966 to December 31, 1974, met the SMI deductible. Again, I quote:

> "Data were generated from the records of the 17.7 million aged persons enrolled in SMI on the day that Medicare operations began. Their median age was then about 73. Nearly 9.5 million of these persons were still enrolled as of December 31, 1974. In their 8 1/2 years of continuous enrollment, they had nine opportunities to meet the SMI deductible. The deductible status of these survivors was tabulated to determine how many times they used sufficient services to meet the deductible. Almost 84 percent met the deductible at least once, and nearly one-fourth met the deductible six times or more. On the other hand, 16.3 percent of these aged persons never met the SMI deductible, and an additional 14.2 percent met it only once out of nine possible times."

The capacity of the Medicare data system to link and interrelate data makes it possible to categorize the various combinations of services used by persons enrolled in the two parts of the program. I have combined all of the categories of services used and the reimbursements made for these services for those enrollees using inpatient hospital services during each year, 1968 and 1969.[3] During 1968, 19.5 percent of the aged were hospitalized. Reimbursement for the cost of hospital care and the related services (physician, extended care, home health, etc.) that may have been used by these patients came to 90.2 percent of total reimbursements in 1968. In 1969 these figures were 20.2 percent of persons and 89.8 percent of total Medicare reimbursements.

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[1] Medicare Patients: Geographic Differences in Hospital Discharge Rates and Multiple Stays. Marion Gornick, Social Security Bulletin June 1977, Volume 40, No. 6.

[2] Ten Years of Medicare: Impact on the Covered Population, Marion Gornick, Social Security Bulletin July 1976, Volume 39, No. 7.

[3] Source: Table B Medicare: Health Insurance for the Aged, 1969 Section 1, Summary Utilization and Reimbursement by Person, U.S. Department of Health, Education, and Welfare, Social Security Administration, Office of Research and Statistics, DHEW Publication No. (SSA) 75-11704.

Discussion

The administrative records system for the Medicare Program has continued to function in essentially unmodified form since July 1, 1966. During these years the statistical tabulations of data that were to be spun off from that system have become more and more difficult to complete. Perhaps the system content and tabulations were overly ambitious. Perhaps the demands for the development of effective program cost controls and medical care system cost controls have been given overriding priority. As it should, priority for computer time and computer personnel has always gone to program operations.

During this time, the two statistical systems that were a part of the overall Medicare data system, but independent of the administrative system, have been abandoned. The Current Medicare Survey, a continuing monthly interview survey of a cohort of Medicare beneficiaries over 12 month cycles, that provided data on the cost and use of both covered and non-covered medical care services, has recently been terminated. Also, the collection of copies of paid SMI claims for a 5 percent sample of beneficiaries terminated with the data for 1972. This sample has been replaced by the 5 percent sample bill summary record. This sample provides for the 5 percent sample of beneficiaries a summary record based on the individual items for each bill used by the carrier as input data in preparing reasonable charge determinations or in preparing the explanation of Medicare benefits.

The development and operation of the Medicare data system has continued to demonstrate a number of features. First, it is possible to implement the statistical system just as rapidly as the administrative system is implemented. Second, the quality of the data, its completeness and accuracy, are determined by the diligence with which the administrative system is monitored and operated. To the extent that items of data required for program evaluation are superimposed on the administrative system, it is essential that the evaluators closely monitor the quality of these data items.

Perhaps of greatest importance is the fact that the costs of the data system are minimized. Data system costs are incurred only when staff is involved in coding of information not needed for the administrative system and in data processing for program evaluation and related uses.

DR. DENSEN: In the interest of time, we will hold the questions on both these papers until the end of the next presentation.

Dr. Gail Wilensky is in charge of the analysis of the economic portion of the National Medical Care Expenditures Survey. Dr. Wilensky is an economist who is with the National Center for Health Services Research and has had considerable experience with the kinds of issues with which she is presently groping. I will let her tell you about them in detail.

INFORMATION FROM SPECIAL STUDIES

Dr. Gail R. Wilensky, *Senior Researcher, Division of Intramural Research, National Center for Health Services Research, Hyattsville, Maryland*

I am glad to see that even though I missed the last session of the technical consultant panel, that the suggestions I am going to make for special data needs are consistent with the principles that Dr. Densen outlined earlier.

What I would like to do this morning is to talk to you about some general principles for special data collection efforts and to discuss with you some of the types of surveys that I see resulting from these general principles. I am going to emphasize several times that the special data needs and information needs should be carefully related to the kinds of issues and questions which people want to have answered. This should be the guiding force for setting up any special surveys associated with national health insurance.

It seems clear to me that any specific special data needs will depend on the particular national health insurance program which is adopted. The information which will be administratively generated by an NHI program will differ according to the comprehensiveness of the program eventually enacted. A variety of plans have been discussed during the past several years, including a Kennedy comprehensive bill, a Long-Ribicoff bill, an employer-employee bill, and a catastrophic bill. Recently, there has been some discussion about a consumer choice plan, a target plan, a quasi-public corporation plan, and a publicly guaranteed plan. At this point, it is not clear which type of program will eventually be adopted.

What is important for a discussion of special data needs is that we can only count on administrative records to provide information for covered population in covered areas. This means that the less the coverage, the greater the reliance on special data collection efforts. Even comprehensive programs, however, would result in special data needs. Someone also pointed out to me this morning that there also can be a considerable difference between what is collected as a part of administrative records and what in fact ever becomes available either for analysis or planning from these records. I believe that even with a comprehensive program we will need special data collections to evaluate the effectiveness of an NHI program. This will require an understanding of the determinants of medical care utilization in general and also particular types of utilization, the cost of illnesses, and other related issues.

There are several points in time when new data bases will need to become available. Our first one is preferably a year or so prior to the enactment of an NHI program. Dr. Densen referenced a major data collection effort which is now under way and with which I am associated. This is the National Medical Care Expenditure Survey. NMCES is a survey which is cosponsored by the National Center for Health Statistics and NCHSR with data being collected by the Research Triangle Institute, the National Opinion Research Center, and Abt Associates. The survey covers 13,500 households. Information is being collected on calendar year 1977 expenditures and utilization for all types of medical care, disability days, perceived and actual health insurance, associated medical conditions, and access to medical care.

The household data is being supplemented with information from the providers of medical care, including both the physicians and hospitals which the sample of families used during calendar year 1977, and also with information on their actual health insurance coverage from their employers and health insurance companies. A sample of the physicians they visit during the year will also be asked some questions about their practices, including the number of hours they work, the visits they have had during the past week, the number of aides they employ, and several other measures describing their practice.

NMCES is more than adequate to provide the information which would be necessary for baseline data if a national health insurance program is passed within the next few years. If that is not the case, then a similar, although perhaps not quite so large, survey ought to be conducted in which information is collected on income and employment including wage rate, hours worked, sick leave benefits, et cetera; utilization by type of care and by place of care; expenditure data both in total and in terms of out-of-pocket and third-party coverage; tax data; diagnostic and condition data; time and access measures including travel time, appointment time, waiting time, et cetera; and insurance coverage.

At the present time, the National Center for Health Statistics is attempting to initiate a new survey which will make use of some of the lessons learned from the National Medical Care Expenditure Survey. This new survey, the Medical Care Utilization and Expenditure Survey, is scheduled to begin in calendar year 1979. It is possible that with some modifications this new survey could provide baseline data should national health insurance enactment be more than several years hence.

Given baseline data, we will also want to survey the population during at least two other points in time. The first time is a year after the enactment of national health insurance; from then on, every three or four years. I would like to emphasize that I think it would be a big mistake to envision these special data collection needs as requiring an annual survey. I think an annual

survey would be both onerous and unnecessary. The kinds of measures which we are talking about, utilization, income, employment and other kinds of information about the population, do not change so drastically from year to year as to make it necessary to burden the population with collection of such data on an annual basis.

As I have mentioned, the data elements to be collected ought to flow from the kinds of research issues and other issues, in terms of evaluation, planning, and management, which people will want to address. Nonetheless, I think that the general types of variables probably are the same as those that have been used on surveys for several years. The measurement of these variables, however, is likely to differ considerably.

There are two major surveys now under way which represent analytically chosen data collection efforts. These surveys should provide considerable insights into the proper measurement of these traditional variables. The surveys are the National Medical Care Expenditure Survey, which I have just mentioned, and the Rand Health Insurance Experiment. There has been substantial agreement about the major classes of variables that need to be included on a survey, up to a limit. There has been less agreement on the precise definition and measurement of these variables. I hope the individuals who will be planning these new surveys will make use of the knowledge gained from the National Medical Care Expenditure Survey and the Rand Health Insurance Experiment.

I would like to list for your consideration some of the research issues which I think will be of concern no matter which national health insurance program is adopted. These in turn define our data collection needs.

The first and probably the foremost issue relates to the distributional effects of national health insurance. Who gains and who loses? How much does it cost? How much time does it take to get the care? Essentially, are people getting what they want or "need"?

In order to understand these distributional effects we need to understand the determinants of utilization. This means understanding the demand for care and the supply of care, both in a detailed and in an aggregated way, and also what happens when these forces are out of balance. What kind of adjustment occurs, who ends up in fact actually getting services, and who ends up having only nominal access to these services?

I think that another issue which is much more difficult than the one which I have just raised but which is going to become more and more important as the public involvement in medical care grows is the effectiveness of medical care on health and also the effectiveness of alternative public health measures on health. This issue raises a host of measurement problems related to outcome, effectiveness, morbidity, and other kinds of data required to measure effectiveness of care and outcomes.

The third area that I think is likely to be important involves estimations of both the private and social costs of various kinds of illnesses. What does it mean to the individual and to society as a whole for people to have cancer, heart and lung disease, or other major diseases which affect the population? This will require episodic data, data that has careful time boundaries attached to it, in addition to all of the other data that is needed in order to do demand estimates and supply estimates; that is, information about the demographic characteristics of the population, their economic characteristics, their use, their access to medical care, et cetera.

A fourth area involves the cost and impact of national health insurance proposals other than the one that is actually adopted. I assume we will be able to learn from our experiences and will begin considering at least minor variations on whichever proposal is actually adopted as we have experience with that system.

Finally, there is an issue which I have avoided in this discussion but which I know is important to many of the individuals in the audience. That is, what are we going to do about making small area estimates? It seems to me that we have two choices.

One is that we can have a very large sample. Our most current experience with a data set that is capable of making State reliable estimates is The Survey of Income and Education. The sample for this survey was approximately 190,000 households. The collection of comprehensive health data, data over time, data which would be matched with providers of medical care and insurance companies (if the private insurance sector maintains the role it now has) would in my view be very, very expensive, but also necessary if we insist on a survey which in fact can be used at the State level.

A second possibility is to have a smaller survey and to use the synthetic estimation techniques which have been developed for small area estimations. These synthetic estimations could be verified and validated by special small area studies. I think that this is a feasible and more workable plan, but it will require a sophisticated understanding of estimation procedures by the people who are most affected as to how well these procedures work, i.e., the people who are actually responsible for local and regional estimates in health planning. I believe this is a major issue, which will have to be addressed in any special data collection effort.

DR. DENSEN: Thank you very much, Gail.

I would like to make a few general comments to pull these three presentations together and maybe serve as a basis for some of your questions.

You will recall that at the end of his discussion Mr. West pointed out some of the problems that occurred when the statistical system and the administrative system were put together. The statistical system lost out in that combination. Several things which were formerly available to provide us with information on the workings of the Medicare program no longer exist.

There is a lesson in that of some kind. We need to think about this very hard in connection with national health insurance. It relates to the comments which I made previously about wording the legislation in such a way that the kind of statistical information which is

obtained, the setting up of an analysis program, is required by the legislation and is not left to the whim of particular administrators.

Having heard Dr. Wilensky's presentation, one can raise the question of what parts of those data that are now being collected by the National Medical Care Expenditure Survey would become available in the national health insurance administrative system. This, of course, depends a great deal upon the way in which the legislation is written.

Dr. Wilensky mentioned the distributive problem as one of the areas for research and evaluation of the national health insurance program. One might also speak of this in terms of the equity issue. It is another way of saying the distributive problem.

The nature of the statistical system is going to be very much dependent on what the purposes of the legislation are. As you may have seen in an article by Robert Ball in "Science" just recently, one can have a national health insurance system or a national health program. Those are two quite different things. One is concerned with cost and the other one is concerned with health. Depending on how the legislation is written, the nature of the information to be developed will vary.

As for the small area versus the national estimates, one of the questions I think one might want to give some thought to is what role the Cooperative Health Statistics System plays in relation to that kind of an issue.

These are some general issues. You may have some suggestions and questions of the previous speakers. The floor is open for questions.

MR. COPELAND: My name is Robert Copeland with the Department of Labor. I was glad to hear you make the acknowledgment that national health insurance has practically nothing to do with health. I am concerned, however, that Dr. Wilensky listed the data needs of the system and made no mention of how we could use the system to help improve health. I would wonder if you are going to move in that direction.

DR. WILENSKY: I think that the second major research issue, as I saw it, was beginning to measure what I call the impact of medical care on health and the impact of other public health measures on health. I clearly did mean by this that one of the areas that we have to get a little more serious about is what is the relationship between medical care use for particular kinds of problems and any measurable outcome which we wish to and are able to measure.

I do think that there will be increased emphasis, if only because of the increased costs that are likely to be associated with the program, with attempting to grapple with what are the relationships between health resource use that result from such a program and any impact on what we want to call health. There are hard areas, as anyone who has tried to do research in the area has realized. I think as we become more publicly involved in health, it will be harder and harder to avoid coming to grips with these issues. I do not disagree at all.

MR. COPELAND: I would like to follow up. I should say that I want to use "health use" to get at the cause of the problem. You are talking more in terms of what happens after the use.

MR. FUCHSBERG: Dr. Wilensky stated that there was no need for an annual data collection similar to the one in the Medical Care Expenditure Survey. I agree on that, but I think you can use exactly the same amount of resources and have a continuous data collection operation. This would provide annual data on broad elements of the program and by combining several years of data make available the detailed information that is required to monitor the program. I think this would not be an added burden to either the health community or the respondents, and it would not require any additional funding.

DR. WILENSKY: I agree. I think that a lot of information will normally become available and may be needed for other purposes annually. But the kind of information which is much more detailed and is both therefore more costly and somewhat more burdensome, in the sense that it will take more time to collect, ought not to be envisioned as an annual survey, if for no other reason than that I personally would be concerned that if the choice were to do that every year or not to do it, the answer would be not to do it. I do not think it is necessary, but I think there may be other data that do in fact need to be collected on an ongoing basis.

MR. TRAXLER: I am data manager and analyst with the Florida State agency. Over the past year we have obtained, pursuant to Federal encouragement and HSA pressure, the fiscal year 1976 and 1977 Medical Cost Reports because these are supposedly public documents. Very shortly, we found out that the hospitals and the courts think otherwise.

We have had a number of court injunctions. The original such case was Parkridge Hospital, Inc., vs. Blue Cross and Blue Shield of Tennessee, which the injunctions always referenced. Section 1905 of Title 18, U. S. Code, which prohibits any public employee or officer from disclosing fiscal or statistical "competitive" information which can be used against or to the advantage of a hospital competitor, was also repeatedly referenced. Infractions are punishable by up to $1,000 and one year in jail. I have been personally threatened, but I have yet to be put in jail; I still feel uneasy.

What I am getting at is that the public information and the cost reports containing "public data," which we are encouraged to gather and to use in planning and project review activities on the one hand, and what happens in reality on the other hand are often at odds. Has the technical panel considered this issue? What

are you going to do about it? It may take years until these court issues are resolved. In the meantime, we are just in limbo. The reality of what we are required and encouraged to do and of what we actually can do is very different.

DR. DENSEN: I would like to answer the question about the availability to the public. If you look at the list of principles, you will recall that I mentioned that one of the principles should be making available information to the consumer and to the general public. So that is a very important issue.

DR. BURCH: His question brought to my mind something that was bothering me a bit and that was concerning exactly who would be able to utilize this information and also where these linkages would be performed. Is this all going to be central? Would this be in regional areas where linkages and utilization would be conducted?

I have one other concern. We are having more and more problems of people who object to giving us information on our vital statistics records because they say it is an invasion of privacy and none of our damn business. Now, what is going to be done when they have the same attitude about some of the information required for these documents?

Specifically, you mentioned that race was one of the items that would be required.

DR. WILENSKY: As a last point, typically as a portion of interviewing, if in fact you have any portion of the interview conducted by personal interview, it is not a question that is asked. It is an answer that is observed and recorded later.

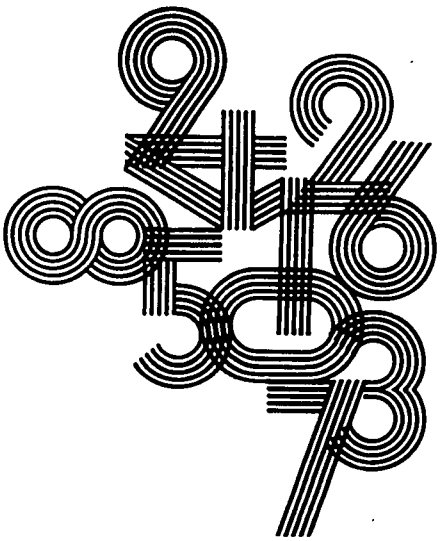
I was not indicating that that was mandatory. I was suggesting that in studies which have been done, if you are trying to measure use and you are concerned as to who is getting care, how much it costs them, both in terms of time and money, and how they are affected before and after the financing of the program, you may want to be able to say something about groups of concern, one of which has been how the black population is faring under the system. Of course, that is the reason for wanting to do that. It is not mandatory, but it clearly is useful.

DR. BURCH: Actually, what I was thinking about was the piles and piles of paper that would be having that question on them and other questions. I believe another speaker had also mentioned race being called for as one of the data items.

DR. DENSEN: Thank you.

I would like to repeat that the current statement of principles is still not the final draft. We would be very pleased if you would submit to us your suggestions regarding any of these principles, either for amplification of them or for changes in the wording. If you have such suggestions, I would appreciate it if you would send them to Maura Bluestone at the National Center for Health Statistics.

Thank you all very much for coming to this session. I would like to thank my fellow speakers for taking the time to present this to you this morning.



CONCURRENT SESSION M

Vital and Health Statistics in the Health Care System

DEVELOPMENT OF SOCIOECONOMIC MEASURES IN THE ANALYSIS OF VITAL STATISTICS DATA

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Introduction

The analysis of possible relationships between socioeconomic status and various determinants of health status presents the researcher with a long recognized problem: determining a suitable definition of what is meant by socioeconomic status. It is apparent that no one definition of a satisfactory socioeconomic indicator has been agreed upon.

Kitagawa,[1] in reference to such characteristics as marital status, race, ethnic group, education, income, occupation and housing unit of residence states "Although many of these characteristics are related to a person's socioeconomic status—however it may be defined—no one of them is directly equated with socioeconomic status in the sense that it is accepted as the sole determinant of such status or that it is a fully satisfactory index of socioeconomic status for all research purposes."

But the problem really goes beyond the situation of researchers failing to recognize a universally accepted definition of socioeconomic status. Stockwell [2] warns of the extent of the problem and its possible ramifications when he states, "The way in which socioeconomic status is defined (for example, in terms of income as opposed to education, or occupation, or some combination of these, or even other variables) will largely determine the nature and extent of any resulting relations."

Thus, when specifically dealing with vital records and the resulting vital statistics, it is not a clear choice as how one should attempt to relate mortality and natality data to socioeconomic status. The certificates of death and live birth allow for the collection of rather firm statistics on selected birth- and death-related outcome variables. The distribution of deaths by cause, the proportion of low birthweight infants and the extent of neonatal mortality, for example, can all be accurately reported on an aggregate basis, because of the sophisticated vital records registration systems in operation in this country today.

However, information related to socioeconomic status collected on the certificates is, for reasons pertaining to the issues of privacy and confidentiality, not complete. Thus, the entire problem of relating vital statistics to socioeconomic status is compounded—not only is there disagreement on what indicators should be used to measure socioeconomic status but many of the suggested alternatives are not available from vital records systems.

Available Socioeconomic Measures

Of course, recognizing such difficulties does not leave us with only one alternative—concluding that the task cannot be completed because of the lack of adequate data. The available data must be utilized in an attempt to somehow quantify the relationship between social class and health status. A review of the U.S. Standard Certificate of Live Birth, the U.S. Standard Certificate of Death, and the similar documents actually utilized by the New York State Department of Health reveals the following variables which could possibly be considered as measures of socioeconomic status, either of themselves, or in various combinations. These variables are itemized in appendix 1 of the handout.

Residence data allows for the application of U.S. Census Data to vital statistics whereby the general socioeconomic characteristics of a small geographic area such as a Census Tract or minor civil division are used as an estimate of the particular socioeconomic status of all individuals residing within that area. Numerous indices, based upon various data collected on the official census, have been utilized by a variety of researchers.[3–6]

Race has been a point of major discussion as to whether any observed differences in health status among various races are due to ethnic differences or socioeconomic differences. Because arguments have been made for the value of race information as a socioeconomic indicator, it is included in the list of possible measures of socioeconomic status. Hendricks,[7] for example, presents evidence which, it is claimed, supports the hypothesis that differences between whites and nonwhites in reproductive efficiency are "...predominantly socioeconomic rather than ethnic."

Data pertaining to occupation, as collected on vital records, is subject to some criticism as to its potential use in socioeconomic stratification, for a variety of reasons. Two principal objections are the difficulty in classifying various occupations in some sort of hierarchical system according to status and, secondly, in trying to interpret just what is being collected: usual occupation, most recent occupation, etc. Despite these difficulties, it is well recognized that occupation is generally an excellent source of information pertaining to socioeconomic status [8] if collected and classified properly.

In New York State questions pertaining to the occupation and industry of both the mother and the father

in the case of births and to the occupation and industry of the deceased for deaths are contained on the certificates. The U.S. Standard Certificate of Death, revised in January of this year, contains a similar item on occupation but no such item for the parents appears on the 1978 Revision of the U.S. Standard Certificate of Live Birth. New York State is one of a very few States which attempts to ascertain the occupation of both parents on the Certificate of Live Birth.

Education level, perhaps more than any one indicator, has been relied upon as a measure of socioeconomic status.[1 9 10 11] It is easily classifiable, has a natural order to it, and when asked for is fairly accurately reported. In New York State educational attainment is asked for on both the birth certificates and death certificates. The U.S. Standard Certificate of Live Birth recommends the use of education as a collectable item but no such item appears on the U.S. Standard Certificate of Death.

Marital status has been included by many as a socioeconomic indicator when pertaining to births. Most often its value lies in its ability to add to information available from some other indicator. The dichotomy of married-single does not lend itself to reliable socioeconomic stratification but marital status combined with education, occupation, or race has been utilized in studying the relationship between natality characteristics and socioeconomic status.

Methodology

I would now like to return to the statement of Stockwell to which I referred earlier. "The way in which socioeconomic status is defined (for example in terms of income as opposed to education, occupation, some combination of these, or even other variables) will largely determine the nature and extent of any resulting relations." I find this statement not only interesting but troublesome, in a way. Could so many studies related to socioeconomic status be really mistitled? Should articles titled "Socioeconomic Status and Its Relationship With Health Status" really be titled, "*Occupation* and Its Relationship With Health Status" or "*Educational Attainment* and Its Relationship With Health Status" or "*Race* and Its Relationship With Health Status"?

In an attempt to look further into the Stockwell statement, a set of data has been selected and various methods of socioeconomic stratification applied to that data to see if similar results are achieved. This exercise is not intended as an attempt to determine if one method of socioeconomic stratification is preferable to another. What the following is, is merely a descriptive analysis which will show, for the particular data set selected, whether the results of various socioeconomic stratification techniques yield similar or contradictory results.

All live births to residents of Albany County, New York, which were recorded in New York State, exclusive of New York City (upstate New York) for 1976 are analyzed in the following discussion. This population was selected for a variety of reasons:

1. It is part of a Standard Metropolitan Statistical Area and is thus census tracted. These tracts are entered onto the computer files of vital records maintained by the New York State Department of Health.
2. It contains a wide range of socioeconomic conditions, however measured. It has a centralized city with a typical urban population as well as a large suburban population and a considerable rural population.
3. The number of events was small enough to manually code occupation of both parents. Although New York State does ask for occupation data on its Certificate of Live Birth, the coding system and subsequent computer accessibility are just now being developed and were not available for this special study. Thus, a reasonable number of events was needed to allow for the manual work necessary to retrieve the records in question, abstract occupation information, code the occupations, and add this to a specially created computer file.

In 1976 a total of 3,242 Albany County resident births were recorded in upstate New York. These births were classified according to two outcome variables, birthweight and Apgar score. Birthweight was analyzed in two different ways—proportion of low birthweight infants and mean birthweight—while Apgar score was analyzed for the distribution of 1-minute readings.

These outcomes were tabulated separately for various socioeconomic classes, the classes being determined by four separate criteria. A description of the four methods follows and appears in appendix 2.

Method I—Maternal Education Within Race
Method II—Maternal Education Within Marital Status
Method III—Father's Occupation (Mother's Occupation Used If Not Married or Father Unemployed)
Method IV—1970 Census Tract Data for Individual Census Tracts Applied to All Residents of the Census Tract

On the New York State Certificate of Live Birth the education item is a series of check boxes for the highest year of schooling completed, ranging from 00 to 16+. In the following analysis, maternal education is tabulated by the following groups: 0–8; 9–11; 12; 13–15; and 16+. [less than high school; some high school; high school graduate; some college; college graduate]

Race is the race of the child. The New York State Certificate asks the question of race for both mother and father and the combination of these two items

determines the race of the child.

Marital status is an inferred item, not directly asked for on the New York State Certificate. If information pertaining to the father is entered on the certificate, the live birth is considered to have occurred to a married woman. Lack of information concerning the father results in the assumption, for statistical purposes, that the birth occurred to an unmarried woman. This method of estimation has been found to be a fairly accurate procedure on the aggregate level.

Occupation information is asked for both mother and father in the form of a question on occupation and a question on type of business or industry. For each live birth to a resident of Albany County where the birth was recorded in upstate New York, the microfilm copy of the birth certificate was manually retrieved and the occupation and type of business and industry abstracted. These occupations were coded on a scale of 00 to 100 according to the occupational status scores described by Nam et al. at the 1975 Meeting of the American Statistical Association.[12] The scores were later classified into five subgroups as follows:

Low	= 00
Lower Middle	= 01–39
Middle	= 40–79
Upper Middle	= 80–89
High	= 90–100

For each live birth, the occupation of the father was utilized if information on the father was given and the father was employed. If the birth was to an unmarried woman or if the father was listed as unemployed, the occupation of the mother was used. A score of 00 was thus coded only when both parents were unemployed or the birth was to an unmarried woman who was listed as unemployed or a housewife.

The New York State Department of Health codes census tract on each certificate of live birth according to the address of the mother. These census tracts have been assigned a score according to the general characteristics of the population residing in the tract as of the 1970 Census.[3]

The socioeconomic score (SES) of each tract varies from 0 to 12 and is a combination of the median school years completed by the adult population of the tract, the percent unskilled workers in the tract, and the median family income in the tract. For the purpose of this analysis, the scores were grouped as follows:

Low	= 0–4
Lower Middle	= 5–6
Middle	= 7–9
Upper Middle	= 10–11
High	= 12

The Cross Classification of Socioeconomic Variables

The major socioeconomic variables considered in this discussion are maternal education, father's occupation (mother's occupation used if not married or father unemployed), and the socioeconomic score based upon the resident census tract of the mother. The following discussion does not consider race or marital status, which will be considered later in this paper.

Table 1 presents maternal education cross classified by socioeconomic score of census tract. If one considers those combinations on the diagonal or within one of the diagonals to be in agreement, approximately 74 percent of 3,242 individuals are similarly categorized by the two methods. An interesting interpretation of this table arises if one considers maternal education level as a measure of "potential" and census tract of residence as an "achieved" state. Of the 852 individuals whose education level and SES do not agree, 272 (32 percent) are above the diagonal and 580 (68 percent) are below. Those below the diagonal could be considered those individuals whose education level would indicate a higher SES than actually achieved while those above the diagonal could be considered those whose education level would indicate a lower SES than actually achieved. Interestingly, there are nearly twice

Table 1. ALBANY COUNTY NEW YORK RESIDENT LIVE BIRTHS RECORDED IN UPSTATE NEW YORK BY MATERNAL EDUCATION AND CENSUS TRACT SOCIOECONOMIC SCORE 1976

Maternal Education In Completed Years Of Schooling	Socioeconomic Score of Census Tract I (0–4)	II (5–6)	III (7–9)	IV (10–11)	V (12)	Total
0–8	49	10	29	4	0	92
9–11	249	59	147	47	29	531
12	259	131	485	245	163	1,283
13–15	69	63	216	163	156	667
16+	24	27	138	151	223	563
Not Stated	26	11	41	19	9	106
Total	676	301	1,056	629	580	3,242

as many individuals whose "achieved" state falls below their "potential" than the other way around.

Maternal education and father's occupation, as defined earlier, are compared in table 2. The total agreement is slightly better for these two variables, approximately 80 percent. The same phenomenon is seen if one considers occupation an "achieved" state, only much more decisively. Nearly 89 percent of those not in agreement are below the diagonal, indicating a father's occupation below the level one would expect considering maternal education.

Table 3 compares the two variables considered "achieved" states: resident census tract SES and father's occupation. There is an agreement of approximately 71 percent between these two variables.

Without considering any outcome variables, tables 1 through 3 seem to indicate a fair degree of consistency in allocating the individuals under study to hierarchical categories of socioeconomic status by the three major criteria considered.

Birthweight As An Outcome Variable

Tables 4 through 11 summarize the results of classifying the mean birthweight and the proportion of live births with weight less than or equal to 2500 grams by socioeconomic status as defined by the four methods described earlier. Of the 3,242 live births considered, a total of 3,219 had birthweight stated on the Certificate and are considered for analysis in this section of the paper.

In tables 4 and 5 the birthweight characteristics are tabulated by maternal education and race (method 1 of socioeconomic stratification). It should be emphasized that we are dealing with small numbers, particularly among nonwhites. This will affect interpretation, but the emphasis in this section concerns methodology and, in this context, I feel comfortable in proceeding.

Among whites, there appears to be a positive relationship between birthweight and education at the lower levels of education while this positive relationship among nonwhites is in evidence at the higher levels of education. Once a level of 12 completed years of school is achieved for the whites, both the mean birthweight and the proportion of births with birthweight less than or equal to 2500 grams remain fairly stable. For nonwhites, the three lower levels of maternal education are quite similar while the two upper levels are considerably "better" and are approaching those results shown for whites. From this particular

Table 2. ALBANY COUNTY NEW YORK RESIDENT LIVE BIRTHS RECORDED IN UPSTATE NEW YORK BY MATERNAL EDUCATION AND OCCUPATION OF FATHER* 1976

Maternal Education In Completed Years Of Schooling	Occupation Status Score I (00)	II (01–39)	III (40–79)	IV (80–89)	V (90–100)	Total
0–8	46	34	11	1	0	92
9–11	233	159	117	15	7	531
12	176	349	603	116	39	1,283
13–15	34	101	324	140	68	667
16+	10	33	209	130	181	563
Not Stated	52	18	23	8	5	106
Total	551	694	1,287	410	300	3,242

*Occupation of Mother used if unmarried or father listed as unemployed.

Table 3. ALBANY COUNTY NEW YORK RESIDENT LIVE BIRTHS RECORDED IN UPSTATE NEW YORK BY OCCUPATION OF FATHER* AND CENSUS TRACT SOCIOECONOMIC SCORE 1976

Occupation Status Score	Socioeconomic Score of Census Tract I (0–4)	II (5–6)	III (7–9)	IV (10–11)	V (12)	Total
I (00)	282	48	164	36	21	551
II (01–39)	207	95	220	103	69	694
III (40–79)	158	117	476	277	259	1,287
IV (80–89)	21	27	126	132	104	410
V (90–100)	8	14	70	81	127	300
Total	676	301	1,056	629	580	3,242

*Occupation of Mother used if unmarried or father listed as unemployed.

Table 4. ALBANY COUNTY NEW YORK
RESIDENT LIVE BIRTHS RECORDED IN UPSTATE NEW YORK MEAN BIRTHWEIGHT FOR LIVE BIRTHS WITH BIRTHWEIGHT STATED BY MATERNAL EDUCATION AND RACE
1976

Maternal Education In Completed Years Of Schooling	Whites		Nonwhites	
	No. of Live Births With Birthweight Stated	Mean Birthweight In Grams	No. of Live Births With Birthweight Stated	Mean Birthweight In Grams
0–8	76	3087.2	16	2967.8
9–11	388	3258.6	136	3030.8
12	1,134	3357.6	139	2925.7
13–15	623	3410.5	42	3246.2
16+	530	3395.2	30	3378.7
Total With Education Stated	2,751	3355.4	363	3041.4
Education Not Stated	83	3430.2	22	3138.9

Table 5. ALBANY COUNTY NEW YORK
RESIDENT LIVE BIRTHS RECORDED IN UPSTATE NEW YORK PROPORTION OF BIRTHS WITH BIRTHWEIGHT STATED WEIGHING LESS THAN OR EQUAL TO 2500 GRAMS BY MATERNAL EDUCATION AND RACE
1976

Maternal Education In Completed Years Of Schooling	Whites Number of Live Births		%	Nonwhites Number of Live Births		%
	With Birthweight Stated	≤2500 Grams	≤2500 Grams	With Birthweight Stated	≤2500 Grams	≤2500 Grams
0–8	76	9	11.8	16	3	18.8
9–11	388	40	10.3	136	16	11.8
12	1,134	66	5.8	139	27	19.4
13–15	623	30	4.8	42	1	2.4
16+	530	24	4.5	30	1	3.3
Total With Education Stated	2,751	169	6.1	363	48	13.2
Education Not Stated	83	4	4.8	22	3	13.6

Table 6. ALBANY COUNTY NEW YORK
RESIDENT LIVE BIRTHS RECORDED IN UPSTATE NEW YORK MEAN BIRTHWEIGHT FOR LIVE BIRTHS WITH BIRTHWEIGHT STATED BY MATERNAL EDUCATION AND MARITAL STATUS
1976

Maternal Education In Completed Years Of Schooling	Married		Not Married	
	No. of Live Births With Birthweight Stated	Mean Birthweight In Grams	No. of Live Births With Birthweight Stated	Mean Birthweight In Grams
0–8	61	3073.7	31	3052.2
9–11	354	3250.6	170	3093.1
12	1,148	3345.8	125	2985.4
13–15	638	3402.0	27	3356.2
16+	545	3393.7	15	3417.5
Total With Education Stated	2,746	3350.0	368	3085.6
Education Not Stated	76	3392.0	29	3309.3

data it is apparent that a higher level of maternal education is necessary for nonwhites to achieve birthweight characteristics similar to those of less educated whites. The very nearly equal characteristics for whites and nonwhites at the higher levels of education would be an argument for some that race information is valuable in measuring socioeconomic differences rather than ethnic differences.

Tables 6 and 7 present cross tabulations of the birthweight variables by maternal education level and marital status. Very similar results can be seen when comparing these tables with those of maternal education and race. Among the married, education appears to have an impact upon birthweight until the level of 12 completed years of school is achieved. The higher three educational levels appear fairly consistent. Among those estimated to be not married, as with nonwhites, the lower three educational levels appear similar for mean birthweight while the higher two levels are nearly equal. Small numbers among the unmarried group make interpretation of the data in table 7 difficult but, overall, it appears that the utilization of maternal education within race yields similar results to the utilization of maternal education within marital status.

Tables 8 and 9 show the birthweight data by the five occupation status groupings described earlier. As with our previous discussion, the socioeconomic status (as measured by occupation) appears to have a positive relationship with birthweight with the most pronounced effect at the lower levels of the occupational status scores. Again, we can observe the remarkably similar data for the three higher levels of occupation status that was apparent with the three higher levels of maternal education for whites and for the three higher levels of maternal education for married women.

The assigned socioeconomic scores of resident census tracts are presented with the associated birthweight data in tables 10 and 11. The positive associations exhibited earlier are again repeated. A slight variation

Table 7. ALBANY COUNTY NEW YORK
RESIDENT LIVE BIRTHS RECORDED IN UPSTATE NEW YORK PROPORTION OF BIRTHS WITH BIRTHWEIGHT STATED WEIGHING LESS THAN OR EQUAL TO 2500 GRAMS BY MATERNAL EDUCATION AND MARITAL STATUS
1976

Maternal Education In Completed Years Of Schooling	Married Number of Live Births		%	Not Married Number of Live Births		%
	With Birthweight Stated	≤2500 Grams	≤2500 Grams	With Birthweight Stated	≤2500 Grams	≤2500 Grams
0–8	61	9	14.8	31	3	9.7
9–11	354	30	8.5	170	26	15.3
12	1,148	69	6.0	125	24	19.2
13–15	638	31	4.9	27	0	0.0
16+	545	23	4.2	15	2	13.3
Total With Education Stated	2,746	162	5.9	368	55	14.9
Education Not Stated	76	3	3.9	29	4	13.8

Table 8. ALBANY COUNTY NEW YORK
RESIDENT LIVE BIRTHS RECORDED IN UPSTATE NEW YORK MEAN BIRTHWEIGHT FOR LIVE BIRTHS WITH BIRTHWEIGHT STATED BY OCCUPATION OF FATHER*
1976

Occupation Status Score	Number of Live Births With Birthweight Stated	Mean Birthweight In Grams
I (00)	544	3131.5
II (01–39)	690	3301.9
III (40–79)	1,282	3374.5
IV (80–89)	407	3363.6
V (90–100)	296	3417.3
Total With Birthweight Stated	3,219	3320.4

*Occupation of Mother used if unmarried or father is listed as unemployed.

Table 9. ALBANY COUNTY NEW YORK
RESIDENT LIVE BIRTHS RECORDED IN UPSTATE NEW YORK PROPORTION OF BIRTHS WITH BIRTHWEIGHT STATED WEIGHING LESS THAN OR EQUAL TO 2500 GRAMS BY OCCUPATION OF FATHER*
1976

Occupation Status Score	Number of Live Births With Birthweight Stated	Number of Live Births ≤2500 Grams	% ≤2500 Grams
I (00)	544	69	12.7
II (01–39)	690	53	7.7
III (40–79)	1,282	67	5.2
IV (80–89)	407	19	4.7
V (90–100)	296	16	5.4
Total With Birthweight Stated	3,219	224	7.0

*Occupation of Mother used if unmarried or father listed as unemployed.

Table 10. ALBANY COUNTY NEW YORK
RESIDENT LIVE BIRTHS RECORDED IN UPSTATE NEW YORK
MEAN BIRTHWEIGHT FOR LIVE BIRTHS WITH BIRTHWEIGHT STATED BY CENSUS TRACT SOCIOECONOMIC SCORE
1976

Socioeconomic Score of Resident Census Tract	Number of Live Births With Birthweight Stated	Mean Birthweight
I (0–4)	672	3147.4
II (5–6)	300	3299.5
III (7–9)	1,050	3331.6
IV (10–11)	621	3419.7
V (12)	576	3405.8
Total With Birthweight Stated	3,219	3320.4

Table 11. ALBANY COUNTY NEW YORK
RESIDENT LIVE BIRTHS RECORDED IN UPSTATE NEW YORK
PROPORTION OF LIVE BIRTHS WITH BIRTHWEIGHT STATED WEIGHING LESS THAN OR EQUAL TO 2500 GRAMS BY CENSUS TRACT SOCIOECONOMIC SCORE
1976

Socioeconomic Score of Resident Census Tract	Number of Live Births With Birthweight Stated	Number of Live Births ≤2500 Grams	% ≤2500 Grams
I (0–4)	672	76	11.3
II (5–6)	300	25	8.3
III (7–9)	1,050	69	6.6
IV (10–11)	621	25	4.0
V (12)	576	29	5.0
Total With Birthweight Stated	3,219	224	7.0

can be noted, however, in the groupings of levels which appear similar. The middle level of socioeconomic score for both mean birthweight and proportion of births of low birthweight appear better grouped with the lower levels of SES rather than the higher. However, the same general relationship is observed.

Apgar Score As An Outcome Variable

Tables 12 through 15 summarize the results of Apgar scores at 1 minute by the various measures of socioeconomic status under consideration. This score is an international code used for evaluation of infants at 1 minute and 5 minutes after birth.[13] Of the 3,242 births under consideration, 3,171 had one minute Apgar scores entered on the birth certificate, attesting to the widespread utilization of this evaluation tool.

As a measure of outcome, the proportion of live births with scores below 7 are calculated by the various levels of socioeconomic status under consideration. Table 12 shows a similar proportion of low Apgar scores taken at one minute at the four higher levels of educational attainment, all of which are considerably below that of the lowest level of educational attainment. The upper levels of education among nonwhites

Table 12. ALBANY COUNTY NEW YORK
RESIDENT LIVE BIRTHS RECORDED IN UPSTATE NEW YORK
PROPORTION OF LIVE BIRTHS WITH 1 MINUTE APGAR SCORE STATED HAVING SCORE LESS THAN OR EQUAL TO SIX BY MATERNAL EDUCATION AND RACE
1976

Maternal Education In Completed Years of Schooling	Whites			Nonwhites		
	Number of Live Births With 1 Min. Apgar Stated	≤6	% With 1 Min. Apgar ≤6	Number of Live Births With 1 Min. Apgar Stated	≤6	% With 1 Min. Apgar ≤6
0–8	75	10	13.3	15	2	13.3
9–11	384	30	7.8	136	16	11.8
12	1,123	99	8.8	135	24	17.8
13–15	608	48	7.9	42	1	2.4
16+	521	41	7.9	30	3	10.0
Total With Education Stated	2,711	228	8.4	358	46	12.8
Education Not Stated	80	2	2.5	22	6	27.3

Table 13. ALBANY COUNTY NEW YORK
RESIDENT LIVE BIRTHS RECORDED IN UPSTATE NEW YORK
PROPORTION OF LIVE BIRTHS WITH 1 MINUTE APGAR SCORE STATED HAVING SCORE LESS THAN OR EQUAL TO SIX BY MATERNAL EDUCATION AND MARITAL STATUS
1976

Maternal Education In Completed Years Of Schooling	Married			Unmarried		
	Number of Live Births With 1 Min. Apgar Stated	≤6	% With 1 Min. Apgar ≤6	Number of Live Births With 1 Min. Apgar Stated	≤6	% With 1 Min. Apgar ≤6
0–8	59	9	15.3	31	3	9.7
9–11	350	26	7.4	170	20	11.8
12	1,136	103	9.1	122	20	16.4
13–15	622	48	7.7	28	1	3.6
16+	537	43	8.0	14	1	7.1
Total With Education Stated	2,704	229	8.5	365	45	12.3
Education Not Stated	73	2	2.7	29	6	20.7

Table 14. ALBANY COUNTY NEW YORK
RESIDENT LIVE BIRTHS RECORDED IN UPSTATE NEW YORK
PROPORTION OF LIVE BIRTHS WITH 1 MINUTE APGAR SCORE STATED HAVING SCORE LESS THAN OR EQUAL TO SIX BY OCCUPATION OF FATHER*
1976

Occupation Status Score	Number of Live Births With: 1 Min. Apgar Stated	1 Min. Apgar ≤6	% With 1 Min. Apgar ≤6
I (00)	534	73	13.7
II (01–39)	682	68	10.0
III (40–79)	1,256	95	7.6
IV (80–89)	404	28	6.9
V (90–100)	295	18	6.1
Total	3,171	282	8.9

*Occupation of Mother used if unmarried or father listed as unemployed.

Table 15. ALBANY COUNTY NEW YORK
RESIDENT LIVE BIRTHS RECORDED IN UPSTATE NEW YORK
PROPORTION OF LIVE BIRTHS WITH 1 MINUTE APGAR SCORE STATED HAVING SCORE LESS THAN OR EQUAL TO SIX BY CENSUS TRACT SOCIOECONOMIC SCORE
1976

Socioeconomic Score of Resident Census Tract	Number of Live Births With: 1 Min. Apgar Stated	1 Min. Apgar ≤6	% With 1 Min. Apgar ≤6
I (0–4)	662	80	12.1
II (5–6)	291	30	10.3
III (7–9)	1,038	98	9.4
IV (10–11)	614	39	6.4
V (12)	566	35	6.2
Total	3,171	282	8.9

show proportions similar to whites as does the lowest level of education. The middle maternal education groups (years completed of 9 through 12) exhibit considerably larger proportions for nonwhites. Apparently this data tends to show no differences in the proportion of low Apgar scores between the races at the extremes of maternal educational attainment. Again, this would be an argument for some that differentials in pregnancy outcome among whites and nonwhites is a socioeconomic phenomenon and not an ethnic differential.

The data in table 13, the proportion of low Apgar scores by education of the mother and marital status, appear very similar to the data in table 12. In fact, at the extremes of education level, the unmarried women actually appear to be doing better than the married women. Of course, we again must realize the small numbers we are dealing with.

The occupational status scores and assigned socioeconomic scores to resident census tracts are tabulated for the proportion of low one minute Apgar readings in tables 14 and 15. The same downward trend in the proportion of low scores as socioeconomic status increases is observed.

Summary

In summary, data available on certificates of vital events which can be used as measures of socioeconomic status are very limited. For mortality data such indicators are limited to items on residence, race, occupation and education. For natality data these same measures for the parents are available plus marital status.

Analyzing a small data set of 3,242 Albany County, New York, resident live births for 1976 leads to the conclusion that sensible use of any of these potential indicators, either alone or in combination, results in similar findings, at least in outcomes measured by birthweight and one minute Apgar scores. The utili-

zation of aggregate data available for small areas such as census tracts, collected on the United States Census, appears to be a valuable tool in assessing socioeconomic differentials.

Future advancements in the development of socioeconomic measures in the analysis of vital statistics data may well be centered in the area of occupation coding. Such items are not now universally collected. The development of usable coding structures together with more widespread collection of such data may well lead to more accurate categorization of attained socioeconomic status as related to vital statistics.

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APPENDIX 1

Socioeconomic Variables Available on Birth and Death Certificates

U.S. Standard	New York State
Certificate of Live Birth	
Residence Data of Mother	Residence Data of Mother
Mother's Race	Mother's Race
Father's Race	Father's Race
Marital Status	Marital Status Inferred
Mother's Education	Mother's Education
Father's Education	Father's Education
	Mother's Occupation and Industry
	Father's Occupation and Industry
Certificate of Death	
Residence Data of Deceased	Residence Data of Deceased
Race of Deceased	Race of Deceased
Usual Occupation and Industry	Usual Occupation and Industry
	Education of Deceased

APPENDIX 2

Criteria For Socioeconomic Classification

Method I —Maternal Education Within Race

For each birth under consideration, the highest year of school completed by the mother was classified into one of the following groups:

0–8 years
9–11 years
12 years
13–15 years
16+ years

These educational classifications were applied to whites and nonwhites separately.

Method II —Maternal Education Within Marital Status

The same educational groups were utilized as in Method I and applied to married women and unmarried women separately. Marital status was inferred from information or lack of information pertaining to the father on the certificate.

Method III —Father's Occupation With Mother's Occupation Used if the Mother is Unmarried or the Father is Listed as Unemployed

Each occupation was coded to an occupational status score ranging from 00–100 according to the method described by Nam and his co-authors at the 1975 Meeting of the American Statistical Association. These scores were then grouped as follows:

Low – 00
Lower Middle – 01–39
Middle – 40–79
Upper Middle – 80–89
High – 90–100

Method IV —1970 Census Tract Data for Individual Census Tracts Applied to All Residents of the Census Tract

Each Census Tract in Albany County New York was assigned a score, ranging from 0 to 12 according to the following system, based upon U.S. Census Data compiled in 1970.

Socioeconomic Score (SES) equals the sum of the values for the three characteristics of the individual census tract. For example, if the population of an individual tract had nine median school years completed, 20 percent unskilled workers and $10,000 median family income, the SES would be 5 (1 + 2 + 2).

The tracts were then grouped into the following categories for the purpose of this paper.

Low = 0–4
Lower Middle = 5–6
Middle = 7–9
Upper Middle = 10–11
High = 12

Value	Characteristics		
	Median School Years	Percent Unskilled Workers	Median Family Income
0	0.00–8.49	35.0+	0–5,599
1	8.50–9.74	22.0–34.9	5,600–8,499
2	9.75–10.99	14.5–21.9	8,500–10,199
3	11.00–11.99	11.5–14.4	10,200–12,249
4	12.00+	0.0–11.4	12,250+

ABORTION STATISTICS

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INTRODUCTION

Abortion is a very emotional and controversial issue. The collection of statistics on abortion, however, should be neither emotional nor controversial. In July, 1976, the United States Supreme Court, in its decision on Planned Parenthood of Central Missouri versus Danforth, and Danforth versus Planned Parenthood of Central Missouri 44 U.S.L.W. 5197, ruled that States could require physicians and health facilities to report all abortions to the State health department as long as these requirements were "reasonably directed to the preservation of maternal health and ... properly respect a patient's confidentiality and privacy."[1]

Currently, several States have no reporting systems or only voluntary reporting systems. Those States that do have mandatory reporting require the reporting of various items on various forms. In an attempt to help standardize the information on abortion, the National Center for Health Statistics (NCHS) recommended the U.S. Standard Report of Induced Termination of Pregnancy to be adopted in January, 1978 (see figure 1). This form was part of the standard certificate package developed by a technical consultant panel.

This paper examines the various sources of national abortion data, the ways in which these are collected, the actual information that is collected and some of the possible uses of these data.

SOURCES OF NATIONAL DATA

Currently, there are two major sources of national abortion statistics—the Center for Disease Control (CDC) and the Alan Guttmacher Institute (AGI). NCHS has also begun collecting information on abortions. The three sources of data are different in terms of the methods of collection and the statistics that can be produced as well as in terms of the possible uses of these statistics.

Center for Disease Control (CDC)

CDC began collecting medical and demographic information on women having legally induced abortions in 1969. It generally relies on the central health agency in each State to collect these data. However, for those States that do not collect statewide data, CDC surveys hospitals and facilities. CDC *only* collects summary information. Annually, since 1969, it has produced the *Abortion Surveillance Report* [2], which includes tabulations on the number of abortions by State of occurrence, residence status, age, race, marital status and number of living children, types of procedures, weeks of gestation, types of procedures by weeks of gestation, and number of previous induced abortions.

Alan Guttmacher Institute (AGI)

AGI began collecting information on the number of abortions following the 1973 United States Supreme Court decision legalizing abortion. It has conducted three surveys of hospitals, facilities, and a sample of physicians providing abortions. It collects only the number of abortions performed quarterly. From this information, AGI produces tabulations of the number of reported abortions by State, type of provider, and by Standard Metropolitan Statistical Area (SMSA) of occurrence; it also provides estimates of the need for abortion services in the United States, each State and SMSA, by metropolitan residence and poverty status. AGI has produced two reports containing this information.[3]

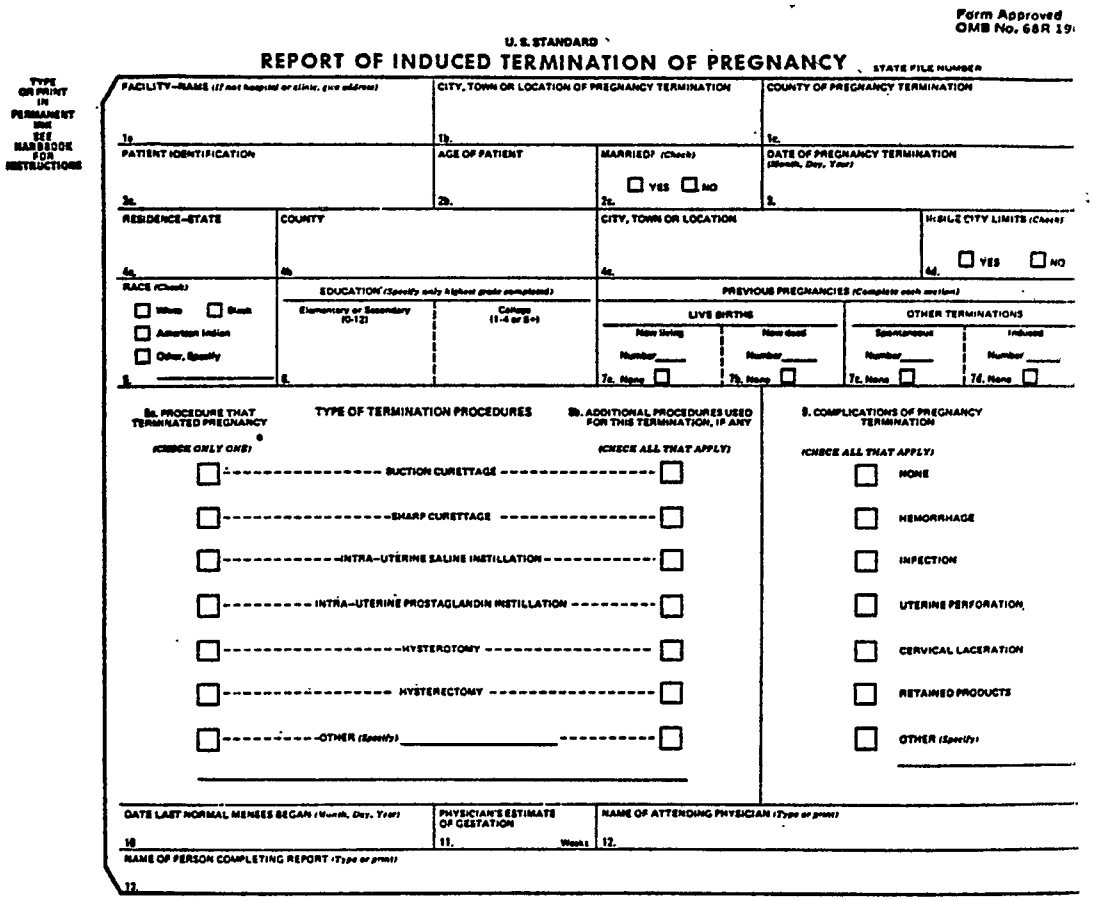
National Center for Health Statistics (NCHS)

NCHS began collecting data on abortions from five States (New York State, Vermont, Kansas, Nebraska, and Oregon) in 1977. Like CDC, we rely on the central health agency in the State to collect this information. More specifically, we have relied on the State Vital Statistics Office. We receive information on *each* woman obtaining an abortion. This information is transmitted to us on magnetic tape through the Cooperative Health Statistics System (CHSS) contracts. As mentioned previously, NCHS recommended a U.S. Standard Report of Induced Termination of Pregnancy, which includes demographic information on the woman such as age, race, marital status, educational attainment, number and type of previous terminations, and place of residence. It also includes medical information such as type of procedure, complications, length of gestation, and type of facility. So far, we have published no data; but we expect to publish the data for the five States in the system in 1977 later this year in a Supplement to the NCHS publication *Monthly Vital Statistics Report.*

In 1978, we have added four States (Illinois, Tennessee, South Carolina and Virginia) and in 1979, we expect to add five more States. For a State to be eligible to join the system it must meet the following criteria:

> It must have mandatory reporting of data on individuals, use a form similar to the standard in

FIGURE 1



Form Approved
OMB No. 68R 19

U. S. STANDARD

REPORT OF INDUCED TERMINATION OF PREGNANCY

STATE FILE NUMBER

TYPE OR PRINT IN PERMANENT INK SEE HANDBOOK FOR INSTRUCTIONS

FACILITY–NAME (If not hospital or clinic, give address) 1a.	CITY, TOWN OR LOCATION OF PREGNANCY TERMINATION 1b.	COUNTY OF PREGNANCY TERMINATION 1c.
PATIENT IDENTIFICATION 3a.	AGE OF PATIENT 2b.	MARRIED? (Check) ☐ YES ☐ NO 2c.
		DATE OF PREGNANCY TERMINATION (Month, Day, Year) 3.

RESIDENCE–STATE 4a.	COUNTY 4b.	CITY, TOWN OR LOCATION 4c.	INSIDE CITY LIMITS (Check) ☐ YES ☐ NO 4d.

RACE (Check) ☐ White ☐ Black ☐ American Indian ☐ Other, Specify 5.	EDUCATION (Specify only highest grade completed) Elementary or Secondary (0-12) 6.	College (1-4 or 5+)	PREVIOUS PREGNANCIES (Complete each section) LIVE BIRTHS Now living Number 7a. None ☐	Now dead Number 7b. None ☐	OTHER TERMINATIONS Spontaneous Number 7c. None ☐	Induced Number 7d. None ☐

8a. PROCEDURE THAT TERMINATED PREGNANCY (CHECK ONLY ONE)	TYPE OF TERMINATION PROCEDURES	8b. ADDITIONAL PROCEDURES USED FOR THIS TERMINATION, IF ANY (CHECK ALL THAT APPLY)	9. COMPLICATIONS OF PREGNANCY TERMINATION (CHECK ALL THAT APPLY)
☐	SUCTION CURETTAGE	☐	☐ NONE
☐	SHARP CURETTAGE	☐	☐ HEMORRHAGE
☐	INTRA-UTERINE SALINE INSTILLATION	☐	☐ INFECTION
☐	INTRA-UTERINE PROSTAGLANDIN INSTILLATION	☐	☐ UTERINE PERFORATION
☐	HYSTEROTOMY	☐	☐ CERVICAL LACERATION
☐	HYSTERECTOMY	☐	☐ RETAINED PRODUCTS
☐	OTHER (Specify) _____	☐	☐ OTHER (Specify) _____

DATE LAST NORMAL MENSES BEGAN (Month, Day, Year) 10.	PHYSICIAN'S ESTIMATE OF GESTATION 11. Weeks	NAME OF ATTENDING PHYSICIAN (Type or print) 12.

NAME OF PERSON COMPLETING REPORT (Type or print)
13.

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terms of content, and have complete reporting.

DISCUSSION

What is the purpose of having three sources of national abortion data? First, let me point out that NCHS will not be producing national estimates of the number of abortions for several years. Also, NCHS and CDC agreed that as States begin reporting the base line statistics on legal abortions to NCHS, they no longer need to report the same statistics to CDC. NCHS will supply this data to CDC. So, actually, we are talking about two sources of data—CDC/NCHS and AGI. These two independently-collected sources of data allow an evaluation of the completeness of the reporting of these data. In fact, the AGI data have already helped to identify problems of underreporting in several States. With this information, the States have taken steps towards correcting reporting problems. Also, the AGI data contain more information on the type of provider than the data collected by either NCHS or CDC.

What are some of the uses for this data? In general, public health analysts and planners can answer questions concerning where to put facilities, the characteristics of women having abortions, and where women actually have abortions—in clinics or in hospitals. With the information on the characteristics of women obtaining abortions, it may, for instance, be possible to plan a family planning program for a particular group or to identify those women who may need alternative means of family planning. These data can also be used in determining the impact of abortion upon the birth rate or the illegitimacy rate. Finally, one of the more important general uses is the assessment of the health implications of abortions. From the data that have been collected thus far, we know that the health risks increase significantly after the first trimester of pregnancy.

What types of questions can't we answer with these data? We will not be able to estimate the number of medically necessary abortions or elective abortions. We also will not have information on why women have abortions instead of carrying a pregnancy to term, or the psychological effects of abortion, or whether the pregnancy was due to a contraceptive failure. Individual States may have some of this information.

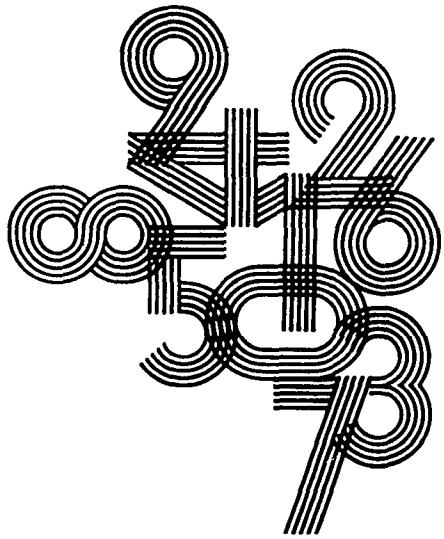
Another question which will not be answered with these data is the effect of an induced abortion upon subsequent pregnancies. Will a woman who has had an induced abortion have a more difficult time with her next pregnancy, or will she be more likely to abort spontaneously? While these data cannot answer these questions, they can be used as a basis for studies involving these questions. In summary, each of these data sources (CDC, NCHS, and AGI), are useful and serve different purposes.

FOOTNOTES

[1] United States Supreme Court. *Planned Parenthood of Central Missouri vs. Danforth,* 44 U.S.L.W. 5197.

[2] Center for Disease Control. *Abortion Surveillance, Annual Summary,* 1969–1975, Atlanta, 1971–1977.

[3] The Alan Guttmacher Institute, *Provisional Estimates of Abortion Need and Services in the year Following the 1973 Supreme Court Decision: United States, Each State and Metropolitan Area,* New York, 1975; and *Abortion 1974–1975: Need and Services in the United States, Each State and Metropolitan Area,* New York, 1976.



CONCURRENT SESSION N

Health Planning and Environmental Health Statistics

DATA ASPECTS OF A STRATEGY FOR LINKING ENVIRONMENTAL CRITERIA INTO HEALTH PLANNING

Frank S. Lisella, PhD., *Chief, Program Development Branch, Environmental Health Services Division, Bureau of State Services, Center for Disease Control, U.S. Department of Health, Education, and Welfare, Atlanta, Georgia*

Introduction

The protection of individuals from adverse influences in their environment represents one of the major interlocking elements in any program to prevent illness, injuries, and premature mortality. The prevention of unnecessary morbidity and mortality as the result of environmentally-induced exposures which occur in the home, recreational, or workplace setting should have priority.

The prevention of environmentally associated trauma should receive the same attention as the treatment of disease disability. Through environmental manipulation, the health professions have in the past achieved great reductions in morbidity and mortality from infectious diseases and have greatly increased life expectancy as a result. Now, however, our population faces new environmental threats including those associated with injuries and toxic chemicals. Existing programs must not only be sustained, but more sophisticated strategies must be added to our current armamentarium of preventive programs if we are to cope with many of the new health threats imposed on society by technologic developments.

The National Health Planning and Resources Development Act of 1974 creates timely opportunities for developing innovative prevention proposals. Under the provisions of this legislation, Health Systems Agencies (HSA's) are required to address "the environmental and occupational exposure factors affecting immediate and long-term conditions."

Collection of data relating to those environmental and occupational forces which may impact upon the population within an HSA should be an identifiable portion of Health Systems Plans (HSP) and Annual Implementation Plans (AIP). One approach which will be discussed today [1] involves the use of a series of modules which can be incorporated in most plans. These modules relate to the health problems of food- and water-borne intestinal illnesses, accidental injuries, and insults from toxic and hazardous substances.

In addition to these categorical program areas, there are others which should be included in the health planning process:

1. *Air Pollution Control*—Air quality criteria on the chemical contaminants in the atmosphere which may impact directly on the community are vitally important. Carbon monoxide, nitrogen dioxide, ozone, sulfur oxides, hydrocarbons, and particulate matter are of concern in this respect.
2. *Solid Waste Management*—The storage, collection, and disposal of refuse, garbage, and other unwanted materials from residential, commercial, and industrial establishments represent an important community concern. The health aspects of each phase of the solid waste problem in an area must be given consideration in the planning process.
3. *Vector-Borne Diseases*—Disease problems associated with flies, mosquitoes, ticks, and other insects of public health importance should be included in health plans. This should include the frequency, distribution of the vectors, and control measures currently being used to suppress insect populations.
4. *Radiation Hazards*—The association between exposure to radiation and human health is well established. The sources of radiation-producing devices in the community need to be outlined in the plans.
5. *Noise Pollution*—Health disturbances due to noise, including loss of hearing and other subtle physical and mental effects, should concern HSA's. Land-use planning, code development and enforcement, and other preventive measures are aspects that an HSA must use in order to insure that residential, industrial, business, and recreational environments are not subjected to noise hazards.
6. *Recreational Sanitation and Safety*—Leisure time and, therefore, exposure to the recreational environment has been increasing. The growth of the recreation industry has placed an added burden to control all types of hazards. The recreational setting becomes a micro-environment in which water supply, waste disposal, injury control, vector suppression, etc., must be managed.

[1] Laesig, R. E., Ph.D.; Sturm, Herman M.; and Purdom, R. W., Ph.D.: *Plan Development for Four Environmental Hazard Modules: Data Needs and Problems,* Proceedings of the Public Health Conference on Records and Statistics, Washington, D.C., June 1978.

We believe these topical areas represent logical candidates for modular development and subsequent "locking in" of environmental concerns into the HSP. I will attempt to elaborate on some of the data needs in relation to these areas by using water supply, sewage disposal systems, and housing hygiene programs as examples. Hopefully the role of HSA's will be implicit in this discussion.

1. *Rural Water Supplies and Individual Sewage Disposal Systems*—Approximately 30 percent of the population in the United States is serviced by private on-lot water supplies, many of which are questionable in potability and, therefore, represent a potential health problem. In 1974 about 20 million households in the United States disposed of their wastewaters by some sort of private sewage facility. Most of these consisted of septic tanks and subsurface soil absorption systems which can become health problems if not properly maintained. Due to the emerging trend of population movement to rural areas, the number of individual water supply and sewage disposal systems have been growing. In order to adequately explore this situation within a Health Service Area, the following data points, among others, need to be explored:
   a. Prevalence of water-borne diseases and gastrointestinal disorders in the area.
   b. Expenditures for treatment of gastrointestinal disorders.
   c. Extent of hospitalization by persons consuming water from private supplies or disposal of sewage through private systems.
   d. The extent of the area and population covered by existing water and sewage systems.
   e. Adequacy of laws or ordinances relating to water supplies and sewage disposal systems.
   f. Extent of past expenditures and plans for future development and maintenance of water supply and sewage disposal systems in a Health Service Area.

2. *Housing Hygiene*—According to the 1974 Annual Housing Survey,[2] many housing units, particularly those in rural areas, lacked the minimum facilities considered essential for a healthful home environment. The report indicated 9 percent of all rural housing units did not have a complete bathroom and 6 percent lacked complete kitchen facilities. The Annual Housing Survey conducted in 1973 showed that 6.3 million low income families lived in physically inadequate housing and an additional 5.9 million lived in marginally acceptable housing still needing renovation. While these measures are rough, they do serve to underline the widespread need for community environmental improvement programs as close adjuncts to strategies for improving the quality of housing. Within the health planning area, the data necessary to evaluate housing problems includes:
   a. Size and composition of the housing inventory.
   b. Characteristics of the occupants.
   c. Changes in the housing inventory as the result of new construction, and losses due to fires or demolition.
   d. Indicators of housing and neighborhood quality.
   e. Characteristics of the housing units.

Coordination

The HSA's have further responsibilities mandated in Section 1513 of P.L. 93-641 to coordinate activities with other agencies, secure needed data from them, provide technical assistance, and enter into necessary agreements to insure that the components of the HSP and AIP are carried out. OMB Circular A-95 outlines the project notification and review system.

An example of this coordinative responsibility is in the area of Environmental Impact Assessments. Congress passed the National Environmental Policy Act (NEPA) in 1969. This legislation requires that environmental impact statements be prepared on those activities or projects which might adversely affect delicate environmental balances.

Ample opportunities are presented by law for individuals and agencies to shape the development of planned projects by offering commentary on the impact statements. HSA's need to be involved in this process because of the common thread (health effects) that runs through each project and must, therefore, be carefully considered. The concept of giving consideration to environmental impact and of developing plans and strategies which tend to enhance environmental quality and minimize both short-term and long-range adverse effects is the main benefit of the process.

To maximize the effectiveness of the environmental assessment procedures in this area, the HSA's need to have data on:

1. The health impact of the proposed project on people residing within the HSA.
2. Current, future, and proposed development

[2] Annual Housing Survey: 1974, United States and Regions. U.S. Department of Commerce and U.S. Department of Housing and Urban Development, August 1976.

projects.

3. The health delivery system mechanisms for dealing with problems the project might cause.
4. Ability of the regulatory agencies to address health problems that might be anticipated.

Summary

In addition to the three modules being prepared by Drexel University and the additional program areas suggested, there are many other environmental health areas with which health planners might become involved. The thrust of health planning with an environmental motif is to successfully identify high risk populations and hazardous conditions in order that appropriate intervention strategies can be initiated. Since the etiology of many diseases thought to be environmentally induced is complex and not totally understood, health planners become participants in the research process as they document diseases, disabilities, and associated environmental hazards in the appropriate areas. It is incumbent upon health planners to take cognizance of environmental insults which may influence human health. By having a viable environmental health component in area plans, maximum consideration can be given to cost containment and to the quality of health services being rendered.

HEALTH PLAN DEVELOPMENT FOR FOUR ENVIRONMENTAL HAZARD MODULES

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In accordance with Sec. 1533 of the National Health Planning and Resources Development Act of 1974, P.L. 93-641, the Bureau of Health Planning and Resources Development has sponsored various programs for technical assistance to Health Systems Agencies, one of which is a project for developing guidance materials related to environmental health planning. This project was carried out through a contract that is about to be completed by staff of Drexel University assisted by the staffs of Government Studies and Systems Inc. and the Orkand Corporation.[1]

This paper describes the approach and results of that project, and its relevance to the use of data in health plan development by Health Systems Agencies (HSA's). It will be helpful to start by noting the significance of environmental health concerns as recognized in P.L. 93-641, and some limitations affecting plan development by HSA's in reference to those concerns.

The Federal health planning law includes as one of the priorities set by Congress for the development and operation of Federal, State, and area health planning programs the "promotion of activities for the prevention of disease, including studies of nutritional and environmental factors affecting health and the provision of preventive health care services."[2]

In providing planning and resources development for an area, HSA's are required to assemble and analyze data on the status of the population's health, on the status and effects of the health system on residents of an area, including utilization of health resources, and on environmental and occupational exposure factors affecting immediate and long-term health conditions. To the maximum extent practicable, the HSA's are required to use existing data and to coordinate their activities with the Cooperative Health Statistics System. After appropriate consideration of the data developed (and other guides) the HSA is required to establish, annually review, and amend as necessary a Health Systems Plan (HSP) for its area, and also an Annual Implementation Plan (AIP). These plans must provide a detailed system of goals and related objectives, describing a healthful environment in the area and health systems which assure the availability and accessibility of quality health services at reasonable cost.[3]

The general approach for the environmental health planning project was developed by staff of the Bureau of Health Planning and Resources Development with assistance from staff of the Environmental Health Services Division, Center for Disease Control, and from other specialists in the field of environmental health. The project plan reflected the following considerations:

1. As far as possible, the general approach to plan development recommended by the Bureau to the HSA's, in regard to goals, objectives, and recommended actions, had to govern the environmental health plans.[4]
2. Many HSA's were newly created organizations, most of whom had limited staff and financial resources, and all of whom were required to carry out a new, complex, broad range program for developing health plans for their areas, in a short period of time.
3. The Bureau's aim was to provide technical assistance to the HSA's which would help them perform their planning functions for environmental health on a basis which would reflect the foregoing factors with due regard for the fact that environmental health problems comprise a very large number of different hazards.

The project plan, therefore, was designed to provide guidance material that would show HSA's how to:

- develop a selective strategy for approaching environmental health planning needs and set priorities for particular needs in their areas.
- take steps needed for specific plan development as illustrated for a group of four

[1] Contract No. HRA 230-76-0247, "Health Planning Related to Environmental Factors."

[2] P.L. 93-641, Sec. 1502

[3] P.L. 93-641, Section 1513.

[4] Bureau of Health Planning and Resources Development, Health Resources Administration, DHEW. "Guidelines Concerning the Development of Health Systems Plans and Annual Implementation Plans," December 23, 1976.

modules, each representing one category of environmental hazards among the universe of such hazards (which would probably include a total of approximately 15 such module categories).[5]

The guidance materials developed in the now completed project are being prepared for publication. There will be five volumes, having the general title of *Health Planning Related to Environmental Factors,* with subtitles as follows: Volume I. *Preliminary Technical Guidelines;* Volume II. *Foodborne and Waterborne Intestinal Illnesses Module;* Volume III. *Hazardous and Toxic Substances Module;* Volume IV. *Accidental Injuries Module;* and Volume V. *Nosocomial Infections Module.*

The presentation in these volumes is focused primarily on needs of health planners who have not had specialized experience in health planning related to environmental factors. Nevertheless, it is likely that some of the guidance materials will provide help to most HSA's, either directly in regard to the hazards included in the four modules or by suggesting how to deal with other hazards.

Some notable characteristics of the materials are as follows:

- The *Preliminary Technical Guidelines* volume provides general coverage of the field of environmental threats to human health and sets forth major considerations for dealing with them in the health planning process, including the needs for selectivity and prioritization.
- The *Foodborne and Waterborne Intestinal Illnesses Module* provides detailed guidance on how to assess health status and health systems problems relating to these hazards in local areas, describes relevant indicators, data, and their sources, and suggests planning approaches for dealing with such hazards.
- The *Hazardous and Toxic Substances Module* deals with the range of threats represented by problems such as air and water pollution, solid waste hazards, and some of the specific residential and consumer product hazards resulting from toxic substances of various kinds.
- The *Accidental Injuries Module* covers accidents in the home and in recreational and rural environments; it omits specific coverage of vehicle and occupational accidents but includes some guidance to plan development relevant to the latter hazards.
- The *Nosocomial Infections Module* deals with infections acquired in a hospital environment having no direct relation to the patient's original reason for undergoing treatment. A hazard to patients' lives which often results in lengthening hospital stays with concomitant increase in patient distress and the costs of hospital care, it presents special problems to the community health planner, for which this module provides guidance.

All four of the modules deal with problems the HSA's face in compiling data from Federal, State, and local government sources concerning the health status of the population and characteristics of the health system. But among the four, the degrees of difficulty in problems of acquiring and analyzing such data differ somewhat.

The foodborne and waterborne intestinal illness hazards category and the accidental injuries category offer relatively minor difficulties from the standpoint of data acquisition and use. In the case of the former, the illnesses of concern reflect "traditional" public health hazards. Records relating to its health status effects (at least for reportable diseases) and to relevant health systems performance (such as water quality testing, food inspection practices, etc.) are likely to be readily available. Also it may be relatively simple to tie certain health status indicators problems to environmental health system measures in connection with foodborne and waterborne intestinal illness hazards. For example, if it is determined from available data that there is an exceptionally high incidence of salmonellosis in a particular locality (or population subgroup), corresponding data regarding food sanitation practices in the locality may be readily available from local inspection or other monitoring agents of the health system likely to be involved. In the case of accidental injuries, the health status data (i.e., records of injuries to people) often show directly the cases of the trauma, so that specific needs for improvements in the environment or health system performance can readily be identified from interrelated data on health status and the health system's performance.

Nevertheless, even for these two categories of hazards, data problems are likely to exist—especially in regard to availability of needed detail. For example, in Orange County, California, the HSA could identify population sub-groups at special risk (for the case in point, Spanish surnamed residents who had shown abnormally high rates of shigella) only by obtaining and re-arranging data on computer tapes of the local department of health. Similarly, a special study of hospital records on emergency cases in one of the counties served by HSA Inc. of Northwestern Pennsylvania was needed to identify the types of accidents which were most prevalent in that area. These situations did not involve serious difficulties from the standpoint of data acquisition, just some special effort. Much more serious is concern about underreporting, in both the intestinal illness and accidental injuries data. For example, it is estimated that perhaps only 40

[5] A discussion of significant aspects of a modular approach to health planning is provided in another paper presented at this conference session: Frank S. Lisella, "Data Aspects of a Strategy for Linking Environmental Criteria Into Health Planning."

percent of all accidental injuries are reflected in EMS records, in general.

For other categories of environmental health hazards, reliable data tend to be somewhat more difficult to obtain or analyze. This is especially true when there is a time lag between exposure to a hazard and the resulting health status impact. An example of this difficulty involves the hazardous and toxic substances believed to be related to cancer. In such cases, possibly relevant mortality data may be readily available, but the more immediately and clearly relevant morbidity data may not be obtainable except through sources such as health interview surveys and health examination surveys, which have limited coverage. (Cancer registries, where in operation, also provide very useful data.) But even where health status data may indicate "hot spots" of a disease—such as leukemia—the causal factors applicable to the high incidence rates may be highly elusive. The difficulty often arises from time lags involved; current morbidity and mortality data may reflect exposure to environmental hazards that occurred earlier, even as long as 15–20 years earlier. Moreover, even if relevant data can be obtained, and associations with environmental conditions apparently established, it may be that the suggested relationships are spurious, that data relating to the real causal factors simply are not available. In some cases, even when suspected agents are known, data on them are not collected. Such may be the case with benzapyrene, a carcinogen which is not usually sampled in air pollution monitoring programs.

The foregoing examples suggest some of the limitations of available data that must be dealt with or at least considered, in the development of HSP's and AIP's by planning agencies.

As indicated by the term "Preliminary" applied to the *Technical Guidelines Volume,* the products of this project must be expected to have limitations that are hard to avoid in early efforts at environmental health planning under P.L. 93-641. After the five volumes of guidelines have been made available to the planning agencies, a period will ensue in which their usefulness will be tested. One aspect, of particular interest, will emerge from reports on the experience of HSA's in using these materials as a guide to compiling data needed for plan development. Eventually, analysis of this experience is likely to provide valuable information for appraising the adequacy of available health statistics, from the standpoint of environmental health planning needs, and showing further where needs for improvement exist.

QUANTITATIVE AND ORGANIZATIONAL ISSUES IN THE ENVIRONMENTAL AND OCCUPATIONAL HEALTH PLANNING PROCESS

Hardy Loe, Jr., M.D., *Region VI Center for Health Planning, Southwest Center for Urban Research, Houston, Texas*

This paper has been developed from contributions of the staff and consultants of the Center for Health Planning in United States Public Health Service Region VI. The Center for Health Planning is located at the Southwest Center for Urban Research in Houston, Texas, and its work is supported by contract 232-78-0109 with the Department of Health, Education, and Welfare. The concepts presented are based on material in a generic document in preparation by the Center for Health Planning to be published later this year. The purpose of that document, "Guide to Environmental and Occupational Health Planning," is to assist Health Systems Agencies, State Health Planning and Development Agencies, and Statewide Health Coordinating Councils to incorporate environmental and occupational health concerns into the process and functions of community-wide health systems planning and development.

The paper attempts to place known concepts and practices in the measurement sciences in environmental and occupational health into the context of issues relating to data and information requirements of health planning and resource development functions as authorized by the National Health Planning and Resources Development Act of 1974, Public Law 93-641. Hence it is not the purpose to present original research, rather it is to offer the author's views about the application of what is currently known in environmental and occupational health fields to health planning and resource development as currently practiced by Health Systems Agencies, State Health Planning and Development Agencies, and Statewide Health Coordinating Councils. It is appropriate to start with a description of the purpose and salient features of that process.

Particular acknowledgements are made to the following consultants who contributed concepts, information and ideas from their different technical backgrounds from which the author developed his views:

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Lawrence Heidemann, M.D.—Director and President New Community Service Corporation and privately practicing internist
Richard K. Severs, Ph.D.—University of Texas School of Public Health
Stanley Pier, Ph.D—University of Texas School of Public Health

Purpose of the National Health Planning and Resources Development Act of 1974

The stated purpose of Public Law 93-641 is "to facilitate the development of recommendations for a national health planning policy, to augment areawide and State planning for health services, manpower and facilities, and to authorize financial assistance for the development of resources to further that policy." (Section 2). With respect to the environment generally and the workplace specifically Section 1513 of this Act requires Health Systems Agencies to "...assemble and analyze data concerning... (F) the environmental and occupational exposure factors affecting immediate and long term health conditions." Further along in the same section the health systems plan to be produced by each Health Systems Agency is described (in part) as "... a detailed statement of goals... describing a healthful environment and health systems in the area which, when developed, will assure that quality health services will be available and accessible in a manner which assures continuity of care, at reasonable cost, for all residents of the area;..." While the principal task of the health planning and resources development system is to concern itself with needs for health care and restructuring of the system that provides care, it is clear that the effects of the environment and occupational exposures on the population are also to be reckoned with.

The Health Planning and Resources Development Process

A consideration of Public Law 93-641, related committee reports of the Congress, and accompanying regulations and guidelines reveal some fundamental characteristics prescribed for the planning and resources development process. These are listed and discussed briefly as a prelude to a consideration of their specific implications for planning for a healthful environment and the information requirements for planning.

1. The health planning and resources development process is policy-based.

The health plans and implementation strategies and procedures that are produced are to take into account health policies at national, State and areawide levels. National policy statements are to be found in the National Health Planning Guidelines. These are devel-

oped by the Secretary of the Department of Health, Education, and Welfare from recommendations of the National Council on Health Planning and Development, an advisory body authorized by Public Law 93-641. State policy is to be considered as revealed in the compilation of administrative and legislative decrees concerning health and the various health service programs at each State level. A similar compilation of policies and programs is to be considered at the local and multi-county levels.

These policies determine the priority given to health problems and public approaches to resolving these problems. The relative importance given to environmental and occupational influences on health can be ascertained by analysis of these policies. This in turn will determine the ease or difficulty to be encountered as well as resources available in pursuing effective planning for occupational and environmental health.

2. Health planning and resources development are population-based.

This means that health needs are determined from a consideration of the demographic and behavioral characteristics and the morbidity-mortality experience of the population. The system of health services and environmental influences is then designed and structured to meet those needs. This contrasts with resource-based planning which projects needs and services based on utilization of existing health care facilities. This approach offers no incentive to development of new services or different approaches to meeting needs. The population-based approach implies the collection and interpretation of data to describe the impact of environmental and occupational health influences on a given population. This practice, thoughtfully done, wil reveal significant mortality and morbidity that might otherwise be overlooked in a resource-based approach.

3. The health planning and resource development process should be quantified whenever it is feasible.

Quantification allows priorities to be placed on competing health concerns and benchmarks to be established to evaluate progress in resolving health problems. Agencies are to select data and indicators for health problems and programs, including those in the environmental and occupational area, that are quantifiable, and they are to employ analytical techniques that facilitate an understanding of the significance of the data that is collected. Agencies will be pressured to be precise so as to promote measurable progress in reducing health problems.

4. A systems approach is to be employed by Health Planning and Resources Development Agencies.

The planning framework should be sufficiently broad that those significant health problems emanating from environmental and occupational exposures will be discovered, and that coordinative relationships for planning will be established with the wide range of organizations that have responsibilities for control of the quality of the workplace and the ambient environment.

5. The health planning and resources development process and the products of that process require public involvement.

This requirement has at least two facets: the public must be provided meaningful opportunity for input to the process, and the public should be given opportunities to learn about issues significant to their health that the Health Planning and Development Agency deals with.

The environment and the workplace should be included in this public agenda. Organizations and individuals active in the community on behalf of environmental and occupational health should be sought out and should receive regular information about the agency's activities. Community perceptions about health hazards and control approaches should be solicited. Community education efforts should include appropriate subject matter.

6. Preparation of health plans that can be implemented is a strong emphasis.

Environmental and occupational health concerns identified in health plans should be those that something can be done about in terms of community acceptability, economic affordability and technical feasibility. Moreover the policy makers and staff should have a firm philosophical commitment to implementation as an end of the planning process.

7. Cost containment in the health system is an overriding priority.

The focus of the cost containment emphasis is on the health care delivery system; therefore the cost-saving effect of prevention of illness or injury through control of hazards is an important consideration. Illness prevention is a clear link between environmental or occupational factors on the one hand and medical care services on the other. In development of the environmental and occupational health data set care should be taken to collect data and information that will allow estimations to be made of the cost of problems as well as the cost benefit to the community from the reduction of exposure to harmful influences.

8. The Health Planning and Development Agency acts, for the most part, indirectly by attempting to influence other implementors or health service providers in the community.

This is particularly true in the environmental and occupational health field where there are a myriad of agencies at local, State, and national level with legislatively mandated responsibilities, technically qualified personnel, and funding to directly effect enironmental and occupational health quality control. The Health Planning and Development Agency must establish a credible role as the watchdog of health status, and, toward that end, establish active working relationships with the most important agencies in the field. This working partnership includes sharing of data, joint planning activities and exchange of technical advice and information. The Health Planning Agency can provide information about health status and attempt to influence priorities and programs on behalf

of human health as compared with other considerations.

Issues in the Selection and Use of Environmental and Occupational Health Data

1. Support role of data in health planning and development decisions and actions.

Data do not exist for their own sake. They are the building blocks of information to be used in support of rational decisions and actions. Hence the development and use of an environmental and occupational health data set should be secondary to the health planning and development process. Which data are required, in what form, which sources, how they are to be collected, stored, and analyzed should depend on what uses will be made of them.

The planning and development decisions and activities become the determinants of the data set. Those decisions and activities may be briefly listed as they occur in the process:

Description of health status of the population and the health system that serves them.
Determination of health needs.
  Identification of problems.
    Health status problems.
    Health system problems.
  Establishing priorities among needs.
Policy review at national, State, and local levels.
Formulation of goals and selection of objectives.
Establishing priorities among goals.
Determination of recommended actions to achieve goals and objectives and selection of resource requirements for those actions.
Formulation of short-range implementation objectives, plans, and projects.
Development and conduct of resource development activities.
Development and conduct of project, facilities, and appropriateness review activities.

2. Measurement of health status.

The definition of health—In the context of health planning and resource development health is defined broadly as not simply the reciprocal of disease but, rather, a complex positive concept that ranges from bare survival to an optimal state of well-being. Health is affected by both positive or health supporting factors, such as nutrition, exercise, and emotional satisfaction, and by negative factors such as environmental hazards, infectious agents, disease processes, economic, social, and physiological deficiencies.

This definition poses problems in its use since the current state of the art and science of measurement is not sufficiently advanced to describe all the influences on health as defined. One would like to measure and analyze the beneficial environmental and occupational influences, but very few "quality of life" measurements are available. Most descriptions of health and health status describe illness or injury, the absence of health. One important issue then is the absence of useful data to describe health status.

Mortality-morbidity indicators—The usual health status indicators relied on are reported mortality and morbidity statistics. The value and limitations of this data are well understood, and it is not germane to include a detailed discussion. The use of such data to describe environmental and occupational impacts on health status is worth some mention however.

It is important that health planners and data managers have a good technical understanding of what is known about the cause and effect relationships between exposures and specific disease entities. In the absence of such knowledge, information about significant health problems may not be apparent and sorted out from readily available data. If, for example, the relationship between chronic respiratory disease and the level of particulates in ambient air is not appreciated, a critical problem for a particular population of risk may be missed. The respiratory morbidity from that particular source may lie unnoticed among other causes of respiratory disease. Correlations between ambient air quality measurements and respiratory morbidity can lead to inferences of cause and effect sufficient to identify need for corrective programs for the affected target group.

Disability indicators—Sometimes measures of disability are available. This kind of information is particularly valuable because it reflects directly and specifically the impact of causal agents on health status much more clearly, usually, than mortality and morbidity reports. The difficulty, of course, is that information about a wide range of disabilities in the population and their related causes is generally not forthcoming.

A second problem is that often the determination of disability is subjective, e.g., chronic back pain, and therefore less precise in its significance, even when it is available.

Community perceptions—Important impressions of health problems related to environmental and occupational exposure may be gained from community perceptions, however subjective those sources of information may be. Community opinion reflects the priorities of the population served and should be accepted as a measure of what kinds of problems are of most importance. The opinion of an expert subset of the community is often the only available indicator of certain problems or favored approaches to solving problems. At the same time it should be recognized that community perceptions of environmental hazards are often misconceived. For example, the major community perception of environmental hazards may be the factor which smells or looks the worst, while more important health threats may neither be seen or smelled. The objective value of community perceptions is in direct proportion to how well the population is informed. The best use of this source of information

requires a commitment of the Health Planning and Development Agency to ongoing community education.

3. Measurement of environmental and occupational factors.

The environment comes in many forms, shapes, and sizes and has many faces. Each element of the environment must be measured according to which of its characteristics are measurable. Consequently, the Health Planning and Development Agency is faced with a very long and varied list of measurements to consider. A monumental task is implied in selecting the kinds of measures that are most important and the skills and knowledge required to understand and utilize them. The following brief classification of environmental measures illustrates this point.

Biological measurements of humans—Measurement of human hair, blood, urine, excreta and selected tissues are commonly utilized to assess the effects or level of exposure to metals, pesticides, organic compounds, and other toxins. With respect to some substances, many people have some detectable level on their tissues or body fluids, e.g., D.D.T. In this situation a standard of "normal" residual for such substances is necessary for interpretations to be made.

Whether biological measurements are used to define problems or evaluate change it should be clear that such measurements are not likely to be available on a large scale. A few applications to planning use are possible; however. Some occupational groups, for example, are required to have periodic physical examinations as a preventive measure, and with care in interpretation that information may be useful. Special sample surveys of the biological effects of selected hazards may prove to be affordable and productive of useful information.

Biological measurements of other organisms—More commonly available than biological measurements on humans are biological measurements of other species. Frequently publicized are the effects of water pollutants such as nitrates, phosphates and ammonia on fish or the growth of green algae. Changes in growth, color, and leaf structure of plants are monitored as a manifestation of levels of sulfur dioxide, fluoride or photochemical smog in the air. While not always directly applicable to human disease, biological organisms are useful in assessing pollution effects over time. When combined with measurements of pollutants themselves, the specific effects of a particular hazard can often be identified.

Within this category, the measurement of various infectious agents themselves are often available and useful as indicators of actual or potential disease problems. A case in point is the routine measurement of arborviruses in the blood of sentinel flocks of chickens to assess the presence or absence of encephalitis virus in the community. The quantitative level of rabies occurring in wildlife may be used to assess the level of threat of that disease to an area. Periodic sample bacteriologic surveys may be done to assess the carrier state of certain infectious diseases. Skin tests and serological studies reveal the level of infection in the community. The tuberculin skin test is an important tool in this regard.

Measurement of hazardous substances in the air and water—Measurements of air quality are applied to the characteristics of the air itself, e.g., temperature, wind speed and direction, humidity, and pressure; and of the things put into the air by humankind. In the latter category the most commonly measured indicators of air pollution are particulates, nitrogen oxides, sulfur oxides, carbon monoxide, hydrocarbons, photochemical oxidants, and odors. Units of measurement are parts per million or micrograms per cubic meter.

Water quality problems are commonly indicated by the type and amount of chemical, physical and biological hazards present. Commonly measured chemical indicators of water quality include dissolved solids, dis olved oxygen, miscellaneous toxins, acid/alkali contest, and oxygen demand. Physical hazards of importance are thermal pollution, suspended solids, oil, and radio-activity. Biological indicators of human fecal contamination include coliforms and other organisms.

As a consequence of the great emphasis in the last decade on air and water quality control programs, a great number of physical and chemical substances and qualities are routinely measured. Health planners as a result have access to data adequate to construct useful descriptive profiles of air and water in most communities. The range and variety of measurements is great and the technology complex. Most Health Planning Agencies require technical advice to be able to understand and make best use of the data that is available to them.

Measuring hazardous events—Hazardous events include earthquakes, landslides, land subsidence, flooding, hurricanes, tornados, fires, explosions, and the like. Measures of interest to the planner are those that allow prediction of events or allow accurate estimates of the potential for occurrence. Accurate information of that sort would allow preventive or control strategies to be brought into operation.

The technology to predict the potential for fires, explosions and accidents in most industrial settings is good, so that effective planning for control and management of hazardous events at the workplace can occur. The same is not true of natural events, although some judgments of a long-range nature can be made. Fault lines in the earth's crust can help identify earthquake-prone areas, for example, but the occurrence in the short run of a particular earth tremor defies prediction. Similarly, flooding potential of areas can be ascertained, hurricanes can be tracked, and land subsidence can be measured and projected.

Measurement of facilities and sanitary practices—The physical characteristics of facilities and the procedures followed in facilities operations can be important elements affecting health status. The architectural design, structural materials used, use of safety devices, and adherence to approved sanitary and/or occupa-

tional safety practices are discrete measurable elements than can be used to define a descriptive profile, identify problems, or monitor changes. Much information of this sort, particularly about industrial work settings, restaurants, hospitals, and other facilities, is available in the files of agencies which have licensing or surveillance responsibilities regarding such institutions.

Geographic distribution—Finally a word should be mentioned to stress the importance of understanding the geographic distribution of environmental problems, hazards, population, diseases, and the like. The value of the use of maps to display data of this sort should not be underestimated. This tool used in correlation with other measurements allows refined and useful analysis not otherwise possible.

4. Determining the impact of environmental and occupational influences on health status.

Determinations of the effect on health of exposures in the occupational setting and the environment generally rest on associations between environmental events or measures and health events or measures. The more directly the association can be made and observed and the fewer intervening factors admitted, the stronger the relationship. If a man dies 30 seconds after being shot in the heart, that is an impressive presumption of cause and effect. If he dies 37 weeks after being shot in the shoulder, the cause and effect relationship is substantially less evident.

The current state of understanding of environmental effects on health is quite incomplete and changing. Many of the hazards described in the previous paragraphs of this paper have no clearly proven relationships to human health. They are presumed to be causally related changes in health status, but new knowledge causes these impressions to be constantly revised. Standards of acceptable levels of various substances in air, water, or human tissues, even, are in a state of flux, varying with experience and new research findings.

Data which is used to indicate health effects, then, must be interpreted with great care. The choice of interventions to reduce environmentally- or occupationally- caused disease may well be based on such indicators, which underscores the importance of the correct interpretations. A few of the complexities in determining cause and effect will be discussed to illustrate these points further.

The threshold phenomenon—It is accepted practice to establish quantitative standards that reflect safe levels of exposure to hazardous substances. The theory behind this practice is that most hazards generally adhere to a threshold phenomenon; that is, up to a certain level there is little or no adverse effect, but above that level the effect becomes significant. Some workers argue, however, that most environmental hazards that have been studied sufficiently at lower and lower levels and for cumulative effects over a prolonged period of time have adhered more to a "zero threshold" theory, i.e., demonstrable effects are proportional to length of time exposure right down to the lowest measurable levels of exposure. With this interpretation even small amounts of a hazardous substance, given a long enough exposure, can be harmful.

This issue is not resolved and will not be resolved until much more research and experience establishes the health effects of various hazards with greater precision. At the present time most substances have not been studied extensively enough at low levels of exposure. Moreover, industry introduces new chemicals at a rapid rate, adding to the backlog of required research. In the meantime great caution is justified in interpretation of cause and effect data, and the planner must be prepared to alter cause and effect assumptions as new knowledge requires.

Single agent vs. multiple agent effects—Most previous experience attributes specific health effects to single agents, and control efforts are directed accordingly. Increasingly the effects of multiple hazards on multiple physiological systems in human subjects are being appreciated. Factors that promote these complex interactions are progressing urbanization, industrialization, and proliferation of commercial products. These factors cause multiple chemical and physical exposures in households and workplaces.

The effects of multiple hazards may be additive, potentiating, or antagonistic in varying degrees. The kind of interaction may vary among different physiological systems in the same combination; e.g., sulfur dioxide and oxidant air pollutants are additive in effects on some systems and antagonistic in others.

Real world environments and actions often produce multiple qualitative and quantitative effects rather than simple all-or-none effects. For example, air conditioning mitigates heat stress and adverse effects on the respiratory tract such as drying of mucosa. At the same time it may cause morbidity by particle generation and dissemination or by producing local or general chilling. With these complex interactions the ability to measure health effects of specific environmental or occupational influences is difficult if not impossible.

Determining the population at risk—A further complication in measuring health effects of environmental and occupational exposures is the variability in sensitivity to the effects of a given substance on different members of the population at the same level of exposure. People with emphysema or bronchial asthma are highly susceptible to various irritant inhalants at levels that cause no dysfunction or discomfort to most of the population. On a less serious scale of morbidity some individuals develop a runny nose and watery eyes during air stagnation episodes much more readily than others.

An assessment of health effects must take into account individual differences in susceptibility. This variability affects decisions about where the threshold for safety for a given hazard should be set. If the majority of the population that experiences adverse effects is to be protected, the standard must be well below the level where deleterious effects are noted by the balance of

the population.

5. Planning coordination issues.

The point has been made earlier that the Health Planning and Resource Development Agencies must accomplish their mission to improve health status indirectly where environmental and occupational influences are concerned. They must depend on active working relationships with the many agencies charged with quality control of the workplace and the environment.

The number of environmental and occupational hazards to be understood is vast and growing each year. The technology to measure, interpret measurements, and initiate controls is increasingly complex and beyond the training and experience of most staff of Health Planning and Development Agencies.

For these reasons the Health Planning and Development Agency should seek data and analyses from agencies that are already collecting and analyzing it. They should seek technical advice in the understanding of the environmental and occupational field and the cause and effect relationships to human health. Coordination activities should include data sharing, joint plan development activities, exchange of technical assistance regarding facility development and project development, as well as community education activities.

In its turn the prime role of the Health Planning and Development Agency is to first of all to determine the priority impacts of environmental and occupational influences on health status. Correlations should be made between these influences and the health care delivery system. It should attempt to influence the strategies of environmental and occupational health agencies to make health effects a priority with them. The expected morbidity from uncontrolled hazard exposure should be accounted for in the planning of required health services. Project review criteria should include safety and health considerations as well as the environmental impact of proposed projects. Community education about the significance of environmental and occupational exposure to health status should be promoted and sponsored by the Health Planning and Resource Development Agency.

Planning coordination as described is a monumental task and requires the commitment of many hours of staff and volunteer time. It is often a sensitive undertaking requiring great skill to avoid rivalry and conflict. Given the great significance of these influences on health, it is justified to devote the necessary resources and sensitivity to developing meaningful planning in this area. If not, many of the principal health status goals of Health Planning and Resource Development Agencies will not be achieved.

Summary and Conclusions

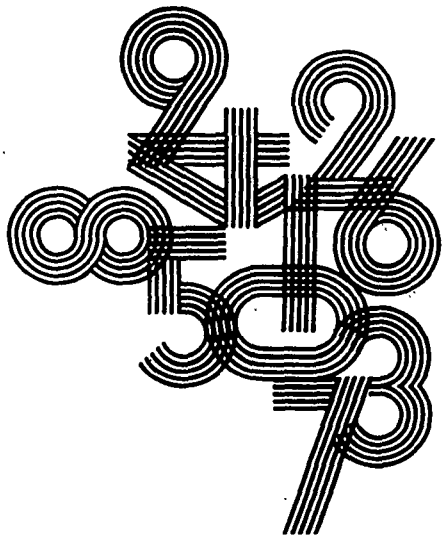
A new, complex, and quite serious health planning effort is being established in the United States. While its clear priority is a focus on cost containment and the health care delivery system, environmental and occupational influences on health status are to be taken into account in the work of the Health Planning and Development Agencies. An improved data set and system for measuring health status, environmental and occupational influences, and their impact on health status is needed to support health planning and development decisions.

An array of pluses and minuses are apparent in the present use and application of data.

On the positive side there is much more data available for critical measurement than in the past and a better technology to interpret the data. Health Planning Agencies are better staffed and funded than were their predecessors of a decade ago and well suited to play an integrative role between health and environmental concerns. Environmental and occupational health agencies are also more capable than they were a decade ago.

On the negative side, notwithstanding improvements in data availability and technology, there still remains much that is critical that is not understood. Cause and effect relationships between environmental and occupational influences and health status are not clearly worked out. There remain important data gaps, particularly in the ability to measure the positive aspects of health and the environment and in the systematic assessment of disability. Environmental and occupational health agencies are many, often resulting in overlap of function in the community, complicating coordination efforts. The technology of environmental quality control and occupational health maintenance is complex, requiring a large body of knowledge, making it impossible for Health Planning and Development Agencies to be technically self-sufficient in this area.

Finally, coordination between agencies must be seriously pursued and accomplished if the purposes of achieving a healthful environment are to be realized.



CONCURRENT SESSION O

Utilization of Preventive and Community Health Services

INTRODUCTION TO THE SESSION ON UTILIZATION OF PREVENTIVE AND COMMUNITY HEALTH SERVICES

Jack Elinson, Ph.D., *Service Fellow, NCHS. Hyattsville, Maryland*

This session was to have been chaired and addressed by Dr. J. Michael McGinnis, Deputy Assistant Secretary for Health. Dr. McGinnis is unable to be here this morning because he has been called to testify on a bill, S.3115, recently introduced by Senator Edward Kennedy in the 95th Congress, "to establish a comprehensive disease prevention and health promotion program in the United States." Dr. McGinnis' responsibilities include the organization of a "prevention initiative" on the part of the Department of Health, Education, and Welfare. In connection with DHEW's "prevention initiative" I have been serving on a couple of work groups, one on lifestyles, and the other on data needs. Because of this involvement, and because I am this year a Service Fellow with the National Center for Health Statistics (on leave from Columbia University School of Public Health, Division of Sociomedical Sciences), Dr. McGinnis asked me to take his place in chairing this session on the "Utilization of Preventive and Community Health Services."

The resuscitation of interest in prevention is accompanied by a spreading awareness of the limits of efficacy of medical care, a sense of dismay about costs of medical and hospital care, a resentment of large scale tax-supported programs and the resultant income tax bite, disappointment with the measurable impact of government-sponsored social action programs and the difficulty of systematically evaluating such programs, an impatience with heavily funded biomedical research to produce clinically useful findings, a weariness of social activism, and a retreat into self-actualization (doing for others yielding to doing for self).

As sophistication develops about the burden of illness on the economy, competition for scarce resources becomes more open between medical doctors whose primary interest is to treat sick people and those whose primary interest is in the prevention of sickness. More are wondering whether money being spent on health is being spent in the most effective way in terms of the benefits derived.

Some of the modern-day advocates of preventive activity are anxious to get on with the job. For example, Anne Somers says, "The practice of health education can no more be put off until all the data are in than can the practice of medicine." Others like Charles Lewis feel that at present "Preventive medicine contains more advocacy than reality and suffers from overpromotion in the face of underachievement." At the very least, it would appear wise to ensure the development of evaluative evidence with respect to effectiveness and efficiency at the same time that large-scale and costly preventive programs are launched. "We do not have," as Philip Abelson recently noted in a *Science* editorial, "enough evidence of the effectiveness of such measures as exercise, appropriate diet, and adequate sleep." In Alameda County the practice of such health behaviors has been found to be predictive of longevity among adults. In the same study it was found that persons surrounded by strong psychosocial supports were likely to live longer than persons who were not.

With a view to contributing further relevant data on the issue of prevention along these lines, the National Center for Health Statistics, at the request of Dr. McGinnis, is considering the possibility of a national study of health practices and health consequences. While indeed it is true that social policy does not wait on social statistics, the beacon of dependable social statistics must continue to inform social policy.

It is convenient to think of prevention action in terms of a triad of activities: personal health services, environmental control, and personal behavior. Intended consequences of such activities with respect to health status include prevention of early and untimely death, prevention of disease, and prevention of disability and discomfort arising from disease. Besides improving the health status of the population, intended consequences of preventive activities could include a reduction in the need for and use of medical, dental, hospital and other health services.

Recent estimates suggest that of the nearly two million deaths recorded each year, perhaps as many as 1 in 8 are untimely and might have been prevented from occurring that year by appropriate use of medical and health services. The papers we are to hear this morning address the health services: family planning, immunization, and health education.

UTILIZATION OF FAMILY PLANNING SERVICES IN ILLINOIS

Jane S. DeLung, M.A. *Director, Data and Evaluation, Illinois Family Planning Council, Chicago, Illinois*

Agency Background

The Illinois Family Planning Council (IFPC) is a non-profit corporation which receives Federal, State and private family planning funds and distributes these funds to service providers throughout the State of Illinois. The Council does not provide medical services directly but contracts with 53 diverse service providers throughout the State.

Through these providers, family planning services are offered in 64 of the 102 counties in Illinois (exhibit 1). These clinics or referral programs offer access to 90 percent of the women in need of family planning services in the State of Illinois.

The Council is a membership agency composed of individuals interested and involved in family planning services throughout the State. The Illinois Family Planning Council was originally the Coordination Council of Metropolitan Chicago. The organization began out of roundtable luncheons of the provider agencies in the Chicago area who were attempting to coordinate the family planning programs in the city.

In 1970 DHEW gave the organization a grant to establish a coordinating agency for the nine family planning providers in Chicago. The Council membership elected a Board of Directors who employed an Executive Director and professional staff.

In 1973 the State of Illinois asked the Council to assume the Maternal and Child Health Family Planning programs (Title V). This expansion of responsibilities gave the Council programs throughout the State of Illinois. At that time the membership of the Board and the Council was expanded to include interested persons from all of Illinois. The Council membership is now 320 persons.

During this period the Council's budget grew from $500,000 in 1970 to $5,000,000 in Federal funds, in 1978. This did not include the local funds which are contributed by the various programs and communities.

The primary functions of the Illinois Family Planning Council are:

1. To coordinate the family planning activities in the State of Illinois.
2. To raise the financial support for family planning activities in Illinois.
3. To increase the access of women to family planning services.
4. To allocate financial resources.
5. To establish uniform patient service and financial data.
6. To monitor the performance of service providers.
7. To provide technical assistance to those projects needing technical assistance.
8. To interface between the service providers on the local, Federal, and State government levels.

Medical Services Delivery

The Council provides medical services through a variety of service delivery mechanisms, utilizing the most appropriate mechanism for the area. The Council has always attempted to develop family planning services through existing providers agencies rather than begin new delivery mechanisms and therefore duplicate services. Presently services are provided through hospitals, health departments, freestanding clinics, neighborhood health clinics, visiting nurse associations, Planned Parenthood Affiliates, and referral programs utilizing private physician's offices.

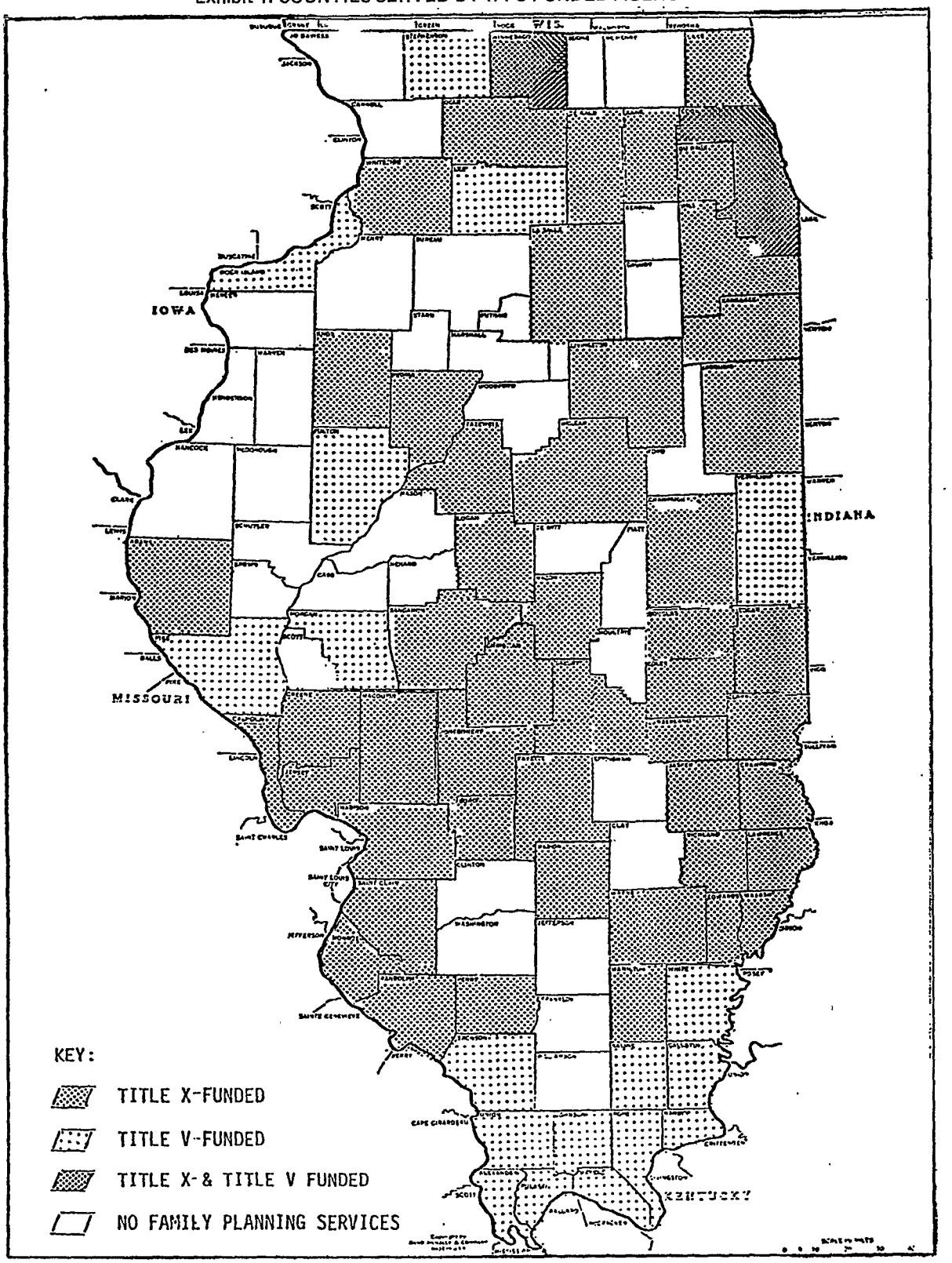
One of the primary objectives of family planning programs is to provide quality medical services to patients. The Council requires all initial and annual patients to receive a Pap smear, pelvic, breast exam, blood test, urinalysis, syphilis test, and gonorrhea test.

The medical services received by the patients throughout Illinois have improved over the years. The organized effort of the Council to improve medical services has improved the quality of medical services received by the family planning patients. The number of tests provided to patients has grown signficantly over the years (exhibit 2).

Patient Distribution by Source of Funding—1977:

		TITLE X	TITLE V	TITLE 19
Number of Projects		40	5	8
Percent of Patients		70%	25%	5%
Base	111,562			

Exhibit 1. COUNTIES SERVED BY IFPC-FUNDED AGENCIES 1978



PERCENT OF PATIENTS SERVED BY AGENCY TYPE—1977

TYPE:	HOSPITAL	HEALTH DEPT.	FREESTAND.	NHC	REFERRAL
	5	17	17	8	6
	22%	27%	22%	24%	5%

Patient Base: 111,562

EXHIBIT 2

	MEDICAL SERVICES PROVIDED 1973–1977				
TYPE OF SERVICE	1973	1974	1975	1976	1977
BASE	90247	90701	108711	106218	111562
PAP	71332	81653	93169	96826	103400
PELVIC	98510	106409	123944	129248	136930
BREAST	85308	92337	104886	105964	111879
PREGNANCY	6266	8482	10943	11882	16677
SYPHILLIS	54383	72730	84739	86678	95374
GONORRHEA	67693	80269	94214	99049	107892
URINALYSIS	52968	73557	86578	91269	104634
BLOOD	48206	70062	84452	88740	99037

Prepared by the Illinois Family Planning Council
June 1978

Data Collection

The Council has the responsibility for interfacing between the Federal Government's National Reporting System for Family Planning Services and the service providers. The Council operates its own data system and collects specific data which it submits to Washington in accordance with the requirements of NCHS.

The data collected by IFPC includes:

1. The medical services provided.
2. The staff providing the services.
3. The type pf contraceptive at the end of each visit.
4. Educational level of the patients.
5. The specific contraceptive-type prescribed, if Pill or IUD.
6. The type of prior contraceptive usage, the length and the source of the previous method.
7. Source of referral.
8. Sex, race and ethnic groups.
9. Patient origin data including HSA, county and zip code.

This data is used primarily by the Council staff for program analysis and planning. Very little data is used to conduct impact evaluation or research. These data elements are produced routinely in various tabulations to give individual clinics more insight into the programmatic activities. This output provides the Council with an accurate picture of those individuals who are using the Council services.

The Illinois Family Planning Council began collecting data in 1972; however, the data described above was initiated in 1978 simultaneously with the advent of the Sample Data Reporting System organized by the National Center for Health Statistics.

As previously stated, the data to be presented and analyzed is collected in 53 different clinics throughout the State of Illinois. The quality of data submitted varies from 100 percent acceptance rate of all forms submitted to a 50 percent acceptance rate of data submitted. On an annual basis there is about a 7 percent discrepancy between the manual count of the projects and the computer count of the Council. The manual count of the projects is generally higher.

The questions completed on the forms are asked orally and accepted from the patient with no verification. The Council, because of a commitment to confidentiality, has never interviewed patients outside of the clinic setting to verify demographic data reported to IFPC. The only verification process that occurs is an annual audit of medical files that the Council conducts in clinics. During the annual audit, the medical services provided, the signatures of persons providing the services, the medical and demographic history of the patient in the medical file is compared with the data reported on the IFPC data collection instrument.

Because of our auditing procedures, activity of services statistics are generally more accurate than the unverified demographic data supplied by the patient. However, Illinois demographic data is consistent with national data.

UNDUPLICATED FAMILY PLANNING PATIENTS/MEDICAL VISITS
1973–1977

YEAR	INDIVIDUAL PATIENTS	TOTAL MEDICAL*	AVG. VIST. PER PAT.
1973	90,798	123,263	1.35
1974	90,701	123,113	1.35
1975	108,320	146,990	1.35
1976	106,218	161,122	1.51
1977	111,562	173,580	1.55

*This figure does not include supply visits.

The first data system of the Illinois Family Planning Council was instituted in 1972; however, it was not until 1973 that all projects were enrolled in the data system.

Patients Served

From 1973 to 1977 the Council has seen an increase of 21,000 unique patients and 50,000 medical visits.

Medical Visit Type

The data also shows that the visit type mix has changed considerably since 1973:

VISIT TYPE MIX—1973 AND 1977

		1973	1977
Initial Visit		41%	30%
Routine		24%	26%
Problem		12%	18%
Annual		23%	26%
	Base	123,263	173,580

These changes in visit type reflect the aging of a family planning program. There are fewer new patients and an increasing number of revisits and medical problems. This increase in the number of visits per patient is a result of the increasing number of medical visits that patients using Pills and IUD's are required to make, which is due to an increasing awareness of the medical complications. This figure does not reflect the number of supply visits that occur each year. Oral supplies given to patients have been decreased from 6-month supplies to 3-month supplies. Also recently new medical data have shown the need to increase the number of Pap smears given to women over 35 from once a year to twice a year.

In addition, more patients are using family planning clinics as a source of their primary health care because the clinics are reasonably priced, are located within the community and are operated by physicians within the clinics.

This increase in the average number of visits per patients per year is expected to grow. As this number grows the planning for clinic staffing will become increasingly important. Additionally, the cost of providing services to one patient per year will increase as each patient demands more time and resources from the service provider.

An increasing cost without an accompanying measurable increase in health benefit is also being seen in family planning programs as more patients turn to family planning for general health care and as more testing, etc., is required to insure patient's care and health.

EXHIBIT 3

		PERCENT OF PATIENTS BY METHOD AT LAST VISIT OF YEAR					
YEAR	BASE	ORAL	IUD	DIAPHRAGM	STERILIZATION	OTHER	NONE
1973	90798	73%	9%	2%	1%	4%	11%
1974	90701	74%	8%	2%	1%	4%	11%
1975	108320	73%	7%	2%	1%	4%	13%
1976	106218	66%	10%	5%	1%	6%	12%
1977	111562	65%	10%	5%	1%	8%	11%

Prepared by the Illinois Family Planning Council
June 1978

Patient Profile: Method Choice

During the year that the Council has been collecting data on patients there has been a decline in the percent of patients utilizing the most effective contraceptive methods. During this period the percent of patients who received no method because of pregnancy or because they are seeking pregnancy has remained constant at 11 percent (exhibit 3).

In 1973, 85 percent of all women enrolled used one of the most effective contraceptive methods (Pill, IUD, Diaphragm or Sterilization). In 1977, of all women enrolled in family planning 81 percent (90,365) of the patients used one of the four most effective methods. Even within the utilization of the most effective methods there has been a decline in the number of patients electing to use the Pill as the method of contraception.

This decline has occurred because of the increasing educational level of the patients and their increasing awareness of the side effects of the Pill. Every clinic reports an increase in the number of patients who come to the clinic desiring a different method after an article appears in a newspaper or magazine on the potential side effects of the Pill. Many of the pregnancies that come to IFPC clinics are pregnant because they went off the Pill after reading such an article.

This decline has also occurred because patients are interested in seeking a more natural and less chemical method of birth control. This decline in utilization of the most effective methods has significant programmatic impact for activities within family planning clinics.

There also has been an increase in the utilization of the methods (IUD and Diaphragm), which increases the time which the clinician must spend with the patient. This increase in clinician-patient contact must be considered in each instance of staffing and costing a clinic. Each such increase reduces the number of patients that can be seen at a clinic and will increase the cost of providing services to those patients not only in direct clinician time but also in the educational time which must be spent with patients to aid them in correctly using one of the methods.

An increase in the number of nonmedically prescribed methods (4 percent in 1973 to 8 percent in 1977) can be correlated to an increased demand on the educational activity in the clinics to correctly inform patients how to correctly use the method. This increase means that many patients will also be lost to follow-up because of the availability of these methods in drug stores, etc.

The Council has not seen an increase in the number of patients who are reported as using sterilization as a method of contraception. Until 1978, the Council did not request marital status information of the patients enrolled in the program. However, it is suspected that a majority of the patients are not married. Sterilization is a popular method of birth control with middle class married couples, who are not reflective of the total patient population of the Council. In addition, the wording of the question on the form may be responsible for underreporting of the number of sterilizations that occur. The question concerning contraception reads, "What is the method of contraception at the end of this visit?" In many instances a clinic will arrange for, pay and refer a patient to a private physician or hospital for the sterilization but will not see the patient after the sterilization. Therefore the patient would be reported as leaving the clinic with a temporary method rather than with a sterilization.

Patient Profile: Income Level

One of the primary objectives of Federally funded family planning programs is to serve low income patients. The Council has seen an increase in the number of patients who report an income at or below 150 percent of poverty. Interestingly the Council has also seen an increase in the past few years in the number of patients who report an income of above $9900.

The financial data reported by patients to clinic personnel are not verified through any type of income tax or personnel statement.

The reported income of patients seen throughout the programs in Illinois indicate that the clinics within the State are meeting the goal to serve women who come from low-income families and who cannot afford to procure these services through the private sector.

The reported income of the patients within the family planning programs have impact when one considers the different sources of revenue for support of clinic activity.

Obviously, not many of these women would have access to private health insurance which might aid

PERCENT OF PATIENTS BELOW 150% POVERTY
1973–1977

YEAR	NO. OF INDIVIDUAL PATIENTS	PERCENT USING PUBLIC AID	PERCENT REPORTING INCOME BELOW 150% (Include Public Aid)	PERCENT REPORTING ABOVE $9900
1973	90798	6%	54%	5%
1974	90701	19%	59%	3%
1975	108320	19%	63%	4%
1976	106218	19%	64%	5%
1977	111562	19%	68%	7%

clinics in developing their private resources. Although many of these patients are eligible for Title XX reimbursement, the State of Illinois has just begun this year to work out a satisfactory Title XX reimbursement rate for projects which will cover the cost of providing services.

In addition, although the Bureau of Community Health Services requires that all clinics have a fee schedule which is to recover cost, women below 150 percent of poverty cannot be charged for services. This means that many of the family planning clinics throughout Illinois will not be able to develop an adequate financial base to be able to provide services without the categorical grant program or an expansion of the activity and payment under Title XX mechanisms.

The Council believes that one of the reasons for the increase in the reported family income of above $9900 is the increase in the number of teens reporting their families' incomes in 1976 and 1977. These were the years in which there was an increase in the number of teenagers serviced by the Council programs. Regrettably the income data available is not by age category, so that this impression cannot be confirmed.

Patient Profile: Education Level

Between 1973 and 1977 there has been an increase in the educational level of the patients who receive services from the Council programs. This is somewhat contradictory of the income level of the patients reported. However, this is another unverified data field and may be reflective of the increasing educational level of all Americans without a necessary increase in the level of income or job expectations. The increase in the educational level is also reflective of the increase in the availability of junior colleges throughout the State. This increase may also reflect the increasing utilization of our services by teens and younger women who are in college.

EDUCATIONAL LEVEL OF FAMILY PLANNING PATIENTS—1973. 1977

	1973		1977
0–4	1	.09	1
5–8	13	4.4	5
9–10	30	10.9	11
11–12	43	28	28
13–14	8	41	41
15–16	4	8.5	8
Unknown	1	6.3	6
BASE	90798		111562

Patient Profile: Racial Composition

The shift in racial composition of the patients in family planning clinics in Illinois is reflective of many variables. The current population of the Family Planning Council is becoming more reflective of the State's low-income population.

Family planning programs were first organized in the large urban areas in hospitals and health departments which historically served urban blacks. The Council made a concerted effort to expand services into the rest of the State of Illinois which is predominately white, particularly the rural areas and the suburban areas. The result of this expansion into rural areas and into suburban areas was an increase in the number of white patients seen (exhibit 4).

Patient Profile: Spanish Speaking Subgroup

The Council has also made a concerted effort to increase the number of clinics in the Spanish-speaking

EXHIBIT 4

PATIENTS BY RACIAL CHARACTERISTICS

Year	Total	White	Black	Spanish Speaking	Unknown
1973	90,798	30,871 (34)	53,570 (59)	4,540 (5)	1,817 (2)
1974	90,701	31,745 (35)	53,513 (59)	4,535 (5)	908 (1)
1975	108,320	47,661 (44)	53,077 (49)	6,499 (6)	1,083 (1)
1976	106,218	45,568 (42.9)	50,772 (47.8)	7,223 (6.8)	2,655 2.5
1977	111,562	51,765 (46.4)	48,195 (43.2)	8,701 (7.8)	2,900 (2.6)

Prepared by the Illinois Family Planning Council
June 1978

EXHIBIT 5

AGE DISTRIBUTION OF PATIENTS 1973–1977

Year	Total	10–14	15–19	20–30	30+
1973	90,798	908 (1%)	29,964 (33%)	44,491 (49%)	15,435 (17%)
1975	108,320	1,083 (1%)	37,262 (34.4%)	56,218 (51.9%)	13,757 (12.7%)
1976	106,218	958 (.9%)	36,220 (34.1%)	54,914 (51.7%)	14,126 (13.3%)
1977	111,562	1,118 (1%)	37,707 (33.8%)	59,462 (53.3%)	13,275 (11.9%)

Prepared by the Illinois Family Planning Council
June 1978

areas of Chicago. There has been an increase in the number of Spanish-speaking personnel at the service delivery level, an increase in the number of service sites in the Spanish community, and a more accepting attitude in the Spanish community to the use of contraception.

Patient Profile: Age Distribution

Although there has been an increase in total number of patients, the percentage age distribution of patients serviced by family planning clinics has not changed significantly over the period of operation (exhibit 5).

The largest percentage of patients are in the age group of 20–30. This cohort of patients can be expected to increase over the next years as this age group increases in the general population.

Patient Profile: Teens

One of the major priorities of the Federal family planning programs has become services to teenagers. In September of 1977, an additional $500,000 has been allocated to Illinois for increasing services to teens in the State.

In the first quarter of 1978 the results of this expenditure can be seen. Twenty-one point one percent of all returning patients were teens while forty point five percent of all new patients were 19 and under.

An analysis of the teen population in the State of Illinois since 1973 shows a redistribution of the percentage of white and black teen patients seen by projects. In 1973 54 percent of the teen patients were black and 46 percent were white. By 1977 54 percent of the teen patients were white and 46 percent of the patients were black.

This shift is reflective of programmatic activity throughout the State to expand activities out of the major urban areas with more suburban and rural areas. This increase in the number of white teens is also reflective of the lack of options for medical services available to teens in suburban and rural areas that are available in urban areas.

Informal surveys monitoring education and counseling activities throughout the clinics show that 5 to 6 months may elapse between an educational encounter in the city and the appearance of that teen in a clinic. In the suburban area the elapsed time between the encounter and the appearance at a clinic is 2 to 3 months.

Patient Profile: Number of Children

In 1973 the number of children reported by patients were:

PERCENTAGE OF PATIENTS WITH LIVING CHILDREN

Year	1973	1975	1976	1978
# of living children.				
0	37%	45%	47%	51.5%
1	25%	23%	29%	24.6%
2	16%	15%	15%	14.9%
3	9%	8%	5%	6.2%
4	12%	9%	9%	4.8%

The Council has not collected data on the number of pregnancies or abortions per patient.

Although fewer of the patients enrolled in family planning clinics have no living children (from 37% in 1973 to 51.5% in 1978), still slightly less than one half of all patients have had at least one child prior to or during enrollment on the program.

EXHIBIT 6

Racial Composition of Patients 15–19 1973–1975

	Total	15–19	% of Total Patients	Black	White
1973	90,798	29,963	33	16330 54%	13633 45%
1975	108,320	37,262	34.4	17295 46%	19967 53%
1976	106,218	36,220	34.1	17385 48%	18834 52%
1977	111,562	37,707	33.8	17345 46%	20362 54%

Prepared by the Illinois Family Planning Council
June 1978

In Conclusion

The Council has had growth in budgets, clinic locations, and patients seen. During the past 7 years the Illinois Family Planning Council has seen a significant broadening in the characteristics of patients who utilize public family planning services. Family planning is becoming a service utilized by people in all parts and segments of the State. This expansion does not mean that there are not areas for further efforts in family planning.

One of the areas where increasing attention is needed is in expansion of education and services to teens, particularly before the first pregnancy.

Another area of concern is that of obtaining adequate mix of funding for continued operation. Family planning programs and particularly those in Illinois have been successful in reaching those women most in need of preventative family planning services.

EXHIBIT 7

Medical Services
Provided 1973–1977

Type of Service	1973	1974	1975	1976	1977
Base	90247	90701	108711	106218	111562
Pap	71332	81653	93169	96826	103400
Pelvic	98510	106409	123944	129248	136930
Breast	85308	92337	104886	105964	111879
Pregnancy	6266	8482	10943	11882	16677
Syphillis	54383	72730	84739	86678	95374
Gonorrhea	67693	80269	94214	99049	107892
Urinalysis	52968	73557	86578	91269	104634
Blood	48206	70062	84452	88740	99037

Prepared by the Illinois Family Planning Council
June 1978

# of Living Children by % Distribution

# of Living Children	1973	1975	1976	1978
0	37%	45%	47%	51.5%
1	25%	23%	29%	24.6%
2	16%	15%	15%	14.9%
3	9%	8%	5%	6.2%
4	12%	9%	9%	4.8%
Base	90798	108320	106218	111562

Prepared by the Illinois Family Planning Council
June 1978

PERCENT EDUCATIONAL LEVEL OF FAMILY PLANNING PATIENTS
1973–1977

	1973	1977
0–4	1%	1%
5–8	13%	5%
9–10	30%	11%
11–12	43%	28%
13–14	8%	41%
15–16	4%	8%
Unknown	1%	6%
Base	90,798	111,562

Prepared by the Illinois Family Planning Council June 1978

IDENTIFICATION OF SMALL AREAS AT HIGH RISK FOR IMMUNIZATION PROGRAMS

Arthur C. Curtis, *Immunization Division, Bureau of State Services, Center for Disease Control, Atlanta, Georgia*

For a given child, six different visits to health providers are required to obtain the recommended immunizations against seven diseases. The recommended series begins at 2 months of age and ends at 72 months. Our best information indicates that nearly all children begin the series; but far fewer complete it. The annual U. S. Immunization Survey in the fall of last year indicated that only 60 percent of children 1 to 4 years of age had adequate immunization against polio and rubella, only 63 percent had adequate immunization against measles, and only 48 percent had recommended immunizations against mumps. These levels reflect a significant decline in recent years of immunity levels for nearly all these diseases.

In response, the government has begun a 2-year immunization initiative with the primary objective of attaining 90 percent completion rates of the recommended vaccinations series by October 1979. Government funding for immunization activities this fiscal year is *$23M* compared to *$4.96M* in 1976. So, many needles and guns must touch many arms very soon.

My involvement in this whole process was substantially deepened when the question was asked,

> "Where are all these kids whom we have failed to properly serve with our preventive medical system?"

I share with you now the gnashing of teeth and scratching of head that we have suffered with this problem in recent months.

Our first attempt to answer the question was based on the availability of data. For each U. S. county, we used estimates of population in the 0- to 4-year age group, and modified that with regional indicators from the U. S. Immunization Survey and State-based surveys to get an indicator of the need there for immunization services at a point in time about the end of 1977. We then adjusted the score with recent vaccination activity data from project areas to the counties therein based on the percent of the population in the county compared to the project area. We came up with a measles risk score (in this case for measles; we did it for the other vaccine-preventable diseases as well) and plotted here on this map the top 400 counties as ranked by that mechanism. The darkest pattern indicates the top 100 counties in the United States as stratified by the scoring mechanism. You can see very plainly that these are highly populous areas, and it is clear that this is a modified, population-based mechanism.

The second attempt is also population-based. It involves the manipulation of four variables for which we have data on each U.S. county. We looked at the number of births in each county to mothers under the age of 20, number of families in the counties with female heads of households, and number of families by race in the county below the poverty level as defined in 1970. We ranked, or assigned a rank, to each U.S. county based on these four variables and then summed the ranks for those four variables in each county, and again displayed the top 400. It is very similar, I think, to this chart with the original measles risk score.

An entirely different pattern is represented, however, if you look at the rate of those four variables in the county; that is, if instead of looking at numbers of births to mothers less than 20 years of age, you look at the proportion of births to mothers less than 20 as compared to total births in the county. This is 1973–74 data. Basically rural counties are apparent here. Looking at morbidity due to measles in 1976 by county, it appears that measles morbidity occurs in highly populated areas, or is at least reported from there. Could morbidity be occurring in these rural areas and not be reported in conventional surveillance mechanisms? Or is it true that our risk scores that are based on population are really indicative of where morbidity occurs or has the potential to occur?

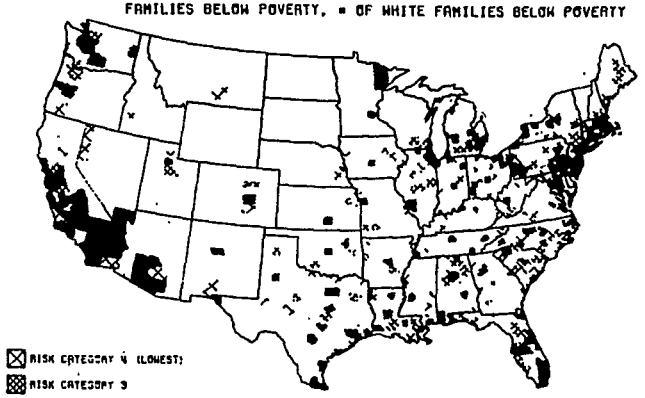
The correlation matrix showing the relationships among these five ranking schemes demonstrates numerically the moderate to strong correlation among population-based rank scores. (Measles Population-based Index, Observed Natality/Poverty, and Reported Morbidity.) A weak correlation exists between the Natality-Poverty Rate Ranks and population-based indicators. The negative correlation between rank scores for measles morbidity and natality/poverty rates suggests the need to determine the reason for absence of measles morbidity reporting in counties high-ranked by the natality-poverty rate scheme.

These data are certainly not *optimal* for answering our question about where the kids are—they were simply the *best available.*

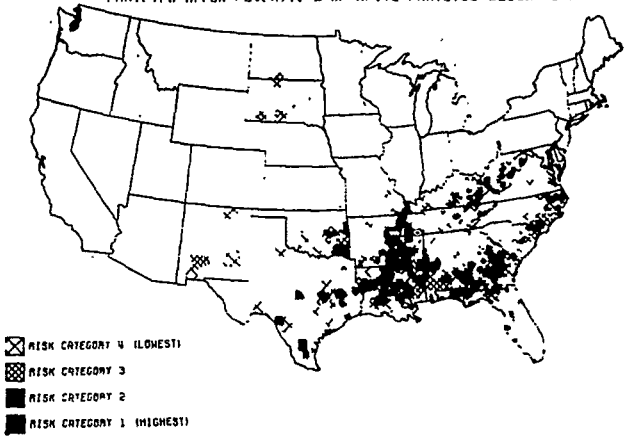
These means discussed here offer some use in describing where the children are but fail to give useful information on their immunization status that we can be confident of.

Two avenues remain now for us to explore in the short term. First, though our *national* immunization survey is too small a sample to yield small area rates of immunization, compression of the data for several years may yield an adequate sample for many small

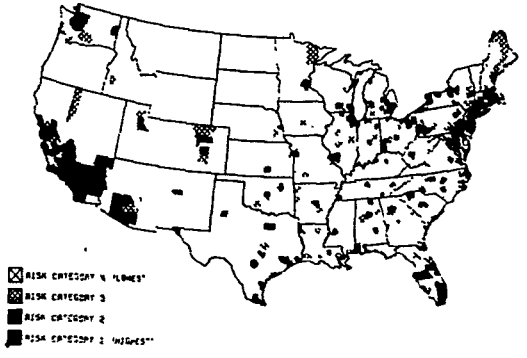
RANK SUMS: % BIRTHS TO MOTHER <20, % FAMILIES WITH FEMALE HEAD, % NON-WH: FAMILIES BELOW POVERTY, % OF WHITE FAMILIES BELOW POVERTY



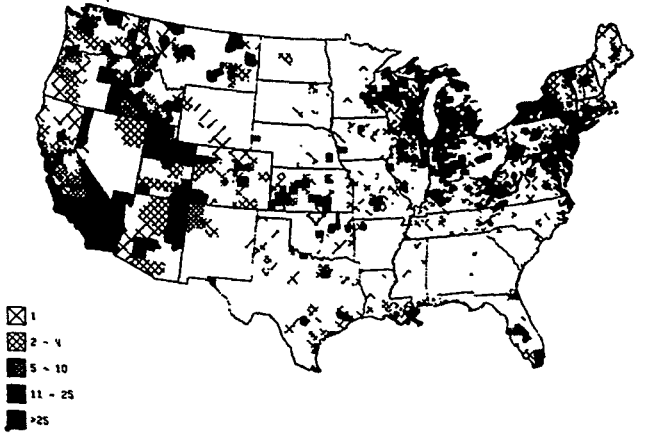
RANK SUMS: % BIRTHS TO MOTHER <20, % FAMILIES WITH FEMALE HEAD, % NON-WHITE FAMILIES BELOW POVERTY, % OF WHITE FAMILIES BELOW POVERTY



MEASLES RISK SCORE BY COUNTY, 1977



TOTAL REPORTED MEASLES CASES BY COUNTY, 1976



areas to be classified into "degree of problem" groups. The Bureau of Census, however, is the agency which conducts the survey in the fall of each year and, when approached with our request for several years' CPS data, they cited logistical problems and a high price tag.

The second approach is much more promising.

A recent survey of 2-year-old children in Ohio indicates that parental education and birth order are the two factors which best correlate with failure to receive complete immunization series. The survey results indicate that if we select any child who has three or more siblings or either parent with less than a high school education, he has about a 47 percent chance of failure to complete recommended series by 2 years of age compared to the population proportion incomplete of approximately 29 percent. The study also indicates that if socioeconomic status is controlled, there are no racial differences in immune status. For most States, these parental education and birth order data appear on the detail birth record and are accessible for a number of years. We are working now to compress these data and provide indicators of the number of children 3 to 7 years of age in each U.S. county who have likely failed to receive recommended immunizations.

In summary, in the long run, the best way to answer our question is through the development of better records systems and survey mechanisms to monitor the changing epidemiologic characteristics of those children who have been failed by our preventive medical systems.

In the short view, many thanks to NCHS for yet another programmatic application of vital statistics data. We are grateful for the methodical collection of detailed birth data by NCHS as a basic reference for health planning in preventive programs for children.

CORRELATION MATRIX OF COUNTY RANKS FOR FOUR RANKING SCHEMES—(MEASLES)

	Measles Population/Natality-Assessment Risk Index	Natality-Poverty Rates	Reported Poverty Observed	Measles Morbidity
Measles Population/Assessment Risk Index	1	.0139	.9337	.4205
Natality-Poverty Rates	.0139	1	.2181	−.1910
Natality-Poverty Observed	.9337	.2181	1	.3859
Reported Measles Morbidity	.4205	−.1910	.3859	1

UTILIZATION OF HEALTH EDUCATION SERVICES

Frances E. Williamson, MPH, *Associate Chief, Office of Health Planning, Ohio Department of Health, Columbus, Ohio*

Having served as director of the training program in my department, I learned that some people have difficulty transferring their learnings from one experience area to another. In several of our training sessions on interpersonal relationships and human behavior we would set up role plays and discussions in a family setting as we felt that provided a common frame of reference to the multi-disciplined group we generally had in the training session. Without fail, we would have at least one participant, and usually more, criticize us for using the family setting instead of their real world in a specific discipline in the health department.

The general public and some health professionals seem to suffer the same difficulty in transferrring experience in solving one health-related problem to another problem area. It had been assumed by many that the predilection of people in this country to "blame the victim" had been eased, if not fully erased, by enlightened legislators' placing protective laws in State statute for victims of rape.

Now, and in ever increasing decibels one hears the noise of a new bandwagon across our land blaring out accusations that the health problems of people are of their own making out of ignorance or irresponsibility. Those with the "me too" mentalities are hopping on the bandwagon and quoting the La Londe [1] report from Canada or some recent writings of Dr. John Knowles.[2] In my files I saved a copy of an editorial from "Hospitals," *Journal of the American Hospital Association,* May 1, 1976, Vol. 50, [3] and I quote the first and last paragraphs—"the buck-passing days are gone for good. Blaming poor health, disease and premature mortality on the health care "system" just isn't any longer valid." This is followed by 5 paragraphs stating that scientific evidence increasingly points to life style and behavior as being directly related to the principal causes of death and then exhorts hospitals to get into health education. Then the last paragraph, "If we are to stop expending pounds of cures to solve health-related problems that need not have occurred in the first place, we must commit ourselves to making health education a vital part of the health care delivery system. If we don't act now, our health education efforts will continue to be unplanned, uncoordinated, and sporadic, and we will continue to deny ourselves a means of improving the country's health care, and health."

We can all add writings and pronouncements to my short list, that point us to that same conclusion that it's now the responsibility of health education to educate the ignorant and motivate the irresponsible to alter or change their life styles so as to reduce the demands on doctors to excise the self-inflicted diseases or miraculously medicate the malignancy. What a travesty! What a copout!

Who among us is not aware that for most of this century—especially the past 30 to 40 years—the so-called "health resources" of this country have gone into erecting "palaces of healing" to the extent that it is now estimated that the U.S. has 1,434,000 hospital beds, 25 percent of which are empty on an average day. Excess beds are estimated to be over 100,000.[4]

The insurance mechanisms, inappropriately called "health insurance," have restricted payments to those persons who were admitted to the "palaces" by physicians, dubbed medical engineers by Thomas McKeown, whose almost total orientation is to disease intervention. Even a generally normal process such as the birth of a human being has been mechanically engineered and intervened with drugs and surgery and required to be conducted in hospitals mainly for the convenience of the doctor—not of the expectant family. Intervention in the birth process in our country has become so pronounced that it is now estimated that we have the highest rate of Caesarean section in the world, with some facilities already delivering more than 20 percent of infants by surgical procedures and the nationwide increase in Caesareans said to be approaching 15 percent a year. For the normal births anesthesia and episiotomies are routine. In a recent edition of our local paper a Dr. Robert Mendelsohn,[6] in his regular column, answered a woman's question regarding Caesarean sections and ended with this advice: "as mounting technologic intervention threatens to change pregnancy from a natural process into a 9-month disease that can only be 'cured' surgically, it is vital for each pregnant woman to add one more question to her list as she interviews prospective obstetricians—namely, 'What is your Caesarean-section rate?'"

My purpose in this recitation of the situation is to try to dissuade you from jumping on the bandwagon and to urge you to place your expectations in the real world and help prevent health education from becoming a protective banner for blaming the victim.

I maintain that the public's use of the current medically oriented delivery system is a "conditioned response" to its restricted use and not the result of an overt education process. As Dr. Thomas McKeown has stated in his article, "Determinants of Health", [5] "For some 300 years an engineering approach has been dominant in biology and medicine and has provided the basis for the treatment of the sick. A mechanistic concept of nature developed in the 17th century led to the idea that a living organism, like a machine, might

be taken apart and reassembled if its structure and function were sufficiently understood. Applied to medicine, this concept meant that understanding the body's response to disease would allow physicians to intervene in the course of disease. The consequences of the engineering approach to medicine are more conspicuous today—because the resources of the physical and chemical sciences are so much greater. Medical education begins with the study of the structure and function of the body, continues with examination of disease processes, and ends with clinical instruction on selected sick people. Medical service is dominated by the image of the hospital for the acutely ill, where technological resources are concentrated." I recall hearing Dr. Bill Stewart, Surgeon General of the U.S. PHS in the early to mid 60's, say that to change the focus of the health delivery system we had to change the education of the physician. To quote from a speech by Dr. William R. Roy,[7] former congressman from Kansas and one of the architects of P.L. 93-641, the National Health Planning and Resources Development Act of 1974, "the training of existing personnel is important because as a general rule people want to do and will do the things they're trained to do. I heard a little statement recently on that; some very clever person said, 'If you give a man only a hammer, the whole world looks like a nail,'—a very good way of emphasizing that people will do what they're trained to do." The developers of two new medical schools in my State vowed to develop a new model education system for physicians, yet when the programs were finally started one couldn't detect one whit of difference. I simply don't know if there is a medical school in this country that has refocused medical education.

How can we have an impact on the public's perception of health and personal responsibility without getting the physician, whom most people hold in high regard, committed and participating in the process?

Early in 1960, I was invited by a county home demonstration club council to help them plan a year's program that addressed protecting the health of mothers. Their problem was that mothers were expected to concern themselves with the health of the father and their children but who was to help maintain and promote the health of mothers? We proposed that the year-long focus on health for the 300 or more members of the 20-some clubs start with each woman's getting her physician to perform a complete physical on her to provide base data. Most of the women on the planning committee, mostly rural women, laughed at the suggestion, saying a call to their physician asking for an appointment would generate the question "what's wrong?" and then if they replied that they only wanted a complete physical, the physician would likely tell them he didn't have time for that foolishness.

Dr. C. Arden Miller in his address to the Society for Public Health Education in Miami Beach on October 16, 1976, entitled "New Demands for Health Education" [8] summarized a 1971 nutritional survey in his State which documented the percent of households consuming inadequate diets and the disproportionate numbers of nonwhites to whites having inadequate diets. With less than 6 years education, one-third of the households experienced an inadequate diet. But surprisingly, even with more than 16 years of education, 20 percent of the households had an inadequate diet. Other facts he reviewed showed that even good knowledge of nutrition did not assure adequate diets.

Follow-up recommendations were published a year after the report was released. Dr. Miller listed a half dozen recommendations regarding society's responsibility that were *not* made, then said: "What the report *did* recommend was a statewide program to improve the understanding of everyone on what they ought to be eating. The recommendation was made without apparent regard to the circumstances, that many people already had far more information about what they ought to eat than they made use of. Impoverishment and lack of resources to prepare, refrigerate and store food were among the deterrents that interfered with effective use of information already at hand. And for other people, the report did not cope with the impressive number who already had been educated to a high level of understanding on matters of diet and yet who reported inadequate dietary intakes, even in spite of living circumstances and income levels that would have allowed a better dietary performance."

He *rightfully* doubted that those recommendations were written by health educators even though the program was packaged as a major statewide emphasis on health education. He wondered if health educators had responded with a quiet outrage that health education had been set up as the patsy for an easy cop-out to avoid social reforms that might actually impact favorably on diets, but which would be politically troublesome. He used the example because to him it typified a new kind of popular expectation that was being laid at the door of health educators. He said, "It is an expectation that no matter what the circumstances of work or living might be, people can be exhorted to increase their knowledge, skills and practices in patterns of daily living that will influence health, and thereby make it unnecessary for society collectively to cope with a disease-inducing environment or with an ecology that powerfully fosters the very behavior that educators hope to alter."

Also, quoting Dr. Miller, "One may legitimately ponder the extent to which people are programmed to acquire conforming habits and behavior patterns by prevailing social values—or the extent to which, out of despair, people demean their own lives out of a realistic assessment of their low value as reflected by prevailing societal influences. Advertising campaigns and reward systems of our society are potent influences on personal behavior....Participating in such behavior in some sectors of society almost represents a patterning of behavior rather than a deliberate choice." Then, he said, "You can marshal the popguns of health education that exhort people to improve themselves one at a time, against the heavy artillery of national advertising

campaigns that sway masses of people at a single blast."

I'd like to cite another warning regarding the reality. The April 1978 issue of the *American Journal of Public Health* contains an article entitled "Socioeconomic Differentials in Selected Causes of Death" by Yeracaris and Kim.[9] In the last paragraph is this final sentence: "...(b) from the point of view of the health of our Nation this study presents an additional warning: socioeconomic inequities in our society continue to contribute wasted lives—a social by-product a democratic and humane society can no longer afford."

The health educator is a person with the training and expertise to help assess the needs of people in the community through a variety of procedures and then participate in the planning process with the other health providers in the development of programs to meet the needs.

Clearly, the provision of preventive services and the health education components of those services must be based on a solid base of information and targeted to specific groups.

Another warning! There is a growing tendency to speak of "health education," "health information," "health promotion," and "disease prevention" as one and the same—particularly since the passage of P.L. 94-317. The position paper on health education published in the *American Journal of Public Health,* February 1978, Vol. 68, No. 2, (see Ap. 2) makes these statements:

> "Health education is the term applied to the planned use of education processes to attain health goals. It includes 'any combination of learning opportunities designed to facilitate voluntary adoption of behavior which will improve or maintain health.' The Joint Commission on Health Education terminology 1972–73, defines health education as 'a process with intellectual, psychological and social dimensions relating to activities which increase the abilities of people to make informed decisions affecting their personal, family and community well being.' This process based on scientific principles facilitates learning and behavioral change in both health personnel and consumers including children and youth.
>
> "Health education is more than the provision of information. While health education includes acquiring knowledge about health matters, its purpose is the use of that knowledge. It addresses the formation of values, the acquisition of decisionmaking skills and the adoption or reinforcement of desirable health practices. Health education honors individuals' right to privacy, their right to meaningful information, and their right to make their own choices."

Preventive services are usually designed to reduce mortality and morbidity. Health education is an important component of that process and often is the responsible activity promoting the agreed upon measures designed to prevent disease and disability.

What should be coming through in my message is that the health care system and the providers of care need alteration and education, or reeducation, (respectively), as much as do the consumers. Health services and particularly *preventive services* must be planned within the broadest social context. The pouring out of health information with the exhortation to people, the consumers, to change life styles comes through as a lot of static to a large portion of our population entrapped by our system. Health providers must be taught that we are a country diverse in its needs, its resources and their distribution. Efforts to improve health cannot be "shotgun" but must address the diversity of places, people, economics, environment and culture, among others.

To emphasize the foregoing, I'd like to quote Bess Dana, who is Associate Professor of Community Medicine and Director, Office of Education, Mount Sinai School of Medicine. In her essay, "Consumer Health Education" which appeared in *Health Services: The Local Perspective,* (This is a 1977 publication of the Academy of Political Science, 2852 Broadway, New York, NY 10025.) she says,

> "Perhaps the first learning requirements for the provider is a redefinition of the term *consumer* to acknowledge the fact that, in terms of the understanding of health needs and the management of health care, the consumer is also to a large extent a self-taught provider. Health education and health care, in the urban as well as the rural environment, often begin long before contact with the health care system and frequently continue long after the contact is interrupted or ceases altogether.
>
> "Far from being a stranger to the concept of 'self-responsibility for health' as articulated in much of the current professional rhetoric of consumer health education, the consumer—particularly if he or she is poor, nonwhite, non-English speaking, lacks formal education, has little access to the normal support systems of family, neighbors, friends, and religious or fraternal groups—is an expert in self-responsibility, often more through necessity than choice.
>
> "To what extent does the evidence that social and psychological deprivation places people at high risk for chronic disease reflect the fact that the poor and socially disadvantaged have had to assume too much responsibility for meeting their own health needs rather than too little? To what extent do 'adverse' health behaviors—such as cigarette smoking, alcoholism, drug abuse, sexual promiscuity, and fat-filled diets—reflect coping mechanisms for dealing with inadequate welfare allowances, joblessness, loneliness, and social and emotional isolation? When, for whom,

and under what circumstances do the self-help systems that are part of the culture of every indigenous group in a pluralistic society work? When and under what circumstances do they break down? These are some of the nagging questions that can be answered only through professional engagement with the consumer in the natural life of home and community."

It is rewarding to note that health education has at last captured the interest of society, but I am alarmed at the onrush of the "blame the victim" rhetoric.

Yes, we do need statistics and data to identify the people with problems, the locale of these people, their work world (if employed), their housing and other environmental factors, socioeconomic status, cultural identity, educational experience, disease experience, etc.

We need people with educational expertise to help analyze and utilize the information to involve the consumer and help make appropriate decisions on programs and solutions.

We need to address the health problems in concert with other social needs of the people and their families.

We need to focus the system and the providers and/or professionals on health care and preventive approaches as opposed to sickness care—and help prevent health education from becoming a protective banner for "blaming the victim."

We need to recognize that people, given the opportunity in a responsive and supportive system, are anxious to practice preventive measures, secondary prevention, if not primary.

We need the specialist in health education to work with people, the consumer, in the community, with other health professionals, with outreach workers, or as the World Council of Churches calls the indigenous worker, the "health promoter," with the information specialists and the many other resources of a community to aid in organizational, informational and solution producing programs identified and desired by the people.

We need to recognize that the involvement of people in the process of problem identification and problem solving is a "heady" educational and rewarding experience.

One more reference that you who are interested in health education should try to get for your staffs. It's a manual prepared by Dan Sullivan entitled, "Educating the Public About Health—A Planning Guide." [10] It was prepared under a contract with the Bureau of Health Planning and Resources Development. Not only does he give some useful definitions of health education, but also he reviews planning guides for program development. This includes the collection and analysis of data and procedures for designing programs. There are examples of experiences in data collection and problem definition. Best of all, he provides a Health Education Program Development Scorecard to be used as a checklist during program development or as a self-evaluation schedule after a health education plan or program has been completed.

My health career has been exclusively in the public health arena; thus I am experienced in stretching the health dollars that have trickled into our programs. (I believe I've made my point as to where the resources have been flowing.) It appears we must continue to stretch our resources as I see no evidence of many additional dollars being committed to health education efforts. What is important, then, is for us to identify the many activities extant at the local, State and national levels in both the public and private sectors and continue our efforts in cooperation and collaboration. We cannot afford to duplicate efforts when our resources are so limited. In this use of the editorial "we" I am including planning agencies and program agencies; I'm including local, State and Federal agencies. As Dr. Mayhew Derryberry used to say, cooperation *doesn't* mean "You coo while I operate." Cooperation must be built on trust, mutual respect, honest communications and understanding of each other's functions and responsibilities. Only then can we expect to coordinate our energies and activities and present a collaborative and useful product.

As health educators say, you must start where people are and people are at the local level. Health education is essentially a local affair and a people affair. The successful health education programs, then, are those in which people are the focus, people are involved throughout the process from need determination to the selection of programs and the completion of the project or activity.

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APPENDIX I

DEFINITION: HEALTH EDUCATION AND PROMOTION*

Health education and promotion is a process that favorably influences understandings, attitudes, and conduct in regard to individual and community health. Specifically, it influences and affects individual and community health behavior and attitudes in order to moderate self-imposed risks; maintain and promote physical and mental health and efficiency; and reduce preventable illness, disability and death. Health education and promotion subsumes a set of activities that

1. Inform people about health, illness, disability, and ways in which they can improve their own health;
2. Educate people about appropriate and efficient use of available health care services and other health resources;
3. Provide individuals and groups with educational experiences that will encourage them to develop and/or maintain more healthful practices and styles of living;
4. Help educators and health providers acquire the ability to transmit knowledge and skills to people in ways that will encourage them to establish and maintain healthful practices and life styles;
5. Advocate changes in the physical and social environment that facilitate healthful conditions and healthful behavior;
6. Advocate the provision of personal and community health services essential to the attainment and maintenance of optimal health; and
7. Systematically examine the above activities to determine which methods are most effective.

*Adapted from report of the Task Force on Consumer Health Education of the National Conference on Preventive Medicine (1975)

APPENDIX II

Position Paper

TOWARD A POLICY ON HEALTH EDUCATION AND PUBLIC HEALTH

I. Public Health and Health Education

Optimum health for the nation's population is the goal of public health. Today more than ever before, examination of the causes of ill health and of the means available for improving health status is focusing on health education as a way to achieve public health goals. The conviction is growing that the next major advances in health will come from changes in the life-styles of individuals and from control of health hazards in the environment. In a democratic society the education process is a way of alerting citizens to personal and societal obstacles to good health and offers a channel for achieving needed change.

Health education can help prepare people to take greater responsibility for their own health and that of their families and communities. Through health education individuals acquire the information, skills, and values for making responsible decisions about their personal health. Since health is influenced by environment, social conditions, institutions, and economic policies, solutions to complicated health problems often require coordinated citizen action.

The goal of health education is the health-educated consumer-citizen who adopts a health-promoting life-style, wisely selects and uses health care resources, products and services; and influences public policy and planning on health care issues and larger environmental matters that affect health.

II. APHA and Health Education

The American Public Health Association has viewed health education as a vital and indispensable component of public health practice since the establishment of the organization and continues to recognize the importance of the educational process in achieving public health goals. The Association's position paper on Prevention, adopted in 1976, and its School Health Education position paper, adopted in 1974, are recent evidences of this interest.

In view of the current rapid expansion of interest in health education, there are many opportunities for APHA to give guidance and take leadership which will result in more effective programs.

Therefore, it is timely for APHA to pull together its thinking on health education into a single position paper. This position paper is designed to be of use to policy makers, administrators, program planners and practitioners both within and outside of the health field. It is recognized that no statement can encompass such a comprehensive field as health education and that elaboration will be required from time to time.

III. Why Health Education?

Many forces have converged to create a resurgence of interest in stronger, more comprehensive, and more imaginative health education efforts. Among the reasons for strengthening health education are:

- A shift in leading causes of death and disability from acute disease to chronic conditions which requires increased individual involvement in prevention, in recognition of illness and in care;
- Growing awareness among health professions that many health problems such as smoking, poor nutrition, overweight, lack of exercise and recreation, abuse of drugs and alcohol, and dangerous driving involve behavior patterns and life-style choices which individuals can to a great extent control;
- Acceptance by environmentalists and others that if control of many environmental hazards such as air and water pollution, occupational risks, and toxic substances are to occur, group action by informed citizens is required;
- Concern about the high cost of health care which has resulted in efforts to recognize and prevent health problems and to promote more effective planning and use of health care resources as ways of achieving savings and obtaining maximum benefit from expenditures;
- Recognition by health care providers that improved communication and understanding help consumers to accept their share of responsibility for both personal and community health;
- The growth of the consumer movement in all aspects of American society with resulting pressure for consumer involvement in all levels of health decisionmaking and with growing interest in self-care movements.

IV. What is Health Education?

Health education is the term applied to the planned use of education processes to attain health goals. It includes "any combination of learning opportunities designed to facilitate voluntary adoption of behavior which will improve or maintain health."[1] The Joint Commission on Health Education terminology,

1972–73, defines health education as "a process with intellectual, psychological and social dimensions relating to activities which increase the abilities of people to make informed decisions affecting their personal, family and community well being. This process based on scientific principles facilitates learning and behavioral change in both health personnel and consumers including children and youth."[2]

Health education is more than the provision of information. While health education includes acquiring knowledge about health matters, its purpose is the use of that knowledge. It addresses the formation of values, the acquisition of decisionmaking skills and the adoption or reinforcement of desirable health practices. Health education honors individuals' right to privacy, their right to meaningful information, and their right to make their own choices.

Health education is one very promising approach to health improvement but it has only limited power to counteract the health impact of such factors as economic deprivation, poor housing, and persuasive media.

V. When Is Health Education Carried Out?

There are health education needs throughout the life span and through all stages of health and illness. School-aged children and pre-school children and their parents present especially important targets and opportunities for education about health. Therefore, the APHA is on record as supporting "the concept of the national commitment to a comprehensive sequential program of health education for all students in the Nation's schools, kindergarten through twelfth grade."[3] Since all parents provide role models and establish basic health practices, and because attitudes and beliefs about health are early developed in the home, parents also need to be assisted in their role as health "teachers". College students, families, men and women in the middle years, and senior citizens in their turn have special health education needs.

Health education is an essential ingredient in programs for promotion of wellness, prevention of illness and disability, and for the control of disease. Because the need for health education is interwoven throughout the life span, it should be provided in a variety of settings: in the home, in the school, in programs for senior citizens, in the workplace, in offices, institutions and agencies where medical care is provided, in community civic and social organizations, and through mass media.

VI. What Are Methods of Health Education?

The implementation of a health education program requires the use of a variety of methods since no single method can be expected to be effective with all persons under all circumstances. A combination of methods organized in a systems approach is more likely to achieve a desired result.

Methods are selected following an analytical process which includes consideration of the needs and characteristics of the target group, the goal to be achieved and the nature of the learning issue to be addressed. For example, an anti-smoking campaign, driver safety, nutrition, gun control, and school health instruction are so different in nature that each requires a separate educational approach. Methods available include health counseling and other one-to-one exchanges, formal and informal instruction, community organization, written and audio visual communication, use of mass media, and group interaction. Involuntary methods such as some forms of behavior modification are not health education.

VII. Who Carries Out Health Education?

Health education is carried out in many settings by a variety of people under diverse organizational auspices, i.e., State and local health departments, voluntary health agencies, school systems, health care institutions, and others. Preparation for fulfilling this function should be a part of both pre-service and in-service training for all health care practitioners and health administrators. Some personnel are also recruited from minority and ethnic groups for outreach and other special health education purposes. In many cases they are prepared for particular assignments. In addition to these health workers, there is a group of people who are specially prepared, by education and experience, to identify the education and demands that must be met to attain health goals and who are equipped to plan, carry out, and evaluate health education programs. In short, they manage the health education experience.

Health educators help people become interested in health as a means to a fulfilled life. They provide information about health, illness, and disability and help people to acquire the necessary skills to adopt and maintain healthful practices and life-styles. Health educators also assist other workers in health care, education, and community organizations to provide education directed towards health goals; they establish programs and curricula suitable for various settings; assist communities to make changes in the environment in order to promote health; and they stimulate and conduct research and evaluation in relation to education for health.

Some health educators are prepared for work in a particular setting such as the school or hospital while others may have more comprehensive preparation. Professional preparation programs are offered at the bachelor's, master's and doctoral academic level. Standards for preparation have been formulated and are applied by State Departments of Education, regional accrediting bodies, and at the graduate level in public health by the Council on Education for Public Health.

VIII. Considerations in Planning Education Programs or Interventions

Crucial to the success of an educational endeavor are the managerial elements common to all program planning. These are identification of problems, analysis of alternative approaches, setting objectives, assignment of resources, preparation of staff to carry out the function and monitoring performance. An organization base and sustained administrative and budgetary support are required.

The focus of an education program may be on individual and family practices. Different timetables, target audiences, and methods may need to be selected depending on the problems and objectives. In developing the education program design, special attention must be given to involving members of the target population in the planning process and to determining their previous social, environmental, and educational experiences.

The education process can also be used along with other forms of intervention to bring change to systems, institutions, and social conditions. Such educational goals may be sought directly through education for legislators, policy makers, administrators or indirectly through educating citizens about health problems and ways of solving them.

Educational programs must be adequately staffed with individuals having appropriate education and technical expertise, to help insure desired learning outcomes. Staffing plans should carefully consider the match of personnel to targeted groups to insure clear communication and receptivity.

Because of the long neglect in support of health education, in many cases, planning for expanded educational services will need to include inservice education and mid-career retraining of many existing health practitioners as well as the preparation of a large cadre of well-trained health education workers at all levels.[4]

Because of the complex issues that health education must address, programs must be supported and nurtured over time. Experience has shown that, while some results of education can be observed immediately, many are slow to occur. Thus, in planning programs and evaluations, distinctions must be made as to the time period in which results can be realistically achieved or assessed.[5]

IX. Evaluation and Research

A number of means are available for evaluating health education programs. Progress is being made in developing even more useful approaches to evaluation and research by applying procedures adapted from standard social research and health services research methods. The results of research and evaluation can guide planners and administrators and enhance the state of the art of health education by further clarifying what health education can or cannot do and by validating which methods are effective.

Support for carefully designed health education research and demonstration is needed to provide a stronger base for practice. This support should be of sufficient magnitude, continuity, and planning to assure the production of results.[6]

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[5] Simmons, J. (ed.), Making Health Education Work, APHA, 1976.

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RESOURCES

Listed are groups with staff available to handle inquiries about the field of health education.

American College Health Association, Health Education Section, 2807 Central Street, Evanston, IL 60201

American Medical Association, Department of Health Education, 535 N. Dearborn Street, Chicago, IL 60610

American Public Health Association, Public Health Education Section, 1015 18th Street, NW, Washington, DC 20036

American Public Health Association, School Health Section, 1015 18th Street, NW, Washington, DC 20036

American School Health Association, 107 S. Depeyster Street, Kent, OH 44240

Association for the Advancement of Health Education, American Alliance for Health, Physical Education and Recreation, 1201 16th Street, NW, Washington, DC 20036

Bureau of Health Education, U.S. Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control, Atlanta, GA 30333

National Center for Health Education, 44 Montgomery Street, Suite 2424, San Francisco, CA 94104

Office of Health Information and Health Promotion. Office of the Assistant Secretary for Health, 200 Independence Avenue, SW, South Portal Building, Room 717H, Washington, DC 20201

Society for Public Health Education, Inc., 693 Sutter Street, 4th Floor, San Francisco, CA 94102

State Departments of Education. Each State department has one or more specialists in health education.

State Departments of Health. Each State department has one or more specialists in health education.

RAPPORTEUR REPORT

Gail H. Sherman, *NCHS, Hyattsville, Maryland*

Session O, "Utilization of Preventive and Community Health Services" was chaired by Jack Elinson, Ph.D., Service Fellow, NCHS. Dr. Elinson was substituting for Dr. J. Michael McGinnis, Deputy Assistant Secretary for Health, who was called to present DHEW testimony on Senator Kennedy's bill, S. 3115: To establish a comprehensive disease prevention and health promotion program in the United States.

The presentations in this Session were: "Utilization of Family Planning Services," Ms. Jane DeLung, Illinois Family Planning Council, Chicago, Illinois; "Utilization of Immunization Service," Mr. Arthur C. Curtis, Immunization Division, Center for Disease Control, Atlanta, Georgia; and "Utilization of Health Education Services," Ms. Frances Williamson, Office of Comprehensive Health Planning, Ohio Department of Health.

The issue of sterilization as a method of family planning was discussed. It was pointed out that the reason for strict sterilization regulations by the Federal government stem from the fact that many illegal sterilizations are performed. It was also noted that sterilizations are often done with private funds instead of Federal funds in some family planning projects so that these will not have to be reported.

It was noted that the intent and basis for family planning programs was originally to provide care for low income individuals. However, the emphasis on family planning services is moving toward the more affluent, suburban middle-class. The reason for this shift in emphasis to the suburbs is the teenage population which is designated as "in need" by Federal standards

The immunization issue was discussed. It was noted that there are declining rates for vaccination in Canada which is comparable to the situation which exists in the United States. There is a higher rate of immunization in public programs where there is a high priority for health delivery services.

It was asked if anything could be done to identify high-risk areas in the United States. Follow-up is important, with complex immunization schedules, to assure that these schedules are completed. Also, records systems must be maintained because there is often a loss of responsibility for care in mixed provider systems.

The U.S. target for immunization coverage is 90 percent by 1979. The goal for accomplishing this target is to construct a system to deliver immunization services to all children born. There is, however, no method to define the target population by age group. The methodology for accomplishing the measurement of the goal will be through a U.S. immunization survey.

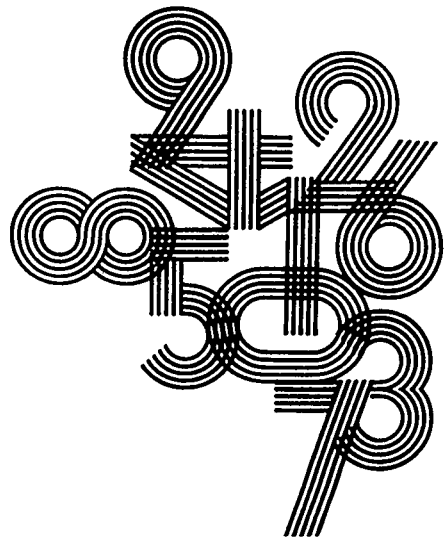
One comment was that local health departments are not meeting the needs of children regarding immunization services. In Mississippi, for example, only 40 to 50 percent of the children are being immunized. There is a need for small area data on immunizations, and this may be obtained through education systems and school nurses. Many States legislate the need for immunization prior to school entry. A record review between schools and health departments may accomplish the data need but is a laborious process.

In the health education area there were two major questions asked. One of these was what kinds of records and statistics would be useful to the health educator's role, and the second was what should be done other than cooperation.

The questions were responded to jointly. The health educator should assist parents in the development of education projects. The emphasis for these should be on education in a preventive mode rather than a curative one when crisis occurs.

Equally important is the development of health education components in health systems plans. These have not been well written in the past because health education is such a broad arena. Planning agencies should work toward the development of priorities in health education in areas such as community health activities, patient education, school health activities, public awareness programs, and education of workers in industrial settings.

Finally, the three areas of prevention were discussed. These are preventive health services, control of the environment, including exposure to occupational hazards, and personal health behavior. It was mentioned that the National Center for Health Statistics is proposing a national study to look at life styles and health behaviors in relation to subsequent illness and mortality, and the use of health services.



CONCURRENT SESSION P

Data Resources for Future Policy Research

CHANGING HEALTH MANPOWER POLICY PERSPECTIVES AND ANALYTIC DATA NEEDS

Howard V. Stambler, *Chief, Manpower Analysis Branch, Bureau of Health Manpower, Hyattsville, Maryland*

To say that the Nation's perspectives on health manpower are changing dramatically would be to understate significantly the developments of the past year or two. Earlier dialog about manpower shortages and a national health care crisis has now been replaced by talk about possible manpower oversupply, practitioner-generated demand, unneeded surgery, and exploding health care costs. Yet, these complex issues all emerged into the public consciousness without the systematic and comprehensive analytical underpinning that such critical issues require. Unanswered questions and uncertainty abound, with incomplete data, analyses, and research making policy development difficult and chancy. What we have today is a public forum trying to develop major new policy initiatives while a handful of analysts and researchers, who should already have provided the requisite intelligence base for these policy debates, struggle vainly on an *ad hoc* basis to respond to the myriad of questions being asked of them (and many more than should be asked but aren't).

Happily, however, the importance of manpower data and analysis is now being recognized, and the signals from the "powers that be" are positive and encouraging. With the strong support of the Department, OMB, and the Congress, the analytic units of the Bureau of Health Manpower, the Health Care Financing Administration, and the National Centers for Health Statistics and Health Services Research are being given resources and asked to sort out the truly critical health care and manpower issues and to develop the data and analyses needed to shed light on them. Even more encouraging is the apparently growing recognition that providing even partial answers to policy questions requires an investment of time, money, and staff, and a continuing commitment. In essense, health manpower analysis may finally be coming of age and shedding its short pants, sneakers, and "beanie caps"—for which the Bureau of Health Manpower is especially thankful.

This new support for expanded health manpower analysis comes none too soon. Policy issues have become more and more complex, technical, important, and (perhaps most significantly), more interrelated and inseparable. And, those who are raising the policy issues and supporting the analytical efforts have made it abundantly clear that health manpower data, analysis, and research must take into account more than simply health manpower, and must be tied closely to issues and policies, both present and potential.

If one were to briefly summarize the Bureau of Health Manpower's analytical and data concerns, it could be said that they largely reflect the need for a better understanding of the health education and health care systems and the roles that manpower play in them. Key components would improve supply and requirements estimates and projections, a better grasp of why specialty and geographic distribution are as they are, and a clearer picture of how and why health education institutions produce what they do.

Although it might appear that the Bureau of Health Manpower's primary concerns should be with the training of health manpower per se, the Bureau's interests are much broader, also dealing in depth with the services provided by health manpower—their amount, type, appropriateness, quality, availability, distribution, and cost, and why they are that way. This is true not only for physicians, but also for dentists, other health professionals, and allied health workers, as well as for the settings in which they work, whether private offices, HMO's, hospitals, nursing homes, and neighborhood health centers. (This is really not so strange, since support of health manpower education and development programs *should* have as its ultimate goal the production of the services needed to meet the Nation's requirements.)

More specifically, what are some of the key data and analytical issues that the Bureau feels need to be addressed? First, let's look at a few of those related to physicians and medical care.

A major concern here relates to the services provided by medical specialists, and the medical and other need for such specialty care. Our graduate medical education policies can ultimately be no more reasonable than permitted by our understanding of how changes in graduate medical education affect the type, amount, and cost of care, of the relationship of specialty services to actual patient need, and of the patient's willingness and ability to seek specialty care. We need to relate generic data on specific services provided to information on both the patient and the provider. We also need to look at the whole patient—his physical and mental health and his environment—rather than at one aspect of his health at a time (e.g., cardiovascular conditions). It would also be helpful to have data on *incidence* of new conditions or acute phases of chronic conditions, rather than on *prevalence* at a given time.

Dental manpower analysis is more advanced than other types of analysis, partly because dental care represents a simpler and more discrete analytical problem. For example, a micro-simulation model of the dental care system is under active development in the Bureau of Health Manpower. However, needs still

exist for economic data, population projections by dental health status, dental insurance information, and dental care production statistics. Furthermore, as dental conditions seldom are self-limiting or curing, it is particularly appropriate to examine dental health status and the link between status, past dental care practices, and population characteristics. A final concern is the possible cross-elasticity of dental care with other types of care. Do people seek more dental care as their other health needs are increasingly met by insurance and not out-of-pocket?

Data and analytical issues abound among most of the other health practitioners. Although current policy emphasis is less on such groups as optometrists, pharmacists, and podiatrists, there still remains the major concern about achieving a general balance of supply and demand. While reasonably good counts of such manpower exist, too little is known about how they produce services, or on the interaction or partial substitution of their services with those of physicians. This is very important in estimating manpower requirements for these fields, as well as for physicians, especially because of the large growth anticipated in the supply of physicians.

For nurses, allied health manpower, and some newly emerging health fields, the issues relate heavily to role delineation and to employment setting. Manpower policies for nurses are strongly affected by nurses' changing role in the provision of care and by their educational preparation. How does one determine empirically what an appropriate level of educational preparation is? Can one look at hospital performance to see if efficiency or outcome measures differ according to nurses' preparation?

Another role issue is that related to midlevel practitioners. Although BHM is supporting training of various types of physician extenders, we don't really know how many will be effectively employed in the late 1980's. Basic to our future educational policy is a better understanding of the incentives and disincentives that exist for physicians, dentists, hospitals and HMO's to utilize these personnel.

Turning to allied health manpower such as medical technologists and physical therapists, these fields are looked on as being largely a State and local responsibility, not a national one. But there is a dire need even for reasonable head counts of allied workers by type. We also badly need measures of their activities, preferably linkable with other supply and demand data, as well as information on their training, certification, and distribution. Also needed is information how allied manpower (or nurses) improve or constrain the performance of physicians and dentists, and how they relate to hospital output and costs.

By describing first the analytical and data needs in specific health professions, I do not mean to play down the need for a comprehensive overview of the total health manpower system. Any consideration of physicians, nurses, or allied manpower requires an understanding of hospital roles and behavior. While HCFA is very active in hospital analysis, its emphasis is heavily on costs, and it is not yet clear whether HCFA analysis will address manpower in relation to hospitals. It is clear the manpower policies affect and are affected by such hospital factors and costs, technology, and staffing; we are unsure how, why, or how much. For example, how do staffing patterns affect the quality and cost of care provided by hospitals?

Encompassing nearly all the issues and needs already mentioned is the Bureau's interest in development of an improved understanding through modeling activities of the health care system. Clearly, some relationship exists between supply and demand for care that is not yet understood. Does competition among providers exist? What form does it take? Does some form of consumer resistance limit the demand for care? Why do we have the care prices and utilization levels that we observe, and why is it not higher or lower? It is thus very important to relate manpower policies to each other and then to other health policies on insurance, costs, reimbursement, and facilities, since they affect the same care system and must complement, rather than oppose each other. Furthermore, the analysis must be causal, asking *"why"* something happens rather than *"what."* Current data, research and analysis appears to be too much concerned with numbers of manpower and visits, and too little with such things as dollar and nondollar prices, insurance, other disincentives to seeking care, disease incidence, practitioner incomes, productivity, costs, and the like. This type of analysis requires supply and demand data in the same data set, and for enough years or areas to permit statistically significant results.

Finally, even if answers to these questions were available and if we understood well the workings of the health care system, we would still be faced with geographic distribution issues. What are the factors that have brought about the distribution that currently exists? On one hand, we observe differences in manpower density and in the way manpower provides services. On the other hand, many studies show little or no difference in such things as waits for appointments for new patients and the amount and frequency of care provided. How do we rationalize these differences and gain a clearer understanding of geographic issues?

A second aspect of distribution issues reflects the tremendous emphasis currently being placed on education and training of health professionals willing to serve in shortage areas. Yet, a basic policy question still remains—what really constitutes a shortage of health manpower? Or a surplus? What is the critical level at which the supply of health manpower is adequate to serve the needs of an area, population, or institution? How can we measure the effects of more or fewer manpower on the amount or accessibility of the care provided? Needless to say, the requirement for data to conduct geographic analysis is staggering.

In closing, I want to make clear that the responsibility for providing the needed health manpower information does not lie entirely with the Bureau of Health

Manpower, HCFA, the National Centers, or even with the Federal Government itself. Input is needed from all sources. Neither as concerned citizens or as statisticians can we sit back and wait for "someone" to collect the data, do the analyses, and answer all the questions that need to be answered. All components of the statistical, analytical, research and planning community must work together to provide effective input into the critical health policy deliberations. Only in this way can we develop the necessary answers and provide the hard facts, figures, and insights needed to address the major health policy issues that confront us.

Thank you.

BASIC RESEARCH AND ACADEMIC PERSPECTIVE ON NEEDED HEALTH RESOURCE DATA AND DATA FILES

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The National Center for Health Statistics is an absolutely crucial source of data for health services researchers. Its data are used either directly, as when someone analyzes utilization rates with data from the Health Interview Survey, or indirectly, when published national data is used to place micro studies in perspective. While more and improved data will always be helpful, I will argue that somewhat more attention should be given to making existing and future data easier to use and analyze.

Three years ago the NCHS published a report by the U.S. National Committee on Vital and Health Statistics entitled, "The Analytical Potential of NCHS Data for Health Care Systems."[1] A number of their suggestions have already been implemented—for example, the outstanding document, *Health: United States, 1975*, and the Medical Economics panel survey. Other recommendations have not been implemented, or at least are not apparent to the casual outside observer. Among these I would emphasize the suggestions for more small area statistics, data on services in institutional settings such as hospitals and clinics, data on utilization and health status over time, and data to measure the influence of supply on utilization.

The NCHS must obviously consider any recommendations within the constraint of scarce budgetary resources. Thus, I will focus my own suggestions on changes and activities that, from the outside, seem to be relatively simple and inexpensive. These suggestions fall into four groups: (1) analytical studies, (2) small area data, (3) changes in the types of data collected, and (4) changes in data processing and preparation procedures.

One of the suggestions of the Technical Consultant Panel was for increased analysis of the data by NCHS staff. This has been implemented through the new Division of Analysis, and I am sure that as the staff continues to use the data, they will have a substantial impact on survey design changes. Some analytical studies, however, might be undertaken to make the existing data more usable. For instance, the National Health Interview Survey has been in operation long enough for us to be able to ask about changes in health status and utilization over time. Unfortunately, design changes in the surveys make direct comparisons at best difficult, and are potentially very misleading. It may well be possible, however, that adjustments can be made to develop linked series in much the same way that linked indices are developed by the Bureau of Labor Statistics. (While NCHS publications often point to the difficulties in making time series comparisons and sometimes decline to do so, many a more daring, and perhaps foolhardy, researcher simply lifts figures from several publications. It would be far better to have the adjustments done by those who really know the limiations in the data.)

In other situations, the computational work has already been done, but is lost to the user. The recent volume on synthetic State Estimates of Disability and Utilization is a good example.[2] Publishing data from the next to last step, *before* adjusting the State estimates to match regional totals, would highlight the importance of regional differences *not* explained by age, race, sex, income, etc. Other analytical studies should compare estimates of the same things from different data sources. Examples are hospital days, physician visits, expenditures, health care personnel, and health status. For example, what is the correlation between health status measures from the HIS and HANES?

This leads to the second group of suggestions—small area data. For most NCHS data the units of observation are either too large or too small for convenient use by the researcher. Published reports are limited to comparisons across four regions. The alternative, microdata tapes, require major programming, computational and financial support. In addition to cost, there is an analytical problem. Medical care utilization obviously depends upon local supply conditions. We are also getting increasing evidence of the role of environmental factors on health status. Providing data for Primary Sampling Units (PSU's) or aggregates of neighboring PSU's might serve as a useful intermediate level. For example, HIS microdata could be aggregated to determine the distribution of people with different responses to each question. Confidentiality would thus be maintained even if the PSU was identified. Supply and environmental variables from the Bureau of Health Manpower's Area Resource File of counties could then be linked to the PSU file. I have done similar linkages combining microsurveys of the disabled with data for occupational groups from the Census. Being able to work with a richer set of variables and a manageable number of observations makes analysis easier and helps clarify exactly what data should be collected on a micro basis.

With respect to data collection, my comments fall into two categories: minor changes in the timing and location of surveys; and changes in the questionnaires themselves. In the first category, surveys should be designed to complement one another. This will pro-

vide a crucial form of validation that is often lacking in health services data. The HANES PSU's should be a subset of the ones used in the HIS and comparisons made of the two surveys. It is unfortunate that the nursing home inventories were done in 1967 and 1971, making impossible a direct comparison with 1970 Census data on nursing home residents. Hopefully, there will be more coordination in 1980. Similarly, the Master Facility Index should be designed to interdigitate with the 1980 Census data on health occupations.

The survey questions themselves can often be improved. For example, I have Kaiser coverage combined with a commercial carrier's major medical plan through my employer. My wife has Blue Cross coverage for our daughter and herself through *her* employer. I have tried to answer the "Health Insurance" questions on recent HIS and find my answers inconsistent, misleading, and not what I, as a researcher, would interpret them to mean. Perhaps we should ask why a question is being asked and then design the question. For instance, as a health economist, I am more interested in whether the respondent has coverage for, say, a preventive checkup or for a broken arm. Couldn't we set arbitrary, but realistic, prices for these and ask people how much their insurance plan (or plans) would pay or provide for directly? Another crucial variable in economic models of utilization is the value of time, or a wage rate. The 1974 HIS had just the type of data one would like, days and hours usually worked per week as well as usual earnings—*but only for those who missed days from work.*

Changes in the processing and presentation of the data themselves would also improve access and increase analysis. For some purposes, the five-file format of the HIS is unwieldy and linkage a difficult hurdle. An alternative format combining all the records into a single file structure with appropriate pointers would be relatively simple to provide. A second problem is that some data which is collected never seems to get on tape. If necessary, the file can be sampled to provide two-three subfiles, each on a single reel of tape. For example, the 1974 HIS asked each person how much income they received.[3] The final tape only identifies family income and that of the household head.[4] While sometimes the quality of certain items is so poor that they must be suppressed, there should be a series of technical memoranda outlining each of those decisions.

Related to this is the fact that there is sometimes so much data it is overwhelming. With various years from which to choose, which will be most likely to answer the researcher's questions? The interview schedule is of little positive help because one can never tell if a question really is on tape and how it is coded. Furthermore, the documentation itself only represents "potentialities." What is really needed is a set of marginals, or the weighted and unweighted responses to each question. Such data can be very useful alone, even if it is not cross-classified, but more importantly, it can make it vastly easier for a researcher to determine if a path is worth pursuing.

Finally, data sets are no better than the quality of the data elements. Methodological studies must be done to improve validity and reliability. But attention must also be paid to make sure that simple keying and processing errors are avoided. For example, I am currently working with a tape of data for Standard Metropolitan Statistical Areas. To check things out, I converted almost everything to rates and printed the results. If, instead of 258 SMSA's, I was using 3,078 counties or 40,000 families, this checking would have been omitted. In addition to a few missing numbers and some obvious garbage entries, nearly all the values for one SMSA were off by a factor of 10, and calculated birth rates ranged from .06 to 133 per thousand. Multiple regressions with such data might well have produced statistically significant and highly unusual results.

In summary, while I and every other researcher could list data that they "need," I think we may be approaching the point at which some careful reflection is necessary to identify what new data will be most useful. Continued effort by the NCHS in making existing sources easier to use, and more careful analysis by NCHS staff and others will hopefully lead to a better understanding of how to design better data resources for future policy research.

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NCHS ROLES, RESPONSIBILITIES, AND CAPABILITIES—NOW AND IN THE FUTURE

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NCHS has statutory authority for the collection of statistics on health resources, including physicians, dentists, nurses, and other health professionals by specialty and type of practice, and the supply of services by hospitals, extended care facilities, home health agencies, and other health institutions.

NCHS has traditionally met this responsibility, at least partially, through national surveys and inventories. In the case of health manpower resources several of these national surveys and inventories have been conducted by NCHS with funds provided by the Bureau of Health Manpower, and in the case of hospitals, through coordinated efforts with the American Hospital Association.

Since 1975, the long-term strategy of the Public Health Service has been to develop the capabilities of State health statistics centers so that they could meet the needs for health resources data of HSA's, State governments, or other local and State users of such data. Under this strategy, the uniform data collected at the State level is then to be summarized to produce national data.

The initial efforts in this Cooperative Health Statistics System, in which NCHS has played a leadership role, have included the implementation of basic inventories of 13 health occupations, basic characteristics of inpatient health facilities, and a hospital care statistics component in which the uniform hospital discharge data set (UHDDS) is collected on all discharges from all hospitals. At the present time over half of the States are implementing the basic health manpower and inpatient health facilities inventories, while only ten States are funded to develop and implement the hospital care component. All States are expected to be funded by NCHS on a cost-sharing basis for the health manpower and inpatient health facilities components by FY 1980, with national statistics being produced by 1982.

It is recognized that, even when in place in all States, the uniform minimum data sets collected in the manpower and inpatient facilities inventories will not meet all the needs for data by planners, researchers, and other users of health resources data. However, many of the most basic needs should be satisfied. NCHS will continue to work collaboratively with BHM and other Federal and private agencies to meet their data needs not met by the CHSS inventories through the conduct of national sample surveys and inventories. Depending on the source of the data and geographic detail at which the data is required, these surveys and inventories may be collected centrally by NCHS, through CHSS State agencies, or through a mixture of the two means. These data collection activities may be collected by NCHS through its own funds or through the funds of other Federal and private agencies under reimbursable agreements.

At this point, I wish to call to your attention that the addition of items to the uniform minimum data set by States to meet specific user needs has always been an integral part of the CHSS concept. This can be done at little additional cost. The extent that this has not been done in many States suggests inadequate coordination between users and producers of health data.

From the above, you will probably conclude that NCHS has high expectations for our needs being met in the future, but you may also be asking yourself if these expectations will be realized. And you may also be thinking that even though these expectations may be realized, what about our needs for today and tomorrow?

Even though only half the States are implementing the inpatient facilities inventory, NCHS will continue to update the Master Facility Inventory on a biennial basis by directly collecting data in the States where it is not being collected by CHSS State agencies. The Master Facility Inventory data set is the same as the CHSS facilities minimum data set. The health manpower data set is also being collected, or soon will be, for key health occupations (RN's, pharmacists, optometrists, and LPN's) with funding support from BHM in States not implementing the CHSS so that national statistics will be available by 1980. The National Hospital Discharge Survey, the National Ambulatory Medical Care Survey, and the National Nursing Home Survey provide data on the utilization of health resources on a fairly current basis. These data and data from other sources are published by NCHS in *The Nation's Use of Health Resources* and the *Health Resources Statistics* volumes.

Also, many States implementing the manpower and facilities component of CHSS have published or otherwise disseminated data to users within their States. NCHS has established a clearinghouse activity to assist users at the national level in knowing what data is available in what States.

There has been some criticism to date of the CHSS with doubts expressed about the ability of the system to meet its goals. Although much of the criticism is justified, we feel that with time and active attention to addressing the sources of the criticism, the high expectations we have for the CHSS will be realized. Clearly there is no evidence that the philosophy of a CHSS is not sound. On the contrary, much has been accomplished although a great deal more needs to be done. I have no doubt that a voluntary system—which evolves with the full participation at all levels of Government and with input from the principal interests of the health community, i.e., official health agencies, hospitals, physicians, health planners, and third party

payers—will be most effective and efficient in the long run. It is only with such collaboration by all those concerned that our Nation can have the best and most efficient health system in the world.

NCHS has been criticized for the slow pace at which the CHSS has been implemented in the States, the quality of the data being generated by State CHSS agencies, the untimely manner in which data tapes have been delivered by State CHSS agencies, and failures to provide analytical and other statistical services to State and local health planning agencies and other data users. I would like to report on some of the activities being undertaken by NCHS and others to respond to these criticisms.

1. There has been some criticism expressed about the ability of the CHSS to meet its goals. Usually criticism centers on the inability of the CHSS to produce immediately data that is needed at present for a particular purpose. I sincerely wish that the CHSS was fully operational and could respond. That it cannot should not be viewed as a failure of the underlying strategy of the Cooperative System. In original planning documents for the legislative proposal (1971) it was not envisaged that the CHSS would be fully operational until 1983. Moreover, the 1983 target assumed a total level of funding in 1978 of $58 million and in 1983 of $68 million. The current 1978 level of funding by NCHS is $14.2 million with roughly equal funding by States. The projection for the 1980 level of funding by NCHS is about $23.8 million.

   After 3 years of essentially no growth, we will have additional funds beginning October 1978 to expand the health manpower and health facilities statistics into many new States. The effect of the expansion in 1979 will be to have 42 States implementing the health manpower component and 42 implementing the health facilities component. Another increment in growth adequate to complete or virtually complete these components in all States seems likely for FY 1980.

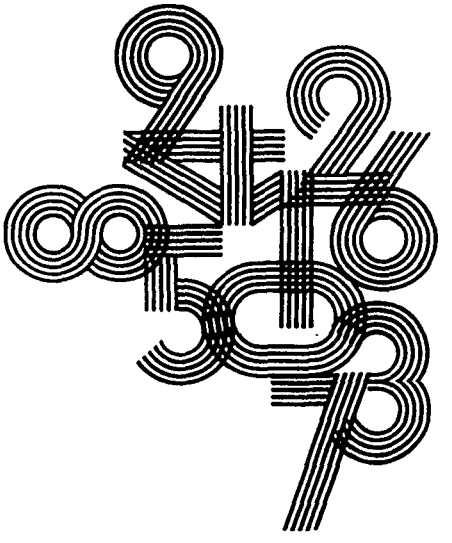
2. Standard procedures have been developed and are being put in place in States to improve the coverage and completeness of CHSS health manpower and facilities inventories. Uniform editing procedures are being developed and will soon be in place in States to improve the quality of data on tapes submitted to NCHS. Successes by States in resolving operational and technical problems are being shared with other States through small group sessions called ASTI Seminars.

3. As the System has matured and stabilized, we have been able to set realistic and timely dates for the delivery of tapes by States to NCHS and to a large extent have been successful in gaining State adherence to these dates.

4. The major problem of user interface has revolved around staff capabilities for analysis by State CHSS agencies, especially regarding *ad hoc* or quick one-time studies. For several years we have been funding the collection of statistics in CHSS through contracts. The contract mechanism has made it difficult to accomplish CHSS activities which do not have a product associated with them. Recently enacted legislation, the Federal Grants and Cooperative Agreement Act, defines the types of assistance instruments and instructs agencies as to their appropriate use. This Act, as well as guidelines that are being established in the executive branch, stress that the cooperative agreement mechanism is appropriate in a nonprocurement relationship where the substantial involvement of the Federal Government is anticipated. We are now taking the necessary preliminary steps to establish a grants program. Once established we would be better able to provide support to State CHSS agencies through cooperative agreements for a wider range of activities. These activities, to be conducted by a core staff of analysts, would include interactions with HSA's, PSRO's, researchers, and other State and local users of health data through regularly scheduled meetings, in-depth analysis of data, consulting services to users, and the provision of special statistical tabulations.

5. A Model State Health Statistics Act has been developed by an expert panel convened by NCHS. This Model State Law, when enacted by the States, will establish a health data focal point in each State, provide for coodination of health data activities, protect the confidentiality of data identifying individuals, and provide for the sharing of health data for purposes consistent with the purposes for which the data was collected.

In conclusion, the NCHS responsibilities in developing baseline data on the supply and characteristics of health resources, in a form in which they are useful for future policy research, are very large and keenly felt. Our capabilities now are not yet adequate to meet all the demands which these responsibilities place on us, but we recognize that there are deficiencies, we know where they are, and we are taking actions to address them.



CONCURRENT SESSION Q

Controlling Capital Investments and Other Regulatory Activities: Required Data and Information

NEW YORK'S APPROACH TO CONTROLLING CAPITAL INVESTMENTS

Arthur Y. Webb, *Executive Director, New York State Planning Commission, Albany, New York*

New York's current efforts to control hospital bed supply center on the Certificate of Need process under Article 28. This process is designed to monitor asset entry into the health system, on the basis of four major criteria: character, competence, need, and fiscal feasibility.

It is the intent of the Certificate of Need process to balance the distribution of health services while improving the economic integrity of the system. However, the process is limited to reactive measures, providing no long term strategy.

An additional control mechanism was added by State law in 1976, when the Commissioner of Health was empowered to revoke the operating certificates of institutions deemed not viable on the basis of need or economics. To date, this control has not been used.

The Certificate of Need program cannot accomplish its goal alone. It needs to be linked to a reimbursement framework. In New York, reimbursement has been used to maintain pressure on our system and to shape it. System shrinkage is encouraged by curtailing inefficient and wasteful services. Penalties are levied on institutions whose occupancy levels fall below certain standards or whose routine costs exceed the norm. Thus, the reimbursement formula attempts to force economies.

But the process that targets "high spenders" can have unfortunate consequences. Those institutions that attain certain economies often find the reimbursement structure nonsupportive. Once the cost level that determines reimbursement rates is reduced, an institution faces reduced cash flow and rate decreases. Clearly, the reimbursement system can be used to reduce capacity, but it may have some disincentives as well by discouraging entrepreneurial interests such as mergers, consolidation, and regionalization.

What have been the results of our efforts to date? New York's bed growth rate from 1972-1976 compares favorably to the United States as a whole. New York State beds increased 1 percent during this period while the United States growth was 9 percent. The average annual rate of increase for New York is under .4 percent, while the rate for the United States has grown in excess of 2 percent a year. Not surprisingly, however, the trend in assets has increased markedly for both the State and counties. The intensity of assets has not slowed to match the decreasing rate in beds.

In summary, the experience of New York parallels that of the Nation. The supply can be contained, and, in some instances, actually reduced. But, the equation remains:

Expenditures = Price x Quantity x Mix of Services

Certificate of Need and reimbursement attempt to control price and quantity factors in the equation. But there remain serious limits to traditional Certificate of Need programs:

- They work only where there is sufficient experience and analysis to establish objective and quantifiable need criteria—and the state of the art in building solid criteria is and probably always will be more art than science.
- They avoid the issue of whether the public can afford to pay for all that is "needed"; given that health care needs are extremely complex, highly personal, and virtually limitless.
- They fail to provide for a priority ranking of projects so that the community's most urgent needs will be met first; instead they rely on an institution by institution, first-come, first-served basis for approving projects—and largely rely on providers to determine what is needed, where, and when.
- They provide little incentive for providers or planners to force trade-offs among alternative delivery means and to strive for regionalization. This is the case because there is no market in health care where purchasers choose the configuration of quantity and price that satisfies—or because suppliers (who, in fact are the purchasers) are rewarded by offering ingenious substitutions and alternatives to attract purchasers.

Clearly, then, the notion of a "cap" to control the left side of the equation is sorely needed.

The premise of a capital expenditure limit or cap program is that, despite the almost limitless demands of the public and providers, there exists a limit to the resources which can be devoted to health care. Such a program would control cost increment by limiting annual capital expenditures. The capital cost component of the reimbursement formula can be sizable. New York State recognizes the fact that recent growth in asset intensity can fuel future cost increases in health care, through the reimbursement mechanism, at an accelerating rate.

With this in mind, the capital cap program would serve a number of purposes. The level of debate would be raised by permitting major service versus expenditure decisions to be made by legitimate purchasers and decisionmakers. In the wake of emergency measures utilized over the last few years in a time of fiscal crisis,

the "cap" would establish a long-term control measure. Orderly limits would be imposed on the growth of the health care industry, thereby permitting that growth to be sustained in future years by affordable reimbursement. In addition, since the "cap" would identify total exposure, the level of regulatory activity would be reduced by decreasing the importance of each and every marginal decision on market entry and pricing.

Incentives would be established to select first those projects that file priority needs, and providers would be encouraged to identify and propose alternatives that use limited resources as efficiently as possible. Local planning and priority setting procedures would be fostered and the level of responsibility in local decisionmaking would be raised, thereby giving more meaning to local planning efforts, where local priority setting should ideally take place.

Approaches to formulae for a capital cap program are currently being negotiated with industry and the Health Systems Agencies. Among major concerns are setting the cap level high enough to maintain needed assets over time, while assuring that it is low enough to force trade-offs. It is thought that, initially, the level should not deviate very far from the past level of Certificate of Need approvals. Efforts should be aimed at rational regional allocation based on age of existing assets, population, and relative development of the health care system.

It is planned that the "cap" will cover all Article 28 facilities: hospitals, nursing homes, and, optionally, ambulatory care settings. Health Systems Agencies will be allocated a "cap" and have an "advisory" capacity in its use. The State will maintain final authority. Projects over $100,000 for similar types of facilities will be batched at the HSA level to allow priority setting and consideration of comparative merits. HSA's will be allowed to carry over unexpended cap allocation for one year. There will be a 10 percent State hold-back to fund emergencies or supplement HSA allocations in the care of extremely large projects.

Expectedly, a number of issues have arisen in connection with this proposal. One concern is that allocation to the HSA's will be greatly subject to politicking. This problem has been anticipated, and the allocation formula has been designed to reduce the opportunity for politics entering into the allocation process. The allocation will be based on three objective measures: identifying facility need, the imminent replacement needs of facilities in the HSA's, and differences in the costs of construction in each HSA. These objective measures are included in a specific formula which divides up the statewide cap (less the 10 percent State hold-back) thereby reducing the politics of the allocation.

Other concerns have focused on the capability of the Health Systems Agencies to perform those activities for which they would be responsible under the program. The proposed legislation permits setting the HSA cap on an advisory basis, depending on the capability of the individual agency. If local planning and priority setting are to become meaningful, and local responsibility in decisionmaking is to be nurtured, the Health Systems Agencies must be further developed. This legislation provides for such HSA program building, and does so on an individual basis, depending on the capabilities of each agency.

Some have expressed concern over whether limited capital dollars will be allocated where they are most needed. Even under our current Certificate of Need program, we have no such assurance today. On the other hand, under the capital cap program, priorities will be identified to meet the greatest needs, and those needs will be satisfied first, within the level of available resources.

Still another issue concerns the State's right to limit a community's use of its own resources. In effect, the State already controls the use of local resources through the Certificate of Need program. The cap would simply make these decisions more rigorous. Presently the State and county jointly bear the burden of Medicaid costs. By imposing a cap, the State is assuring its continued ability to support the health system, as well as that of the local community.

These issues will remain, I believe, throughout any program development phase. In the belief that a limitation on capital expenditures is a sensible way to produce necessary trade-offs on the part of providers, New York State plans to move to implement such a program in the near future. It is anticipated that this will lead to a more equitable and efficient allocation of limited resources within the health system.

THE LINK BETWEEN PLANNING DECISIONS AND COST CONTROL

John A. Beare, M.D., *Director, Washington State Health Planning and Development Agency, Olympia, Washington*

INTRODUCTION

As the designee of the Secretary of the Department of Social and Health Services I issue Certificates of Need for the construction of hospitals in the State of Washington. Before arriving at a final decision on each application, consideration is given to the recommendations of the local Health Systems Agency, the Washington State Hospital Commission and my own staff. The information and data provided by the Washington State Hospital Commission (hereafter referred to as "the Commission") is vital since it relates directly to whether a project will be economically feasible and to foster cost containment.

The purpose of this paper is to describe the current relationship which exists in the State of Washington between the State Health Planning and Development Agency and the Commission. The paper is divided into three parts. Part one provides background on the organizational setting for the Commission and the State Health Planning and Development Agency. Part two describes the current working relationship between the two agencies, and Part three is an analysis of this relationship—its success and its shortcomings.

There is fundamental logic in linking the actions of a planning agency and a rate review agency. There seems little point in approving the construction of a hospital if the rates necessary to finance the construction are unreasonable and will not be approved by the rate review agency. Without prior review by the Commission, capital expenditures approved by the planning agencies could have a serious impact on hospital rates.

PART 1: THE SETTING

The Washington State Hospital Commission (See chart 1)

The Commission was established in 1973 by State law for the purpose of assuring all purchasers of hospital health care services that total hospital costs are reasonably related to total services, that hospital rates are reasonably related to aggregate costs, and that such rates are set equitably among all purchasers of these services without undue discrimination. A cost control program was viewed by the legislature as essential to both enable and motivate hospitals to control their spiraling costs.

Part of the Commission's authority is found in this excerpt from their enabling legislation:

SUBSTITUTE SENATE BILL NO. 2113

Chapter 5, Laws of 1973
(43rd Leg., 1st Ex. Session)

NEW SECTION, Sec. 15...
"In order properly to discharge these obligations, the Commission shall have full power to review projected annual revenues and approve the reasonableness of rates proposed to generate that review established or requested by any hospital subject to the provisions of this chapter. No hospital shall charge for services at rates other than those established in accordance with the procedures established hereunder."

The Commission consists of five members appointed by the Governor and confirmed by the Senate and is required to be generally representative of the public. Its current members include a hospital administrator, a private physician, a businessman, a representative of labor, and the chairman who must be a consumer (currently a retired certified public accountant).

In addition to approving hospital budgets (rates) the Commission has developed a uniform budgeting and accounting system, reviews hospital budgets, and directs a prospective reimbursement experiment involving 115 of the 140 hospitals, funded by the Social Services Administration.

The Commission's enabling legislation also requires that rates be allowed to permit nonprofit hospitals to remain solvent and proprietary profit-making hospitals to receive a fair return to stockholders.

The Washington State Health Planning and Development Agency (See chart 2)

On March 9, 1977, the Governor of the State of Washington requested designation of the Department of Social and Health Services as the State Health Planning and Development Agency. Her request was approved by HEW and became effective July 1, 1977.

The department was created by the Legislature in 1970 and is headed by a Secretary appointed by the Governor and confirmed by the Senate. DSHS, with about 13,000 employees, is the largest agency in Washington State Government. It is currently organized into four service divisions—Adult Corrections, Community Services, Health Services and Vocational Rehabilitation—and five support divisions.

Chart 1. State of Washington Executive Branch

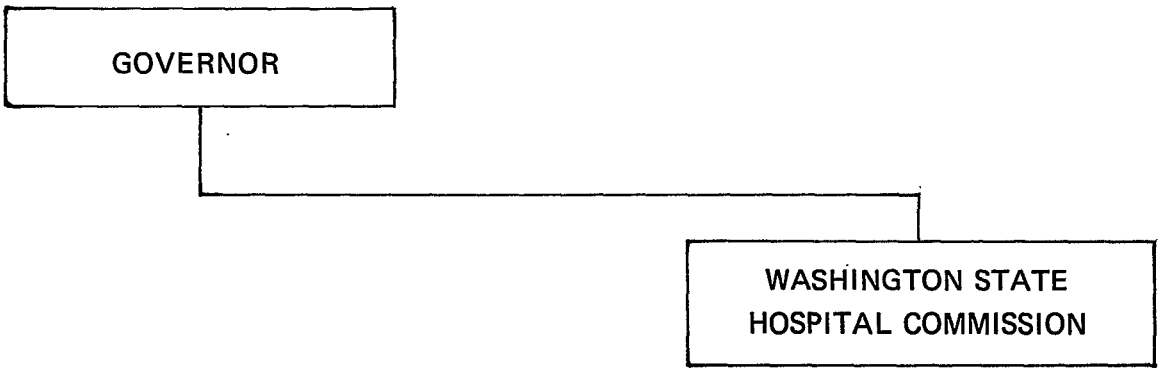


Chart 2. State of Washington Executive Branch

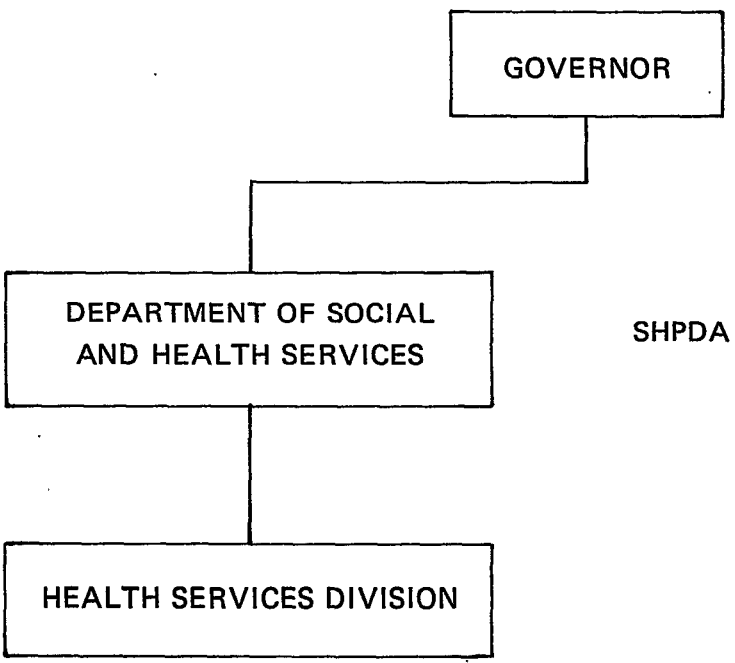


Chart 3.

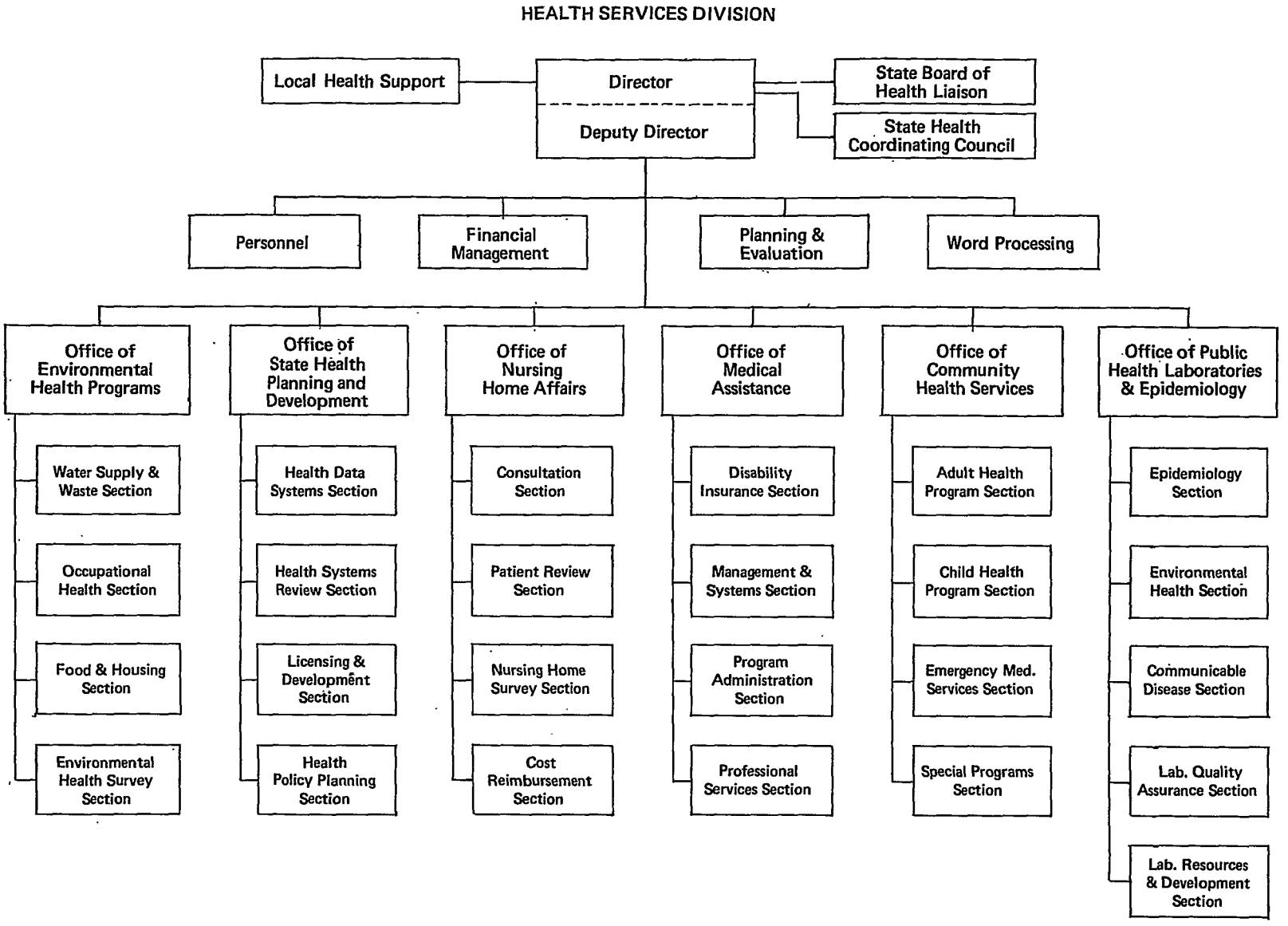
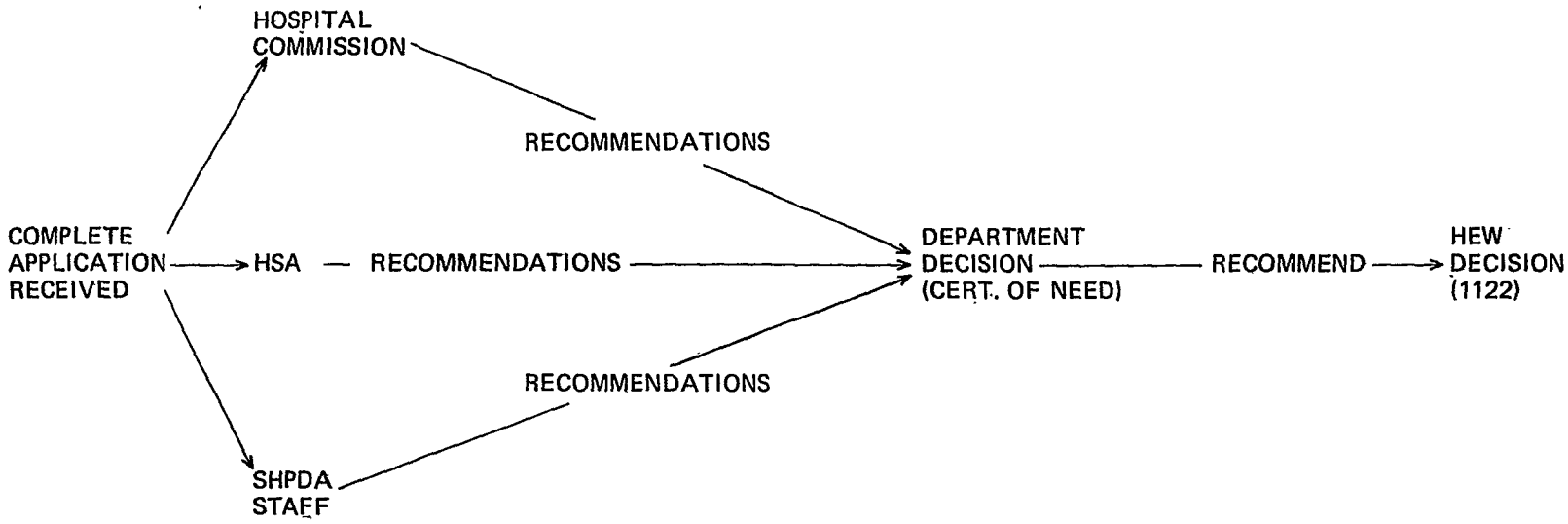

HEALTH SERVICES DIVISION
Local Health Support
Director
Deputy Director
State Board of Health Liaison
State Health Coordinating Council
Personnel
Financial Management
Planning & Evaluation
Word Processing
Office of Environmental Health Programs
Water Supply & Waste Section
Occupational Health Section
Food & Housing Section
Environmental Health Survey Section
Office of State Health Planning and Development
Health Data Systems Section
Health Systems Review Section
Licensing & Development Section
Health Policy Planning Section
Office of Nursing Home Affairs
Consultation Section
Patient Review Section
Nursing Home Survey Section
Cost Reimbursement Section
Office of Medical Assistance
Disability Insurance Section
Management & Systems Section
Program Administration Section
Professional Services Section
Office of Community Health Services
Adult Health Program Section
Child Health Program Section
Emergency Med. Services Section
Special Programs Section
Office of Public Health Laboratories & Epidemiology
Epidemiology Section
Environmental Health Section
Communicable Disease Section
Lab. Quality Assurance Section
Lab. Resources & Development Section

Chart 4. Simplified Flow Chart of Certificate of Needs, Section 1122 Review Process for Hospital Construction



Final authority for the SHPDA rests with the Secretary of the Department. Responsibility for carrying out the functions of the SHPDA have been delegated to me.

I am responsible for staffing, organizing and administering the tasks of the State agency as specified in PL 93–641. (See chart 3)

Within my division the Office of State Health Planning and Development provides the primary staffing for the State agency and carries out the Certificate of Need program, Title XVI, the development of the State Health Plan, as well as regulating health facilities and staffing the cooperative health statistics program.

PART 2: WORKING RELATIONSHIP BETWEEN THE SHPDA AND THE HOSPITAL COMMISSION

In January 1974, the Executive Director of the Washington State Hospital Commission and I jointly signed a memorandum of understanding between our two agencies. This document defines our working relationship. Basically the role of the Commission is to review the economic feasibility and cost impacts of hospital projects. In the case of Certificate of Need applications the authority of Commission's action is found in State regulation. In the case of projects requesting certification under Section 1122, (PL 92–603), the basis for the Commission's action is found in the memorandum of understanding. (See chart 4)

Our review procedure works like this:

1. We refer copies of all applications from hospitals to the Commission.
2. Commission staff, in consultation with my staff, carry out financial feasibility studies and other analyses.
3. Prior to my making a final determination, I receive an analysis recommendation from the Commission (as well as from the HSA and my own staff).
4. If my decision is contrary to the Commission's recommendation, it is agreed that the Commission will receive prior notice and justification.

The Commission's role is to review and make recommendation on economic feasibility and cost containment. The SHPDA is essentially asking the Commission to answer the following questions:

a. Is the projected cost per unit of service reasonable?
b. Will the project result in an unreasonable increase in the patient charge structure?
c. Is the project cost effective considering available alternatives including alternative methods of design and construction?
d. Does the project make use of available resources without unnecessarily duplicating existing facilities and services?
e. Has thorough consideration been given to the economics and improvement of services which could be derived from joint, cooperative, or shared services or resources among facilities?

Let's take a look at an actual review so you can get a better idea of information the SHPDA receives from the Commission.

The first example is a Certificate of Need for $4,600,000 by a hospital association to purchase a neighboring hospital—both property and building as part of a merger between three hospitals in downtown Seattle. These next two transparencies are excerpts from the Commission's report and illustrate the type of data which is analyzed. (See chart 5)

The first schedule shows how the hospital will finance the project. Commission staff concluded that adequate financing was available. (See chart 6)

After evaluating the second schedule, a pro forma operating statement for the property, the Commission staff agreed that the project could be financed within reasonable terms and that financial requirements could be met by operations of the property without affecting inpatient cost. (See charts 7–8).

My second example is a Certificate of Need for $18.7 million for the merger of three hospitals.

On the basis of the material and accompanying tables presented by the applicants, the Commission was able to determine that while new construction would increase the average depreciation and interest expense by $1.6 million (in 1980 dollars), operting and maintenance costs would be reduced by $3.0 million due to staff reduction. The Commission, therefore, concluded that the net annual savings would be approximately $1.4 million (in 1980 dollars).

Operationally, once the analysis of a project is made by the Commission staff, it is presented to the Commission during a public meeting of the Commission when the applicant hospital is present to present their application and answer questions. After considering staff and applicant input, the Commission usually moves to recommend to the department that the application should either be approved or denied on the basis of its being financially feasible.

PART 3: LESSONS LEARNED

Accomplishments

1. In the course of the 4 years in which the Commission has been doing analyses for the department over 200 applications have been processed and in only a few cases have we not accepted their recommendation. In one case we did not accept their recommendation that a Computerized Tomographic Scanner be

denied and in another case we did impose a $2 million reduction the Commission wanted in a proposal. In both cases we felt, upon the advice of our attorney general, there was an insufficient basis to enable us to carry out their recommendations.

2. Having staff that trust each other, communicate frequently, and understand the political dynamics as well as content issues is from our experience the most important ingredient of our working relationship with the Commission.
3. The Commission receives no reimbursement for doing these reviews; they are done as a courtesy. The motivation for continuing our working relationship comes from the logical necessity to have the rate regulations and budget review process closely linked with planning and regulatory control if either program is to accomplish its mission. Joint review of hospital applications came about not as a Federal or State requirement but because the Commission didn't want to see their actions and our actions working at cross purposes.
4. The kind of analysis performed by the Commission is essential to making a final decision. Had we not been able to utilize their talents, very likely additional staff would need to be hired with background and education in the finance area.
5. Our working agreement doesn't limit the authority of either agency. It is informal and its success hinges more on the people involved than the written agreement.

Shortcomings

1. The Commission has been accused by hospitals as going beyond their authority in reviewing not only cost containment and financial feasibility but also need and staffing, the latter two areas being more in the province of the HSA to carry out.
   It is true that the Commission's analysis contains a discussion of each of the four areas just mentioned, and their discussions take in issues of need as well as purely financial and cost concerns.
   The Commission feels strongly that financial feasibility and cost containment can be analyzed without taking need and staffing into account.
   Regardless of how fine the lines are drawn there continues to be sensitivity by applicants, and, in my judgment, whenever the review process is parceled out as we have done there will be charges of agencies departing from their assigned role.
2. The review process is structured in such a way as to require reviewing agencies to make a yea or nay decision. For the Commission to "not endorse" a proposal is the same as to make no recommendation at all. This leaves the State in an awkward position.

As an example, in June 1977 the Commission elected not to endorse a Certificate of Need because of inconsistencies in recommendations made by an HSA. The HSA had recommended denial of the Certificate of Need for the following reasons:

A. There had been no consideration of alternatives to additional beds and services, such as sharing with other hospitals.
B. There had been no planning to meet the health services needs on the eastside by the applicant hospital and its two neighboring hospitals as required by committee's previous actions.
C. Therefore, the need for 26 beds on the eastside had not been established.

This example helps to illustrate the importance of a linked system between planning by the individual institutions, its neighboring institutions, the HSA and the State. Without such an integrated process the final decision as to whether a new facility, service, or equipment is needed hinges excessively on judgment rather than on a careful analysis.

In the absence of planning within and between hospitals the review of individual projects is and will remain burdensome for all involved parties, including the regulators.

The importance of definitive health systems plans backed up by the longrange plans of hospitals cannot be overemphasized.

A Look to the Future

In a report prepared for the Commission by Miller and Associates an integrated process is recommended to budget and account for the growth and development financial requirements of non-profit hospitals. If implemented, the Commission would essentially approve hospital capital expenditures that had been determined to be needed as documented in a health systems plan. Perhaps there is hope through such a mechanism to provide a firmer linkage between the actions of separate agencies.

Chart 5. SCHEDULE I

Cash	$ 300,000
Assumption of First Mortgage (25 Year, 4%)	900,000
Second Mortgage (25 Year, 9 1/2%)	1,075,000
Cash From Sale of Properties, Currently Owned	1,124,250
Total	$ 3,400,000

The hospital does not feel that inpatient revenues can appropriately be applied to the purchase. Since the purchase will not take place for approximately three years, the $300,000 in cash to be applied to the purchase will be generated from the three nonrelated revenue producing businesses the hospital operates. The three businesses, the Mason House, The Optical Dispensary, and the Outpatient Pharmacy will produce an excess of $150,000 per year in revenue.

The hospital also owns three apartment buildings purchased several years ago for expansion or property trades and these are the Castle Crag, Hudson Arms, and Northcliffe. By 1980, value of these properties after accounting for their debt should produce a net cash of at least $1,124,250.

In previous community meetings, Virginia Mason has expressed an obligation to the community to insure that the apartment properties continue to be maintained as moderately priced residential units, and any decision to sell them will have to be evaluated at the time of the transaction not only on the financial impact but in terms of the implication for the neighborhood.

The balance of the purchase price or $1,075,750 will be borrowed under a 25 year, 9½% second mortgage. It is anticipated that Seattle First Bank will provide this financing. The various allocated spaces will be remodeled to adapt the space to the uses. It is estimated alteration costs will range from $15 to $30 per square foot and total estimated remodeling costs will be 1.2 million dollars. All remodeling work has been projected for completion by the end of the first year of occupancy and tenants will bear primary responsibility for their own remodel costs.

Schedule II shows a pro forma operating statement for the property. While the year one shows a net loss of $127,000, by the year five, a loss of $24,000 is projected. Over the five years of the pro forma operating statement, the net cash required drops from $68,000 to $11,000 deficit. Staff would agree that the project can be financed with reasonable terms and that financial requirements can be met by operations of the property without affecting inpatient cost.

Chart 6.
SCHEDULE II—PRO FORMA OPERATING STATEMENT

	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue					
Parking Revenue	$ 90,000	$ 96,000	$103,000	$110,000	$118,000
Rentals	333,000	356,000	381,000	408,000	436,000
Total	$423,000	$452,000	$484,000	$518,000	$554,000
Expenses					
Depreciation—Building and Improvements	$128,000	$128,000	$128,000	$128,000	$128,000
Interest—Property and Improvements	252,000	247,000	241,000	235,000	228,000
Utilities	75,000	80,000	86,000	92,000	98,000
Maintenance	30,000	32,000	34,000	37,000	39,000
Housekeeping	30,000	32,000	34,000	37,000	39,000
Management	35,000	37,000	40,000	43,000	46,000
Total	$562,000	$568,000	$575,000	$584,000	$590,000
Net Loss	($127,000)	($104,000)	($ 79,000)	($ 54,000)	($ 24,000)
Cash Flow					
Sources					
Net Loss	($127,000)	($104,000)	($ 79,000)	($ 54,000)	($ 24,000)
Depreciation	128,000	128,000	128,000	128,000	128,000
Net Cash	$ 1,000	$ 24,000	$ 49,000	$ 74,000	$104,000

Uses					
Debt Principal—Property and Improvements	$ 69,000	$ 75,000	$ 81,000	$ 87,000	$ 93,000
Total Uses	$ 69,000	$ 75,000	$ 81,000	$ 87,000	$ 93,000
Net Cash Required	($ 68,000)	($ 51,000)	($ 32,000)	($ 13,000)	($ 11,000)

Chart 7.

SWEDISH HOSPITAL MEDICAL CENTER—OCTOBER 13, 1977

Hospital Commission Staff Review and Recommendations:

As of December 31, 1976, Swedish Hospital Medical Center has pledged to secure long-term indebtedness, land and buildings with an aggregate book value of $40,838,835. Total long-term debt of $21,975,003 is shown in the financial statements for the year ending December 31, 1976. Of this total $21,105,925 is mortgage payable to Metropolitan Life Insurance Company in monthly installments of $179,167 for fifteen years, the remaining balance payable in full in October 1990. This is at an 8-1/2% interest rate.

Interim financing of the construction cost throughout the development, will come from a construction loan from local financial sources at an expected annual interest rate of no more than 9.5%. At the completion of the construction, this interim loan will be repaid with proceeds from a standard 25 year mortgage with an expected 8.75% interest rate, together with funds provided by all three of the hospitals.

Seattle General Hospital and The Doctors Hospital both have long-term indebtedness which must be repaid before these facilities are sold. Based on the terms of these debts, the remaining principal balances at December 31, 1978, will be as follows:

Seattle General Hospital	$ 951,000
The Doctors Hospital	908,000
Total to be Repaid	$ 1,859,000

The Interim Planning Committee has assumed that these facilities can be sold for their net book value and that proceeds from these sales will be used to repay the outstanding indebtedness as follows:

Proceeds from Sale of Hospitals:	
Seattle General Hospital	$ 2,108,000
The Doctors Hospital	2,319,000
	$ 4,427,000
Debt to be Repaid	1,859,000
Remaining Proceeds from Sale	$ 2,568,000
Additional cash inflows from liquidation of receivables and payables	3,189,000
Net proceeds from disposition of hospitals	$ 5,757,000

The applicant assumes that possible funds are not applied to the project until completion of construction, with the expected amount of the construction loan, $16,730,000, and approximately 50% of the funds in each of the calendar years 1978 and 1979. It is then anticipated that these funds will be repaid on or about January 1, 1980, by a conversion to a long-term debt instrument. It is anticipated that long-term debt financing of between $13,000,000 and $15.5 million will be necessary. The applicant anticipates that 15.5 million dollars would be the maximum debt to be incurred. For this amount with terms of 25 year level debt service at 8-3/4% annual interest, required annual debt service would be $1.53 million. Payments would begin in early 1980.

Chart 8.

SWEDISH HOSPITAL MEDICAL CENTER—October 13, 1977

Ernst and Ernst prepared a demand study and made the following forecast of patient days based on forecasts of admissions obtained from the physicians survey and included only those physicians who reported they would use the Pavilion for the forecast years 1979–1980. To complete the analysis of demand for the IPS facilities, management of each hospital was also asked to prepare their forecast of future patient day volume. This was somewhat more conservative than the demand study based on the physicians survey. The forecasts are as follows:

Year	Licensed Beds	Patient Days	Occupancy
1975	757	198,300	71.8%
1976	757	187,100	67.7
1977	757	187,800	68.0
1978	757	184,200	66.7
1979	602	172,700	78.6
1980	602	175,800	80.0

From these forecasts, the applicant assesses the impact of the Pavilion project on the per patient day cost for depreciation and interest expenses as follows:

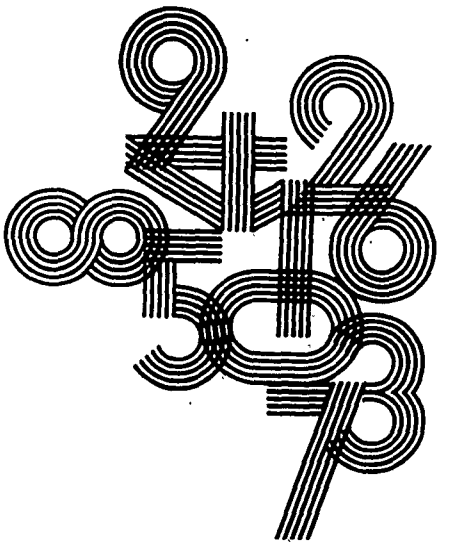
	1976 SGH	TDH	SHMC	TOTAL	1980 COMBINED
Depreciation Expense	$ 221,000	$ 289,000	$2,200,000	$2,710,000	$2,962,000
Interest Expense	86,000	38,000	1,513,000	1,637,000	3,005,000
Total	$ 307,000	$ 327,000	$3,713,000	$4,347,000	$5,967,000
Total per Patient Day	$14.37	$7.09	$33.24	$27.14	$33.95

Table three which assumes inpatient bears the total burden of incurred cost, is not correct because about 18% of the capital cost for the Pavilion project can be directly attributable to non-inpatient functions.

The applicant states that, based on preliminary analysis of staffing patterns, it appears that there is a potential savings in personnel costs of approximately 10% through the merger project. Based on the present combined budgets of approximately $46,000,000, of which about 60% is related to labor costs, it appears that $2,800,000 annually could be saved with the merger.

Also by looking at comparative physical characteristics, the combined facility capacity has been reduced by some 63,000 square feet. This should give significant savings in facility operating and maintenance costs. Based on unit cost presently evidenced in the three physical plants, about $200,000 in annual cost savings can be realized.

The depreciation and interest expense will increase over that presently experienced by the combined three facilities. The applicant estimates that this increase will be approximately 1.6 million dollars annually using 1980 expenses. The applicant assumes these three categories account for the vast majority of the significant changes in cost and state that it can be concluded that the merger will realize an annual cost savings of 1.6 million dollars over the present combined operations at the three facilities. This analysis does include the impact of inflation on cost.



CONCURRENT SESSION R

Studies of Occupational Health

EXPERIENCE IN USING DEATH CERTIFICATE OCCUPATIONAL INFORMATION

Samuel Milham, Jr., M.D., *Chronic Disease Epidemiologist, Washington State Department of Social and Health Services, Olympia, Washington*

For a number of years, I have been working with the occupational and industrial information contained on death certificates. I would like to share some of this experience with you and try to convince you of the importance of doing similar studies in your respective States.

I started using the occupational statement on the upstate New York death certificates in the mid 1960's. Most of the early New York and Washington State studies were matched-pair, case-control studies done manually[1,2]. Later, the case-control selection procedure was automated, and has seen application to other data files.[3] When a population-based study[4] supported the occupational mortality associations seen in the early matched-pair studies, and when interview studies[5,6] indicated that the Washington State death record occupational statement was quite accurate, I decided to examine the mortality pattern for all occupational groups in the State. The rationale behind this approach was that new occupation cause of death associations would be revealed and could be followed up in cohort studies. The great appeal of identifying specific occupational causes of mortality is that, theoretically, all are preventable.

Methods

I will spare you most of the details of the methods since they have been published before.[7] Briefly, for all male deaths in Washington State between 1950–1971 (300,000+), occupation was abstracted, coded, punched, and entered into existing death punch cards. A computer program was written and run on the data to perform an age-standardized, proportionate mortality ratio (PMR) analysis. For each of 195 occupational groups, observed and expected deaths and a PMR were computed for 158 cause of death groups.

Results

Table 1 shows that all the intuitive, or well known, accidental occupational mortality associations are present in these data: i.e., airplane pilots die in airplane crashes, electricians are electrocuted, loggers are struck by falling objects, roofers fall off roofs, and farmers are done in by their machines.

Table 2 presents occupations with high homicide mortality. I chose homicide to show how well the PMR method can do with a known etiology and no latent period. Taxicab drivers, grocers and bartenders are at increased risk of being killed during robbery attempts. Policemen and detectives are occupationally at increased risk of being shot. The other occupations on this list are more liable to fatal assault as a result of lifestyle rather than occupation.

Table 3 summarizes how well the method detects other previously reported occupational mortality associations. Chemists show excess mortality from cancer of the pancreas as in the U.S. chemists study.[8] Clergymen show a marked deficit of lung cancer, dentists show a high suicide rate, asbestos and insulation workers have increased mortality from lung cancer, and miners have a high PMR for silicosis. All of these associations are substantiated in population-based mortality studies referenced in the table.

The most important results of this study, however, are the new occupational mortality associations that emerged (see table 4).

Workers at the Hanford atomic energy facility in Richland, Washington, showed an elevated PMR for

Table 1. PROPORTIONATE MORTALITY RATIOS FROM ACCIDENTAL CAUSES FOR SELECTED OCCUPATIONS WHITE MALES, AGE 20+, WASHINGTON STATE, 1950–1971

Occupation	Cause of death	7th Rev. ICD Code	Deaths Observed	Deaths Expected	PMR*
Airplane pilots and navigators	Aircraft accidents	860-866	86	3.93	2187
Electricians	Accidental death due to electric current	914	14	3.86	363
Loggers	Blow from falling object	910	368	34.23	1075
Roofers	Accidental falls	900-904	16	4.82	332
Farmers	Machinery accidents	912	74	19.02	389

$$*\text{PMR} = \frac{\text{Deaths Observed}}{\text{Deaths Expected}} \times 100$$

Table 2. DEATHS DUE TO HOMICIDE (ICD NUMBERS 980–985, 7th REVISION) WHITE MALES, AGE 20+, WASHINGTON STATE, 1950–1971 TEN HIGHEST PROPORTIONATE MORTALITY RATIOS (OF 195) BY OCCUPATION*

Occupation	Occupation code	Deaths		PMR
		Observed	Expected	
Farm laborers	902	39	10.96	356
Orchard laborers	987	10	2.92	342
Taxicab drivers	714	10	3.03	330
Policemen and detectives	853	15	4.57	328
Cement and concrete finishers	413	6	2.14	281
Bartenders	815	16	6.32	253
Grocers	298	13	6.13	212
Sailors and deck hands	703	21	9.86	207
Laborers NEC	980	74	37.76	196
Miners	685	6	3.35	179

*5 or more deaths observed

Table 3. PROPORTIONATE MORTALITY RATIOS FOR SELECTED OCCUPATIONS WITH PREVIOUSLY REPORTED OCCUPATIONAL MORTALITY EXCESSES OR DEFICITS WHITE MALES, AGE 20+, WASHINGTON STATE, 1950–1971

Occupation	Cause of death	7th Rev. ICD Code	Deaths		PMR	Reference
			Observed	Expected		
Chemists	Cancer of pancreas	157	5	1.83	273	8
Clergymen	Cancer of lung	162.1	10	24.39	41	9
Dentists	Suicide	970-979	32	13.12	244	10
Asbestos and insulation workers	Cancer of lung	162.1	18	4.29	420	11
Miners	Silicosis	523.0	42	1.67	2511	12

Table 4. OCCUPATIONAL MORTALITY ASSOCIATIONS SUBSTANTIATED IN POPULATION-BASED STUDIES WHITE MALES, AGE 20+, WASHINGTON STATE, 1950–1971

Occupation	Cause of death	7th Rev. ICD Code	Deaths		PMR	Reference
			Observed	Expected		
Atomic energy workers	Cancer of pancreas	157	19	8.76	217	13
	Multiple Myeloma	203	4	1.92	208	
Copper smelter workers	Cancer of lung	162.1	30	18.52	162	14
Aluminum workers	Cancer of lung	162.1	26	19.12	136	17
	Malignancy of hematopoietic system	200-204	21	12.35	170	
	Cancer of pancreas	157	13	6.37	204	
Pressmen and plate printers	Cirrhosis of liver without alcoholism	581.0	18	10.84	166	16
	Rectal cancer	154	17	9.09	187	

pancreatic cancer and certain other cancers including multiple myeloma. The pancreatic cancer and multiple myeloma excesses have been substantiated in a population-based study,[13] and more importantly, have been shown to be associated with low-level radiation. Although my data set contained only about 25 percent of the deaths which occurred in this cohort, the PMR method was sensitive enough to detect the important mortality excesses in this work force.

Workers at a large copper smelter showed a PMR excess for lung cancer. Although this excess had been reported in other copper smelters,[14] an early study done at the smelter in question claimed that there was no lung cancer excess.[15] My study provoked a population-based study [16] in the smelter work force, which not only confirmed the lung cancer excess but related it to environmental arsenic exposure. A new and strikingly lowered Federal workplace standard for arsenic in air has been formulated, based in part on this work.

Aluminum workers showed elevated PMR's for cancer of the pancreas and lung, and for malignancies of the hematopoietic systems. A recent industry supported study [17] confirmed the lung cancer and

hematopoietic cancer associations. I am currently attempting to refine these mortality associations in a study of mortality in workers at a large aluminum reduction plant in our State.

Printing pressmen, in a recent labor union study,[18] showed a mortality pattern quite similar to that seen in Washington State pressmen and plate printers.

A number of other previously unreported associations between cause of death and occupation turned up which are still awaiting confirmation and resolution. Agreement between the Washington State occupational mortality patterns and those published by the Registrar General [19 20] are excellent. Recently this method has been used to analyze occupational mortality in an existing 2-year California death file.[21] Again, there is excellent agreement with the Washington State data.

In summary, I feel that the information I have presented offers empirical evidence that epidemiologically useful information is contained in the death record occupation and industry statements. The method (procedures, codes, computer programs) for making use of this information are well worked out and readily available. The application of this study in other States with large populations and concentrations of heavy industry might be even more revealing.

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COMPARISON OF SEVERAL SOURCES OF OCCUPATIONAL INJURY AND FATALITY DATA

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Occupational disease is much like pornography: it is ubiquitous to those looking for it, but almost impossible to define in a way which satisfies all researchers. This all-pervasive problem of definition extends to occupational illnesses, injuries, and fatalities alike and causes severe problems for persons interested in counting these events. The lack of operational definitions leads to differing counts and sometimes seemingly conflicting estimates of the magnitude of presumably the same event, causing aspersions to be cast on numbers that do not concur with our private expectations of the magnitude of the problem.

There are several sources of estimates of the numbers of work-related injuries or fatalities from occupational injuries:

- The Occupational Safety and Health Administration, Bureau of Labor Statistics Survey (OSHA-BLS Survey)
- Worker's Compensation Data (W.C.)
- The National Safety Council (NSC)
- The National Health Interview Survey (HIS)

The numbers presented by these different sources are not the same. The apparent differences have led to specious arguments that one system is superior to another. The numbers obtained from each should not be expected to be the same. Each uses somewhat different counting rules (definitions) and counts in different populations. If, however, one makes the effort to try to extract figures on comparable populations using comparable definitions, the results are surprisingly close.

It is the purpose of this report to compare data from several different sources on injuries and fatalities to attempt to make national estimates of the number of occupational injuries and resultant fatalities.

Injuries

Data were taken from two sources to obtain estimates of the number of work-related accidents: the OSHA-BLS Survey and the National Health Interview Survey.

OSHA-BLS Survey

The Occupational Safety and Health Act of 1970 stipulates that employers subject to the Act must maintain accurate records of work-related deaths, illnesses, and injuries other than those requiring first aid. OSHA obtains estimates of the number of these events through a sample survey conducted by the Bureau of Labor Statistics. Data are obtained by questionnaires mailed to a probability sample of employers covered by the Act. Excluded from coverage are selfemployed persons, farmers, railroad employees, and employees covered by the Coal Mine Health and Safety Act and the Metallic and Non-metallic Mine Safety Acts, and Federal, State and local governmental units.

The survey requests information on the average number of employees, total number of hours worked, number of injuries and illnesses, and number of fatalities.

Reportable events are defined as any occupational injury or illness which results in:

- Deaths, regardless of the time between injury and death or length of illness.
- Lost work days, which are defined as days on which the employee would have worked but could not; worked at his permanent job less than full time or could not perform the duties assigned to it; or was assigned to a temporary job because of the incident.
- No lost work days but which required medical treatment, involved loss of consciousness or restriction of work or motion; resulted in transfer to another job or termination of employment. This includes diagnosed occupational illnesses reported to the employer which may not involve lost work days.

National Health Interview Survey

The National Health Interview Survey (HIS) is a continuing nationwide survey which utilizes a questionnaire to obtain demographic and health-related information on a random sample of households. The population covered by the sample is the civilian noninstitutionalized population living at the time of the interview. Among the information sought are questions about any accidents or injuries the respondent may have experienced. An injury is any condition that could be classified according to the nature of the injury by code numbers N800–N999 in the International Classification of Diseases. These include traumatic events such as fractures, lacerations, contusions, burns, etc., as well as falls, poisonings, motor vehicle accidents, extremes of temperature, and medical misadventures. The incidents are classified by where they occurred: at home, at work, or other. Included in the "at work" category are motor vehicle accidents occurring at work.

Table 1. COMPARISON OF WORK RELATED ACCIDENT/ILLNESS RATES BLS/OSHA SURVEY AND HEALTH INTERVIEW SURVEY (NUMBER OF EVENTS IN THOUSANDS)

	HIS Data			BLS/OSHA
Year	Accidents	Currently Employed	Rate [1]	Rate [2]
1971	9,631	77,407	12.4	12.1
1972	7,938	80,244	9.9	10.9
1973	9,027	83,441	10.8	11.0
1974	9,254	84,307	10.9	10.4
1975	9,841	83,219	11.8	9.1
1976	9,292	87,119	19.7	9.2

[1] Rate per 100 currently employed.
[2] Rate per 100 man-years worked.

For purposes of enumeration, a person is considered currently employed if he is 17 years of age or over and reported that he had work at or had a job or a business at any time during the two-week period covered by the interview. Current employment included paid work as an employee of someone else, self-employment in business, farming or professional practice, and unpaid work in a family business or farm. Persons temporarily absent from a job because of illness, vacation, strike, or bad weather were considered employed.

These two sources estimate similar problems approaching them from different directions. The definitions of what is counted as a "work accident" is roughly the same. The HIS survey possibly includes some events that might not be reported to OSHA, such as first aid cases. The populations covered are not the same. The HIS samples the total population. The OSHA-BLS survey asks the employer to report the event; the HIS asks the employee to report the event. Obviously, the estimates of the number of events in the populations sampled must be different. Yet the rates of occurrence of the events are remarkably similar (table 1).

The annual BLS-OSHA incidence rates are published in annual reports of the survey occurrence rates (incidence rates). For the HIS, the rate for the currently employed population was obtained by dividing the estimated number of accidents occurring at work by the estimate of the number of currently employed persons.

It should be remembered that although all these numbers are subject to sampling error, only for 1975 are the two rates "significantly different." The excess in the HIS data can be attributed to an excess of accidents reported by female respondents in 1975.

The similarity between the rate estimates suggests that the OSHA-BLS survey is counting the events perceived by the employee as occupationally related. This implies that the injury rates in the OSHA survey are reasonably accurate and that there is no tendency for gross underreporting of injuries by the employer. The average number of lost work days per case has been increasing in the OSHA data, suggesting that the employer may not be reporting some of the less severe injuries involving no lost work days in recent years. Published data from the HIS that might help verify this are not available.

The numbers of injuries in the OSHA-BLS survey will be smaller than the national estimate simply because only part of the working population is covered in the survey. Proportional projections yield numbers that agree reasonably well with HIS estimates.

Fatalities

Estimates of number of work related fatalities are found in the OSHA-BLS survey and National Safety Council Publications. In addition, employee fatalities are reported in State worker compensation systems. Information from these three sources were compared (table 2).

It was discovered that there was less agreement among the counting systems on the definition of what constitutes an occupational fatality than on what constitutes an occupational injury. Occupationally related fatalities might be classified as:

A. Deaths from trauma that occur at a fixed worksite while the employee was performing tasks related to this work assignment ("fixed" includes here temporary worksites such as construction sites).
B. Deaths from trauma that occur away from a fixed site but which happen while the employee was performing duties or functions required by his job (i.e., truck drivers, deliverymen, salesmen, etc.).
C. Deaths from occupational diseases.
D. Deaths from apparently natural causes that occur on the job (heart attacks, cerebral vascular accidents, epileptic seizures, anaphalatic shock following insect bites, etc.).
E. Deaths from medical complications following nonfatal injuries or illness.
F. Deaths from violence inflicted by self, fellow employees, or relatives at the place of employment (suicides, homicides).

Table 2. COMPARISON OF ESTIMATES OF THE NUMBERS OF OCCUPATIONAL FATALITIES FROM SEVERAL SOURCES, BY INDUSTRY, 1972

	OSHA/BLS	From Worker's Compensation		NSC
	I	II	III	IV
Construction	1500	1270	1450	2900
Manufacturing	1400	1660	1960	1700
Transportation	1100	935	1070	1700
Trades	700	690	890	1300
Finance, Insurance, Real Estate	100	90	130	—
Services	500	400	530	700

SOURCE:
I. Occupational Injuries and Illnesses, 1972, Bulletin 1830, U.S. Department of Labor, Bureau of Labor Statistics, 1974, page 66, Table 5.
II. Estimates from Workman's Compensation Fatality Reports, Excluding Cardiovascular Disease and Violent Deaths.
III. Estimates from Workman's Compensation Fatality Reports, Excluding Violent Deaths.
IV. "Accident Facts," 1973 ed. National Safety Council 1973, page 23.

The examination of data from Worker's Compensation Reports, the Bureau of Labor Statistics Survey and reports of fatalities made directly to the Occupational Safety and Health Administration suggests that:

1. All of these types of deaths may be found among workers' compensation reports to a varying extent depending upon the reporting laws of each State. There is a tendency to report all deaths which occur at the worksite, on the property of the employer, or during working hours. For example, a man who choked to death on his lunch on an airplane while enroute for a business meeting was counted as an occupational fatality in one State's worker's compensation system.
2. The Bureau of Labor Statistics Occupational Safety and Health Survey counts traumatic deaths that occur at the worksite and those away from the worksite occurring during work assignments (group A and B). Deaths that occur as a medical complication of an acute event may be counted if they occur in the same calendar year (group E). Death from chronic occupational diseases, violence or "natural" causes (groups C, D, F) are less often reported.
3. The fatalities reported directly to the Occupational Safety and Health Administration tend to be those occurring at the worksite. Relatively few of the other deaths are reported. Virtually no deaths from chronic occupational diseases are reported directly to OSHA.
4. No existing system captures the deaths from chronic occupational diseases in such a form that national estimates can be made. No existing system identifies occupationally related deaths among those from apparently natural causes.

Our estimates of the number of occupational fatalities from occupational injuries for 1972 were in the range of 7500–8000. This estimate excludes deaths from apparently natural causes. Not all States report cardiovascular death; among those that do, they were 19 percent of the reports. Of the noncardiovascular deaths, 36 percent were not able to be addressed by OSHA. They were such things as highway or aircraft accidents, violence, bee stings, choking on food, etc.

OSHA uses the injury rates to target inspections. Nearly all deaths of interest to OSHA in States under the jurisdiction of Federal OSHA are investigated. These reports are being studied to explore the need for compliance efforts, training, or standards promulgation.

Similar work is being undertaken for occupational illnesses, a much more difficult problem.

RECORD LINKAGE AS A METHOD TO ASSESS OCCUPATIONAL HEALTH HAZARDS

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Abstract

The purpose of this paper is to describe how administrative files created many years ago are being exploited in Canada by employing record linkage methodology to identify disease and occupational associations. In Canada, as in many other countries, there are no unique record systems which contain both exposure and outcome data. There are, however, files which record outcome in terms of ill health or death. There are also many files which contain exposure data in terms of occupation or length of employment in particular occupations. The problem basically reduces to following up risk groups to determine outcomes.

The basic follow-up environment consists of two files. The first file contains records of all deaths occurring in Canada since 1951. The file contains identifying information pertaining to the deceased, certain demographic information and information describing the circumstances surrounding the death. The second file contains data on new primary sites of cancer discovered since 1969. This file contains identifying information, certain demographic information and a description of the site. Both these files are in machine-readable form.

In Canada, as elsewhere, there is great concern for individual privacy and the preservation of confidentiality. Statistics Canada's operations are governed by a federal law, known as the Statistics Act. The Act, among other things, specifies rules for confidentiality. Basically the Act states that the agency cannot release information which either directly or indirectly identifies an individual. Thus any information leaving the agency has to be unidentifiable and statistical in nature.

Because all of the current linkage applications and many contemplated applications are being done for external users supplying their own at-risk files, there is significant continuing pressure for Statistics Canada to release linked files to researchers. However, discussions between users and Statistics Canada generally result in agreement that statistical tabulations are sufficient to support the subsequent statistical or epidemiological analysis.

The follow-up or linkage methodology used is a probabilistic one developed by Newcombe[1]. However, in some applications simple matching of records is sufficient.

The first large and possibly the most difficult computer linkage application was that undertaken under contract for the National Cancer Institute to determine the possible carcinogenicity of the anti-tuberculosis drug isoniazid. About 100,000 tuberculosis treatment records for the 1951 to 1960 period containing isoniazid treatment and other treatment data were linked to each other to yield a cohort of about 70,000 persons. These person records were then linked to mortality records for the period 1951 to 1973. This file contained some 3,500,000 records. The survivors were then linked to cancer incidence records for the period 1969 to 1973. At present the results are being analyzed by the National Cancer Institute. Although the above was not purely an occupational application, many of the techniques developed were used in subsequent applications.

Some 15,000 persons exposed to uranium dust for at least 30 days during the period 1964 to 1973 were followed up through about 900,000 mortality records. This work was done, under contract, for the Ontario Royal Commission in the Health and Safety of Workers in Mines.[2] The epidemiologic findings supported those of elsewhere indicating that the risk of death due to lung cancer for such exposed persons was about 2 1/2 times greater than that for the general population.

Two further applications are sponsored by the National Cancer Institute. One consists of the follow-up through death records of some 700,000 persons whose occupation was known for the period 1965 to 1971. The results of this linkage work are being analyzed by NCI and are expected to identify in part certain hazardous occupations.

The other application under way is the quantification of cancer-causing doses of radiation, the linkage work consisting of following up persons who were treated in the 1940's for tuberculosis by collapse-of-lung therapy. The follow-up is through death and cancer records.

At present arrangements are being finalized to follow two groups of nickel miners and refinery workers through death records for the period 1951 to the present. These groups consist of 60,000 and 6,000 persons, respectively.

The follow-ups of a cohort of grain handlers and another of petrochemical workers are in the planning stages.

Also in the planning stage is the follow-up of certain

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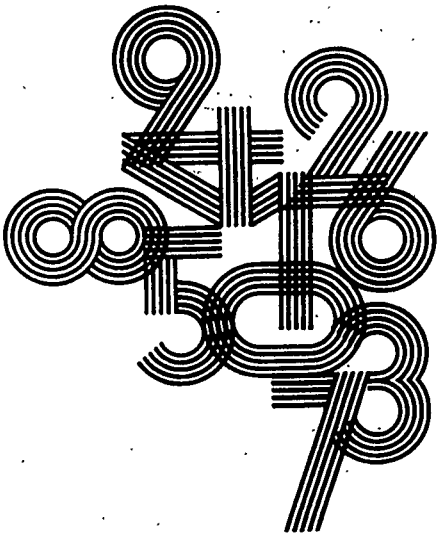
occupational cohorts as identified in the 1971 census.

Having demonstrated that linked record systems, originally developed for administrative purposes, can be used to assess and identify occupations which are suspect as hazardous from a health point of view, it is the intent of Statistics Canada to exploit these files for their information content in the area of occupational health.



CONCURRENT SESSION S

Ambulatory Care Data Utilization

USES OF DATA FROM AN AMBULATORY CARE STUDY

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It must be the ardent wish of those of us who labor in the fields of health services research that our harvests will yield some consumable products. I have been asked here today to relate the ways in which one such study was fed to the community. Of course I can only report on the feedback.

When we in Blue Cross and Blue Shield of Greater New York set out to study the management organization and utilization of hospital based ambulatory care services in 1974, it was because health care service in these settings had expanded significantly with each succeeding year, particularly as private physicians were virtually disappearing in the poverty areas. In order to acquire an understanding of this growing phenomenon a study was launched in 135 hospitals to study 21 major clinics in each hospital (these accounted for the great majority of all patient visits) as well as emergency room services in each of the hospitals. The study spanned the 17 lower counties in New York State.

A total of 17,000 patient visits were surveyed; about three quarters of these were from outpatient departments and one quarter from emergency rooms. It was inevitable that a study of this scope would afford new insights to this delivery system. Some of the more striking facts which were produced by the survey were:

1. The most popul..rly used clinics were the general medical or family practice, pediatrics and eye clinics which together accounted for 28 percent of the visits. Others heavily attended were obstetrics, general surgery, gynecology and allergy.
2. There were dramatic differences in age composition among the various ethnic groups of minorities compared to the white population. For example, visits by the elderly accounted for one-third of the white patients compared with only 13 percent of blacks and 7 percent of the Hispanics. On the other hand, children under 15 were underrepresented in visits by whites and overrepresented among blacks and to a greater degree among Hispanics.
3. The overwhelming utilization of clinics by minorities and females, each of whom made two-thirds of the visits, was a very concrete finding which had not previously been measured.
4. Another important discovery was the fact that three-fifths of the visits made by the minorities were to the local municipal hospitals while the utilization of clinics by whites was predominately in voluntary hospitals.
5. Characteristics of age, sex, and ethnicity were fundamental to clinic use. For example, the dominance of young children and women were directly related to the high use of pediatrics, obstetrics, gynecology and allergy clinics. Utilization of the general medical and eye clinics were also age-related, particularly to the elderly, while services of the walk-in clinics were in demand by all ages over 15.
6. The clinic population are the sick poor whose median income in 1973 (for those who replied to the question) was slightly under $6,000 per family. This was about half of the median for the general population in the survey area.
7. We found that Medicaid and out-of-pocket payments accounted for 73 percent of the payments, and almost equally divided were the two major sources of payments for the visits. Medicare paid for an additional 14 percent.
8. We found that five diagnostic categories or conditions accounted for over half of all clinic visits. Among these were general examinations and checkups, 15 percent; respiratory and OBGYN conditions, 11 percent each; sensory ailments, 8 percent; and circulatory conditions, 7 percent.
9. To examine local community utilization of clinics and emergency rooms we based our data on the 32 health planning districts in New York City and examined the flow of patients from each of these districts to their respective target areas for ambulatory care.

We found the proportion of minority population to be highly correlated with utilization of local clinics. Systematic relationships were also found by districts in clinic and emergency room utilization. For example, clinic utilization rates were highly correlated with ER utilization rates, .668. This high correlation was also found for clinic and ER utilization rates by district residents at .753. Also the proportions of non trauma visits to the ER made by residents were correlated with their ER utilization rates at .411. Our finding indicated that district rates of all these measures of ambulatory care utilization tend to increase with an increasing proportion of minority population and decreasing per

capita income. But minority presence was more important than per capita income.

Uses of the Ambulatory Care Study

Because of the uniqueness of this study wide-spread interest followed the publication of the first monograph, entitled; "Highlights of The Ambulatory Care Study." Many inquiries were made as to the methodology of this study, the problems encountered in the field experience, and also the general study design for a survey of this magnitude. Altogether, the 135 hospitals encompassed over 1,000 clinics.

Requests for methodology came from many health care organizations throughout the country, including national and local hospital organizations, academies of medicine, consulting groups, health planning agencies, governmental departments and bureaus on a national, State and local level. Health care and city planners were particularly anxious to receive data from the study.

Because we had organized our data in a fashion which would permit us to analyze patient origin for each of the hospitals involved in the study, the participating hospitals throughout the 17 county area found the data extremely useful for their own planning needs. In eliciting cooperation from each of the institutions we had in fact promised, and delivered to them, the data collected in their institutions.

Since we had also analyzed the data by ownership or hospital control, the New York City Health and Hospital Corporation was able to receive data for their hospitals both in summary and for each of their facilities. These data contained the following: characteristics of the patients, patient origin, method of payment, utilization of clinics, summary of diagnosis by major categories, services received, and referral of the patients.

We received requests from many universities throughout the country and even from several abroad for copies of the five monographs produced by the study. In addition to the one describing the highlights, these included "Who Uses Ambulatory Care Services," "Major Reasons for Ambulatory Care Visits," "Organization and Processes of Hospital Based Ambulatory Care," and "Small Area Utilization and Inter-Area Mobility for Ambulatory Care." This last monograph engendered enormous interest in many areas. The reason for this was that for the first time this monograph described the patient origin and utilization of clinic and emergency room care. This was a useful contribution in that it coupled uses of clinic care with patient origin on a small local area basis, thus affording planners an opportunity to analyze the reasons for and extent of utilization by patients of local facilities compared with outmigration of patients to institutions in other areas. This was particularly revealing because it disclosed the movements of patients to selected facilities outside of their own area for reasons often associated with the benefit of receiving care in large institutions or teaching facilities when local facilities did not measure up to this quality. This monograph became so popular that we are now into the third printing.

Although we have had over 500 requests for copies of the monographs, it would be difficult for us to assess the actual uses that have been made of this study. However, we do have some concrete evidences of institutions and individuals who have utilized our work.

In addition to planning and other agencies already mentioned many of the contents and the analysis of the study have been used for teaching purposes. Schools of public health at Columbia University, N.Y.U., and elsewhere have included the findings of this survey as part of their curriculum for training of medical students and students of public health. In addition we have been called upon to lecture at various institutions both on the content and methodology of this study. We know of two areas—one in Florida and another in the Midwest—which have used our methodology. Just recently we led a seminar at one of our medical schools in approaches to studies of clinic care.

Since hospital-based ambulatory care has become a major source of inquiry during the past several years, many of the consultant firms in the East have requested copies of our documents as well as of our study design. Needless to say, other Blue Cross Plans in various parts of the country have also used our reports as a foundation for their own particular approaches to this subject. I might add here that ambulatory care has always been a controversial reimbursement issue in the Blue Cross stepdown formulas.

Many special interest groups, for example, those concerned with either the elderly or children, have looked at our work in terms of utilization of clinics and the types of diagnoses presented by patients in these specific age groups.

The monograph entitled "Organization and Processes," reflecting the configuration of how appointments are set up, how clinics are administered, and the roles of the various administrative levels, have been of interest to hospital organizations. We have heard that this has been valuable in several local institutions who have used the data developed from their own hospitals for certain modifications of organizations.

We are flattered by the fact that 4 years after the study was completed we are still receiving requests for its output. Most recently we have received a telegram from the Department of Research in Medical Economics in Tel-Aviv, Israel, for copies of the monographs.

Last but not least the National Center for Health Statistics itself has voiced an interest in undertaking an effort of this scope on a national basis.

COLLECTION AND USE OF AMBULATORY CARE DATA IN RHODE ISLAND

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The Rhode Island Ambulatory Medical Care Survey (RIAMCS) of physician office practice was conducted by Rhode Island Health Services Research, Inc., (SEARCH) in March through July, 1977. This paper provides a review of the sample selection and methodological procedures used and a discussion of the analysis of the data, including some of the specific projects to which the RIAMCS information is being applied.

Sample Selection/Methodology

The Ambulatory Medical Care Survey is a survey of private, office-based physician practice. The sampling frame, therefore, included physicians who provided direct patient care in an office setting and excluded all physicians who were solely hospital or government employees and those specialists who do not for the most part provide direct care in an office setting, including anaesthesiologists, pathologists, and radiologists. Also excluded were all ambulatory visits to hospital- or institution-based facilities, such as emergency rooms and outpatient clinics.

In Rhode Island a 30-percent random sample of physicians was selected, stratified by eight specialty groups. This resulted in a sample of 309 physicians who were randomly assigned to one of 13 survey weeks, during which time the data were collected.

The methodology for the RIAMCS was based on the well-tested experience of the National Ambulatory Medical Care Survey (NAMCS), which has been conducted nationally on an ongoing and continuous basis since 1973. The core of the NAMCS methodology was adopted for the RIAMCS; however, it was modified where necessary to meet local needs.

The first step in the survey process was obtaining the endorsement of the Medical Society, which was considered essential to obtaining physician cooperation. In Rhode Island the endorsements of both the Rhode Island Medical Society and the Rhode Island Society of Osteopathic Physicians and Surgeons were obtained.

Each physician in the sample received two letters, one from SEARCH and one from the appropriate professional society, indicating its support and asking the doctor to participate. An interviewer then called the physician to make an appointment for a 15- to 20-minute interview, during which time the survey procedures were explained and a few items of information relating to the physician's practice were obtained. The physician was asked to complete patient records for a sample of his or her patients for one preassigned sample week. The physicians recorded information on the age, sex, and race of the patient, the patient's reason for visit (as presented by the patient), physician's diagnosis, characteristics of the illness such as chronicity and severity, diagnostic and therapeutic services provided, disposition of the physician, and duration of physician contact. In addition, data on allied health personnel were collected, which were not collected in the NAMCS (see Patient Records).

Data were also obtained on the census tract of patient residence by use of a doubly-perforated log attached to the record, which was also used to select patients for the sample. The first perforation was used by the physician to list the names of patients seen. A record was completed for either every patient or every second, third, or fifth patient, depending on the size of the physician's practice, the idea being to limit the amount of time required of the physician. This was the procedure developed for the NAMCS. In Rhode Island we added a second perforated area for recording the address of the sampled patient. At the close of the survey week, the interviewer visited the physician's office to pick up the forms, before which time the list of names would already have been removed. The interviewer then coded the census tract of the patient's address onto the record and detached the address list. Using this procedure, research staff did not see patients' names, and no address left a physician's office, which satisfied the concerns of the Medical Society and individual physicians regarding patient confidentiality. (For additional information on the RIAMCS methodology, see "Rhode Island Ambulatory Medical Care Survey: Survey Specifications," L. Robison and A. Chuman, SEARCH, 1977.)

Response Rate and Cost

As mentioned previously, there were 309 physicians randomly selected to participate in the survey. Of this sample 12 percent were found to be out-of-scope (retired, deceased, no office practice, or moved from Rhode Island), and 9 percent were not available during their assigned survey week (due to illness, vacation, or other personal business). Among the physicians in-scope and available, we achieved a response rate of 68 percent, resulting in data from 166 physicians and a total of 5,013 completed records.

The cost of the data collection phase of the RIAMCS

was $21,000 or an average of $4.20 per record and about $126 per participating physician. These costs include the costs of interviewers and coders and all expenses related to collecting the data and preparation of computer files. They do not include salaries of the professional staff and computer time for analysis. The data, however, do indicate that an ambulatory care survey can be conducted on a local level at an economical cost. (For additional information on response rate and cost, see "Surveying Physician Office Practice: The Rhode Island Experience," A. Chuman and L. Robison, SEARCH, presented at the 105th Annual Meeting of the American Public Health Association, Washington, D.C., November, 1977.)

Analysis: RIAMCS Profiles

The first phase of analysis of the data collected from the RIAMCS is currently being conducted, to be published as part of the SEARCH Profiles from the Health Statistics Center series. A Profile is published for each of the data sets available at SEARCH. They are largely descriptive in nature and are designed as reference documents for use in meeting the routine data needs of health planning and organizations in Rhode Island. In order to provide a flavor of the descriptive analyses being generated and of the possible applications of the data, the numerous tables from the Profile has been collapsed into a few simple illustrative examples.

The first few tables present patient profiles by demographic characteristics of the patient. Examining the relationship to age (table 1), as expected, the elderly were found to have a considerably higher rate of utilization (mean number of visits per year were calculated by deriving an estimated volume of visits per year from the sample and dividing by a population estimate) and to make a higher proportion of visits for chronic problems and problems evaluated as serious by the physician. Even among the elderly, however, only about one-third of all visits were evaluated by physicians as "serious" or "very serious," indicating the relatively benign nature of medical problems treated in the physician's office. Comparing the percentage of visits for selected disease categories by age, about one-third of all vistis by patients 65 years of age and older were for diseases of the circulatory system; however, the age group 25–44 were the most likely to make visits for mental disorders; and patients 0–14 years of age were the most likely to make visits for respiratory problems.

Examining selected differences by sex of the patient (table 2), females were found to utilize services at a significantly greater rate than males, a finding similar to that found from health interview survey data. Among diagnoses, females made a higher percentage of visits for diagnosis of mental disorders and diseases of the endocrine-nutritional-metabolic system (such as diabetes and obesity); males made a higher percentage of visits for injuries and diseases of the circulatory system.

Table 1. CHARACTERISTICS OF OFFICE VISITS BY AGE GROUP OF PATIENTS: RHODE ISLAND, 1977

	Age Group				
	0–14	15–24	25–44	45–64	65+
Mean # Visits/Year	2.0	1.8	2.5	3.0	4.6
Percent serious or very serious	9	12	16	32	37
Percent chronic	14	21	30	50	61
Percent with circulatory disease	1	2	6	24	32
Percent with Mental disorders	3	4	9	6	3
Percent with respiratory disease	16	7	7	7	7
Percent for exams/ special conditions	42	39	28	11	9

Source: Rhode Island Ambulatory Medical Care Survey, March–July 1977; Rhode Island Health Services Research, Inc. (SEARCH).

Table 2. CHARACTERISTICS OF OFFICE VISITS BY SEX OF PATIENT: RHODE ISLAND, 1977

	Sex	
	Male	Female
Mean # Visits/Year	2.2	3.0
Percent serious or very serious	27	21
Percent chronic	36	39
Percent with circulatory disease	16	14
Percent with injuries	7	4
Percent with mental disorders	4	6
Percent with Endo-Nut-Metab.	4	6

Source: Rhode Island Ambulatory Medical Care Survey, March–July 1977; Rhode Island Health Services Research, Inc. (SEARCH).

In addition to age and sex, in Rhode Island we are also able to look at the relationship of utilization to socioeconomic status of the patient, a variable which cannot be analyzed from the national study. In Rhode Island an SES factor score has been assigned to each census tract (poverty, low, middle, high) based on a factor analysis of tracts using 1970 census data. A patient is then assigned the SES of the tract in which he or she resides. This ecological definition of SES is not as precise as obtaining relevant information from the individual, as is done in a Health Interview Survey; however, it serves as a useful proxy when individual assessments aren't possible or would be too difficult to obtain, as is the case with the Ambulatory Medical Care Survey. In Rhode Island, residents in high SES areas were found to have a higher rate of utilization than residents in other areas (table 3), though it should be remembered that visits to sources of care which are

Table 3. PERCENT DISTRIBUTION OF OFFICE VISITS, AND ESTIMATE OF MEAN NUMBER OF ANNUAL VISITS, BY SOCIOECONOMIC STATUS OF PATIENT: RHODE ISLAND, 1977

Socioeconomic Status	Percent of Office Visits	Estimated Mean # of Visits/Year
High	30	3.0
Middle	39	2.5
Low	25	2.4
Poverty	6	2.3
Total	100	2.6

Source: Rhode Island Ambulatory Medical Care Survey, March–July 1977; Rhode Island Health Services Research, Inc. (SEARCH).

Table 4. PERCENT DISTRIBUTION OF SPECIALTY OF PHYSICIAN SEEN IN OFFICE VISITS, BY SOCIOECONOMIC STATUS OF PATIENT: RHODE ISLAND, 1977

	Socioeconomic Status			
Specialty	High	Middle	Low	Poverty
General Practice	23	27	35	37
Internal Medicine	19	15	11	12
Pediatrics	14	15	10	9
Ob/Gyn	9	11	9	7
Other	35	32	35	35
Total	100	100	100	100

Source: Rhode Island Ambulatory Medical Care Survey, March–July 1977; Rhode Island Health Services Research, Inc. (SEARCH).

used more often by the poor, such as emergency rooms and outpatient clinics, were not included in the survey. Interestingly, there were also differences in the specialty of physician seen; patients from the low and poverty SES tracts were more likely to use general practitioners as a source of care and less likely to use internists or pediatricians than were residents of middle or high SES tracts (table 4).

In addition to patient profiles, provider profiles have also been generated, comparing the practices of physicians by specialty group. As an example, comparisons between general practitioners and internists have been selected, since both treat patients of all ages and both sexes and because internists are in many areas fulfilling the functional purposes of general practitioners. Some very interesting differences in the patients treated by these two groups of physicians were found (table 5); internists as compared to general practitioners treated an older population, saw a higher percentage of patient visits for circulatory diseases, evaluated a higher percentage of visits as serious or very serious, made considerably greater use of diagnostic tests, including over 50 percent more lab tests, over 4 times as many EKG's, and almost twice the number of X-rays, provided more "medical counseling" and "therapeutic listening," and had considerably longer duration of visits. Internists, in fact, reported the longest duration of physician contact with patients of any specialty, with the exception of psychiatrists. Similar profiles of the practices of other major specialty groups are of course possible and have been conducted.

Similar profiles have also been generated describing the characteristics of patients and treatments provided for various categories of disease. A few disease categories have been selected for comparison: diseases of

Table 5. PERCENT OFFICE VISITS WITH SELECTED CHARACTERISTICS; GENERAL PRACTICE AND INTERNAL MEDICINE: RHODE ISLAND, 1977

	General Practice	Internal Medicine
Percent over 44 years	54	71
Percent visits for diseases of circulatory system	22	34
Percent serious or very serious	25	36
Percent visits with		
Lab test	20	32
EKG	5	22
X-Ray	9	17
Medical counseling	23	38
Therapeutic listening	3	10
Percent duration of contact over 30 minutes	2	18
Mean duration	16	24

Source: Rhode Island Ambulatory Medical Care Survey, March–July 1977; Rhode Island Health Services Research, Inc. (SEARCH).

Table 6. CHARACTERISTICS OF OFFICE VISITS, BY SELECTED CATEGORIES OF DIAGNOSIS: RHODE ISLAND, 1977

	Circulatory	Endo-Nut-Metab.	Mental	Injuries
Percent 45+	88	62	43	27
25–44	9	23	38	29
0–24	3	15	19	35
Percent female	56	70	69	45
Percent serious	42	28	37	20
Percent drug prescribed	77	72	69	33
Percent diet counseling	17	33	7	2
Percent blood pressure check	73	74	45	22
Percent lab test	21	33	9	2

Source: Rhode Island Ambulatory Medical Care Survey, March–July 1977; Rhode Island Health Services Research, Inc. (SEARCH).

the circulatory system, endocrine-nutritional-metabolic diseases, mental disorders, and injuries (table 6). The table illustrates the extent to which visits for circulatory system problems are made predominantly by the older population, while mental disorders and injuries are presented by all age groups. In relation to sex of the patient, 70 percent of the visits for diseases of the endocrine-nutritional-metabolic systems and mental disorders are made by females, compared to only 45 percent of injuries, the only diagnostic category for which male visits are more prevalent than female. Treatments, as expected, vary widely and provide a picture of the management of illness; for visits related to circulatory system problems, 77 percent had a drug prescribed, 17 percent received diet counseling, 73 percent had blood pressure checked, and 21 percent had a lab test ordered or provided; a similar percentage of patients making visits for endocrine-nutritional-metabolic diseases had blood pressure checked and a drug prescribed, but 33 percent received diet counseling, and 33 percent had a lab test ordered or provided.

In addition to these profiles, two other areas of analysis are being conducted which involve variables which are not collected on a national basis. Table 7 provides a profile of the services provided in physicians' offices by allied health personnel. In Rhode Island patients were provided services by such personnel in 46 percent of all visits. Measurements, blood pressure, lab procedures, and history-taking were the services most often provided.

Finally, the census tract information obtained in the survey also allows for conducting an analysis of patient flow, determining where patients go for services. In Rhode Island the State has been divided into acute care and ambulatory care service areas, based principally on a plurality of patients in an area seeking care in that area. The service areas were originally developed from Health Interview Survey data on the basis of asking individuals for their regular source of care and relating census tract of patient residence to census tract of physician. A similar analysis was conducted using the visit data from the RIAMCS. Similar patterns were found with some differences in areas of small population where sample sizes are small, when comparing the ambulatory care areas derived from the Health Interview Survey to the patterns obtained for visits to primary care physicians (general practitioners, internists, pediatricians, ob/gyn) in the RIAMCS. Patterns for ambulatory utilization of secondary care physicians, however, were more like the acute care (hospital) service areas, with patients from a wider geographic area seeking secondary care in more centralized locations, such as Providence. This might be expected as surgeons, for example, often locate offices adjacent to affiliated hospitals; but it serves to indicate that in developing ambulatory care service areas, an important distinction must be made between primary ambulatory care and secondary ambulatory care.

Once service areas are developed, data from the survey can then be applied to population bases by geographic service areas so that population-based utilization rates can be calculated.

Table 7. SERVICES PROVIDED BY ALLIED HEALTH PERSONNEL: RHODE ISLAND, 1977

Service	Percent of Total Visits	Percent of Visits in Which Allied Personnel Were Seen
Measurements	30	66
Blood Pressure	12	27
Lab Procedure	10	21
History	10	21
Other Assistance	7	15
EKG	4	8
X-Ray	3	7
Instruction/Counseling	2	4
Injection	1	2
General Exam	1	2
Dressing Change/ Cast or Suture Removal	—	1
Any Service	46	100

Source: Rhode Island Ambulatory Medical Care Survey, March–July 1977; Rhode Island Health Services Research, Inc. (SEARCH).

Applications

In the short amount of time that the ambulatory care data has been available for analysis, SEARCH has already received data requests for applications of the information to specific projects or programs. One such application is in relation to a Diabetes Control project which is being conducted in ten States, including Rhode Island. The project is funded by the Center for Disease Control by contract with the Rhode Island Department of Health with SEARCH holding a subcontract for activities related to analysis of relevant data. The purpose of the project is to reduce the preventable and serious side effects of diabetes. The first year of the 3-year project is being used to plan interventions to be conducted in the following 2 years. Information from SEARCH is being used to examine the current status of mortality (vital statistics), morbidity (Health Interview Survey), and utilization of services (hospital discharge, Ambulatory Medical Care Survey) related to diabetes and diabetics in Rhode Island. Table 8 illustrates a few items of information provided from the RIAMCS. Fifty-six percent of visits for a principal diagnosis of diabetes were made by females. Almost half of all visits for diabetes were made to general practitioners and another 29 percent to internists. Services relevant to diabetes, such as prescription drugs, diet counseling, and medical counseling, were provided much more often to diabetics than to the general population, though, still, less than one-third did receive diet counseling during their visit.

Table 8. SELECTED CHARACTERISTICS OF VISITS FOR PRINCIPAL DIAGNOSIS OF DIABETES: RHODE ISLAND, 1977

	Diabetes	All Visits
Percent Female	56	59
Percent seen by		
General Practitioners	48	28
Internists	29	14
Percent Received		
Prescription Drugs	71	50
Diet Counseling	30	8
Medical Counseling	47	29

Source: Rhode Island Ambulatory Medical Care Survey, March–July 1977; Rhode Island Health Services Research, Inc. (SEARCH).

Analyses of differences by socio-economic status and service area have also been conducted.

A request has also been made by the Health Planning Council of Rhode Island in reference to the charge of a Pediatric Task Force to evaluate and plan for services for the under-21 population. Information was requested from SEARCH's manpower files on the number and type of pediatricians' practices, on hospital utilization of the young population from the hospital discharge data set, and from the RIAMCS on ambulatory care utilization. A profile of the practices of pediatricians was provided, including the age distribution of patients seen, diagnosis, severity of the problem, first visits and repeat visits, and size of practice. Also included were patient profiles for age groups 0–2 years, 3–12, 13–18, 19–21, indicating the specialties of physicians from whom care was obtained, problems and diagnosis presented, severity of illnesses, and services received.

A request has also been discussed with Blue Cross/Blue Shield of Rhode Island in relation to a pediatric insurance benefit being developed. The request is for volume estimates of visits made by the under-21 population, including volume of diagnoses, specialty seen, and diagnostic tests and therapeutic services provided, such as the number of X-rays and lab tests.

Conclusions

The experience of Rhode Island Health Services Research, Inc., (SEARCH) in conducting its own Ambulatory Medical Care Survey indicates that with the guidance of the methodological experience of the NAMCS and with local medical society support a successful, economical survey of physician office practice can be conducted on a local level which will serve as an important database for planners and other users of health care information.

UNIVERSITY OF SOUTHERN CALIFORNIA'S NATIONAL PHYSICIAN PRACTICE STUDY

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Introduction

In keeping with the objectives as defined for us, the focus of this paper will be on ambulatory care data utilization. The study about to be presented is much more comprehensive since it has obtained data related to all facets of the practicing physician's professional day, the interactions with patients through use of a telephone and detailed information about each face-to-face encounter wherever it occurred. While ambulatory care constitutes the bulk of medical practices, one should also have access to facts about nonambulatory face-to-face and indirect (telephone) care to place this in proper perspective. Our study provides these related facts.

By way of background, the University of Southern California School of Medicine's Division of Research in Medical Education (DRME) embarked on its study of 24 medical and surgical specialties in 1973. Within a year, this ambitious plan had been expanded to include studies of practices that employ nurse practitioners and physicians' assistants (and a comparison group that did not employ these providers).[1]

There were about 10 years of prior studies by the DRME Director and Project Director as antecedent research experience with various data collection modalities tried and with varying degrees of success. It would not be particularly germane to discuss each of these modalities in the context of this paper; however, the most important contributor to the studies being presented today was a national study of adult cardiology done by DRME during 1971–73. In this study, we were able to assess the kinds of biases inherent in questionnaire response compared to log-diary response and establish the fact that busy physicians will, when properly motivated, complete comprehensive log-diaries for extended periods of time. Equally important, the adult cardiology study provided precise statistics regarding patient care that documented differences in practice content attributable to physician years in practice, certification, practice arrangement and geographic distribution—some "known," but many not known before.

Our initial sponsor, The Robert Wood Johnson Foundation, asked us to expand our research design to permit eventual analysis of data based on "primary care" and "non-primary care" services. Two years of developmental and pilot-testing work in five specialties demonstrated that overall research objectives could be met. The Social Security Administration (now Health Care Financing Administration) asked us to apply the research design to a study of practices employing either Nurse Practitioners or Physician's Assistants or both, and compare these practices with comparable ones that had no such personnel. The SSA (HCFA) study began during our second project year. At the end of the first 2 years, the major study of 24 specialties had dual sponsorship—The Robert Wood Johnson Foundation and DHEW, HRA, BHM, Division of Medicine.

As most of you can appreciate, it takes a *long* time to advance from the decision to study a particular specialty to the actual initiation of the field data collection process. For us, this amounts to an average of about 9 months because we always involve selected spokesmen for the respective organizations that represent the specialty in the specification of the content of their study instrument, in letters to participants, and in a field telephone calling network that is designed to encourage participation in the study. We also involve these specialty representatives in the data analysis phases. Evidence available to us from external validation of study data, internal (instrument) validity checks, parallel validation and reliability studies of selected participant's judgments, and actual practice data support the elaborate study mechanism which we have employed; we do have sound data that can be used with confidence.

Our first full-scale study of a specialty other than the SSA (HCFA) studies began in January 1976 with General Internal Medicine. Studies are initiated at approximately monthly intervals with several months involved for larger specialties. We expect to initiate our last field study under current sponsorship arrangements in July of 1978. Our initial analyses of specialty data will be completed in September 1979. We fully expect to be analyzing these study data for several years and hope

[1] The 24-specialty study is funded by a continuous grant, beginning in 1973, from The Robert Wood Johnson Foundation. The DHEW, HRA, BHM, Division of Medicine became a joint-sponsor in 1975—a relationship that has also been continuous. The Social Security Administration (Health Care Financing Administration) provided funding beginning in November 1974 for the "Physician Extender Reimbursement Study." Besides the Project Director and Associate Project Director, other key persons for the studies include John S. Lloyd, Ph.D. and George P. DeFlorio, M.P.H.

to have sponsorship for continued longitudinal studies.

The specialty studies and their probable completion through the initial report stages are as follows:

SPECIALTY	INITIAL REPORT
General Internal Medicine	August 1977
Gastroenterology	September 1977
Dermatology	September 1977
Obstetrics & Gynecology	September 1977
Otorhinolaryngology	December 1977
Pulmonary Disease	January 1978
Allergy	February 1978
Cardiology	March 1978
Endocrinology	April 1978
Infectious Disease	May 1978
Rheumatology	June 1978
General Practice	July 1978
Family Practice	August 1978
Pediatrics	September 1978
Neurosurgery	October 1978
Nephrology	November 1978
Hematology	December 1978
Oncology	January 1979

Between January and September 1979:

Psychiatry
Ophthalmology
Neurology
General Surgery
Emergency Medicine
Orthopaedic Surgery

One of the most critical problems in use of ambulatory patient care data pertains to the incredibly wide range of techniques employed by the practicing physician to maintain office records. This is particularly true if the interest is in drawing inferences about "episodes of disease" from a one-time inspection of the patient record. Similar problems are present if the interest is in determining whether or not this is a "regular patient." one who receives the majority of his or her care from this physician, how the patient was obtained, number of visits for this (these) problem(s), or where the encounter actually took place. Status or disposition facts will not necessarily be found in the office records for the patient. Diagnostic and therapeutic procedures will be recorded if the physician feels they are important in overall management of the patient or for billing purposes: otherwise, they will not be entered. Nothing will be noted in the patient record which suggests the amount of time involved for either the physician or the physician's staff in a particular patient encounter—either as associated with direct patient care or with indirect activities related to that care.

Given these limitations in office records, the USC/DRME study design employs a standardized recording form which is superimposed on the existing office record system during the time when the pertinent ambulatory patient care data are obtained.

Some Uses of USC's Ambulatory Patient Care Data

Some of the uses of our data are obvious. Others are important to individuals or groups with limited scope objectives.

Preparation of national, regional, practice-arrangement, or area population density service normative measures constitutes a first-order type of analysis. We have prepared volumes of data of this sort on an individual specialty basis as applied to the activities and patient care services on a national basis for those who are board certified, not board certified, and the specialty as a whole. Because our samples are randomly drawn and stratified by practice arrangement in ways that we know, we are able to draw inferences to the total practicing population. We know the number of patient encounters on a typical day, the number of hours of office examinations and treatments, the time in supportive patient care work, the characteristics of telephone encounters (and the time associated with them), and many precise facts about the individual face-to-face encounters. Since the study instrument for each specialty is either standard or represents a logical premutation of that standard, we can compare one specialty with another on virtually any dimension contained in the study instrument. Let me illustrate this with some specific examples using actual data:

A. The USC/DRME survey instrument collects summary data on all patient encounters for a practice during the study week, and is not limited simply to direct face-to-face encounters with the physician. Table 1 illustrates the value of these data, in that as many as 1 of every 3 encounters an ambulatory patient has with a practice may occur over the telephone. One of every seven encounters may be between the patient and a health professional other than the physican.

B. Table 2 shows that on a "typical day," the working physician averages from about 4 to 6 hours in direct care of patients (depending on specialty), and that the proportion of this patient care time spent in the office may vary across specialities from about 30 percent to 80 percent.

C. Table 3 compares the age distributions of patients for different specialties with the U.S. population distribution. While 1 patient in 10 in the population is 65 years or over, 1 patient in every 6 seen by general and family physicians, 1 patient in every 4.5 seen by general internists, and 1 patient in every 3 seen by cardiologists, are in the 65 and over age group.

Table 1. PHYSICIAN ACTIVITY BY SPECIALTY PRACTICE

Specialty		Encounters During Week: Telephone Self	Outpatient: Self	Outpatient: Other Staff	Outpatient: Subtotal	Inpatient	Total
General IM	#	31.8	51.4	14.8	98.0	46.1	144.1
	%	(32.4)	(52.4)	(15.1)	(100.0)		
Family Practice	#	32.3	106.5	24.9	163.7	36.3	200.0
	%	(19.7)	(65.1)	(15.2)	(100.0)		
GP	#	37.3	117.2	26.6	181.1	36.1	217.2
	%	(20.6)	(64.7)	(14.7)	(100.0)		
Gastro	#	22.8	34.8	9.6	67.2	43.6	110.8
	%	(33.9)	(51.8)	(14.3)	(100.0)		
Card	#	24.2	38.5	19.1	81.8	48.1	129.9
	%	(29.6)	(47.1)	(23.3)	(100.0)		
Pulmonary	#	14.3	27.7	24.7	66.7	43.6	110.3
	%	(21.4)	(41.5)	(37.0)	(100.0)		
Endo	#	20.3	31.8	9.2	61.3	23.6	84.9
	%	(33.1)	(51.9)	(15.0)	(100.0)		

Table 2. AVERAGE DAILY HOURS IN OFFICE EXAMS AND TREATMENTS BY SPECIALTY

Specialty	Office $\bar{X}$ Hours	Office % of DPC	All DPC $\bar{X}$ Hours
General Internal Medicine	2.4	41.4	5.8
General Practice	3.5	57.4	6.1
Family Practice	3.5	61.4	5.7
Cardiology	2.1	40.4	5.2
Gastroenterology	2.0	37.7	5.3
Pulmonary Disease	1.3	31.0	4.2
Allergy	3.8	77.6	4.9

D. Table 4 shows some of the leading problem diagnoses seen by selected specialties. For example, diabetes mellitus accounts for 2.6 percent of the problem diagnoses of general practitioners, and this is the fourth ranked problem seen by general practitioners.

E. Tables 5 and 6 illustrate how specific problem diagnoses can be treated across a group of specialties. For the group of specialties shown in tables 5 and 6, diabetes mellitus accounts for 3.2 percent of all non-hospital encounters. Together, general practitioners and general internists provide approximately 85 percent of the ambulatory care for diabetes among all these specialties, with the aggregate of general practitioners handling more patient encounters, and the

Table 3. PERCENTAGE DISTRIBUTION OF AGE-GROUPED PATIENTS BY SELECTED SPECIALTIES (Non-Hospital Encounters)

Age Groups	U.S. Norm*	GP	FP	GIM	Card	OBG
thru 14	24.4	13.5	16.7	2.6	1.6	0.6
15–19	9.9	9.8	8.5	3.9	1.3	9.9
20–24	9.1	11.1	9.4	5.8	2.4	26.1
25–34	14.9	13.4	15.7	11.9	6.3	38.7
35–44	10.7	10.6	10.1	11.2	8.4	11.4
45–54	11.0	12.0	10.9	16.7	17.3	7.3
55–64	9.3	11.1	10.5	18.4	22.9	3.1
65+	10.7	17.1	17.2	28.4	34.4	2.0

*Bureau of the Census: *Population Estimates and Projections,* Series P-25, No. 704, Table 6 (estimates of population, July 1, 1976).

Table 4. PERCENTAGE DISTRIBUTION OF SELECTED NON-HOSPITAL PROBLEMS BY SPECIALTY

Problem/Diagnosis	Specialty				
	GP	FP	IM	Card.	Gastro.
Essential Benign Hypertension	5.5(2)*	5.9(3)	10.4(1)	10.9(2)	6.2(3)
Chronic Ischemic Heart Disease	2.1(8)	1.9(7)	6.6(2)	25.1(1)	2.3(14)
Medical or Special Examination	14.8(1)	9.9(1)	6.4(3)	3.9(6)	2.7(8)
Diabetes Mellitus	2.6(4)	2.3(6)	5.0(4)	2.3(9)	2.5(12)

*Number in brackets denotes ranking for specialty

Table 5. NON-HOSPITAL ENCOUNTERS WITH DIABETES PATIENTS*

Specialty	Specialty Statistics			Aggregate Projections	
	% of Dx	$\bar{X}$ min	$\bar{X}$ age	% of Dx	% of time
General Practice	2.6	11.6	57.9	45.8	36.4
Family Practice	2.3	12.3	60.7	9.5	8.0
General Internal Medicine	5.0	18.4	56.2	38.8	48.8
Cardiology	2.7	13.5	60.3	2.6	2.4
Pulmonary Disease	1.9	16.4	62.5	0.4	0.5
Gastroenterology	2.5	18.6	55.9	0.7	0.9
Endocrinology	19.7	20.9	46.4	2.1	3.1
				100%	100%

*3.2 percent of all non-hospital encounters for these specialties apply to diabetes mellitus.

Table 6. NON-HOSPITAL ENCOUNTERS WITH CHRONIC ISCHEMIC HEART DISEASE PATIENTS*

Specialty	Specialty Statistics			Aggregate Projections	
	% of Dx	$\bar{X}$ min	$\bar{X}$ age	% of Dx	% of time
General Practice	2.1	11.3	72.7	30.2	21.0
Family Practice	1.9	11.5	70.0	6.7	4.7
General Internal Medicine	6.6	19.3	67.0	42.0	49.8
Cardiology	25.1	18.8	63.4	19.6	22.7
Pulmonary Disease	5.0	18.5	69.8	0.9	1.0
Gastroenterology	2.3	19.8	68.7	0.5	0.6
Endocrinology	1.5	19.3	66.6	0.1	0.2
				100%	100%

*3.9 percent of all non-hospital encounters for these specialties apply to chronic ischemic heart disease.

aggregate of general internists spending more total time, and more time per patient, on diabetes.

F. The final illustration of the use of USC/DRME survey data is shown in table 7. Percentages represent the percentage of patients who receive the diagnostic test, and because each patient may have more than one test, percentages total more than 100 percent. For example, obstetricians/gynecologists take a pap smear in 40.1 percent of all their non-hospital encounters, and chest X-rays are taken by cardiologists in 21.0 percent of their patient encounters.

Table 7. THE USE OF SELECTED DIAGNOSTIC TESTS/INSTRUMENTS IN NON-HOSPITAL ENCOUNTERS BY SELECTED SPECIALTIES

Tests and Procedures	GIM	GP	FP	OBG	Gastro	Card
None	41.0	60.3	59.2	25.8	32.3	26.4
"Panel"-automated	13.0	2.5	3.1	1.8	35.0	13.5
X-Ray—Chest	15.9	3.0	4.3	0.8	13.0	21.0
Electrocardiogram	16.4	2.2	2.9	0.4	12.6	41.0
Pap smear	4.2	3.9	4.2	40.1	2.0	2.3
Endoscopy	1.4	0.3	0.4	0.7	20.8	0.6
Laparoscopy				0.4		
Cystoscopy				0.2		
Hysteroscopy				—		
Other				—		
Sigmoidoscopy					14.0	
Esophagogastroduodenoscopy					4.8	
Colonoscopy					1.3	
Endoscopic biopsy/cytology					0.7	
Peritoneoscopy					—	

The preceding specific data presentations are examples of at least the following general applications of study results:

A. Composite patient care profiles for specialties are important sources of data for those concerned with training the physician at any level of physician's training. They identify the frequency of occurrence of particular conditions within a practice and, in association with measures of service complexity and diagnostic and therapeutic modalities employed, provide the kinds of insights that can direct varying types of emphasis and specific kinds of training. Our data are being used in this way now. Future plans will see these composite profiles sharpened as they are constructed on regional and "years-in-practice" bases.

B. Composite "disease" profiles leading to an aggregate measure across specialties represent the most interesting use of these data. This is particularly true when the occurrence within a specialty is projected to the entire specialty and, in turn, the ultimate composite profile permits the inference that this represents the number of encounters by patients with physicians for *this* condition.

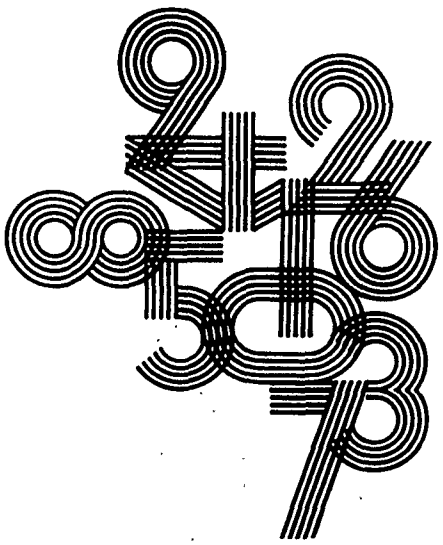
C. Technological diffusion and use of specific therapeutic or diagnostic techniques is potentially of use to those concerned with issues such as costs of health care and patient access to optimum care modalities. Such a simple statistic as the overall use of a chest X-ray within a particular specialty and within practice arrangements within that specialty and/or within geographic areas can be quite revealing. It is relatively simple to construct across-specialty technological-use-profiles as well.

D. Classification of services by type of encounter, i.e., is it a first encounter, consultation, one with evidence of comprehensiveness and continuity *vis a vis* the patient, etc., may prove useful beyond the fact that it documents the characteristics of these types of care. In the overall picture, it should be valuable to know how many encounters there are on a daily basis with the Nation's physicians in which consultation was the reason for the encounter. A similar interest should exist in the characteristics of first encounters and the extent to which the care given to patients defined as patients receiving the majority of their care from this physician differs from that given to patients seen on an episodic basis.

E. Use by the physician in his planning is one added value of these data. DRME has prepared "individual physician profiles" for the various participants in the studies as the one reward that could be offered them for their participation. These profiles present statistical norms for the physician, norms for the physician's practice arrangement and norms for the specialty. From this data, the physician can see what an objective summary of his practice looks like and compare this with others. Such profiles have been very well received by the physicians.

Summary

There is an enormous potential for systematic educational and manpower planning in data obtained from practicing physicians where such data are collected in standardized formats. Some of the uses of these data have been described. Studies such as ours should be conducted on a continuous basis because this is the only cost-effective way to learn about the actual content and characteristics of physicians' practices.



CONCURRENT SESSION T

Quality of Health Services

THE EVALUATION OF AMBULATORY CARE

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Ambulatory Care—Defined

Ambulatory medical care is defined broadly as care for the walking patient, that is, any medical services patients seek out for themselves. Ambulatory services add up to the largest part of medical care.

According to the National Ambulatory Medical Care Survey there were an estimated 567.6 million office visits in 1975.[1] Of all morbid states (e.g., conditions of illness or injury) presented to office-based physicians, about 55 percent were acute problems and about 45 percent were chronic.

The largest portion of visits (an estimated 49 percent) were not serious. Visits for circulatory diseases accounted for the largest proportion of all visits made by patients over 44 years of age. The top ten diagnoses for ambulatory care were:

- Medical or special exam.
- Medical or surgical aftercare.
- Essential benign hypertension.
- Prenatal care.
- Neuroses.
- Chronic ischemic heart disease.
- Otitis media.
- Diabetes mellitus.
- Eczema and dermatitis.

Ambulatory care contacts include visits to physicians' offices, hospital outpatient departments, emergency rooms, health centers, home calls, and phone contacts for medical advice, but exclude visits made by physicians to patients in hospitals and long term care facilities such as nursing homes.

Only 10 percent of the people seen in the office are admitted to a hospital. About 60 percent of all U.S. physicians are in office practice.[2]

Private practice is at once the most important and the least studied sector of the U.S. health care delivery system. This is not surprising since private practitioners of any profession are loath to have outside researchers look into their work. The resistance and inertia of basic human nature are, therefore, a basic problem in evaluating ambulatory care. Any attempt to manage the quality of the care given during these encounters is a staggering task not only because of the volume of the figures but because of the innate complexity of medical care. A face-to-face encounter between physician and patient can be the occasion for a tremendous range of services, from the reassuring chat, to medical and surgical procedures requiring skilled radiologic and other internal examinations or even anesthesia. Physician-patient encounters therefore have the potential for an infinite number of risks of error and poor quality care. The surprising thing is that most of us survive these encounters pretty well, some of us seem improved; and a few may even be cured of our complaints, or at least of complaining.

Factors Affecting Ambulatory Care Evaluation

The evaluation of ambulatory care occurs on three levels:

1. The physician review of his own practice and what he is doing.
2. Third party evaluation of what physicians are doing. This includes review by insurance companies, claims reviewers, Professional Standards Review Organization (PSRO) groups and researchers.
3. Government funded evaluation research that looks at the interaction between 1 and 2 on the physicians' practice patterns.

The first problem to be encountered by any kind of evaluation in ambulatory care is determining what to evaluate. The next question is how such an evaluation is to be undertaken. Before evaluation is undertaken, however, one qualification must be made. The right way to treat many diseases is still not known. The exact cure for a common cold still eludes us, for example.

The essence of any evaluation is establishing the degree of variation that exists. The focus of ambulatory care evaluation is on the differences between physicians in how they treat patients with similar diseases. Heavy dependence has been made on the statistical model where a norm is established and standard deviations from that norm are calculated. When a physician's practice pattern exceeds the norms which have been established, his practice patterns are called into question. Given that 80 percent of the services generated are under the direct influence of physicians, evaluators must look at the factors which influence physician behavior and use of clinical resources. These influences include:

1. The need to improve quality.
2. Patient demand.
3. Fear of malpractice suit.
4. Fiscal incentives.
5. Practice variables including group versus solo, specialty, prepayment versus fee for service.

6. Educational background.
7. Knowledge of medical costs.
8. Medical teaching.
9. Personal attributes including personality, interest in impressing peers, alternate problem solving styles, etc.
10. Availability or access to resources.
11. Location of practice.
12. Work load, including time pressures.
13. Limitations in knowledge.[3]

The amount and kind of ambulatory care received by patients is influenced by each of the above factors that influence the physician's decisionmaking. The influence of these on physician practice patterns must be better understood if evaluation of ambulatory care is to succeed.

Research Findings and Problems in Evaluation

A number of issues and problems are raised by research studies in evaluating ambulatory care. A sampling of these results shows that the average level of patient care does not necessarily improve when a significant increase of time is allocated to direct patient care and that different types of payment affect utilization of services. There are differences between fee-for-service and HMO settings in utilization trends. Studies suggest the existence of inappropriate antibiotics and unnecessary testing. To exemplify the problems facing evaluation in general, we can examine the area of ancillary laboratory testing as a beginning. Statistics from the National Ambulatory Care Survey suggest that laboratory tests are ordered on approximately 22 percent of the yearly ambulatory care visits in this country. That means approximately 125 million office visits result in a laboratory test, among other things.[1] Researchers have concluded the following with regard to laboratory testing: First, there is little association between lab use and optimal care.[4] Second, the potential for waste and abuse in laboratory testing is quite substantial, especially given the fact that 5 billion tests are done in this country each year.[5] Billions of dollars are wasted on misinterpretation of results, technical errors, physiological variations within the blood sample itself, uncritical acceptance of published opinions, and unnecessary repetition of tests. The latter is considered the worst abuse of all. Results suggest the increasing volume of unnecessary tests alone is reducing the quality of test results.[6] Seventy-six percent of the physicians do laboratory testing work in their own offices.[1] This work is not always of the highest quality according to another study.[7] It also encourages a conflict of interest situation wherein much of the laboratory testing is self-referred work.

Others found that strict adherence to PSRO criteria on laboratory testing would produce a 97.8 percent increase in the number of tests ordered. There was no consistent utilization pattern within diagnoses. Some of the tests were ordered 100 percent of the time; others less than 3 percent.[8] Study raises serious questions regarding the value of specific criteria in peer review. Payne and colleagues [9] reviewing ambulatory care in Hawaii found that if quality assurance programs had been successful in increasing physician performance levels to the criteria, the number of ambulatory services would have increased over 140 percent. Others have found similar results.

In another study a simulated case was presented to a group of practicing physicians and house staff officers. A number of hypothetical contingencies were placed upon the study case. The results showed wide variations between physicians in their laboratory testing ordering habits. Variations were attributable to style, location, attitudes towards risk, ability to cope with removal of tools, desire to seek out and accommodate new medical information, and many other individual and group differences. As an example, one reason offered by a number of physicians for not ordering an electrocardiogram on patients with a sudden collapse and a severe chest pain was because requesting an electrocardiogram and sending the results to a nearby city hospital would take three days. The authors suggest employing a cautious and flexible approach towards constraints on medical diagnostic procedures.[10]

While financial gain and fear of malpractice are typically understood as underlying factors or clinical errors which create increased testing, there are other explanations. McDonald [11] has shown that clinical errors and subsequent waste and overutilization of lab testing is due not to greed but rather the physicians' inability to process the bulk of information presented to him in testing a single case. In short, the physician is suffering from information overload.

Other issues confront evaluation experts as well. Where is the best place to treat certain kinds of illnesses? The choice of location of treatment affects not only quality of care but the cost of services. Davenport [12] has shown that home treatment can be as good as hospital care. Others have shown that if patients were shifted from facilities to home dialysis there would be savings of $241 million with no apparent compromise in terms of life expectancy.[13] There have also been outright abuses of third party reimbursement systems.[14] Peer evaluation must develop counter strategies for dealing with fraud and billing practices, promiscuous referrals, overutilization of diagnostic services, overutilization of physician services in nursing homes, etc.

Will certification and licensure improve quality of care and help to reduce costs? Studies find that noncertified M.D.'s gave 4 times as many inappropriate injections in the ambulatory sector as did certified M.D.'s.[15] Others find that extramedical factors contributed to the decision to admit 21 percent of the cases studied. Reasons for admission included patients' inability to follow the directions, the home situation

where there is social isolation, etc. A key finding with regard to ambulatory evaluation, however, was that treatment outside the hospital was considered by most physicians interviewed in this study as feasible, but no realistic alternatives were shown to exist.

Kessner[17] signals a major difficulty facing evaluation in the ambulatory care sector. He found a 29-fold variation among six ambulatory practice sites in the prevalence of anxiety and depression. He also found serious deficiencies in using encounter forms as compared to medical record abstracts in recording diagnoses. In short, the major difficulty facing peer evaluation is determining what is being done. Having touched on psychiatric problems the issue of proper referral guidelines and criteria presents itself. Many patients being treated by primary-care physicians have psychological, not medical, problems.[18] Estimates show that between 15 and 50 percent of those persons seeing primary care physicians have no biological disease. Patients with psychiatric diagnoses are known to be high utilizers of medical services.[19] Psychiatric intervention has been shown to reduce subsequent medical care utilization and save money.[20] Should PSRO and peer review committees use referral guidelines for patients with mental health problems in the ambulatory sector?

Another concern is whether peer evaluation should focus on utilization of services only or on the prices of those services as well. Rivlin found that price contributed 60 percent of the increase in personal health expenditures between 1950 and 1976.[21] The emphasis on peer evaluation programs thus far has been on rising utilization, not prices. If the latter contributes a larger portion to the problem of rising costs, then it's likely that peer evaluation efforts will not save much money. An HEW study of PSRO has recently concluded just that.[22] Perhaps the fact that they are concentrating their efforts on utilization explains the lack of impact on cost.

This raises a crucial question with regard to peer evaluation in general. That is, what is the cost of conducting quality assurance and peer evaluation programs? One study conducted in California suggests that PSRO may raise costs.[23] According to Phelps,[24] quality assurance programs can lead to increased cost three ways:

1. By altering economic incentives.
2. By increasing the costs which result when quality assurance guidelines are applied; that is, that conformance to criteria can yield greater utilization and cost.
3. By cost increases when incorrect decision rules are used in quality assurance programs.

Analyzing statistics on peer evaluation results since 1972, one researcher found approximately 9,500 charts were reviewed annually to identify an average of six patients per year who required intervention of utilization review committees. The cost of identifying each patient was $34,212. Medical audit studies averaged $4,788 per audit. The author concludes that this kind of evaluation effort seems an extremely expensive way to improve quality of care.[25]

Office audits of pediatricians and family practitioners revealed that overall documentation of criteria was approximately 50 percent. Measurements and laboratory data were recorded frequently, counseling items infrequently. The method of review was judged accurate and acceptable by physicians, but only 50 percent said the results accurately portrayed their performance. Lack of accurate recording may make it impossible to achieve valid peer review of ambulatory child care. Documentation of only abnormal findings was the main reason given for not recording.[26]

Other problems in ambulatory care evaluation include:

1. There is a lack of continuity of care where patients do not have a primary care setting to which they return for all medical attention.
2. Ambulatory patients have no distinct episodes of illness with specific beginning and end points.
3 Patients initiate the physician encounter, so there is a wide range of severity and type of illness encountered by the physician.
4. Lack of documentation in the medical record creates difficulties, but observation, interviews, and simulation are also limited in both efficiency, practicality and value.
5. There is no standard format for the medical record nor are there standard coding and index systems used.
6. A major problem in ambulatory care is that of twisting ICDA coding to conform to the ambulatory setting.[27]

The International Classification of Diseases, Adapted, was developed for hospitals and pathologists working at discharge. The pathologist has an opportunity to draw tissue samples and perform test results and confirm or deny the existence of certain diseases. The major difficulty encountered in evaluating ambulatory care is that an individual presenting himself with a cold may receive a diagnostic code under urinary tract infection or a number of other categories. There is no code for the common cold. There is no code for the doctor to catalog a sore throat, runny nose, diarrhea, itchy eyes, etc. Without a clear indication of what the diagnosis or problem being treated was, there is no way to evaluate the efficacy of the treatment and tests which were ordered. The evaluator is looking for the rationale used by the physician in his treatment paradigm. Upon conducting an office audit, what one finds most often is that the code listed on a claim form does not adequately describe what is going on in the ambulatory setting. Another factor is time. The physician working with hospital technology can come up with definitive diagnoses quickly. The same is not the

case in the ambulatory care sector.

Physicians are trained in hospitals and in how to use hospital facilities. They are given very little formal training on how to practice in the office setting. As a consequence, much of what goes on there is quite idiosyncratic.

Patient demand is another significant factor in physician practice variations. Patients present themselves to primary care physicians for social problems, personality problems, and general problems of living, but not always medical problems. Others may take up the doctor's time at the suggestion of their lawyer to build up a medical case for later court action. In short, physicians may be pressured into doing certain things as a function of popular trends or social mores, (e.g., enlarged breasts, hysterectomies).

Methods of Evaluation

Ambulatory medical care can be evaluated in a variety of ways, including investigation of medical history, chart review, tracing an episode of illness, staging its severity using a physician performance index, auditing a problem oriented medical record, and assessing the outcome of care by means of the office record or the patient's own report, or claims review. A complete description of the various methods used in the past is beyond the scope of this treatise. Interested readers are referred to other sources for more complete discussion of these and other techniques.[28,29]

Ambulatory Care in PSRO

At Health Care Management Systems we are now evaluating the methods used to review the quality of medical care for ambulatory patients in five areas covered by Professional Standards Review Organizations (PSRO's).[27] The data used during the process of review vary among the five who are at differing stages of their programs. In one PSRO a total of 8,697 cases are being examined to assess 21 topics and 304 providers. The number of data items for the total set of cases is nearly 307,000. The average time per case incurred for manual data collection ranges from 16 to 31 minutes, and more than 13,300 hours have been used up just in collecting, not for planning: in the selection of topics or analysis, not for making decisions or using the data for feedback and behavior change. The approaches being used by some of these PSRO ambulatory demonstration sites include:

1. Use of readmission as a screen for ambulatory care review.
2. The use of hospital disease stage at admission as a screen for identifying potential problems in ambulatory care. According to Gonella, staging techniques can be used to distinguish between the outcomes of ambulatory care.
3. Use of Medicare claims as an ambulatory review screen.
4. Integration of hospital and ambulatory data.
5. Interface of claims and office audit data.

Our projections suggest that if 200 PSRO's each reviewed an average of five topics and 75 providers in ambulatory, they would require about 15 million data elements projecting from our sample of four PSRO's. The manpower resources expended to collect this amount of data could come to 600,000 hours.

A Sample Case

One of the PSRO's is looking at patients admitted repeatedly to six hospitals, using the hospital data to determine whether deficiencies in their ambulatory care are at the bottom of their frequent hospitalizations.

Even when review was limited to four topics, the amount of data collected was huge. An elaborate coding scheme is now being set up to process the data by computer. Some providers had to be excluded from the review samples after collection for reasons related to the system design. When physicians were asked to give consent to a retrospective review of cases they had already treated, 32 percent refused to participate. Forty-four percent more could not be located, had moved or retired, or had no ambulatory practice. Some patients of the physicians who were eligible and did consent to participate had no ambulatory care or had been treated by other physicians who could not be traced. Attrition among their cases amounted to 50 percent.

PSRO's encountered the following problems in trying to evaluate ambulatory care: planning ambulatory care review was difficult because they were in a voluntary position; leadership from the Health Standards and Quality Bureau was not always present or consistent; there were difficulties in accessing and using other data systems, and opposition by providers to ambulatory review—there were difficulties in developing budget figures to conduct office review (no one knew how much it was going to cost), and the topics chosen for review were not always reflective of actual practice, and the rationale for using criteria was not always documented. It is really too soon for us to determine which of the programs produces the best results. Others have researched the effects of different kinds of evaluation on types of problems uncovered. Their results indicate that different methods of evaluating care will produce substantially different results when measuring quality of care. The most valid approach seems to be individual case analysis of both medical care process and patient outcome. The use of claims review has also demonstrated both cost saving and behavior change. The least effective method appears to be measuring quality of care rendered against a list of process criteria. We have tentatively concluded that on-site office audit is both time consuming and prohibitively expensive.

Suggestions for Evaluating Ambulatory Care

1. The primary purpose of the review program should be made clear enough to build a system that supports the aim. A system intended to find outlying physicians with widely aberrant practice patterns might use a claims for payment system comparing physicians with peer group norms. If, on the other hand, the purpose is to improve the quality of treatment rendered to all patients, then more information gathering is required. My own instincts tell me that the surest way to modify a physician's behavior is to conduct extensive profile analysis on individual practice patterns. Whatever approach is chosen will have a significant effect on the degree of automation possible, the types of technical and support personnel required, the kinds of decisions and feedback approaches and criteria to be used.
2. Whenever possible, data should be collected from available systems to keep manual data collection at a minimum. Gathering data from office records is costly.
3. Ambulatory care review systems should be designed to suit the characteristics of the area. Demographic and health data must be at hand, and the resources available to meet the needs of the population should be well known, as well as the rates at which the services and facilities are used and their cost.
4. Define what is meant by a peer. Comprise peer review committees of heterogeneous groupings of physicians. Various specialties should review the same case because they can bring in different perspectives. Williamson's most recent model [19] expands this to include nonphysicians as well.
5. Commence peer evaluation training at the residency level.
6. Conduct extensive evaluations of ambulatory laboratory and X-ray procedures. Be especially sensitive to unnecessary duplication of hospital admission screening tests.
7. Increase physician accountability for overutilization.
8. Establish guidelines for appropriate referrals. Too much ambulatory, laboratory and X-ray work is done on a self-referred basis.
9. Measure the change in the physician's practice pattern before and after he has been exposed to some form of peer evaluation. It is generally agreed that payment denial is the most effective motivator in changing physician practice patterns.
10. Integrate cost-effective, clinical decision-making into ambulatory care quality assurance programs.
11. Consider both utilization and price increases in peer evaluation efforts. Determine the guideline for most appropriate ambulatory care treatment. Determine the medical necessity for the most frequently ordered procedures in the ambulatory care sector. There should be peer committees looking at old or outmoded procedures and those which are done in combination with other procedures that are redundant or produce no new information. These tests or procedures should then be actively discouraged. Blue Shield's pilot program in medical necessity has proven that a great many antiquated and questionable procedures are still being billed for.
12. Encourage more studies on the relationship between cost and quality. It is increasingly becoming apparent that increased spending in terms of exposing a patient to a greater number of tests or procedures does not necessarily improve the quality of care. In fact, it raises the level of possible iatrogenic disease.
13. Develop counterstrategies for fraud and abuse.

Dr. David Owen provides peer evaluators with a major challenge; "clinical freedom is not an abstract concept. Its full realization demands that the professional faces the practical economic facts of life. The constraint on the total resources available means that doctors acting individually can constrain the clinical freedom of their colleagues, and also limit the effectiveness of health care for other patients. We need a readiness amongst individual doctors to insure that their own particular group of patients does not use up a disproportionate share of available resources at the expense of services to other groups of patients, and therefore of the clinical freedom of other doctors. This will not be achieved unless we abandon self-defeating, limited interpretation of clinical freedom as freedom to prescribe treatment for individual patients without regard to the consequences for their patients."[30]

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PSRO DATA PROBLEMS IN PLANNING LONG TERM CARE SERVICES

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The state of the art in hospital discharge data processing and analysis is well developed compared to long term care (LTC) data where problems exist for the PSRO program in trying to determine what data should be collected and processed and what resources should be expended. The problems are largely technical, i.e., little is known about routine data processing in LTC, but are also political in that the problems reflect the interests of the levels of government that pay for long term care.

Introduction

A. Utilization of Long Term Care Services

Federally funded health care financing programs provide reimbursement for a wide range of services to a broad range of people from acute hospital and skilled nursing home care to home health care and related support services.

In the past several years, considerable effort has been expended in an attempt to control, or at least understand, utilization and the escalation of cost in the acute hospital setting. This effort in large part has focused its resources on acute care and paid only passing and sporadic attention to the problems of long term care.[1]

The trend in long term care has been towards overutilization and underprovision of services. The National Nursing Home Survey (NNHS) stated that the 15,700 long term care facilities in the United States had an 87 percent occupancy rate in 1972.[2]

A study estimating need for nursing homes in six counties of western New York State found that 27 percent of the patients did not need to be in the nursing home and suggested the misuse was due to two factors. First, the resources providing the proper level of care, namely intermediate care, home health care, or some other supportive care are in many cases not available, consequently leaving the patient with no alternative but to remain in the nursing home. Secondly, there was some choice or preference involved on the part of the patient or sponsor.[3]

A Federal study completed in Michigan based on evaluation of 378 patients in 30 Michigan skilled nursing facilities (SNF) reported that 79 percent did not need nursing home care. The President's Task Force on Aging found Medicare patients were being prematurely discharged from SNF's because of Medicare's 100 day limit on SNF benefits within an episode of care.[3]

A 1975 survey undertaken by the Office of Health Planning and Statistics of the Massachusetts Department of Public Health showed that many individuals who were cared for in long term care institutions were placed inappropriately with respect to the State guidelines for levels of care. Further, the general tendency was for patients to be placed at a higher level of care than would be indicated by their health condition. Specifically, "in level II (of four levels), nursing homes which comprise the bulk of the nursing home beds in the Commonwealth, as many as 33 percent of the patients do not appear to need nursing home care. It would seem that they would be more suitably placed in a rest home, or perhaps in a community setting." In level II facilities (not included in the survey) approximately 25 percent of the patients need only level III care. The survey also stated that "the relatively small percentage of patients in level III who need level II care (13 percent) translates into a relatively large number of level II beds (more than 3,000) which would indicate, even after taking into account the extent of the misplacement of level II patients, a need for additional level II beds in the State."[4]

The Baltimore City Professional Standards Review Organization (PSRO), as part of a Federally funded Long Term Care Demonstration Project completed a survey in 1977 of approximately 4,000 patients in 41 facilities in the City of Baltimore. As a direct result, the State of Maryland restricted the licensure of long term care facilities and submitted a budget to the legislature for a significant increase in per diem at the skilled level of care. The survey had indicated the true level of care to be almost a complete reversal of facility licensing and set in motion the necessary planning actions to relieve the backlog of long term care patients inappropriately placed in hospitals.[5]

It is clear that there are significant numbers of inappropriately placed patients at each level of care. Some hospital patients belong in SNF's and some SNF patients beong in ICF's. Still others could probably receive appropriate care outside the institutional setting if it were available.

B. PSRO Program Overview

The Professional Standards Review Organization program was authorized under Public Law 92-603 to assure the medical necessity, quality, and appropriate utilization of institutional health care services provided to the beneficiaries of the Medicare, Medicaid and Maternal and Child Health programs. In recent months, this mandate has been modified to encompass Department of Health, Education, and Welfare (DHEW) initiatives in controlling costs, fraud, and abuse.

During the initial phase of implementation, the PSRO program has given priority to review of health care services provided in acute hospitals. PSRO's, however, are now beginning to assume responsibility for review of health care services provided in long term care facilities. As with the hospital review system, each PSRO (Public Law 92-603 designates PSRO's as local review organizations) is free to design and operate a health care review system for long term care facilities. In October 1976, DHEW selected 15 PSRO's to participate in a 2-year long term care demonstration program, designed to demonstrate various approaches to long term care review. Since the initiation of this program, approximately 30 additional PSRO's have initiated long term care review.

Long Term Care Environment

The long term care environment is a patchwork of reimbursement programs and regulations which have resulted in competing "orientations," i.e., the competing interest of patients' social and medical needs, the insurance and welfare aspects of the system, and the roles of the State governments and Federal Government. These competing orientations have tended to cloud priorities and are consequently often reflected in PSRO approaches to long term care data.

In the United States, the care of individuals deemed unable to care for themselves has been a responsibility of local and State governments since colonial times. Long term care was traditionally a welfare function and the population cared for included the impoverished, feebleminded, retarded, blind and sick. The role of the local health departments was minimal. This tradition was strong, lasting without interference until the 1930's. The depression of the 1930's greatly altered public welfare with respect to the role of the Federal Government and resulted in development of a number of new programs. Among these programs was a system of Federal grants to the States to provide financial assistance for dependent children, the aged, the blind, and the disabled.

Not until the 1950's did Congress authorize direct payments to providers of health care. The 1960's saw the introduction of Medicare and Medicaid and their resultant effects on health care.

Although both programs are part of the Social Security Act they reflect different orientations. Medicare is an insurance system, viewing "patients" as beneficiaries. Coverage and benefits are uniform nationwide, and contain common insurance provisions such as deductibles, co-payments, and limits on benefits.[6]

Medicaid was built on the welfare systems of the States. This system is characterized by the concept of income redistribution.

Patients have not paid for their insurance; they are not beneficiaries; they are recipients. Coverage and benefits vary State by State. One result of the difference in orientation is the different benefits provided by each program for long term care. In both programs, efforts were made to provide alternatives to hospitalization. This was due to the experience of commercial insurance companies that their system encouraged the use of expensive hospital facilities because alternatives were not covered.

In Medicare, however, the emphasis is on medical care. Long term care benefits, therefore, are only available as a followup to an acute hospital episode, and for a limited number of days. Additionally, Medicare benefits only cover the skilled level of nursing care.

Medicaid has the legislative mandate to provide "comprehensive" services, and frequently results in almost unlimited long term care benefits for recipients. Medicaid also covers the intermediate level (personal care with limited nursing care) of care in addition to the skilled level, as a less costly alternative to skilled nursing care.

The Government's increased role as payer was met by the market place. Expenditures for nursing home care rose nearly 600 percent between 1960 and 1970 from 500 million to 2.8 billion.

Many factors contributed to the demand. These include an increasingly aging population, increasing acute care charges, and the disappearance of multigenerational households.[3]

With Government's expanding role as payer came the impetus to regulate the industry. The nursing home industry had largely failed to improve professional standards of service. Regulatory activities at the Federal level have consisted primarily of the regulations for skilled nursing and extended care facilities and the Medicare certification activities.

At the State level, regulation exists because of Federal and State requirements, but its effectiveness has been hampered for reasons characterized as ranging from insufficient inspection staff to unavailable alternatives for patient care. State level certification includes certification of SNF and ICF facilities and the Medical Review and Independent Professional Review (MR/IPR) for SNF and ICF, respectively. These reviews are required by the Medicaid Program, are usually conducted by physician and nurse teams, and were often contracted out by the Medicaid agency to the Department of Health. They carry out many utilization review functions now delegated to PSRO's. Thus as PSRO's assume review of LTC in a State, the MR and IPR reviews are phased out.

Our experience to date indicates that the States with a large Medicaid population have not been anxious to give up their review functions. It could be because the State programs may have more funds invested in the system than the Federal Government, and also because of the State's traditional responsibility to provide long term care. Total government expenditures for skilled nursing home care under Medicaid are 4 times greater than for care under Medicare although SNF's under Medicare serve more patients per year and represent a far more consolidated Federal interest in the nursing home industry.[3]

States have gone further than the Federal Government in the classification of institutions, though these classifications are not uniform across States. Massachusetts, for example, has four levels of care including chronic hospitals, and Colorado is seeking to eliminate levels of care because reimbursement may not reflect patient needs. It plans to reimburse facilities based on their ability to meet expected outcomes of patient functioning.

PSRO's move into a long term care environment marked by a lack of coordination among various levels of government, where the priorities of the State and Federal governments are different.

Acute Data Environment

The acute data environment, while beset with problems ranging from abstracting from the medical record to assuring the validity and consistency of hospital discharge data across hospitals can nevertheless be characterized as capable of providing a source of comparable, if not completely accurate, basic data. This basic set of data, known as the Uniform Hospital Discharge Data Set (UHDDS), is a multipurpose minimum set of data generally available in all hospitals for all discharges which in aggregate form is useful to a variety of organizations ranging from the hospital itself to third party payers, PSRO's, health planners, and others. Mechanisms to collect and process these data already exist in the form of trained hospital medical records departments, hospital abstracting services and the like, and report products emanating from the UHDDS have been generally available to users for several years. Another facet of the acute data environment which bears mentioning is that discharge information summarized in the UHDDS reflects one episode of hospital care and as such stands alone.

The long term care data environment is primitive when compared to the acute environment. To begin with the medical records in long term care facilities are often out of date, incomplete, or erroneous, if they exist at all. Where they exist and are generally available they are often not comparable across facilities. Long term care facilities generally are not large enough to employ a trained medical records staff. A uniform long term care data set is only in the development stage, and experience in record keeping for patient assessment purposes is quite dynamic and has only evolved recently. Conflicting priorities and requirements also bear heavily on data activities. In addition, the nature of the long term care patient complicates collection of information. In long term care review, admission review of patients is conducted while they are still in the hospital. Continued stay review, reflecting the normal length of stay of patients in LTC facilities, unlike acute care review, requires multidisciplinary involvement in review activities reflecting the role of health care practitioners other than physicians.

Major Developments in LTC Data

This section of the paper will explore some of the major developmental activities in LTC data including assessment systems, the long term care data set, and their implications for PSRO's.

Since 1963 NCHS has utilized two types of surveys to gather nursing home data: A universe survey, known as the Master Facility Inventory, and a sample survey, the National Nursing Home Survey, which was first published in 1977 from the 1973–74 Survey. The latter survey provides information on nursing home facility characteristics and nursing home patient characteristics and utilization patterns in the United States. Much of the statistics are broken down by census region: Northeast, North Central, South, or West. These reports are useful to PSRO's to learn about the nature of the nursing home industry, to obtain normative data about population, and to determine the types of information that may be useful to their purposes. PSRO's may find, for instance, that a variable such as facility certification status or ownership may be significant in determining length of stay. One table in the survey shows that physical problems tend to dominate as a reason for admission into a nursing home, and are also significant in relation to long lengths of stay. However, behavioral and social problems become increasingly significant as length of stay increases.[2]

Another activity sponsored under the auspices of NCHS is development of a LTC data set. Formal development of the LTC data set was begun in a conference in Tucson in May 1975.[7] The LTC minimum data set has several important features. It is client-oriented and appropriate for both institutional and non-institutional LTC settings. It is to be applicable for data collection at admission, at discharge, at service delivery or for a periodic census. It is due to be tested later this year, and a draft of the data set will be available this summer. The fact that it is appropriate for ambulatory as well as institutional LTC may make it larger than needed for just PSRO purposes.

The Hospital Utilization Project, Skilled Nursing Program, contains a data set which is useful for the study of skilled nursing patients with short stays as in the Medicare program. It is based on the UHDDS, with additional elements to reflect the SNF level. It is collected only on discharge and is diagnoses oriented. As a result, the HUP Skilled Nursing Program may be of only limited use to PSRO's, which may have a large nonmedically-oriented Title XIX population with long lengths of stay, and where primary problems are not diagnostically oriented.

The activity which is probably having the largest impact upon LTC review and upon LTC data is the development of assessment instruments. These include the Patient Classification for Long Term Care, developed by Paul Densen et al., the PACE form (the Patient Assessment and Care Evaluation), and the OARS instrument (Older Americans Resources and Services Program), plus other instruments that are

developed for use in individual facilities or by States, or by PSRO's for use on a facility basis. Assessment forms have filled a gap because of the lack of valid information on which to plan patient care.

One of the fundamental assessment technologies is described in the *Patient Classification for Long Term Care.* Characteristic of the Patient Classification is that it is composed of a set of descriptive terms which can be characterized as patient-oriented, multi-dimensional in content, objectively stated, precisely defined, and relative to the goals of long term care. The assessment technology must be viewed as a process and as an aid to the decisionmaker to assist in professional judgment.[8]

Assessment instruments have resulted in many benefits including development of a uniform terminology and improved record keeping. They have assisted in the development of a consensus as to significant patient-specific elements, such as the Activities of Daily Living(ADL's); they have also assisted in the development of a team approach by looking at the universe of patient needs and by often using a terminology that is understood by the full range of employees involved in patient care i.e., from the nurse's aid, to the therapist, to the physician.

There is, however, a tendency among PSRO's to view the assessment form as a data collection instrument, i.e., a data set which is valuable for multilevel decision purposes.

This concept was probably fostered by the assessment technique designers themselves. For instance, the "Patient Classification for Long Term Care" was envisioned in 1974 as being multipurpose. In addition to patient care and placement, it was considered useful for community resource allocation, policy making, epidemiologic research, education and training.[8] However, this view changed over time. In December 1977 at a conference for the review of assessment instruments in Washington, D.C., there appeared a persistent theme that the information to be used for high level decisionmaking is not of the detail needed for care decisions. Two PSRO's, the Wyoming Health Services Company (WHS) and Vermont Professional Standards Review Organization (VPSRO), as part of their scope of work in the LTC demonstration project, are testing the utility of automated processing of entire assessment forms.

PSRO Experience

A. Wyoming

Wyoming Health Services has had some experience in LTC review prior to the demonstration project. Their LTC review system consists of admission certification within 24 hours, a comprehensive evaluation in 30 days, and continued stay review every 90 days. The WHS data set consists of 88 elements, i.e., all those that appear on their four-page assessment form, and is used for both admission and continued stay review. The PSRO has had several problems in the automated processing of the forms. Originally they were using two different forms, one for initial assessment, and another for continued stay, but found that it was technically difficult to merge them. In addition, the PSRO experienced some delays in obtaining deliverables from their data processing subcontractor and expressed concern that LTC deliverables had been given low priority because of the relative high priority of their acute data system. This is one indication of the somewhat extensive resources needed to develop such an LTC system.

The Wyoming report set consists of review activity, facility, region and State comparisons on level of care, functional status and demographic data, and the equation of nursing services with level of care. One of the goals of this demonstration is to identify the data elements and reports which are valuable for PSRO purposes.

A sample report appears in Appendix I. It summarizes nursing services that patients are receiving and assists the PSRO in determining if the assigned level of care corresponds to the services listed.

B. Vermont

Vermont PSRO is under contract with the State Medicaid Agency, as part of a DHEW research project, to conduct MR/IPR review for the State. In addition, they are doing PSRO review.

The process of developing an evaluation protocol for this project highlighted a significant issue that relates to States' expectations of the PSRO program, and which may impact upon State monitoring of PSRO's. LTC costs may rise with improved patient care. Therefore, how may States measure program impact?

The protocol, agreed upon by DHEW, the State Medicaid Agency, and the PSRO, and finalized in March 1978, addressed the issue of the relative priority of evaluating cost versus quality. During the development of the protocol DHEW placed a much stronger emphasis on cost than did the State and the PSRO. The State, in this case, wanted the emphasis of the evaluation to be placed primarily upon the change in the quality of patient care, i.e., the appropriateness of institutional and community placements, and increased level of physician involvement.

The evaluation will also consider how a data system could assist in the review and placement of patients. As a first step they will be looking at the factors that influence professional decisions on how to place patients. The evaluation consultant, Hebrew Rehabilitation Home for the Aged (HRCA), will be developing a technique for identifying patients inappropriately placed in an institution, who had the capacity to be placed in the community.

Future goals for the data system include screening patients for community placement and matching them with a community care home.

C. Experience at the Federal Level

Our experience with extensive data processing of LTC data has shown that:

1. The separation of meaningful information from the mass of data collected is extremely difficult. Analysis of the data is not possible without sophisticated analytical support.
2. There is a tendency not to change what is collected because system changes are expensive and frequently affect the credibility of the PSRO.

Because we have not yet established the utility of specific types of data at the local level, or what patient specific data, if any, to collect at the national level, and because we do not have sufficient experience with the PSRO systems already in place, we are encouraging a process whereby PSRO's identify specific needs and their most economical means of collection and processing. For collection, PSRO's are advised to consider collecting the data on a one-time or periodic basis, on a sample basis, or to obtain it from another source. For instance, level of care patterns may be determined from statistics that are often available from the fiscal intermediary. If data is collected routinely, the PSRO is encouraged to process it manually.

The Charles River PSRO is developing and testing a manual approach as part of its demonstration program. One advantage, in addition to the relatively low expense of a manual system, is that this approach focuses on questions a PSRO needs to answer rather than on data collected.

For instance, in the State of Massachusetts, waivers are granted to patients who no longer meet the medical criteria for SNF but for whom the State agency feels a move may be detrimental. Charles River PSRO decided that it needed to know the effect of the waivers both on the review system and on the patient. Appendix II, tables 1 and 2, represent displays created to meet this need. Table 3 was designed to identify the frequency of specific patient care problems in nursing homes.

The Charles River PSRO also helps to illustrate a point made earlier concerning the use of assessment forms. An assessment form is used for review in the facility but is not generally removed from the premises and is not automated since the PSRO feels that extensive data processing would divert resources with no apparent benefit.

The Bronx PSRO, also, found that their questions for which they needed data were rather basic. For instance, they used a manual system to produce documentation on the frequency of discrepancies between nursing home admission review determinations made by hospital discharge planners and those made by the PSRO. From this a plan of action based on improved coordination between hospital departments, i.e., the review coordinator and discharged planning, was developed.

Finally, PSRO approaches to data will be affected by the data requirements of the States. P.L. 95–142 provides for Medicaid State agency involvement in the development of a formal LTC review plan and modifies previously legislated authority with respect to data sharing. PSRO's are now authorized to disclose information as provided by their Memorandum of Understanding and DHEW approved monitoring plan.

States will need information to support their regulatory activities, which include facility certification, rate setting, and health planning. The means for meeting these needs can vary widely, as illustrated by the experience of PSRO's in the States of Massachusetts and Colorado.

After several years of work, Massachusetts developed an automated system to process detailed patient specific MR/IPR data to meet its needs. Because Massachusetts no longer conducts MR in some areas as a result of PSRO assumption of review, the State has requested that the PSRO's supply patient specific data on a quarterly tape. At a recent meeting between the State and the PSRO's the State commented that the real regulatory authority was in the facility certification process. Therefore, data from the PSRO is necessary to tie the PSRO experience to facility certification.

A similar philosophy underlies the developing Colorado system: i.e., there should be a link between the PSRO and the State regulatory agencies. The proposed PSRO statewide review system which is being tested as part of the PSRO LTC demonstration project would entail the collection of broad screening data on a sample of patients in facilities, more in-depth PSRO review of facilities that "fall out" of the screens, and referral to the appropriate State agency for sanctioning, if necessary.

Conclusion

Whatever the final shape of LTC data in the PSRO program, it appears that it will play a very significant role in the development of a continuum of care for the patient and for meeting the goals of payment and regulatory agencies at the State and Federal levels.

APPENDIX I

Wyoming Health Services

Report Date 11/30/77 Page 1

Report LTC-008 Long Term Care Plan Summary—Patients Level of Care

Region	Facility	Patient Name	Patient SS.	Primary Diag A	Primary Diag B	Secondary Diag A	Secondary Diag B	No.	Guideline-Frequency A	Guideline-Frequency B	C	D	Certified Care Level
	53		12	454.1	437.0			166	QID	QID			Intermediate
								166	NON	NON			
								166	PRN	NON			
								166	PRN	NON			
								166	PRN	NON			
								166	PRN	NON			
	53		520	713.1	416.4	770.5	308.2	161	QID	QID			Skilled
								161	QID	QID			
								166	PRN	BID			
								166	PRN	NON			
								161	PRN	QD			
								166	QID	QID			
								161	BID	BID			
								161	BID	BID			
								161	QID	QID			
								161	HS	HS			
	53		1525	483.0	Y36.9	250.0	Y59.9	166	QD	QD			Intermediate
								166	BID	BID			
								108	QD	QD			
								166	PRN	BID			
								166	PRN	NCN			
								296	QID	QID			
	53	B	64	440.9		401.0		166	QD	QD			Intermediate
								166	QOD	QOD			
								166	QD	QD			
								166	Q2H	Q2H			
								161	HS	HS			
								166	PRN	1WK			
								166	PRN	CD			
								166	PRN	NON			
								166	PRN	3WK			
								166	PRN	NON			
	53	K	480	436.1	713.0	427.9	442.9	161	QID	QID			Skilled
								166	QOD	QOD			
								166	QID	QID			
								161	Q8H	Q8H			
								161	HS	HS			
								161	PRN	1WK			
								166	PRN	NON			
								166	PRN	NON			
								161	PRN	QD			
	53	A		226.8	173.2	436.0	401.0	166	QID	QID			Intermediate
								166	QCD	QCD			
								166	QD	QD			
								166	QD	QD			
								161	PRN	QD			
								166	PRN	NON			
								156	PRN	NON			
								166	2WK	NON			
								166	PRN	NON			

APPENDIX II

Table I.

Table VI. DISCHARGES* FROM CHARLES RIVER PSRO PROGRAMS (MEDICARE AND MEDICAID) DURING _____ (QUARTER)

Place Discharged	Total Number of Discharges of Patients from Programs		Status at Last Concurrent Review					
			Title 18		Total		Title 19	
							Not Waived	Waived
	#	%	#	%	#	%		
Total Discharges								
Home								
Hospital								
Died								
Other LTC Facility								
Level I								
Level II								
Level III or IV								
Private								
Discharged from Program but not from N.H.								
Level I								
Level II								
Level III or IV								
Private								

Purpose: To determine what happens to patients at time of discharge and to determine effect of waiver policy.

*Total discharges may exceed total number of patients because one patient may be discharged more than once.

APPENDIX II

Table 2

Table VII. NUMBER OF CONCURRENT REVIEWS OF TITLE 19 PATIENTS IN ALL CHARLES RIVER PSRO SNF'S WITH CHANGES IN LEVELS OF CARE ACCORDING TO WAIVER STATUS

		Not Previously Waived				Previously Waived			
				Change Recommended				Waiver Not Continued	
N.H.	Total Concurrent Reviews	Total Not Prev. Waived	No Change Recommended	Waived	Not Waived	Total Prev. Waived	Waiver Continued	Change in Pt's. Medical Status	Change in Pt's. Waiver Status
A									
B									
C									
etc.									

Purpose: Impact of Waiver Policy on Concurrent Review Activities.

APPENDIX II

Table 3

TABLE VIII
RECOMMENDATIONS MADE BY CHARLES RIVER
LONG TERM CARE COORDINATORS
DURING CONCURRENT REVIEW PROCESS

Nursing Home	Total Reviews	Concurrent Reviews: Number of Reviews Without Recommendations	Concurrent Reviews: Number of Reviews With Recommendations	Total Number of Recommendations	Type of Recommendation: Update Diagnoses	Inquiry into Medications	Lab Work	Improve: ADL
A								
B								
C								
etc.								
Total Number and Percent*	# %	# %	# %	# %	# %	# %	# %	# %

*Number and percent of reviews with recommendations and types of recommendations.

Purpose: To monitor over time the number and type of recommendations made to each N.H. by CRPSRO

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