COUNCIL ON GRADUATE MEDICAL EDUCATION

Resource Paper Compendium

Update on the Physician Workforce

AUGUST 2000

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August 2000

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Health Resources and Services Administration

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The Council on Graduate Medical Education

The Council on Graduate Medical Education (COGME) was authorized by Congress in 1986 to provide an ongoing assessment of physician workforce trends, training issues and financing policies, and to recommend appropriate Federal and private sector efforts to address identified needs. The legislation calls for COGME to advise and make recommendations to: the Secretary of the Department of Health and Human Services (DHHS); the Senate Committee on Health, Education, Labor, and Pensions; and the House of Representatives Committee on Commerce. The Health Professions Education Partnerships Act of 1998 reauthorized the Council through September 30, 2002.

The legislation specifies 17 members for the Council. Appointed individuals are to include representatives of practicing primary care physicians, national and specialty physician organizations, international medical graduates, medical student and house staff associations, schools of medicine and osteopathy, public and private teaching hospitals, health insurers, business, and labor. Federal representation includes the Assistant Secretary for Health, DHHS; the Administrator of the Health Care Financing Administration, DHHS; and the Chief Medical Director of the Veterans Administration.

Charge to the Council

The charge to COGME is broader than the name would imply. Title VII of the Public Health Service Act, as amended, requires COGME to provide advice and recommendations to the Secretary and Congress on the following issues:

1. The supply and distribution of physicians in the United States.
2. Current and future shortages or excesses of physicians in medical and surgical specialties and subspecialties.
3. Issues relating to international medical school graduates.
4. Appropriate Federal policies with respect to the matters specified in items 1-3, including policies concerning changes in the financing of undergraduate and graduate medical education (GME) programs and changes in the types of medical education training in GME programs.
5. Appropriate efforts to be carried out by hospitals, schools of medicine, schools of osteopathy, and accrediting bodies with respect to the matters specified in items 1-3, including efforts for changes in undergraduate and GME programs.
6. Deficiencies and needs for improvements in data bases concerning the supply and distribution of, and postgraduate training programs for, physicians in the United States and steps that should be taken to eliminate those deficiencies.

In addition, the Council is to encourage entities providing graduate medical education to conduct activities to achieve voluntarily the recommendations of the Council specified in item 5.

COGME Reports

Since its establishment, COGME has submitted the following reports to the DHHS Secretary and Congress:

- First Report of the Council (1988)
- Second Report: The Financial Status of Teaching Hospitals and the Underrepresentation of Minorities in Medicine (1990)
- Scholar in Residence Report: Reform in Medical Education and Medical Education in the Ambulatory Setting (1991)
- Third Report: Improving Access to Health Care Through Physician Workforce Reform: Directions for the 21st Century (1992)
- Fourth Report: Recommendations to Improve Access to Health Care Through Physician Workforce Reform (1994)
- Fifth Report: Women and Medicine (1995)
- Sixth Report: Managed Health Care: Implications for the Physician Workforce and Medical Education (1995)
- Seventh Report: Physician Workforce Funding Recommendations for Department of Health and Human Services' Programs (1995)
- Eighth Report: Patient Care Physician Supply and Requirements: Testing COGME Recommendations (1996)

- Ninth Report: Graduate Medical Education Consortia: Changing the Governance of Graduate Medical Education to Achieve Physician Workforce Objectives (1997)
- Tenth Report: Physician Distribution and Health Care Challenges in Rural and Inner-City Areas (1998)
- Eleventh Report: International Medical Graduates, The Physician Workforce, and GME Payment Reform (1998)
- Twelfth Report: Minorities in Medicine (1998)
- Thirteenth Report: Physician Education for a Changing Health Care Environment (1999)
- Fourteenth Report: COGME Physician Workforce Policies: Recent Developments and Remaining Challenges in Meeting National Goals (1999)

COGME Resource Papers

- Process by which International Medical Graduates are Licensed to Practice in the United States (September 1995)
- Preparing Learners for Practice in a Managed Care Environment (1997)
- International Medical Graduates: Immigration Law and Policy and the U.S. Physician Workforce (1998)
- The Effects of the Balanced Budget Act of 1997 on Graduate Medical Education (2000)

Other COGME Publications

- Council on Graduate Medical Education: What is it? What has it done? Where is it going? (2000)

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Overview and Executive Summary of Papers

OVERVIEW

COGME has issued a series of reports to fulfill its charge to recommend appropriate Federal and private sector efforts to address identified needs with respect to physician workforce trends, training issues, and financing polices. In particular, COGME has assessed the supply and distribution, both specialty and geographic, of physicians and the adequacy of data bases to support informed analyses and policy determinations relevant to these issues. These issues have been reviewed in two recent reports:

a. The Tenth Report, issued in February 1998,[1] highlighted the need for continued support of Federal and State programs that "increase the number of physicians who choose generalist careers, and who practice in rural and inner-city areas and serve underserved populations." (Recommendation 5)

b. The Fourteenth Report, issued March 1999,[2] expanded upon the need for continued programmatic support by encouraging the Federal government, the medical education community, and the States to "foster a more effective marketplace for the training of physicians by expanding the collection and dissemination of data on supply, need, and demand for physicians by specialty and region." (Recommendation 1)

This document is a compendium of three papers COGME commissioned for the purpose of exploring further those critical policy issues relevant to assessing current and foreseeable future physician workforce needs:

- To what extent will the need for generalist physicians (those engaged in the practice of family medicine, general internal medicine, and general pediatrics) grow—or shrink—as the Nation's health care insurance coverage and staffing patterns undergo changes? How will these changes impact the availability of "safety net" providers for underserved and vulnerable populations?
- Will the Nation's supply of generalist physicians, particularly those in rural areas, be adequate to meet requirements previously established by COGME?
- What is the nature of the documentation on physicians in public health/preventive medicine and what research and policy recommendations follow from the literature review?

The papers described are as follows:

TITLE	AUTHOR(S)
Estimates of Physicians Needed to Supply Underserved Americans Adequately Until Universal Coverage	Donald Libby, Ph.D. David Kindig, M.D., Ph.D.
Increasing Numbers of Family Physicians—Implications for Rural America	Jack M. Colwill, M.D. James Cultice
Physicians in the Public Health Workforce	Jerilyn K. Glass, M.D., Ph.D.

The paper by Libby and Kindig and the Colwill and Cultice paper examine opposite sides of the generalist physician availability issue, the former focusing on requirements, the latter on supply. An important aspect of Libby and Kindig's work is the application of a sensitivity analysis of six potential scenarios for the American health care marketplace. These scenarios portray adjustments to potential changes in insurance coverage or staffing patterns.

The analysis conducted by the authors addresses two sets of issues:

- **DEFICIT** – Considering generalist physicians only, was the United States in a state of over- or undersupply in 1995?
- **SENSITIVITY ANALYSIS** – Holding everything else constant, how many more (or fewer) generalist physicians will be needed under each of Scenarios 2 through 6 as opposed to Scenario 1 (the status quo)? (See Table 2.)

Colwill and Cultice's paper involves a sensitivity analysis of a different sort. Through an extrapolation of recent trends in the number of residency graduates in family medicine, coupled with historic data concerning gender-specific attrition rates, gender-specific decisions to practice in rural areas, and other issues affecting supply, the authors arrive at family physician supply projections through the year 2020 both for the country as a whole and for rural areas specifically. They then

explore the impact upon supply of two alternative scenarios: a five-year decline, at the rate of 200 per year, in the number of family practice residency graduates in the United States; and an analogous increase over five-years.

The Glass paper addresses two additional items of concern in today's health sector environment in which there is an increasing emphasis on population health and preventive strategies: (a) the paucity of physicians in the Nation's public health workforce and (b) the relative inadequacy of data concerning them. Noting such markers as the declining percentage of physicians enrolled in schools of public health, the extremely low percentage of local health departments headed by physicians, and the increasing need for physician faculty trained in research and teaching in schools of medicine and public health, the author recommends several initiatives designed to increase the number of physicians in public health/preventive medicine. One recommendation is to learn more about physicians currently in this workforce by conducting an in-depth enumeration study of the public health functions these physicians perform.

EXECUTIVE SUMMARY OF PAPERS

A. "ESTIMATES OF PHYSICIANS NEEDED TO SUPPLY UNDERSERVED AMERICANS ADEQUATELY UNTIL UNIVERSAL COVERAGE"

by Donald Libby, Ph.D. and David Kindig, M.D., Ph.D.

A key feature of this paper is the authors' disaggregation of the United States into five distinct county types, as follows:

- **METRO-CORE** – Central counties in metropolitan areas that have a population of one million or greater.
- **METRO-FRINGE** – Fringe counties in metropolitan areas that have a population of one million or greater, or alternatively, non-metropolitan counties with an urban population of 20,000 or more adjacent to a metropolitan area.
- **SMALL CITY** – Counties in metropolitan areas that have a population of fewer than one million, or alternatively, non-metropolitan counties with an urban population of 20,000 or more NOT adjacent to a metropolitan area.
- **RURAL** – Non-metropolitan counties with an urban population between 2,500 and 20,000.
- **SPARSE** – Non-metropolitan counties with an urban population of fewer than 2,500.

The authors' surveyed experts in the field of physician workforce planning and analysis for the purpose of eliciting their opinion as to the number of generalists per 100,000 needed to provide (a) an "adequate" and (b) a "minimal" level of physician availability by county type. The responses received from those who responded are shown in Table 1. These standards differ somewhat from the range of 60 to 80 generalist physicians per 100,000 recommended by COGME in its *Eighth Report* (1996).[3]

The "expert-based" requirements standards were compared to the corresponding supply figures for 1995. Supply, as in the case of requirements, was subdivided by county type; however, for counties classified as metro-core, the authors provided a further breakdown by poverty versus non-poverty tract, to reflect the reality that physician supply within large counties is not necessarily uniformly distributed. The distinction between poverty and non-poverty tracts was defined by the percentage of households below the Federal poverty line, with 20% used as the defining threshold. The relevant supply numbers are shown in Table 1.

Comparing these figures to the "expert-average" requirements shown in Table 1, the authors conclude that there existed in 1995 a severe deficit in generalist availability in all but the non-poverty tracts of metro-core counties. Applying the observed deficit per 100,000 for each county type to the corresponding population count for that county type, then summing across county types, they arrived at an estimated deficit for the Nation of 15,441. Had the COGME high figure of 80 per 100,000 been used in place of the expert averages, the estimated deficit would have been 41,359; had the low figure of 60 per 100,000 been used, it would have been 7,676.

The authors then conducted a sensitivity analysis to observe how much greater (or smaller) these deficits would be were the Nation's health care insurance coverage or staffing patterns to change in prescribed ways. This was done by applying the Health Resources and Services Administration/Bureau of Health Professions' Integrated Requirements Model[4] to each of the scenarios defined earlier to determine how many more (or fewer) generalists would be needed in the year 2005 compared to 1995.

The scenarios, previously defined by an expert workgroup formed jointly by COGME and the

TABLE 1
Number of Generalist Physicians* per 100,000 Population

SUMMARY OF EXPERT RESPONSES TO QUESTIONS CONCERNING ADEQUATE AND MINIMAL LEVELS BELIEVED TO BE NEEDED TO PROVIDE:

Type of county	*"Average" level of availability*	*"Minimal" level of availability*	*Number providing patient care in 1995*
Metro-core	72.0	50.7	—
Poverty tracts	—	—	61.9
Nonpoverty tracts	—	—	76.8
Metro-fringe	57.6	41.3	46.8
Small city	71.5	51.5	61.4
Rural	54.7	41.8	48.1
Sparse	51.2	40.5	37.4

* Family medicine, general internal medicine, and general pediatrics.

TABLE 2
Changes in Generalist Physician Staffing Patterns — Six Scenarios

Scenario	*Description*
1. **STATUS QUO**	Continuance of the health care insurance coverage and staffing patterns that existed in 1995.
2. **BASELINE INSURANCE PROJECTIONS**	Reasonably expected increases in managed care, coupled with reductions in the uninsured population. No change in health care staffing patterns for each established mode of delivery (staff HMO, IPA HMO, fee-for-service).
3. **HIGH MANAGED CARE**	Greater-than-expected growth in managed care penetration, with no change in staffing patterns for each mode of delivery.
4. **UNIVERSAL COVERAGE**	Managed care extended to 100 percent of the population with staffing levels increased to reflect higher expected utilization by the previously uninsured.
5. **EQUAL ACCESS AND UNIVERSAL COVERAGE**	Same as Scenario 4 with improved access, and therefore increased staffing, in medically underserved areas and to underserved populations.
6. **DOUBLED NON-PHYSICIAN PROVIDER USE**	Same as Scenario 2 with staffing levels adjusted to reflect a doubling in the use of non-physician providers (nurse practitioners, physician assistants, etc.) in place of physicians.

National Advisory Council on Nursing Education and Practice (NACNEP),[5] are described in Table 2.

The model produced the following percentages which ranged from 10.4% for Scenario 1 to a high of 22.7% for Scenario 5 with Scenario 6 showing a decline of 2.2%. Little difference in percentage change is seen between Scenarios 1, 2, and 3, with Scenarios 4 and 5 running roughly 10% higher.

The 10.4% increase in requirements in the case of Scenario 1, which was due to population growth and aging, was abstracted from each of the other percentages shown, thus arriving at an estimate of the incremental impact associated solely with the changes in insurance coverage and health care staffing patterns postulated in Scenarios 2 through 6. The resulting incremental measures of impact are as follows:

Scenario 2 ..... 1.1%

Scenario 3 ..... 1.7%

Scenario 4 ..... 9.9%

Scenario 5 ..... 12.3%

Scenario 6 ..... MINUS 12.6%

The authors: 1) applied as adjustment factors to the three per capita physician requirement standards the respective expected percentage change for the appropriate scenario generated by the IRM, 2) subtracted the requirement from the per capita physician supply for the area, 3) multiplied that result by the respective geographic area's population to obtain the required number of physicians, 4) then summed across the geographic areas any deficits so derived. The numbers that they arrived at, representing the *implied* deficit for each separate scenario under three different sets of requirements standards, are shown in Table 3. Variations by requirements standard are seen to be great; those by scenario are relatively minor. See Table 4 for a description of adjustment methodology.

Lastly, the authors applied the described methodology on a county-by-county basis rather than merely by county

TABLE 3

Summary of Deficits in Number of Generalist Physicians Reported for Each of Scenarios 1 Through 6

Scenario	*Based on COGME High Standard of 80 per 100,000*	*Based on Expert-Average Standards*	*Based on COGME Low Standard of 60 per 100,000*
1. STATUS QUO	41,359	15,441	7,676
2. BASELINE INSURANCE PROJECTIONS	43,665	16,597	8,050
3. HIGH MANAGED CARE	44,924	17,227	8,254
4. UNIVERSAL COVERAGE	62,120	28,228	15,636
5. EQUAL ACCESS AND UNIVERSAL COVERAGE	67,154	32,522	17,934
6. DOUBLED NON-PHYSICIAN PROVIDER USE	21,988	2,292	3,394

TABLE 4

Description of Adjustment Methodology

The authors derive the adjustment to the 1995 per capita physician standard in the following manner:

LET: **x(i)** = estimated 1995 IRM-adjusted per capita physician requirement standard for scenario (i);

Req = per capita physician requirement standard for 1995.

P(2005)(0) = The IRM projected 2005 percentage change in the requirement for the status quo (scenario 1);

P(2005)(i) = The IRM projected 2005 percentage change in the per capita requirement for scenario (i).

APPLY THE FOLLOWING FORMULA:

(((P(2005)(i)/100)(Req)) – (((P2005)(0)/100)(Req) + 1(Req)) = x(i). The percentage change is divided by 100 to convert the value to decimal equivalent.

TO ILLUSTRATE:

In the case of scenario 3, the percentage adjustment produced by the IRM was P(2005)(3) = 12.1%; for scenario 1, it was P(2005)(1) = 10.4%. The 1995 expert average requirement standard for Metro-core was Req = 72.

Substituting:

(((12.1/100)(72) – (10.4/100)(72) + 1(72))) = (.121(72) – .104(72) + 1(72)) = (.121 – .104 +1)72 = (1.017)72 = 73.1, the 1995 requirement standard of 72 adjusted for changes that are due only to scenario 3.

type, thereby negating the possibility that surpluses in some counties might cause deficits in others to go unnoticed. The result of this expanded effort, shown in Appendix B of their paper, was to increase the deficits associated with Scenario 1 in the following manner:

- In the COGME high requirements case, the deficit went from 41,359 to 52,916.
- In the expert-average case, it went from 15,441 to 29,160.
- In the COGME low requirements case, it went from 7,676 to 19,032.

While not able to quantify precisely the need to increase the National Health Service Corps (NHSC), the authors noted that COGME could reasonably recommend relieving some of the deficit with the NHSC, or some combination of public and private efforts. They ended their paper with the following conclusions and recommendations:

- Because even a finely-grained analysis on a county-by-county basis is subject to the criticism that health care providers may be immediately available on the other side of the county line, a set of well-defined Primary Care Service Areas, similar to the Hospital Service Areas of Makuc and Kleinman,[6] is needed.
- Additional work needs to done to refine the requirements standards for different types of areas.
- Better data and methods of locating where physicians practice, particularly in metro-core areas, and where physicians have more than one practice location, are needed.
- Economic modeling is needed to determine the extent to which expanded insurance coverage will reduce the need for "public safety net" physician programs

B. "INCREASING NUMBERS OF FAMILY PHYSICIANS—IMPLICATIONS FOR RURAL AMERICA"

by Jack M. Colwill, M.D. and James Cultice

The authors note that despite a sharp increase, starting in the mid-1960s, in the number of physicians per 100,000 population, the number per 100,000 engaged in family practice has remained relatively

constant, well below the levels deemed desirable by most physician workforce experts. COGME, as noted earlier, had recommended a minimum of 60 generalists per 100,000 population. In the judgment of the authors, the relatively low level of family practice physicians in this country, hovering in the neighborhood of 30 per 100,000 for the past thirty years, makes the attainment of even that minimum goal unlikely in rural areas where there are relatively fewer physicians in the other generalist specialties of general internal medicine and general pediatrics.

On the positive side, the authors report a sharp rise (over 50 percent) in the number of family practice residency graduates within the past decade. Applying the Health Resources and Services Administraion/Bureau of Health Professions' Physician Supply Model to data extracted from the AMA Masterfile and from the Master File of the American Osteopathic Association, and making use of historic data concerning age- and gender-specific death and retirement rates, they projected that the number of family physicians providing active patient care in the United States (excluding residents and physicians over age 70) would increase from roughly 28 per 100,000 in 1997 to 34.4 per 100,000 in 2020.

This initial set of projections presupposes, however, that the rate at which physicians graduate from family practice residency programs remains at its present level of slightly under 4,000 per year, up from roughly 2,600 in 1992. In the interest of sensitivity analysis, the authors therefore postulated two alternative scenarios, one involving a short-term decrease in the number of family practice graduates produced, the other involving an increase. The results were as follows:

a. If the number of family practice residency graduates were to decrease at the rate of 200 per year for the next five years, the number of practicing family physicians per 100,000 would be no greater in 2020 than it is now,

whereas

b. if the number were to *increase* at the rate of 200 per year for the next five years, the number of family physicians per 100,000 in the year 2020 would climb to approximately 40.

Turning to the issue of rural supply, the authors note that the number of family practice physicians per 100,000 is, if anything, slightly greater in small communities than it is in large ones. The difference, although small, makes sense: in smaller, rural communities, family physicians often must take the place of an internist or pediatrician who chose to practice elsewhere. Applying the Physician Supply Model once again, this time taking into account the rate at which family practice physicians, by gender, tend to practice in rural settings, the authors projected an increase in rural-based family practice physicians from the current level of 31.1 per 100,000 to 36.3 per 100,000 by the year 2020. They noted, however, that even an increase of that magnitude may not be sufficient to reach the COGME minimum, for all generalists combined, of 60 per 100,000.

The authors conclude by emphasizing that the recent upward trend in family practice residency graduates, and what it portends in terms of future supply, has favorable implications for rural areas as well as for the Nation as a whole. However, the authors note that interest in family practice appears to be diminishing and hospitals may have less motivation to maintain such residency positions because of reduced Medicare GME funding (This diminished interest may be evidenced by the results of the National Resident Matching Program (NRMP). Positions filled in family practice by U.S. medical students have declined from the prior year in each of the three consecutive years from 1998 to 2000.) The authors emphasize that in order for such growth to be sustained:

- Medical schools should endeavor to:
  - select students with rural backgrounds,
  - provide rural educational experiences, and
  - emphasize opportunities in family practice.
- Current incentives to maintain family practice residencies must be continued. Title VII training grants were cited as an example of such incentives.

C. "Physicians in the Public Health Workforce"

by Jerilyn K. Glass, M.D., Ph.D.

The author documents a decline over the past several decades in the percentage of physicians engaged in public health/preventive medicine activities and presents a case for (a) reversal of the decline and (b) the need for more current data. The decline can be inferred from a number of different data sets of varying time periods:

1. Shortly after schools of public health were first accredited (1946-47), the majority of students admitted for Masters degrees in public health were physicians (61%). By 1965-66, the percentage had shrunk to 23%, by 1978-79 to 11%.

2. Data from the AMA Masterfile indicate that the percentage of active specialty-classified physicians who self-designated in preventive medicine underwent a similar 50% decline between the mid 60's and late 70's, from 3.2% in 1963 to 1.6% in 1978.

3. More recent data from the AMA's *Physician Characteristics and Distribution in the U.S.* indicate a comparable decline in the percentage of physicians self-designating in aerospace medicine, general preventive medicine, occupational medicine, or public health, from 2.3% in 1970 to 0.9% in 1997.

Noting that physicians have traditionally been leaders in the country's public health movement, the author cites data which indicate this may no longer be the case. Only about a third of full-time local health department executives currently have a medical degree, with the percentage varying by the size of the jurisdiction served. In jurisdictions serving populations of under 250,000, full-time physician executives are a distinct minority. Given today's societal health needs and the need for informed leadership in matters of population health and preventive medicine, the author underscores the importance of physicians with specialized training in public health competencies.

On the issue of data, the author notes that comprehensive, in-depth data on physicians in the public health workforce are currently in short supply. Citing a number of useful studies in the field—in particular, a 1999 survey of public health personnel in the State of Texas, headed by Dr. Virginia Kennedy[7]—she recommends an in-depth enumeration study be conducted across several States, utilizing a research approach similar to that employed by Dr. Kennedy, to explore the functions that public health physicians perform. She proposes the study utilize the expertise and data collection capabilities of the Health Resources and Services Administration's regional workforce centers, and that it involve a number of other governmental and professional organizations as well.

A second major set of recommendations dealt with the issue of funding support. The author recommends:

- Increasing Title VII funding of residency programs, currently averaging between $1.6 and 2.0 million a year, to support greater numbers of preventive medicine residents and faculty, as well as increased faculty development in these residency programs.
- Including preventive medicine residency training in Medicare's GME financing system in recognition that promotion of preventive medicine and population health is relevant to the health care of the Medicare population.
- Extending eligibility for National Health Service Corps (NHSC) scholarships to preventive medicine residents.

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Estimates of Physicians Needed to Supply Underserved Americans Adequately Until Universal Coverage

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PREFACE TO REVISED REPORT

This revision to our final report submitted previously on November 12, 1999, contains some new material provided at COGME's request. Specifically, Table 2 has been revised to show a requirement level of 1500 persons to 1 physician, more explanation of the adjustments to requirements based on output from the Integrated Requirements Model (IRM) has been added to pages 9 and 10, and Appendix B has been added to show the physician deficit computed on a county-by-county basis, rather than on the basis of broad county categories as in the body of the report. Appendix B also shows the distribution of physician deficits across states, and the percentage of generalist physicians who are international medical graduates.

INTRODUCTION

The issue of the geographic distribution of physicians, and the implications for access to care and health outcomes, has been of major policy importance over the past several decades, with multiple public and private responses. In 1998, the Council on Graduate Medical Education (COGME) decided to revisit this issue from a research and policy perspective. To examine the extent to which safety-net providers should be increased considering the changing health care system, COGME commissioned *The Impact of the Restructuring of the US Health Care System on the Physician Workforce and on Vulnerable Populations* (Lewin Group, 1998). The report identified six major trends that are likely to influence the physician workforce and the ability of safety net providers to serve vulnerable populations: demographic trends; economic trends; the growth of managed care, organizational and structural changes in the health care system; trends in clinical practice management; and selected federal public policy initiatives. Using this report and all other available evidence and experience, COGME issued its Tenth Report, *Physician Distribution and Health Care Challenges in Rural and Inner-City Areas*, in 1998. This report made a series of twenty wide-ranging recommendations in three categories: 1) physician geographic maldistribution generally; 2) rural physician shortage issues; and 3) urban inner-city specific issues. With respect to the general maldistribution issue, the report makes the bold statement that

> *It is impossible to disentangle the issue of geographic maldistribution from health insurance. The most direct and efficient way to improve access to underserved populations is to assure that they have health insurance coverage, and then address the residual problem of provider maldistribution with focused programs that deploy health professionals to places with insufficient providers. (COGME, 1998, P. 9)*

Realizing that universal access will remain a significant policy challenge, the report goes on to conclude that "Until universal health insurance is enacted, the federal government will need to continue to support a medical care safety net, a network of integrated programs able to provide care for the tens of millions of people without financial access to health care" (COGME, 1998, p. xiii).

Therefore, the first two recommendations were:

- Continue to develop policies that increase the proportion of the population with health insurance coverage
- Significantly increase the National Health Service Corps to enable it to serve the number of underserved people in rural and urban areas

The COGME recognized that the phrase "significantly increase" was open to multiple interpretations, and that more precision would be needed to guide policy makers. There was some discussion about proposing a doubling of the NHSC based on the professional judgement of some members of the Council, but in the end this was considered too arbitrary for a specific policy recommendation. The COGME Workgroup on Geographic Distribution/Provider Safety Net therefore commissioned the present report to develop a range of quantitative estimates for the number of providers required to provide service to currently underserved populations.

SUMMARY OF DELIVERABLES

Under this contract, we were asked to perform the following tasks:

- Define a standard for primary care physician requirements for urban and rural areas at the county level. This standard will attempt to go beyond the single range for each type of area currently used in COGME policy.
- Compile the available data on existing providers in these areas, including the unique data available to the contractor from its Robert Wood Johnson inner city supply project
- Compare the supply and requirements thus generated, and determine the changes in NHSC numbers that might be needed to meet these needs
- Provide sensitivity analysis on these projections using the Integrated Requirements Model for several policy scenarios including changes in insurance coverage and changes in the supply of nonphysician primary care providers.

DATA AND METHODS

SAFETY NET

The definition of "safety net providers" typically includes providers that are legally obligated to care for persons who cannot afford it, such as public hospitals, teaching hospitals, federally funded community health centers, and city or county health departments (Lipson and Naierman, 1996). We define the safety net somewhat more narrowly to include only federally funded primary care physicians practicing in Community Health Centers, the National Health Service Corps, and the Indian Health Service, using data on numbers of federal physicians supplied by the Bureau of Primary Health Care, the Indian Health Service, and COGME's *Tenth Report*. By comparing existing numbers of these providers with the gap between supply and requirements for non-federal primary care physicians, we aim to quantify the maximum extent to which the federally funded safety net could be expanded to satisfy the primary care physician requirements of underserved populations. We recognize that this gap between supply and requirements might be filled not only by expanding the federal physician safety net, but also by private physicians and nonphysician providers responding to new incentives to locate in underserved areas under private or public policies to address geographic maldistribution, including broader insurance coverage.

PHYSICIANS

Data for the supply of physicians, population, and rural-urban continuum codes for US counties in 1995 were obtained from the Bureau of Health Professions' 1997 Area Resource File (ARF) (BHPr, 1997). Primary care physicians are defined as nonfederal MDs and DOs who have principal specialties of General Practice, Family Medicine, General Internal Medicine, General Pediatrics, General Obstetrics and Gynecology physicians (excluding residents and fellows). Elsewhere in the report, we distinguish between physicians in Ob/Gyn and "generalists" (the other primary care specialties) to highlight requirements for Ob/Gyns, and to make data comparable with other studies that do not include Ob/Gyns in the definition of primary care physicians.

GEOGRAPHIC UNITS

To examine the geographic variation in provider supply and requirements, we used the 10-category USDA rural-urban continuum code, collapsed into five groups of counties for convenience, and we aggregated county data within the groups. The five groups are as follows: (1) "Metro-core" includes central counties of metro areas of 1 million population or more; (2) "Metro-fringe" are fringe counties of metro areas of 1 million population or more and non-metro counties with urban population of 20,000 or more adjacent to metro area; (3) "Small City" are counties in metro areas fewer than 1 million population, and non-metro counties with urban population of 20,000 or more not adjacent to metro area; (4) "Rural" are non-metro counties with urban population less than 20,000 but more than 2,500; and (5) "Sparse" are non-metro counties with urban population less than 2,500.

INNER-CITY DATA

In addition to the aggregate county-level physician data from the ARF, we obtained individual physician data from the AMA Masterfile and address-coded them into census tracts and then matched tracts to census data and population projections for a nationally representative sample of 25 major metropolitan areas (Libby and Kindig, 1999). This allowed us to partition the "Metro core" category into two distinct subcategories: "poverty tracts" defined as tracts where 20% or more of the households were below the federal poverty line in 1990, and "non poverty tracts," which includes the balance of tracts within "Metro core" counties. The sample data were weighted to estimate the national supply of generalist physicians in "Metro core" counties.

REQUIREMENTS SURVEY

To evaluate the adequacy of the physician supply for meeting the population's requirements for primary care physicians, we undertook a survey of expert opinion on population-based requirements estimates. We selected a list of 21 interviewees that included the members of the COGME Physician Workforce Workgroup (Jo Ivey Boufford, Ezra Davidson, Ann Kempski, F. Marian Bishop), major published authors of research articles and reports dealing with physician supply and requirements in recent years, and government employees involved with physician requirement designations (Jonathan Weiner, Richard Cooper, Robert Politzer, Richard Lee, David Goodman, Edward Salzberg, Kevin Grumbach, Michael Whitcomb, Itzhak Jacoby, Stephen Mick, Tom Ricketts, Edward Sekscenski, Fitzhugh Mullan, Patricia Taylor, Norman Kahn, and Gary Hart). Background material was provided for respondents' reference, showing previous requirements estimates from GMENAC, COGME, and DHHS, along with the 1995 distribution of physician supply across the rural-urban continuum of counties. The survey materials are attached as an appendix.

Respondents were asked to provide their best estimate of "minimum" and "adequate" requirements for each type of provider in each type of county, and for all counties combined. To guide respondents, we provided the following instruction:

> *We distinguish between "adequate" and "minimal" ratios to reflect the range of opinions expressed in past documents. GMENAC distinguished between "adjusted needs-based requirements" and "minimum acceptable ratios," COGME specified a range "appropriate to a moderate projection of managed care enrollment" with a lower bound rather than an explicit "minimum," while the DHHS Bureau of Primary Care has used a "Level I" standard of 3,500:1 (about 29 physicians per 100,000 persons) as a "minimum" to designate primary care shortage areas, and a "Level 3" standard of 2,000:1 (50 per 100,000) chosen to roughly indicate "adequacy."*

INTEGRATED REQUIREMENTS MODEL

Because requirements are sensitive to variation in population size, composition, insurance status, and type of health care service model (e.g., managed care, fee for service, team practice with alternate clinicians), and the direction and extent of these variations in the future are necessarily unknown, we conducted sensitivity analysis of our requirements estimates using the Bureau for Health Professions' Integrated Requirements Model(IRM) (BHPr, 1995). Requirements were adjusted based on the six scenarios constructed by the COGME/NACNEP Joint Work Group on Primary Care Projections, as shown in Exhibit 5 on page 26 of the *Final Report of the Workgroup on Primary Care Workforce Projections* (BHPr, 1995). The six scenarios are:

1. "**STATUS QUO**" – holds health insurance coverage and staffing constant at estimated 1995 levels.
2. "**BASELINE INSURANCE PROJECTION**" – health insurance coverage is modified to reflect the best current estimates of future HMO penetration and changes in the uninsured population.
3. "**DOUBLE MANAGED CARE**" – health insurance coverage is set to an upper-limit on managed care penetration consistent with more Medicare and Medicaid recipients shifting into managed care and faster growth in private sector HMO enrollments.
4. "**UNIVERSAL COVERAGE**" – Double managed-care insurance coverage is extended to 100 percent of the population and staffing levels are increased to reflect expected higher utilization by the previously uninsured.
5. "**EQUAL ACCESS WITH UNIVERSAL COVERAGE**" – universal Double-managed care coverage with improved access in medically underserved areas and to populations is modeled by increasing staffing levels to reflect expected higher utilization by the previously underserved.
6. "**DOUBLE NONPHYSICIAN PROVIDER (NPP) USE**" – insurance levels are set to baseline levels used in scenario 1 "Status Quo," and staffing levels are adjusted to reflect an increase in nonphysician productivity and a doubling of nonphysician use with a corresponding decrease in physician use to hold the availability of "delegable" medical services constant.

The output of the IRM for each of these different scenarios is given as a percentage increase in requirements for the year 2005 over the initial requirements in 1995. Year 2005 primary care physician requirement changes for the six scenarios identified above are: 1) 10.4%, 2) 11.5%, 3) 12.1%, 4) 20.3%, 5) 22.7%, and 6) –2.2%.

Since our requirements estimates are for 1995, we subtracted the percentage change due solely to

projected population growth and ageing from 1995 to 2005 (i.e., the "Status Quo") from the percentage change shown for each of the five policy scenarios. This gives us an estimate of the percentage change in 1995 requirements due solely to policy adjustment, holding population constant. The percentage change in requirements thus determined was then multiplied by the 1995 requirement levels estimated by our expert survey and by COGME, to see how physician requirements might change depending on different combinations of insurance coverage and workforce composition. The data tables and our discussion of results from these analyses are presented in the next section.

RESULTS

Table 1 shows the 1995 supply of nonfederal primary care physicians (per 100,000 population in Panel A, and actual numbers in Panel C), and population (Panel B) by type of county and for all counties combined. Also shown are the numbers of primary care physicians serving in the capacity of federal "safety net" providers (Panel D). The table reveals the well-known geographic pattern of a physician distribution concentrated more in urban areas than rural areas, relative to population. In Panel A, we see that there are more physicians per 100,000 in metropolitan core counties than in other types of counties. Panel B shows that slightly less than half the population resides in metro core counties, and Panel C shows that slightly more than half of physicians are in metro-core counties. Panel D shows that slightly more than five thousand physicians comprise the federal primary care safety net.

Although Table 1 shows the supply of physicians, this supply must be compared with estimates of requirements to determine supply adequacy. Table 2 shows four standards of "minimal" physician requirements that have been used for various purposes by the Department of Health and Human Services. Panel A compares each standard (along the left margin) with the 1995 supply (along the top margin) and shows the difference in numbers of physicians per 100,000 persons. Negative numbers indicate that the requirements exceed the supply. Note that when lumping all counties together as a single entity, the oversupply in some areas

TABLE 1

1995 Supply of Active Patient-Care Generalist Physicians (Minus Residents and Fellows) per 100,000 persons, for U.S. Counties, by Type of County

	Metro-Core	*Metro-Fringe*	*Small City*	*Rural*	*Sparse*	*All Counties*
A. Physicians per 100,000						
FP/GP/GIM/GPD	74.6	46.8	61.4	48.1	37.4	64.1
GOBG	13.4	6.8	10.1	4.4	0.1	10.4
B. 1995 Population	118,573,344	20,229,076	86,935,410	30,127,295	6,286,528	262,151,653
C. Number of physicians						
FP/GP/GIM/GPD	88,456	9,467	53,378	14,491	2,351	168,039
GOBG	15,889	1,376	8,780	1,326	6	27,264

D. Number of federal safety-net physicians

Federally Qualified Community Health Centers (minus NHSC)	3,409
National Health Service Corps	946
Indian Health Service	840
Total	5,195

NOTES

COUNTY CLASSIFICATION USING USDA RURAL-URBAN CONTINUUM CODE FROM 1997 ARF:

"**Metro-core**" includes central counties of metro areas of 1 million population or more;

"**Metro-fringe**" are fringe counties of metro areas of 1 million population or more, and non-metro counties with urban population of 20,000 or more adjacent to metro area;

"**Small City**" are counties in metro areas with fewer than 1 million population, and non-metro counties with urban population of 20,000 or more not adjacent to metro area;

"**Rural**" are non-metro counties with urban population less than 20,000 but more than 2,500;

"**Sparse**" are non-metro counties with urban population less than 2,500.

PHYSICIAN CLASSIFICATION USING AMA MASTERFILE CODES FROM 1997 ARF:

Family Practice (FP)
General Practice (GP)
General Internal Medicine (GIM)
General Pediatrics (GPD)
General Obstetricians/Gynecologists (GOBG)

TABLE 2
Four Standards of "Minimal" Physician Requirements Used by the Department of Health and Human Services

A. Difference between "minimal" requirement standard and 1995 generalist physician supply

Persons per Physician	*Physicians per 100,000 Persons*	*Metro-Core* **74.6**	*Metro-Fringe* **46.8**	*Small City* **61.4**	*Rural* **48.1**	*Sparse* **37.4**	*All Counties* **64.1**
1,500	66.7	7.9	–19.9	–5.3	–18.6	–29.3	–2.6
2,000	50.0	24.6	–3.2	11.4	–1.9	–12.6	14.1
2,500	40.0	34.6	6.8	21.4	8.1	–2.6	24.1
3,000	33.3	41.3	13.5	28.1	14.8	4.1	30.8

B. Deficit in numbers of generalist physicians compared to "minimal" requirement standards

Persons per Physician	*Physicians per 100,000 Persons*	*Metro-Core*	*Metro-Fringe*	*Small City's*	*Rural*	*Sparse*	*Total "Minimal" Deficit*
1,500	66.7	-	–4,019	–4,579	–5,594	–1,840	–16,031
2,000	50.0	-	–647	-	–572	–792	–2,011
2,500	40.0	-	-	-	-	–163	–163
3,000	33.3	-	-	-	-	-	0

obscures the undersupply in other areas, and this detail can only be detected by disaggregating counties along the rural-urban continuum. Further disaggregation within these five categories might reveal more undersupplied areas, as discussed below for poverty and nonpoverty areas in metro-core counties, and as shown in Appendix B for county-level dissaggregation within the five rural-urban categories for each state.

Panel B shows only the deficit for those places where requirements exceed supply – this is the number of physicians that would be needed to bring supply up to the given requirement standard. The total deficit with a "minimum" standard of 50 physicians per 100,000 (or 2,000 persons per physician) is approximately 2,000 physicians, or roughly twice the number of primary care physicians now serving in the National Health Service Corps. A higher standard of 66.7 physicians per 100,000 (or 1500 to 1) results in a much larger deficit of about 16,000 physicians.

Table 3 shows the results of our survey of physician workforce experts. Panel A shows the range of opinions for adequate levels of physician availability per 100,000 persons for five different classes of county, and for all counties taken as a whole. Panel B shows the range of opinions for minimum physician requirements.

Note that the range and average requirement estimates vary across the five types of counties, showing lower average requirements in metro-fringe, rural, and sparse counties than in metro-core and small cities. We considered this geographic variation in further analysis of the data using the expert average of "adequate" requirements.

Table 4, Panel A shows the 1995 supply of generalist physicians per 100,000 persons for five classes of counties. Panel B shows three standards of requirements: (1) "COGME-high" standard of 80 physicians per 100,000 in all places, which is the high end of the range of primary care requirements investigated in COGME's *Eighth Report* (COGME, 1996) and also corresponds to the highest estimate of adequate availability for all counties from the expert survey in Table 3; (2) "expert-average" is the average level of "adequate availability" for each of the five classes of counties from Table 3; (3) "adequate-low" standard of 60 physicians per 100,000 in all places is the low end of the COGME range (COGME, 1996) and also is the lowest estimate of adequate availability for all counties from the expert survey in Table 3. Since no separate requirements standards have been developed for Ob/Gyn, we use only the "expert-average" adequate requirements from the survey data in Table 3.

Panel C shows the difference between the 1995 supply per 100,000 persons, and each of the requirement standards for the different classes of counties. Cases where the availability of physicians exceeds the requirement standards are positive, and negative numbers indicate a deficit of supply relative

TABLE 3

Range, and Average, of Expert Opinion on "Adequate" and "Minimum" Levels of Physician Availability

A. "Adequate" level		*Metro-Core*	*Metro-Fringe*	*Small City*	*Rural*	*Sparse*	*All Counties*
FP/GP/GIM/GPD	Highest	80.0	85.0	90.0	78.0	78.0	80.0
	Average	72.0	57.6	71.5	54.7	51.2	68.2
	Lowest	70.0	42.0	62.0	45.0	39.0	60.0
Number of respondents		6	6	6	6	6	11
GOBG*	Highest	14.0	9.0	12.0	10.0	10.0	10.5
	Average	10.4	6.6	9.0	6.0	4.6	9.1
	Lowest	9.0	4.0	4.0	3.0	1.0	7.0
Number of respondents		5	5	5	5	5	8
B. "Minimum" level		***Metro-Core***	***Metro-Fringe***	***Small City***	***Rural***	***Sparse***	***All Counties***
FP/GP/GIM/GPD	Highest	70.0	59.0	74.0	59.0	59.0	60.0
	Average	50.7	41.3	51.5	41.8	40.5	44.0
	Lowest	34.0	20.0	25.0	20.0	18.0	30.0
Number of respondents		6	6	6	6	6	9
GOBG*	Highest	10.0	7.0	11.0	7.0	7.0	7.0
	Average	7.8	5.6	6.4	4.2	3.2	5.4
	Lowest	3.0	3.0	3.0	3.0	1.0	3.0
Number of respondents		5	5	5	5	5	7

*See notes for Table 1.

TABLE 4

Supply of Physicians in 1995 Compared With Three Standards of Physician Requirements per 100,000 Persons

A. Physicians per 100,000 in 1995		*Metro-Core*	*Metro-Fringe*	*Small City*	*Rural*	*Sparse*
FP/GP/GIM/GPD		74.6	46.8	61.4	48.1	37.
GOBG*		13.4	6.8	10.1	4.4	0.1
B. Three standards of requirement		***Metro-Core***	***Metro-Fringe***	***Small City***	***Rural***	***Sparse***
FP/GP/GIM/GPD	COGME-High	80.0	80.0	80.0	80.0	80.0
	Expert-Average	72.0	57.6	71.5	54.7	51.2
	COGME-Low	60.0	60.0	60.0	60.0	60.0
GOBG*	Expert-Average	10.4	6.6	9.0	6.0	4.6
C. Difference (supply minus requirement)		***Metro-Core***	***Metro-Fringe***	***Small City***	***Rural***	***Sparse***
FP/GP/GIM/GPD	COGME-High	–5.4	–33.2	–18.6	–31.9	–42.6
	Expert-Average	2.6	–10.8	–10.1	–6.6	–13.8
	COGME-Low	14.6	–13.2	1.4	–11.9	–22.6
GOBG*	Expert-Average	3.0	0.2	1.1	–1.6	–4.5

*See notes for Table 1.

to requirements. Since the lower "minimum" standards shown in Tables 2 and 3 do not result in substantial deficits of providers, we omitted them from further analysis for the sake of clarity.

Table 5 translates the data in Table 4 into the number of physicians in 1995, which is obtained by multiplying the difference between supply and requirements per 100,000 (in Table 4, Panel C) times the population (in 100,000s) in each of the county classes (from Table 1, Panel B).

Table 5, Panel B shows the deficit in numbers of physicians for each of the classes of counties at the three different standard "adequate" requirement levels. Deficits are shown only in areas where requirements exceeded the 1995 physician supply. Summing the deficits across the different types of counties reveals that somewhere between 7,676 and 41,578 generalist physicians would be required to eliminate deficits, depending on the standard requirement for physician availability used. Using the average of expert opinion for adequate physician availability, a midrange estimate of the deficit is about 14,000 generalist physicians and about 800 general Ob/Gyn physicians.

Although Table 5 shows no apparent deficit of generalist physicians in metro-core counties when using the "expert-average" requirement estimates, Table 6 illustrates the results when metro-core counties are disaggregated into poverty tracts and nonpoverty tracts. With the data disaggregated by using our census-tract level sample of metro-core counties, we find that the expert-average requirements indicate a deficit of 1,620 generalist physicians in poverty tracts of metro-core counties in the United States in 1995 in contrast to the zero deficit exhibited in Table 5. This analysis illustrates the value of using finer units of analysis to detect pockets of need within counties. The value of disaggregating to more detailed geographic units is further exhibited in Appendix B (pages B1 to B 13). Appendix B contains estimates of the physician deficits by states computed on a county-by-county basis. This process increases the apparent deficits for a state because deficits in some counties are not negated by surpluses in other counties within the state.

Table 7 displays the results of our application of the Integrated Requirements Model to analyze the sensitivity of our requirements estimates to differences in health insurance coverage and staffing models. The first column, labeled "Status Quo" shows the "total deficit" computed in Table 5 (e.g., for COGME-high requirements, 41,578 physicians) minus the deficit in metro-core physicians reported in Table 5 (e.g. 41,578 – 6,403) plus the metro-core deficit revealed in Table 6 (e.g. 41,578 – 6,403 + 6,184 = 41,359). The total deficit for each scenario is calculated by multiplying the three per capita physician requirement standards by the respective expected percentage change for the appropriate scenario generated by the IRM, subtracting that calculated requirement from the per capita physician supply for that area, multiplying that result by the respective geographic area's population to obtain the required number of physicians, then summing across the geographic areas any deficits so derived .

The requirements are adjusted upward in scenarios 2 through 5 to account for future expansion of health insurance coverage, and downward in scenario 6 to account for a doubling of nonphysician providers.

TABLE 5
Difference (Supply Minus Requirement) in Numbers of Physicians

A. Difference		*Metro-Core*	*Metro-Fringe*	*Small City*	*Rural*	*Sparse*
FP/GP/GIM/GPD	COGME-High	–6,403	–6,716	–16,170	–9,611	–2,678
	Expert-Average	3,083	–2,185	–8,780	–1,988	–868
	COGME-Low	17,312	–2,670	1,217	–3,585	–1,421
GOBG*	Expert-Average	3,557	40	956	–482	–284

B. Deficit		*Metro-Core*	*Metro-Fringe*	*Small City*	*Rural*	*Sparse*	*Total Deficit*
FP/GP/GIM/GPD	COGME-High	–6,403	–6,716	–16,170	–9,611	–2,678	–41,578
	Expert-Average	0	–2,185	–8,780	–1,988	–868	–13,821
	COGME-Low	0	–2,670	0	–3,585	–1,421	–7,676
GOBG*	Expert-Average	0	0	0	–482	–284	–766

*See notes for Table 1.

TABLE 6

Supply of Physicians in Metropolitan Core Counties Compared With Three Standards of a Physician Requirement per 100,000 Persons, by Poverty Status of Census Tracts

A. Physicians per 100,000 in 1995		***Poverty Tracts***	***Non-Poverty Tracts***	
FP/GP/GIM/GPD		61.9	76.8	
B. Three standards of requirement		***Poverty Tracts***	***Non-Poverty Tracts***	
FP/GP/GIM/GPD	COGME-High	80	80	
	Expert-Average	72	72	
	COGME-Low	60	60	
C. Difference (supply minus req.)		***Poverty Tracts***	***Non-Poverty Tracts***	
FP/GP/GIM/GPD	COGME-High	–18.1	–3.2	
	Expert-Average	–10.1	4.8	
	COGME-Low	1.9	16.8	
D. 1995 Population		16,037,990	102,528,792	
E. Difference (number of physicians)		***Poverty Tracts***	***Non-Poverty Tracts***	
FP/GP/GIM/GPD	COGME-High	–2,903	–3,281	
	Expert-Average	–1,620	4,921	
	COGME-Low	305	17,225	
F. Deficit		***Poverty Tracts***	***Non-Poverty Tracts***	***Total Metro-Core***
FP/GP/GIM/GPD	COGME-High	–2,903	–3,281	–6,184
	Expert-Average	–1,620	0	–1,620
	COGME-Low	0	0	0

Note: A tract has poverty status if 20% or more of the households exceed the federal poverty line.

DISCUSSION

The primary purpose of this analysis was to determine how to quantify more precisely COGME's recommendation in its Tenth Report to "significantly increase" the number of National Health Service Corps providers to provide adequate primary care services for underserved populations until all are provided with health insurance.

Table 8 summarizes our analysis in approaching this question. We find that expert opinion on primary care physician requirements, when considered in the context of different county types across the rural-urban continuum, estimates that 15,441 additional physicians would be required to give "adequate" primary care services to the American population. This is in addition to the 946 National Health Service Corps primary care physicians as well as other federal physicians serving in underserved areas. This number is considerably less than would be required if all counties met the COGME high overall requirement of 80 per 100,000; this is because experts did not believe that number was appropriate for all county types. Using the COGME-low target would require 7,676 additional physicians. If the average of expert opinions regarding a "minimum" requirement—about 44 per 100,000—were used, no county groups would require additional physicians by this standard. Using the DHSS standard of 50 per 100,000 (2,000:1) would require about

TABLE 7

Total Deficit in Numbers of Physicians for Three "Adequate" Requirement Standards, Adjusted for Six IRM Scenarios

SCENARIOS		**1**	**2**	**3**	**4**	**5**	**6**
Deficit (supply minus standard < 0)		***Status Quo***	***Baseline Insurance***	***Double Managed Care***	***Equal Access With Universal Coverage***	***Universal Coverage***	***Double NPP Use***
FP/GP/GIM/GPD	COGME-High	–41,359	–43,665	–44,924	–62,120	–67,154	–21,988
	Expert-Average	–15,441	–16,597	–17,227	–28,228	–32,522	–2,292
	COGME-Low	–7,676	–8,050	–8,254	–15,636	–17,934	–3,394
GOBG*	Expert-Average	–766	–788	–801	–1,064	–1,153	–501

*See notes for Table 1.

TABLE 8

Summary: Range of "Adequate" Requirements for New Generalist Physicians, and Geographic Distribution

A. Geographic distribution of "adequate" generalist requirements:

		Metro-Core Poverty Tracts	*Metro-Core Non-Poverty*	*Metro-Fringe*	*Small City*	*Rural*	*Sparse*	*Total Deficit*
FP/GP/GIM/GPD	COGME-High	–2,903	–3,281	–6,716	–16,170	–9,611	–2,678	–41,359
	Expert-Average	–1,620	0	–2,185	–8,780	–1,988	–868	–15,441
	COGME-Low	0	0	–2,670	0	–3,585	–1,421	–7,676

B. Adjustments in total "adequate" requirements for two policy scenarios:

SCENARIOS		1	6	5
		Status Quo	*Double NPP Use*	*Equal Access With Universal Coverage*
FP/GP/GIM/GPD	COGME-High	–41,359	–21,988	–67,154
	Expert-Average	–15,441	–2,292	–32,522
	COGME-Low	–7,676	–3,394	–17,934
GOBG*	Expert-Average	–766	–501	–1,153

*See notes for Table 1.

2,011 primary care generalists to relieve the national physician deficit.

It should be noted that these are gross rather than net estimates, meaning that we assumed that physicians in places that enjoy a surplus relative to requirements do not relocate to underserved areas. For example, in the non-poverty metro core areas there is currently an excess of 4,921 primary care physicians over "expert-average" requirements; if these could be redistributed to areas in deficit, then the total needed would be less. We are not aware of policy options to make such redistribution, so have presented the needs as the gross sum of deficits in the remaining areas.

Table 8 also shows two of the policy scenarios modeled by the COGME/NACNEP Joint Work Group on Primary Care Projections (BHPr, 1995). The baseline estimates above implicitly include the current level of nonphysician provider as a part of supply. Application of the IRM reduces the physician supply for a "Double" nonphysician provider scenario, reducing the deficit based on expert-average requirements to 2,292 from 15,441. Other scenarios can easily be entered into the IRM model if higher or lower estimates of nonphysician provider supply are expected as data are further updated. Similarly, the "equal access and universal coverage" scenario results in an increase in the "expert-average" requirements to 32,522. In this case, it should be noted that this would not be equivalent to what a public safety net would have to provide, since presumably the private sector would provide care to some proportion of those persons who acquire insurance and market power to pay for services. Engaging in economic modeling to estimate what this fraction would be important, not only for future expansions in coverage, but to track current policy changes such as the increase in coverage for children and some family members under the new child health legislation. It should not be assumed in such modeling that having full insurance coverage would eliminate the need for public safety net providers. Even with full insurance coverage, there will remain areas of low access to primary care providers for a variety of geographic, demographic, and cultural conditions.

This analysis does not automatically provide policy guidance on how to quantify precisely the need for the increase in NHSC called for in the COGME Tenth Report. There is certainly imprecision in these requirements estimates, and changes are taking place from current policy such as CHIP that are not accounted for here. Even if the "expert-average" estimate is reduced by 50%, a deficit of about 7,500 primary care providers would be indicated, which could be relieved by the NHSC, or some combination of public and private efforts. This would certainly be a reasonable position for the COGME discussion to consider when making the Tenth Report recommendations more specific, in a year in which NHSC reauthorization is under consideration.

There are a number of research and analysis issues that deserve attention by COGME as well,

in its role in advancing the analytic capacity of the nation to make workforce policy more responsibly. First, we need a set of well-defined Primary Care Service Areas, similar to the Hospital Service Areas of Makuc and Kleinman, that all researchers and policy makers agree are the appropriate units of analysis. Second, additional work needs to be done on refining the requirements estimates for different types of areas. This analysis shows the ranges of results that occur when a standard requirement across all areas is used instead of a more tailored one. Using "benchmark" examples of best practice within geographic regions may provide better requirements estimates. Third, we need better data and methods of locating where physicians practice, particularly in metro core areas, and where physicians have more than one practice location. Finally, we need economic modeling to determine the degree to which expansion of insurance coverage will reduce the need for public safety net physician programs as private sector organizations enroll previously underserved and uninsured patients in their programs.

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APPENDIX A
Materials Mailed in Survey of Workforce Experts

(Today's date)

(First name) (last name)

(address)

Dear (first name),

We are conducting a survey of twenty-five experts' opinions regarding primary care physician availability as part of a HRSA-sponsored study of safety-net physician requirements. We would appreciate your reply to a brief questionnaire. Your responses will be kept confidential and disseminated only in aggregate with all other responses. We will disclose the names of all respondents in our final report and an acknowledgment in published articles, but names will not be associated with individual responses. The information you provide will not benefit you directly, but may be used to guide program and policy planning toward improving primary care physician availability nation-wide.

Physician/population ratios have long been known to vary along the rural-urban continuum (see enclosed Figure 1). In 1980, GMENAC estimated requirements ratios and minimum ratios for different types of physician (see enclosed Table 1). More recently, COGME has recommended a national average of between 65 and 85 generalist physicians per 100,000 persons, assuming a modest increase in managed care enrollment. Recent DHHS draft guidelines for a revised primary care physician shortage area designation method suggest a ratio of 33 physicians per 100,000 as a minimum threshold to define underserved populations, although a level of 50 per 100,000 is considered adequate and 29 per 100,000 is considered minimal in the current HPSA methodology (see enclosed Figure 2).

We've provided a fact sheet that shows the 1995 non-federal patient-care physicians (MD and DO, excluding residents and fellows) in four specialties, for five groups of counties along a rural-urban continuum, and the size and composition of the population (see enclosed Table 2). On the enclosed questionnaire, please briefly state your answers to our five questions about (1) your opinion of an *adequate* physician-to-population ratio, (2) your opinion of the *minimum* ratio (3) how to conceptualize the difference between "adequate" and "minimum" physician availability, (4) what additional data would be needed to answer the questions confidently, and (5) the reasons for geographic variation. Feel free to add comments, references, or supporting material, and fax your reply to (608) 262-6404, or mail it to me at the address below. If you have questions or require clarification, please call me at (608) 263-7497. Thanks for your contributions.

Sincerely,

Donald L. Libby
Associate Scientist

David A. Kindig, Director
Wisconsin Network for Health Policy Research

APPENDIX A

Physician Availability Questionnaire

Please answer concisely each of the following five questions, providing your own numeric estimates of *adequate* and *minimal* ratios per 100,000 persons for generalist and OB/GYN physicians. To maintain comparability with official usage by COGME and DHHS Bureau of Primary Care, we define "generalist physicians" as non-federal patient-care M.D.s and D.O.s (excluding residents, fellows, and interns) whose principal specialty is General Practice or Family Medicine, General Pediatrics, or General Internal Medicine. In addition, we consider requirements for General Obstetrics and Gynecology separately.

We distinguish between "adequate" and "minimal" ratios to reflect the range of opinions expressed in past documents. GMENAC distinguished between "adjusted needs-based requirements" and "minimum acceptable ratios", COGME specified a range "appropriate to a moderate projection of managed care enrollment" with a lower bound rather than an explicit "minimum", while the DHHS Bureau of Primary Care has used a "Level 1" standard of 3,500:1 (about 29 physicians per 100,000 persons) as a "minimum" to designate primary care shortage areas, and a "Level 3" standard of 2,000:1 (50 per 100,000) chosen to roughly indicate adequacy.

When you have completed the questionnaire, please mail or fax it to:

Wisconsin Network for Health Policy Research
748 WARF Building
610 N. Walnut Street
Madison, WI 53705

Fax: (608) 262-6404

QUESTION 1. ADEQUATE/APPROPRIATE AVAILABILITY. The 1995 national average was 64.1 generalists per 100,000 persons (74.5 with general OB/GYN), and COGME has recommended a range of 65-85 generalists per 100,000 as appropriate for the US population, expecting moderate future managed care enrollment. What do you recommend as an adequate or appropriate standard of physician availability?

(Please provide numbers of physicians per 100,000 in the spaces below for generalists and OB/GYN.)

	All Counties	Core	Fringe	City	Rural	Sparse
Generalists						
Gen Pr & Fam Med						
Gen Int Med						
Gen Pediatrics						
OB/GYN						

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QUESTION 2. MINIMUM AVAILABILITY. The GMENAC geographic panel estimated that approximately 35 to 39 generalists per 100,000 (or about 39 to 43 with OB/GYN) would provide minimum physician availability in any area, and primary care HPSAs have used 29 generalists per 100,000 as a minimum standard. What do you recommend as a minimum standard of physician availability?

(Please provide numbers of physicians per 100,000 in the spaces below for generalists and OB/GYN.)

	All Counties	Core	Fringe	City	Rural	Sparse
Generalists						
Gen Pr & Fam Med						
Gen Int Med						
Gen Pediatrics						
OB/GYN						

QUESTION 3. How do you conceptualize the difference (if any) between "minimum" and "adequate" levels of physician availability for policy purposes?

QUESTION 4. We have provided some county-level data on physician supply and population. What additional data or information (if any) would be required to make more satisfactory estimates of adequate or minimum generalist physician-to-population ratios?

QUESTION 5. The observed physician-to-population ratio varies geographically: how do you explain this variation and should standards of adequate or minimum physician availability reflect such variation?

Thank you for your participation.

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TABLE A-1
Approximate Range of GMENAC "Adjusted Needs-Based Requirements"

	Minimum	*Requirement*
Adult: FP & GP (per 100,000 persons)	16.6 - 17.9	33.2 - 35.7
Adult: IM (per 100,000 persons)	13.4 - 15.4	26.7 - 30.8
Child care: Pediatrics (per 100,000 children < 17)	23.6 - 25.6	47.1 - 51.2
Child care: Pediatrics (per 100,000 persons)	5.1 - 5.5	10.1 - 11.0
Obstetric: OB/GYN (per 100,000 women)	9.2 - 10.0	18.4 - 20.0
Obstetric: OB/GYN (per 100,000 persons)	3.6 - 3.9	7.2 - 7.8

TABLE A-2
Data for US Counties, 1995

	All Counties	***Core***	***Fringe***	***City***	***Rural***	***Sparse***
Population	262,151,653	118,573,344	20,229,076	86,935,410	30,127,295	6,286,528
Percent	100.0%	45.2%	7.7%	33.2%	11.5%	2.4%
Population composition	***All Counties***	***Core***	***Fringe***	***City***	***Rural***	***Sparse***
Under 15	21.5%	21.0%	22.2%	21.7%	22.4%	22.2%
Women 15-44	23.6%	24.4%	22.8%	23.6%	21.2%	19.9%
Over 64	13.5%	12.5%	13.8%	13.8%	15.8%	17.0%
Physicians per 100,000 persons	***All Counties***	***Core***	***Fringe***	***City***	***Rural***	***Sparse***
Gen. Pr. & Fam. Med.	28.1	25.9	26.1	29.6	33.5	30.8
Gen. Int. Med.	23.4	31.5	13.7	20.5	10.5	5.2
Gen Ped.	12.6	17.2	7.0	11.3	4.1	1.4
All Generalists	64.1	74.6	46.8	61.4	48.1	37.4
Gen. OB/GYN	10.4	13.4	6.8	10.1	4.4	0.9

CORE: Central counties of metro areas of 1 million population or more

FRINGE: Fringe counties of metro areas of 1 million population or more and non-metro counties with urban population of 20,000 or more adjacent to metro area

CITY: Counties in metro areas fewer than 1 million population and non-metro counties with urban population of 20,000 or more not adjacent to metro area

RURAL: Non-metro counties with urban population less than 20,000 but more than 2,500

SPARSE: Non-metro counties with urban population less than 2,500

APPENDIX B

County-Level Generalist Physician Deficits and Distribution of International Medical Graduates Across the United States

This Appendix contains estimates of the physician deficit computed on a county-by-county basis, rather than on a category-by-category basis as in the body of the report. The result of changing the geographic unit of analysis to a more fine-grained area is to increase the apparent deficit, because surpluses in some counties are not allowed to offset deficits in other counties, as with the larger units of analysis. This information underscores the importance of choosing an appropriate unit of analysis, which should ultimately be based not on convenient administrative units such as counties, but on rational primary care service areas derived from observations of patient travel patterns to receive primary care services.

This Appendix also shows the distribution of generalist physician deficits among the United States (excluding Alaska for which data are missing), and in addition, it shows the distribution of non-Canadian International Medical Graduates as a proportion of practicing generalist physicians. This latter information may be helpful in determining the relative geographic impact on the primary care safety net of policies to restrict IMG graduate residencies, or J-1 visa waivers.

TABLE B

Sum of County-Level Generalist Physician Deficits Compared With Three Requirement Levels

- ***By Type of County and Percent of Generalist Physicians Who Are Non-Canadian International Medical Graduates***
- ***For All States and D.C. (except Alaska for which data are missing)***

1. NATIONWIDE:

	Type of County	*COGME High Requirement 80/100,000*	*Expert Average Requirement*	*COGME Low Requirement 60/100,000*	*Percent of Generalists who are IMGs*
Whole USA	All types	52,916	29,160	19,032	25
	Metro-core	15,475	9,631	3,336	31
	Metro-fringe	6,806	2,683	3,089	20
	Small city	17,980	12,297	6,418	18
	Rural	9,893	3,368	4,562	17
	Sparse	2,762	1,182	1,626	17

2. BY STATE (as a whole):

STATE	*COGME High Requirement 80/100,000*	*Expert Average Requirement*	*COGME Low Requirement 60/100,000*	*Percent of Generalists who are IMGs*
ALABAMA	1,240	724	536	13
ARIZONA	833	426	158	20
ARKANSAS	673	323	303	9

(Continued)

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STATE	*COGME High Requirement 80/100,000*	*Expert Average Requirement*	*COGME Low Requirement 60/100,000*	*Percent of Generalists who are IMGs*
CALIFORNIA	5,246	2,927	971	26
COLORADO	745	453	238	5
CONNECTICUT	221	59	36	28
DELAWARE	120	40	31	28
DIST. OF COLUMBIA	0	0	0	18
FLORIDA	2,517	1,386	705	45
GEORGIA	2,258	1,325	1,092	18
HAWAII	72	3	0	18
IDAHO	377	203	161	3
ILLINOIS	1,873	1,123	850	41
INDIANA	1,492	770	586	17
IOWA	660	271	240	11
KANSAS	504	216	172	13
KENTUCKY	999	474	454	14
LOUISIANA	1,245	742	555	16
MAINE	157	35	28	9
MARYLAND	950	577	312	33
MASSACHUSETTS	655	384	201	17
MICHIGAN	2,206	1,313	835	34
MINNESOTA	836	444	372	6
MISSISSIPPI	976	501	491	9
MISSOURI	1,400	811	672	19
MONTANA	167	63	42	4
NEBRASKA	379	205	170	6
NEVADA	477	321	182	23
NEW HAMPSHIRE	217	108	36	14
NEW JERSEY	678	375	153	52
NEW MEXICO	362	227	167	13
NEW YORK	2,212	1,170	552	47
NORTH CAROLINA	2,164	1,246	990	9
NORTH DAKOTA	124	53	55	19
OHIO	2,257	1,199	899	26
OKLAHOMA	780	384	326	13
OREGON	554	253	134	6
PENNSYLVANIA	1,530	672	416	23
RHODE ISLAND	67	32	9	30
SOUTH CAROLINA	1,115	701	522	7
SOUTH DAKOTA	153	70	74	9
TENNESSEE	1,224	634	530	12

(Continued)

APPENDIX B

STATE	*COGME High Requirement 80/100,000*	*Expert Average Requirement*	*COGME Low Requirement 60/100,000*	*Percent of Generalists who are IMGs*
TEXAS	5,521	3,454	2,075	24
UTAH	620	404	242	5
VERMONT	46	12	8	5
VIRGINIA	1,603	899	614	20
WASHINGTON	921	495	289	8
WEST VIRGINIA	416	205	181	37
WISCONSIN	954	390	323	16
WYOMING	119	58	41	8

3. BY STATE AND TYPE OF COUNTY:

STATE	*Type of County*	*COGME High Requirement 80/100,000*	*Expert Average Requirement*	*COGME Low Requirement 60/100,000*	*Percent of Generalists who are IMGs*
ALABAMA	Metro-fringe	103	30	37	15
	Small city	711	520	273	12
	Rural	365	145	188	17
	Sparse	61	29	39	23
ARIZONA	Metro-core	429	234	0	21
	Metro-fringe	160	67	77	27
	Small city	211	112	65	17
	Rural	34	12	17	10
ARKANSAS	Metro-fringe	80	29	33	11
	Small city	223	160	87	8
	Rural	286	96	132	9
	Sparse	84	37	51	3
CALIFORNIA	Metro-core	3,747	2,004	441	26
	Metro-fringe	193	94	104	16
	Small city	1,153	778	357	26
	Rural	148	51	67	12
	Sparse	5	1	1	10
COLORADO	Metro-core	335	236	90	7
	Metro-fringe	29	6	9	0
	Small city	256	179	92	4
	Rural	82	14	22	4
	Sparse	43	17	24	7
CONNECTICUT	Metro-core	42	0	0	30
	Metro-fringe	113	14	19	21
	Small city	66	45	16	30
DELAWARE	Small city	90	40	26	26
	Rural	30	0	5	38
DIST. OF COLUMBIA	Metro-core	0	0	0	18

(Continued)

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STATE	*Type of County*	*COGME High Requirement 80/100,000*	*Expert Average Requirement*	*COGME Low Requirement 60/100,000*	*Percent of Generalists who are IMGs*
FLORIDA	Metro-core	677	303	57	53
	Metro-fringe	189	67	79	40
	Small city	1,361	900	420	34
	Rural	224	86	109	51
	Sparse	66	29	41	47
GEORGIA	Metro-core	647	500	278	18
	Metro-fringe	492	255	279	19
	Small city	416	309	179	17
	Rural	511	169	236	18
	Sparse	191	92	120	20
HAWAII	Small city	72	3	0	18
IDAHO	Metro-fringe	23	3	5	4
	Small city	167	119	53	4
	Rural	153	65	82	3
	Sparse	33	16	21	0
ILLINOIS	Metro-core	725	557	347	44
	Metro-fringe	259	115	131	37
	Small city	413	272	133	25
	Rural	420	148	202	37
	Sparse	56	29	37	44
INDIANA	Metro-core	183	102	32	16
	Metro-fringe	235	93	108	21
	Small city	551	373	177	14
	Rural	444	164	219	20
	Sparse	80	38	50	16
IOWA	Metro-fringe	48	15	17	14
	Small city	218	133	48	12
	Rural	309	89	126	7
	Sparse	85	34	49	12
KANSAS	Metro-core	28	16	0	11
	Metro-fringe	66	18	23	15
	Small city	190	115	51	12
	Rural	151	44	63	13
	Sparse	69	23	35	22
KENTUCKY	Metro-core	70	46	10	7
	Metro-fringe	56	17	21	24
	Small city	244	177	104	11
	Rural	405	142	189	20
	Sparse	224	93	131	21
LOUISIANA	Metro-core	176	116	43	19
	Metro-fringe	147	68	76	11
	Small city	596	426	260	12
	Rural	274	105	140	21
	Sparse	53	27	35	19

(Continued)

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STATE	*Type of County*	*COGME High Requirement 80/100,000*	*Expert Average Requirement*	*COGME Low Requirement 60/100,000*	*Percent of Generalists who are IMGs*
MAINE	Metro-fringe	39	0	5	8
	Small city	56	28	9	10
	Rural	63	7	14	9
	Sparse	0	0	0	0
MARYLAND	Metro-core	565	393	135	34
	Metro-fringe	239	102	117	32
	Small city	88	65	35	39
	Rural	48	16	21	22
	Sparse	10	1	4	0
MASSACHUSETTS	Metro-core	159	104	22	17
	Metro-fringe	167	49	62	15
	Small city	329	230	117	17
	Rural	0	0	0	0
	Sparse	0	0	0	11
MICHIGAN	Metro-core	902	666	313	41
	Metro-fringe	236	105	119	37
	Small city	607	391	190	26
	Rural	351	114	156	21
	Sparse	110	36	56	21
MINNESOTA	Metro-core	308	246	153	7
	Metro-fringe	138	57	64	5
	Small city	92	68	46	5
	Rural	238	55	80	5
	Sparse	60	18	29	11
MISSISSIPPI	Meto-fringe	59	29	33	7
	Small city	308	210	119	7
	Rural	475	204	259	10
	Sparse	133	58	80	17
MISSOURI	Metro-core	518	394	215	19
	Metro-fringe	241	134	145	25
	Small city	131	93	53	10
	Rural	323	106	145	25
	Sparse	188	84	114	30
MONTANA	Small city	79	38	5	2
	Rural	51	11	17	5
	Sparse	36	14	20	15
NEBRASKA	Metro-fringe	15	7	8	8
	Small city	183	132	71	7
	Rural	105	34	47	2
	Sparse	77	32	44	8
NEVADA	Metro-fringe	9	0	0	7
	Small city	414	299	154	25
	Rural	45	17	22	12
	Sparse	9	5	6	0

(Continued)

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STATE	*Type of County*	*COGME High Requirement 80/100,000*	*Expert Average Requirement*	*COGME Low Requirement 60/100,000*	*Percent of Generalists who are IMGs*
NEW HAMPSHIRE	Metro-fringe	14	0	0	10
	Small city	166	105	27	16
	Rural	37	3	9	9
NEW JERSEY	Metro-core	477	291	104	53
	Metro-fringe	100	30	37	38
	Small city	102	54	11	45
NEW MEXICO	Metro-fringe	27	15	16	7
	Small city	251	187	116	13
	Rural	67	17	25	18
	Sparse	16	8	10	0
NEW YORK	Metro-core	983	518	122	52
	Metro-fringe	257	73	88	33
	Small city	764	513	248	30
	Rural	200	64	90	27
	Sparse	9	2	4	11
NORTH CAROLINA	Metro-core	183	113	33	7
	Metro-fringe	357	162	183	12
	Small city	968	717	436	8
	Rural	518	196	260	10
	Sparse	138	57	78	13
NORTH DAKOTA	Small city	28	17	7	14
	Rural	25	2	4	18
	Sparse	71	34	45	35
OHIO	Metro-core	531	360	201	24
	Metro-fringe	544	169	205	22
	Small city	709	475	238	29
	Rural	448	181	237	25
	Sparse	25	14	17	0
OKLAHOMA	Metro-fringe	75	25	30	4
	Small city	382	254	149	12
	Rural	307	102	141	17
	Sparse	16	4	6	25
OREGON	Metro-core	162	107	46	7
	Metro-fringe	126	27	36	8
	Small city	189	108	30	4
	Rural	66	7	16	6
	Sparse	11	4	6	0
PENNSYLVANIA	Metro-core	279	185	66	23
	Metro-fringe	355	138	161	34
	Small city	527	262	47	22
	Rural	333	75	122	25
	Sparse	36	13	18	22

(Continued)

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STATE	*Type of County*	*COGME High Requirement 80/100,000*	*Expert Average Requirement*	*COGME Low Requirement 60/100,000*	*Percent of Generalists who are IMGs*
RHODE ISLAND	Metro-fringe	11	0	0	20
	Small city	56	32	9	30
SOUTH CAROLINA	Metro-fringe	41	7	11	4
	Small city	743	561	339	7
	Rural	305	118	154	6
	Sparse	26	15	18	33
SOUTH DAKOTA	Small city	34	22	10	6
	Rural	32	5	9	9
	Sparse	88	43	56	13
TENNESSEE	Metro-core	117	48	0	13
	Metro-fringe	107	37	44	8
	Small city	484	357	226	12
	Rural	408	147	197	14
	Sparse	108	45	62	22
TEXAS	Metro-core	2,039	1,332	306	24
	Metro-fringe	662	335	370	21
	Small city	1,826	1,356	852	25
	Rural	863	360	459	18
	Sparse	133	70	89	20
UTAH	Metro-core	337	242	98	3
	Metro-fringe	60	27	31	6
	Small city	125	100	65	8
	Rural	83	29	39	9
	Sparse	14	7	9	0
VERMONT	Small city	12	8	2	6
	Rural	26	1	2	3
	Sparse	7	3	4	6
VIRGINIA	Metro-core	622	393	161	28
	Metro-fringe	267	102	118	9
	Small city	382	289	174	10
	Rural	170	53	73	25
	Sparse	162	60	88	15
WASHINGTON	Metro-core	168	125	61	8
	Metro-fringe	190	69	79	9
	Small city	441	262	93	8
	Rural	101	31	44	9
	Sparse	21	9	12	9
WEST VIRGINIA	Metro-fringe	18	9	10	23
	Small city	170	125	69	34
	Rural	118	30	41	44
	Sparse	110	41	61	38

(Continued)

APPENDIX B

STATE	*Type of County*	*COGME High Requirement 80/100,000*	*Expert Average Requirement*	*COGME Low Requirement 60/100,000*	*Percent of Generalists who are IMGs*
WISCONSIN	Metro-core	67	0	0	25
	Metro-fringe	262	80	99	20
	Small city	336	234	107	8
	Rural	201	42	68	13
	Sparse	88	35	49	19
WYOMING	Small city	63	44	20	8
	Rural	48	11	17	8
	Sparse	9	3	5	0

Increasing Numbers of Family Physicians—Implications for Rural America

Jack M. Colwill, M.D., James Cultice

SUMMARY

Throughout the past century, rural health care has been dependent on general practitioners (GPs) and their successors, family physicians (FPs). Then and now, only FP/GPs have practiced in rural areas in proportion to the population. As numbers of GPs declined, physician shortages developed in rural areas. The creation of family practice residencies in the 1970s halted this decline but rural shortages persisted.

During the 1990s, the number of family practice residents increased by over 50%. At the same time the percentage of women among FP residency graduates increased to 46% and women have been less likely than men to select rural practice. We project that the non-metropolitan FP-to-population ratio, currently 31.1 per 100,000, will increase 17% to 36.3 per 100,000 by the year 2020, if current numbers of graduates continue. Such increases will be good news for rural America. Nevertheless, the total rural generalist physician-to-population ratio (which includes general internists and general pediatricians as well as FP/GPs) is unlikely to reach COGME's recommended range of 60-80 generalists per 100,000.

From a rural health policy perspective, recent increases in numbers of FP residency graduates must be sustained. Continued federal and state support for family practice programs is fundamentally important in maintaining recent increases in family practice graduates.

A century ago, physicians were almost as available in rural America as in more urban areas. Since then, the ratio of physicians-to-population in rural settings has steadily declined. Only during the past two decades has the physician density increased in larger non-metropolitan counties. Today, rural counties with a population less than 10,000 still show little sign of increased numbers of physicians.

The shortage of rural physicians has been attributed to the relative social and professional isolation of rural communities, the availability of hospitals and technology in cities, and the flight to affluence.[1-4] However, almost certainly specialization in medicine has been the most important cause of the urbanization of medicine. As more and more physicians specialized, numbers of general practitioners, those most likely to serve rural areas, progressively declined. Even following the explosive growth of family practice residencies in the 1970s, the ratio of family physicians/general practitioners (FP/GP) to the general population did not increase due to the high rate of retirement of aging general practitioners and an ever-enlarging population.

Today, 30 years after the creation of residency training programs in family practice, general practitioners are disappearing from the landscape and are being replaced by younger, residency trained family physicians. At the same time, two major forces are shaping the future FP workforce. First, perception of an increasing glut of specialists has made primary care careers more attractive to U.S. medical school graduates. The number of FP residency graduates increased 52% between 1992 and 1999. Second, more women are becoming physicians. Today, 46% of resident physicians in family practice are women, a more than twofold increase in gender share since 1980. Women have been less likely to select rural practice.[5,6] The impact of these two forces has not been explored.

This paper:

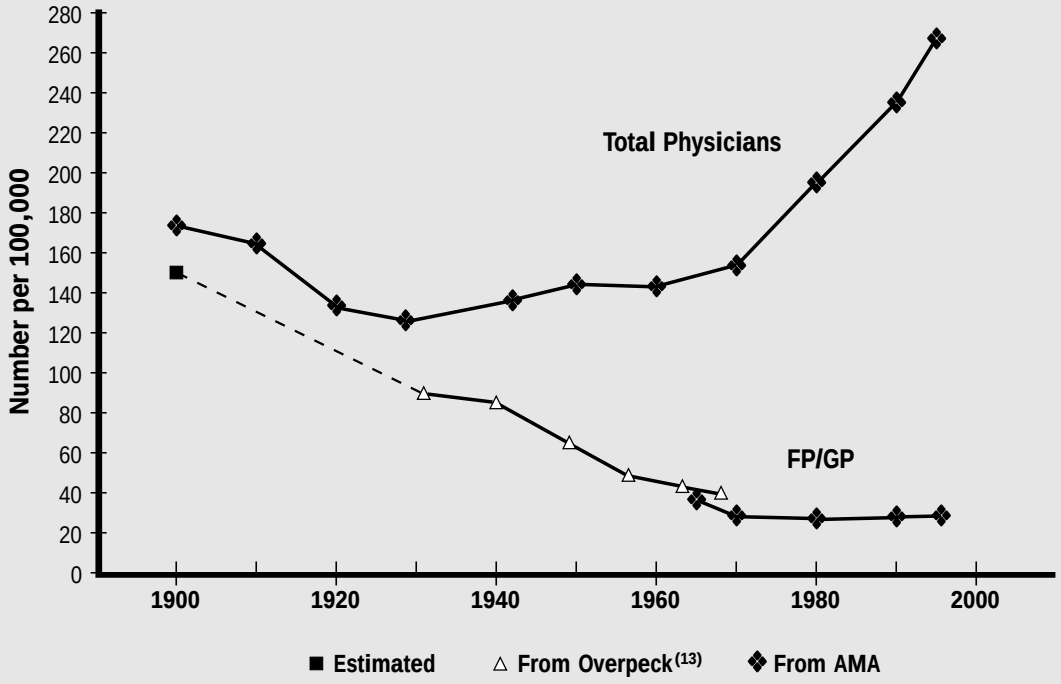
1. Reviews historical trends in physician density in rural areas.
2. Describes the central role of FPs and GPs in rural health care throughout the century.
3. Projects future FP-to-population ratios for both the nation as a whole and for rural areas.
4. Provides policy recommendations to increase numbers of rural FPs.

HISTORICAL PERSPECTIVE

Figure 1 illustrates trends in the physician-to-population ratio for all physicians and for FP/GPs during the 1900's. Two overarching trends are apparent. First, the physician-to-population ratio remained relatively constant throughout the first two-thirds of the century, and then dramatically increased in the last third of the century. Second, the ratio of FP/GPs-to-population fell continuously throughout the century to approximately one-fifth

FIGURE 1

Total Physicians and FP/GP per 100,000 Population



of the 1900 ratio. This occurred as practicing GPs increasingly limited their practice to a specialty in the early part of the century and then as almost all medical school graduates entered residency training programs in the various specialties following World War II. The declining ratio of FP/GP-to-population is a root cause of the shortage of rural physicians, as will be discussed in subsequent portions of this paper.

In 1900, the physician-to-population ratio was 173 per 100,000—almost twice that of European countries.[7] The vast majority of physicians were general practitioners and there was concern about a surplus of physicians.[8,9] Rural areas appear to have been well served. Half of the nation's population and 41% of the physicians resided in communities of less than 2,500[3,4]; the physician-to-population ratio was 142 per 100,000 population in these communities.

Great concern existed both about a surplus of physicians and about the overall quality of medical education.[8-10] The ensuing revolution in medical education resulted in closure or merger of 92 schools between 1904 and 1915. The Flexner Report of 1910 highlighted the problem and catalyzed reform.[11] By 1920, only 85 schools remained and by 1992, the number of graduates had declined by over half to 2,539. The physician-to-population ratio fell to 126 per 100,000 in 1926.[12]

During the first two decades of this century, industrialization was fueling migration from rural America to the cities. Physicians also moved to cities in proportionate numbers. Consequently, in one of the earliest articles reflecting a concern about the availability of rural physicians, Pusey noted, "One third of the towns in the United States of 1,000 or less which had doctors in 1914 were without them in 1925."[12]

Specialization was already a major force in medicine and was rapidly becoming the dominant force.[8] As more general practitioners limited their practices to a specialty, the ratio to population of those continuing in general practice declined (Figure 1).[13] By 1931, 28% of physicians described themselves as specialized, and by 1940, 38% were specialized.[13] These specialists practiced chiefly in urban areas where populations existed to support the limited scope of specialty practice and where hospital services and technology were located. Consequently, in 1940 the physician-to-population ratio in counties of greater than 50,000 had risen to 153 per 100,000, while counties of less than 50,000 had a ratio of 83 physicians per 100,000.[3] The average city doctor was 44 years of age while the country doctor was 57 years old.[3] There was widespread concern about the adequacy of rural healthcare.[3]

Despite this concern, before World War II very few counties had less than one physician per 2,000 population (50 per 100,000) (Figure 2a).[14] By contrast, a U.S. map with 1997 data drawn from the Area Resource File shows many counties currently have less than one physician per 2,000 population (Figure 2b) and many more have less than one *generalist* physician per 2,000 population (Figure 2c). In 1940 the GP ratio to population was 53 per 100,000; by 1970 the FP/GP ratio had fallen to approximately 30 per 100,000 and has remained at that level ever since (Figure1).

During the 1950s the shortage of rural physicians was one aspect of a broader national concern about an overall physician shortage. Federal and state incentives led medical schools to double class size in the sixties and early seventies. Hospitals

FIGURE 2
Physician Density in America, 1937 and 1997

FIGURE 2A: 1937 – Counties With Less Than One Physician per 2000 Population

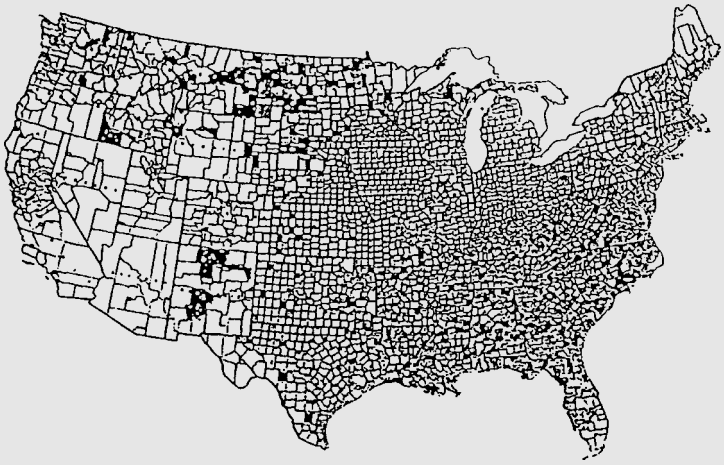


FIGURE 2B: 1997 – Counties With Less Than One Physician per 2000 Population

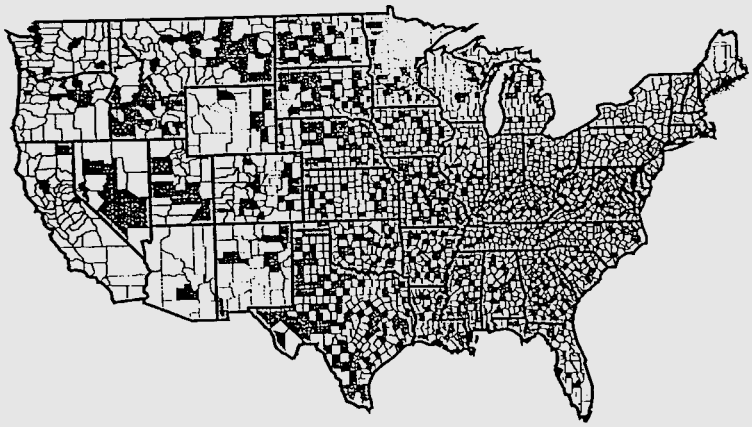
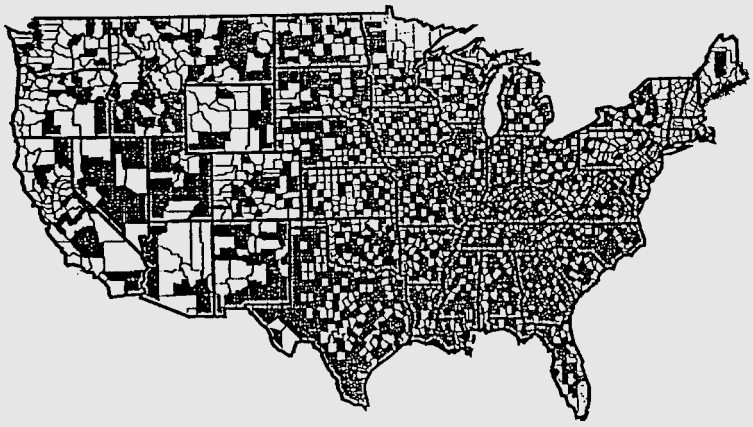


FIGURE 2C: 1997 – Counties With Less Than One Generalist Physician per 2000 Population



increased numbers of residency positions and the government eased restrictions on immigration of foreign medical graduates. A small number of 2-year general practice residencies were established. These changes fueled the rapid increase in numbers of physicians of the past 40 years but did little to increase the number of physicians entering general practice.

During the 1960s there was increasing concern about the availability of primary care physicians. Following a series of reports highlighting this problem, the American Board of Family Practice was founded in 1969 to create the new specialty of family practice.[15-17] The number of residency programs in family practice grew rapidly from 21 in 1969 to 382 by 1980. The annual number of physicians completing family practice residencies increased during the 1970s to reach approximately 2,500 in the early 1980s, where numbers remained for the decade.[18] Federal training grants were instrumental in developing and sustaining these residencies.[19]

During the 1980s, interest in each of the primary care specialties declined among U.S. medical school graduates, reaching its lowest point in 1992.[20] Nevertheless, resident numbers in family practice were maintained through recruitment of osteopathic and international medical school graduates. The overall ratio of FP/GPs-to-population remained relatively constant and the physician density in rural areas showed no sign of improvement. The supply of FP residency graduates barely kept pace with retiring older general practitioners and a growing population. Even today, 16.2% of active FP/GPs, compared with 10.1% of all active physicians, are above age 65.[21] Thus, during the next decade, rates of retirement from practice by FP/GPs will continue to be higher than those in other specialties.

In the early 1990s dramatic changes were anticipated in the medical marketplace. Most felt that explosive increases in managed care would lead to underemployment of specialists and increased demand for generalists. The Council on Graduate Medical Education (COGME), in its Third and Fourth Reports in 1992 and 1993[22,23], highlighted its concern about an increasing surplus of specialists and a continued relative shortage of generalists in an environment that would be increasingly dominated by managed care. COGME recommended that the number of first year residents be limited to 110% of the number of 1993 U.S. medical school graduates and that half of this reduced number should be in generalist programs. Similar concerns were expressed in other reports[24,25], as well as by

specialty groups[26-28]. New grant programs served as catalysts for medical schools to increase their production of generalists.[29-32]

The managed care revolution did occur as anticipated. Medical student interest in the generalist specialties increased dramatically[33]—probably influenced by the marketplace. Hospitals expanded established FP residencies and initiated 93 new residencies.[18] Between 1992 and 1999, graduates of allopathic FP residency programs increased 48%[34,35] and osteopathic program graduates increased by 85% (Table 1). Almost 4,000 graduates completed residency programs in family practice in 1999—an increase of 52% since 1992. This supply of new family physicians has the potential to increase numbers of rural physicians for the first time in a century.

TABLE 1

FP Residency Graduates, 1992 - 1999

	Allopathic	*Osteopathic*	*Total*
1992	2385	239	2624
1999	3538	443*	3981
Increase	1153	204	1357
Percentage Increase	48%	85%	52%

*Estimates based on number of 3rd-year residents.

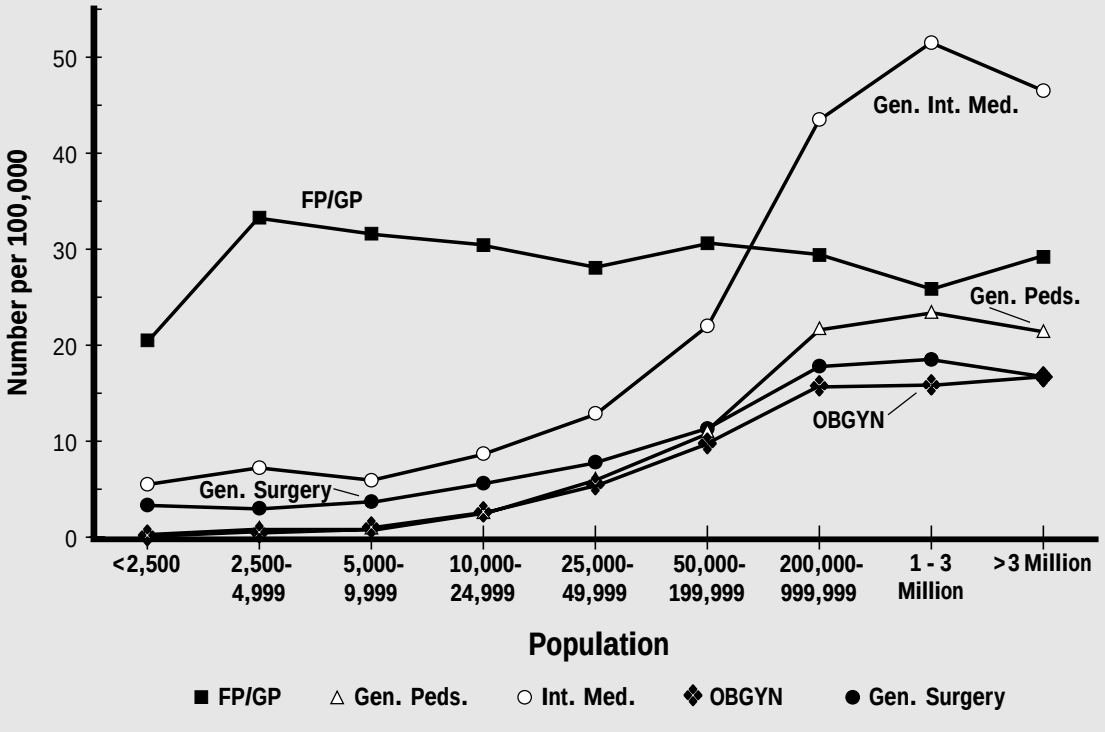
THE ROLE OF FAMILY PHYSICIANS IN RURAL AMERICA

Today, family physicians constitute only 11% of all active physicians. The decline of the FP/GP population ratio from an estimated 150 per 100,000 in 1900 to approximately 30 per 100,000 in recent decades has been a major cause of rural primary care shortages. Then and now, FP/GPs have been distributed across rural and urban America in proportion to their populations. All other physicians have concentrated in urban areas.

The dominant role of family practice in rural health care is illustrated in Figure 3, which is derived from 1997 data in HRSA's Area Resource File.* FP/GPs constitute 64% of practicing primary care physicians in non-Metropolitan Statistical Area (non-MSA) counties, while internists and pediatricians constitute 25% and 11% respectively. Family physicians provide the vast majority of primary care in counties of less than 50,000 population (Figure 3). Physicians in general pediatrics and general internal medicine, while major contributors to primary care in urban areas, are no more likely to practice in non-MSA areas than physicians in aggregate. Only 8% of patient care general pediatricians and 10% of general internists practice in non-MSA counties, while 22% of family physicians practice in these settings, in which 19% of the nation's population reside. Despite increases in numbers of physicians in larger counties, the pattern of specialty distribution for counties of less than 50,000 population is virtually unchanged since 1980.†

FIGURE 3

Physicians per 100,000 Population by Various Specialties, by County Size in 1997



*† Data provided by Thomas R. Konrad, Ph.D., University of North Carolina.

It is clear why few subspecialists are based in rural communities. The population required to support them as well as the technological capabilities required limit them to urban communities that have advanced secondary or tertiary care facilities. It is less clear why general internists and general pediatricians are less likely to practice in non-MSA counties. As with subspecialists, the populations necessary to support a practice may be inadequate. Assuming that approximately 2,000 patients are necessary to support a generalist physician and that these physicians will wish to work in groups of at least three, a population of at least 6,000 would be necessary to support three family physicians. Recognizing that one-third of the population is in the pediatric age group, a population of 9,000 is required to support three general internists, and 18,000 to support three pediatricians. For practical purposes, it is likely that rural health care in smaller communities will continue to depend heavily on family physicians.

THE FUTURE SUPPLY OF PATIENT CARE FAMILY PHYSICIANS

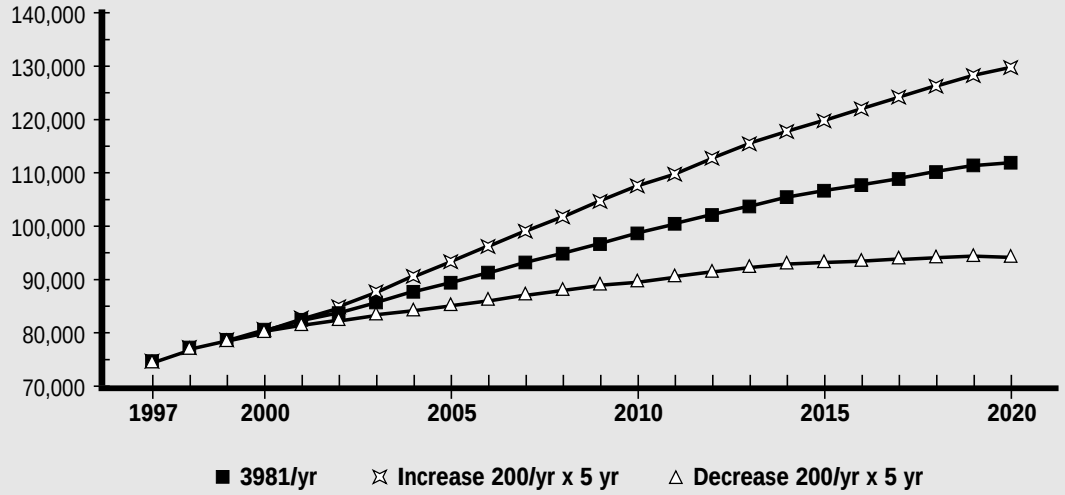
The recent increase in numbers of FP graduates, if maintained, will result in a significant rise in the national FP-to-population ratio. This will favorably affect rural communities, but the impact will be attenuated as the proportion of female physicians increases.

We have projected numbers of family physicians and family physician-to-population ratios for the nation and for rural (non-MSA) areas to the year 2020. Our projections are based upon three different scenarios: 1) a continuation of the current family physician output of 3,981 annually; 2) an increase of 1,000 graduates over five years (200 per year); and 3) a decrease of 1,000 graduates over five years. These three scenarios encompass viable possibilities of future trends and allow for quantitative predictions of the family practice workforce. Projections are for active patient care family physicians excluding resident physicians and those in administration and academia, and are derived from the Bureau of Health Professions Physician Supply Model, which uses numbers of new entrants to the workforce and historical rates of attrition from the workforce.[36]

We obtained information on the 1997 patient care family physician workforce, excluding resident physicians, from the AMA Masterfile and from the Master File of the American Osteopathic Association (AOA). Using current Metropolitan Statistical Area (MSA) definitions, we identified numbers of non-metropolitan and metropolitan patient care FP/GPs, excluding residents, and stratified them by age and gender. Numbers and gender of current FP residency graduates were obtained from the AAFP[34] and the AOA*.

Attrition from the patient care family practice workforce may occur in three ways: movement to non-patient care activities such as administration, switching to another specialty, and retirement from medicine. At present, 4.4% of active FP/GPs, excluding residents, indicate they are in academic or administrative positions. Half of this 4.4% overall loss is assumed to occur soon after residency and half over the next 20 years of the physician's working life. The probability of switching to another specialty by physician age and gender was calculated from self-reported specialty change data from the AMA Masterfile.[37] The Bureau of Health Professions Physician Supply Model

FIGURE 4
Total Practicing FP/GP, 1997 - 2020*



*Excludes resident physicians and physicians in academic and administrative positions.

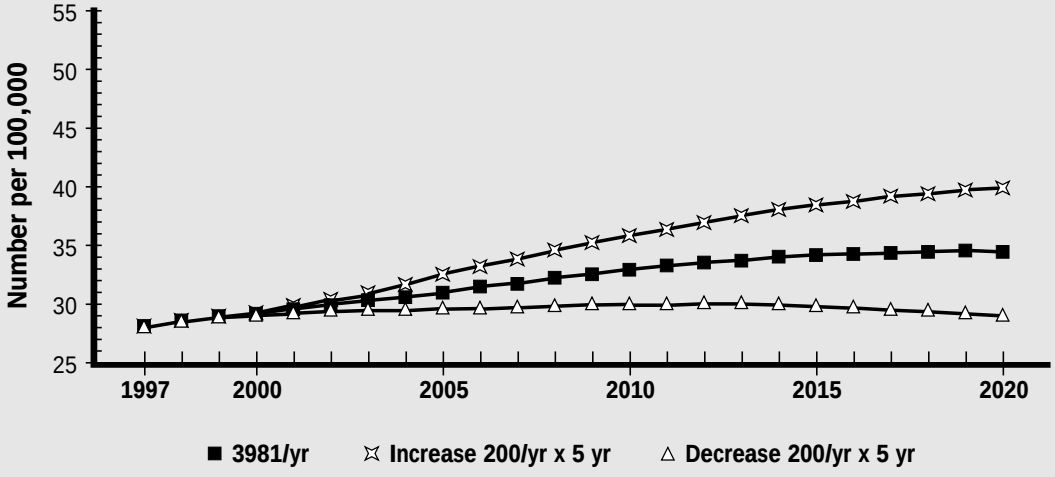
* Personal communication from Michael Wallace of the American Osteopathic Association, Chicago, Illinois.

provides the age and sex specific retirement and death rates. About 11% of FPs in patient care are expected to leave patient care through either specialty shifting or moving to a non-patient care position over a 40 year professional lifetime.

AMA Masterfile data indicate that 11% of active patient care FPs are above age 70. While careful studies have not been performed, it is likely that many of these physicians have very limited practices and many have retired but not notified the AMA. Consequently, physicians over age 70 were excluded from our analysis.

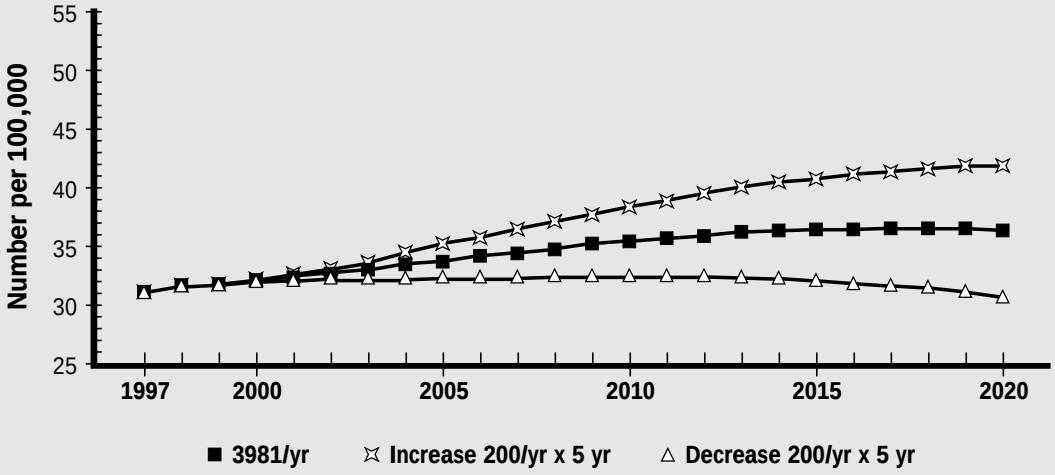
Figure 4, using the above assumptions, illustrates projected increases in numbers of family physicians from 1997 through 2020. If current numbers of family physicians continue to graduate from family practice residencies, the total number of practicing family physicians, excluding residents, will increase 49% to 111,870 by the year 2020. Using Bureau of the Census resident population projections, the anticipated national FP-to-population ratio is expected to increase 23% to 34.4 per 100,000 population in 2020 (Figure 5). Had physicians over age 70 been included, FP-to-population ratios for 2000 and 2020 would have been 9% and 5% higher respectively.

FIGURE 5
Total Practicing FP/GP per 100,000 Population*



*Excludes resident physicians and physicians in academic and administrative positions.

FIGURE 6
Rural Practicing FP/GP per 100,000 Population*



*Excludes resident physicians and physicians in academic and administrative positions.

The projection of numbers of rural family physicians must take into account the percentage of women and the lower probability that women will enter rural practice. The proportion of women in family practice residencies has increased from 19% in 1980 to 46% in 1999.[34] Currently, 16.2% of female FPs and 23.5% of male FPs who are less than 45 years old practice in non-MSA counties. Combining these rates, and recognizing that 46% of graduates are women, 20.1% of current graduates are expected to practice in non-MSA counties. Inasmuch as 20% of the population also resides in rural (non-MSA) counties, current FP graduates will enter non-metropolitan practice in proportion to the general population.

The urbanization of American society has not ceased. Projections of the size of the rural population provided by Standard and Poor's DRI[38] suggest that the rural population, while continuing to increase, will fall from 20% of the population currently to 19% in 2020. Therefore, the proportion of

family practice graduates entering rural practice is assumed to decrease gradually from 20% today to 19% in 2020.

Using the above assumptions, the FP-to-population ratio in rural (non-MSA) counties will increase 17% from 31.1 to 36.3 per 100,000 population in 2020 (Figure 6).

DISCUSSION

Our projections indicate that the nation will have an increasing supply of family physicians if numbers entering family practice continue at current rates. Assuming that FP residency graduates continue at 4,000 per year, the average FP-to-population ratio in rural (non-MSA) counties should increase modestly by 2020. The 52% increase in family practice graduates that occurred between 1992 and 1999 is proving to be critical for rural America. Had these increases not occurred, the FP-to-population ratios in non-MSA counties would fall as the rural population rises and the proportion of women in the FP workforce increases.

The proportion of women in the FP workforce is projected to double from 20% to 41% in 2020. Women have a slightly longer work life and are less likely to change specialty.[37] They are also less likely to practice in rural areas. The net impact in 2020 of doubling the proportion of women will be a 1% increase in total FPs and a 5% decrease in numbers of rural FPs. Studies are needed to ascertain why women select or do not select rural practice.

Our analysis includes both allopathic and osteopathic physicians. Osteopathic physicians are major contributors to rural healthcare, primarily because 46% of graduates have entered family practice. These osteopathic FPs have entered rural practice at rates almost equal to allopathic FPs.[6] Our 1997 Masterfile data indicate osteopathic physicians represent 5% of all physicians, 18% of all practicing FP/GPs and 16% of rural FP/GPs. The number of osteopathic medical school graduates has doubled over the past 20 years and will continue to increase for the next few years.[5,39]

We are also currently completing projections for numbers of general internists and general pediatricians. These data also suggest major increases in numbers of graduates in these specialties as well. Consequently, if current patterns continue, the nation can expect an increasing supply of generalist physicians after three decades of no generalist to population increases. The increasing numbers of general internists and pediatricians will primarily affect urban areas.

To our knowledge, this study is the first to attempt to project future physician supply for rural America. The methodological assumptions on which projections are based must be recognized. The projection model is based upon historical rates of retirement from practice. An increase in retirement rates, a realistic possibility in the current environment, could significantly reduce total numbers of family physicians. Historically, a high percentage of family physicians have been in direct patient care. An increase in the proportion engaged in non-patient care activities could lead to lower than expected numbers of patient care FPs. As already documented by Kahn et al.[40] and by Vector Research Inc. (VRI)[37], the likelihood of switching to another specialty has historically been low. Our production model, using annual rates of switching to other specialties as prepared by VRI, assumes these historically low rates will continue. Female FPs are less likely to change specialty than male FPs. Thus, specialty switching by FPs may be even lower in the future.

Rates of entry into and exit from rural practice also may change. AAFP data demonstrates that a declining percentage of graduates is selecting small town practice. Much of this decline can be explained by the decreasing proportion of the population that is rural and by the increasing proportion of women among FP residency graduates. The proportion of men and of women practicing in non-MSA counties appears to be constant across all age groups for each sex. Further, 1998 residency graduates plan small town practice at rates similar to practicing FPs when stratified by sex.[41] Thus, the projected rates for rural practice, which take into account the differential rates of rural practice by sex, appear to be reasonable. Further, as numbers of generalists increase in urban areas, rural practice may appear more attractive.

As with all physician workforce projections, the most questionable assumptions are those based on projected urban and rural population increases. These projections are dependent on many assumptions about rates of birth and death, immigration rates, and on assumptions about demographic trends in urban/rural distribution. As a result of the multiple assumptions, short-term projections are likely to be more accurate than long term.

The masterfiles of the AMA and the AOA are the only comprehensive sources of data on the physician workforce and thus serve as the "gold standard." The accuracy of the data is dependent on the self-report of physicians. A recent study by Konrad, using physician verification by local pharmacists,

suggests that current numbers of rural practitioners may actually be 20% below the AMA Masterfile figures.[42] If these findings are verified, our projections may significantly overestimate numbers of rural FPs.

As populations increase in some non-MSA counties, some will become metropolitan areas. Specialists can be expected to settle in these larger non-metropolitan areas and in the new MSAs. Thus access to specialists will improve in many of today's non-metropolitan counties as their populations increase.

U.S. medical students have repeatedly changed their patterns of specialty choice.[43] The increasing interest in the generalist specialties during the 1990s provides convincing evidence that the market does affect student career choice. Today's higher interest in the generalist specialties, not only in family practice but also in general internal medicine and pediatrics, could be transient and might change with future changes in the marketplace. Increasing consumer demand for "choice" of physician may curtail growth of "gatekeeper" forms of managed care, thus reducing demand for primary care physicians. Anecdotal reports suggest that some recruiting firms are noting a continued demand for specialists and a leveling off of demand for generalists.[44] Some are suggesting an impending surplus of generalists.[45,46]

Associated with the above, the number of U.S. graduates matching in family practice, primary care internal medicine and in medicine/pediatrics decreased by 8% in each year between 1997 and 1999.[47] At the same time, small increases occurred in categorical programs in internal medicine and pediatrics. Whether these changes reflect a declining interest in generalism is unclear.

The reduction in numbers of U.S. graduates matching in FP residencies, even if sustained, may have little impact on numbers completing these programs. Unfilled positions historically have been filled by osteopathic and international medical graduates. On the other hand, the number of residency positions could be reduced as a result of effects of the Balanced Budget Act of 1997 or because of other future reductions in GME reimbursement. Such decreases would reduce numbers of FP graduates

POLICY IMPLICATIONS

COGME guidelines suggest that generalist physician supply should be in the range of 60-80 generalists per 100,000 population.[48] Currently, rural (non-MSA) America has only 50 practicing generalists per 100,000 (31 FP, 13 general internists, 6 pediatricians). Our calculations project a modest increase in family physicians to 36 per 100,000 by 2020. Projections for rural general internists and pediatricians will be completed in the near future. Recognizing the small proportion of general internists and pediatricians who enter rural practice and the increasing proportion of women in these specialties, it is unlikely that rural generalists will exceed COGME's minimal level of 60 per 100,000 by 2020.

From a policy perspective, workforce needs in family practice must be considered separately from those in the other generalist specialties. Family practice is unique among the specialties in its ability to meet the primary care needs of smaller rural counties. A strong argument can be made that numbers of FP graduates should be increased above current levels to assist in meeting rural physician workforce needs. Numbers of FP graduates should at a minimum be maintained at current levels of approximately 4,000 annually.

Medicare GME reimbursement and Title VII grants for residency education under the Public Health Services Act have been extremely important in maintaining the financial viability of FP residency programs. Title VII training grants will be even more important to sustain residency programs as Medicare reductions reduce hospital incentives to maintain family practice residencies.[19] Title VII grants for predoctoral education, as well as grants supporting Area Health Education Centers, also assist in funding rural training tracks for medical students.

Numerous studies have demonstrated that physicians are more likely to select non-MSA practice if they have a rural background, enter a medical school with a commitment to rural medicine, select the specialty of family practice, and have rural experience as a part of their residency program.[20,49-58] Medical schools and residency programs should continue to emphasize recruitment of candidates with rural backgrounds and should provide rural healthcare experience in their educational programs.

An increasing number of rural family physicians may not benefit the most underserved rural areas, which typically are financially and socially disadvantaged. Poorer and less attractive rural areas will likely continue to suffer from physician shortages. Continued federal support for programs such as the National Health Service Corps and for Community Health Centers is essential in meeting the primary care needs for these populations. State

government also has a major role in enhancing access to medical services in disadvantaged rural areas.

In summary, recent growth in numbers of family practice residency graduates is good news for rural America as well as for the nation as a whole. For the first time in a century, the ratio of FPs-to-population is increasing in both rural and urban areas. These increases should be sustained, but there are threats to these favorable trends. Interest in family practice by current U.S. medical students appears to be diminishing and hospitals may have less motivation to maintain FP residency positions as a result of reduced Medicare GME funding. Medical schools should select students with rural backgrounds, provide rural educational experiences and emphasize opportunities in family practice if recent increases are to be maintained. Incentives must be continued to maintain family practice residencies. Adequate numbers of family physicians have been, and will continue to be, essential for the primary healthcare needs of rural America.

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Physicians in the Public Health Workforce

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Our ever-changing health care system requires continual examination of the degree to which both the public and private sectors are meeting the nation's health care needs. A recent document by The Lewin Group (1997, pg. 1) points out that the traditional distinction between personal health care and public health services is blurring. Both public and private providers are expected to be more accountable and efficient. Policy makers, public health professionals, and researchers are trying to determine if the existing public health infrastructure is adequate to support evolving responsibilities. However, the problem is, and has been, that these groups do not have access to comprehensive information on the capacity and function of the public health system.

The public health workforce, a component of the public health infrastructure, has long been the focus of Federal governmental efforts extending back at least twenty years. Most of the government-sponsored workforce studies and reports of collective expert opinion were published by the U. S. Department of Health and Human Services (DHHS) in the 1980s, but that information source, with a few exceptions, has been dramatically diminished since then. Moreover, those early attempts to describe the public health workforce, document supply, and determine requirements took the approach of examining the public health workforce in general, and only occasionally presented data on the physician component of the public health workforce.

The purpose of this paper is to outline the nature of the documentation to date on physicians who do public health work and to suggest further approaches to gather appropriate data. Sources dealing with the general public health workforce are included because they provide the context for a closer examination of physicians as a subgroup. Much of the difficulty in studying physicians as a group in the public health system is that they are so diverse in where they work, the functions they perform, and the training they have had.

WHAT PHYSICIANS IN PUBLIC HEALTH DO

Physicians in public health strive to achieve the goal stated in *Healthy People 2000: National Health Promotion and Disease Prevention Objectives* (DHHS, 1990) of "healthy people in healthy communities." They often work as team members and in partnerships with other societal entities to achieve the national goals of increasing the span of healthy life, decreasing health disparities, and achieving access to preventive services for all Americans. They are trained in many public health functions: detection of health problems; assessment of community health status; prevention of disease, disability, injury, and premature death; health education and promotion; health services administration and planning; organization and delivery of personal health services by public health agencies; control or elimination of environmental or occupational factors contributing to health problems; and research for more effective public health programs (DHHS, 1982, pg. 33). They serve as health planners and administrators, teachers, researchers, and clinicians working for state, country, and local health departments, the military, the Federal government, industry, hospitals, professional associations, academic institutions, and more recently, health maintenance organizations. Their program efforts deal with public health problems such as HIV/AIDS, handling of toxic wastes, substance abuse, health emergencies like hurricanes and floods, antibiotic drug resistance, and responses to bio-terrorism. They serve such population groups as the elderly, poor, disadvantaged, migrant and immigrant populations, and infants and their mothers. They deliver a variety of prevention services in the community, be it workplace, school, or locality.

DEFINITIONS

Earlier definitions of the "public health workforce," based on local, State, and Federal government health agencies where individuals are employed, have been criticized. Instead, *The Public Health Workforce: An Agenda for the 21st Century* (DHHS, 1997) took a functional approach by including all individuals responsible for providing ten "Essential Public Health Services." This list was part of the *Public Health in America* mission statement adopted in 1994 by the Public Health Functions Steering Committee. On the list were services involving education, community health status monitoring, health problem diagnosis and investigation, community partnership mobilization, policy development, law enforcement, linkage of people to personal health services, competent

workforce assurance, evaluation of effectiveness and accessibility, and research.

Functional definitions have been frequently proposed. The Lewin Group (1997) defined the "public health infrastructure" as "the systems, competencies, relationships, and resources that enable performance of the essential services of public health for every community" (pg. i). Tilson and Gebbie (1998, p.5) added skill elements to their definition of the "public health physician;" that individual is "one whose training, practice and world view are based in large part on a population focus rather than individual practice; that is, on assuring the availability of essential public health service to a population using skills such as leadership, management, and education as well as clinical interventions."

The use of the ten "Essential Public Health Services" has not been criticism-free. Issues of whether to count part-time individuals and concerns over possible omission of personnel in academic public health programs, especially those not captured under the services of training and research activities, have been raised (Rowitz, 1999). Many of those in the field of workforce enumeration have suggested that a lack of a standard agreed-upon definition of public health workforce has hindered research.

VARIED TRAINING

Physicians who have had training in public health skills generally fall into two categories: a) those whose training in public health culminated in Master in Public Health (M.P.H.) or Master of Science in Public Health (M.S.P.H.) degrees and b) a smaller number who have graduated from a preventive medicine residency, during which they also received an M.P.H. Beyond this educated group, there is an estimated large number of physicians who do public health work never having been formally trained in public health; they may be physicians in family medicine, internal medicine, pediatrics, and so forth who carry out public health functions.

For fifty years the American Board of Preventive Medicine has been certifying appropriately trained professionals. Certification requires one year of clinical training in an Accreditation Council for Graduate Medical Education (ACGME) accredited residency program, an academic year leading to an M.P.H. or its equivalent, and a practicum year. The academic year includes core courses in epidemiology, biostatistics, environmental health, and health administration/management. The practicum year consists of experiences in a variety of settings to develop practice skills in population-medicine. The three certification specialty areas are General Preventive Medicine/Public Health (the two areas were merged in 1983 for examination purposes), Aerospace Medicine (very small, specialized group), and Occupational Medicine. As of 1999, the number of living diplomates of the American Board of Preventive Medicine was 6,091 comprised of Aerospace Medicine 897, Occupational Medicine 2,442, Public Health and/or General Preventive Medicine 2,755 (Lane, 1999).

Preventive medicine residency programs most often are in medical schools, but can be offered by health departments, schools of public health, federal and military institutions, and corporations. Currently, 90 preventive medicine residency training programs are listed as being accredited by the ACGME (American Medical Association, 1999). Lane (1999), using information from the AMA GME database, reported a decline in the number of residents in preventive medicine training from 441 in 1993 to 420 in 1998. Within specialty areas, the most prominent declines were in public health and in general preventive medicine. Only half of U.S. medical schools (63) have independent departments of preventive medicine; another 30% have combined family and community medicine departments; the remaining 20% have neither.

Lane (2000) outlined the varied funding sources for preventive medicine residency programs. Government funding sources include Title VII, the Veterans Administration, National Institute for Occupation Safety and Health, and Department of Defense. Title VII, while a major source of funding, has been relatively small in amount, averaging between $1.6 million and $2.0 million each of the last five years (HRSA, 2000). Moreover, preventive medicine training programs receive practically no Medicare GME financing because the residents are not in teaching hospitals. While there is provision for some GME funding in non-hospital settings, it applies only to services to individual patients. The public health functions performed in health departments and a myriad of community-based sites are not given recognition despite the fact that Medicare beneficiaries can profit enormously from population-based and preventive medicine-based approaches to health care.

Most of the available information on physicians graduating from programs in public health has come from Federal Government Reports to Congress that used a variety of data sources. DHHS (1982, pg.

192) reported that the percentage of physicians entering Schools of Public Health had radically declined since they were first accredited in 1946-47. Then 61% of all students admitted for the Masters degree were physicians (although the actual number was not available). By1965-66 it was 23% (436 physicians); by 1978-79 it was 11% (393 physicians). Subsequent Reports to Congress provided similar types of data. Of 3,268 graduates from 23 schools of public health in 1985-1986, 541 (16%) had prior medical degrees (DHHS, 1988, pg. 11-15). A shortage of qualified faculty, especially physician faculty in accredited Schools of Public Health was noted (DHHS, 1990, pgs. IX-7 and IX-9). As reported by DHHS (1993, pg. 94), in addition to 26 accredited schools of public health, there were 7 accredited health education programs, and 11 community medicine programs awarding a Masters degree, as were an additional 69 non-accredited programs. The latest list of US accredited programs included 29 Graduate Schools of Public Health, 12 Graduate Programs in Community Health Education, and 23 Graduate Programs in Community Health/Preventive Medicine (American Public Health Association, 2000). There are also more than 300 non-accredited programs offering related degrees in areas such as health administration and education, and environmental health. However, the number and distribution of physicians graduating from these other programs is a matter of speculation (Pew Health Professions Commission, 1993, pg. 102).

EARLY ENUMERATION DATA ON THE PUBLIC HEALTH WORKFORCE

Public Health Personnel in the United States, 1980 (DHHS,1982) provided estimates of the overall public health workforce that were widely referenced in subsequent years. More than 500,000 people made up the public health workforce, but only half (250,000) were considered the primary public health workforce, spending the majority of their time in public health. Most worked for public agencies. Only 50,000, however, had training in public health and of those, between 28,000 and 30,000 had graduate degrees from schools of public health (pgs. 33 and 35). By area of specialization, it was estimated that there were 2,000 physicians in occupational health and safety, all with graduate public health training, and 4,000 physicians in public health practice and program management, of which 3,000 had such training (pg. 36). This same document referenced data collected in 1977 by the Association of State and Territorial Health Officials (ASTHO) in their annual survey of 57 State and Territorial health agencies (SHAs). The survey is of employees of official SHAs, their contract consultants, and local health department employees whose wages are paid by the SHA. Of a total group of 71,603 public health professional, administrative, and technical personnel, 3,937 were physicians (5.5%). Physician positions are distributed among program areas as follows:

Noninstitutional personal health	1,083
SHA-operated institutions	2,188
Environmental health	12
Health resources	208
Laboratory	52
General administration & services	238
Other and not allocable	156

The Graduate Medical Education National Advisory Committee or GMENAC (1980), taking a different approach, provided a wide range of needs-based information to panels of experts from each medical specialty who then determined specialty physician requirements for 1990. Of 27 medical specialties, preventive medicine was one of four that were forecasted to have requirements larger than supply in 1990. Only 75% of the preventive medicine physicians needed would be available. GMENAC predicted a 9% decrease in preventive medicine physicians from the1978 figure of 6,100 to 5,550 by 1990. Because the projected requirement for 1990 was 7,300, the shortage would be 1,750 physicians. According to Pearson et al (1988), estimating the preventive medicine physician requirement was made difficult by a number of factors: existence of subspecialties within preventive medicine, a relatively large number of physicians who enter the field at midcareer, and a question as to whether preventive medicine is a clinical specialty. The last point engendered considerable debate, with GMENAC ascribing little clinical activity to the specialty of preventive medicine.

Concerned that ignoring clinical time would artificially lower the estimate of need for preventive medicine physicians in the future, an American College of Preventive Medicine (ACPM) Manpower Committee, under contract with BHPr, did a clinical survey of preventive medicine physicians in 1985 (Pearson, 1988). Using the AMA Masterfile, they mailed the survey to 1,000 randomly selected self-designated preventive medicine physicians, 942 of whom could be located by mail. Of that number, 419 responded for a rate of 44%.

Seventy percent of the respondents (293 out of 419) spent at least half a day per week engaged in clinical practice; 16% spent at least 90% of their time seeing patients; 21% practiced clinical medicine at least 50% of the time. Differences existed by gender and sub-specialty; 40% of the males and 20% of the females spent at least half their time seeing patients. Fifty-seven percent of the occupational physicians and 47% of the aerospace physicians spent at least half their time seeing patients, while the percentage for public health physicians was 17% and for general preventive medicine physicians 28%. The work settings for the 293 preventive medicine physicians doing clinical medicine for at least part of the workweek are given below. Note that the percentages total to more than 100% because 30 individuals spent at least half a day a week at two or more settings:

- 32% worked in occupational settings
- 18% in federal, state, or local health departments
- 13% in solo practice
- 13% in "other practice," most often as an occupational medicine consultant
- 11% in group or HMO practices
- 11% in military settings
- 11% in academic settings
- 3% in emergency rooms

The ACPM survey assessed other variables such as time spent according to practice setting, proportion of clinical activities focusing on prevention, physician perception of whether they practice medicine differently from other clinicians, career changes, work settings of board certified physicians, areas of preventive medicine training, clinical skills and knowledge.

The year 1988 was significant in the national debate about public health because it was the publication year of the Institute of Medicine (IOM)'s study, *The Future of Public Health*, sponsored by the Kellogg Foundation, CDC, and HRSA. The study reported that the nation had lost sight of its public health goals and the public health system was in "disarray." Public health had problems of definition, support, and public understanding. Public health services were inadequate due to lack of well qualified professionals, and the expertise that existed was unevenly distributed. Students were likely to be deterred from entering public health because of low salaries and an unrewarding professional environment. Schools of public health were urged to spend more time on training and to forge practice links with state and local agencies.

There were a number of responses to *The Future of Public Health.* The *Eighth Report to Congress* (DHHS, 1991, pg. 173) mentioned a jointly funded contract by BHPr and CDC with Johns Hopkins University School of Hygiene and Public Health to develop a consortium to address the issues raised. The concerns were significant because public health personnel were expected to be able to implement programs for meeting the nation's health objectives described in *Healthy People 2000: National Health Promotion and Disease Prevention Objectives* (DHHS, 1990). There also was to be a Public Health Work Force Data Consortium, comprised of three Federal agencies and seven professional associations, that was addressing the data deficiencies through surveys of state and local health department staffs and other projects (Pg. 44).

The Public Health Foundation, under contract with BHPr, (1992) sought to provide data with regard to state health agencies (SHAs). Surveys were mailed to the 55 SHAs in 50 states plus territories and the District of Columbia, asking for the number of FTEs in given occupational categories on the SHA payroll as of December 31, 1989. Based on 87% response rate, the SHA workforce was found to consist of 130,017 professional, technical, and administrative staff, equating to an average of 5.2 SHA workers per 10,000 state population, a figure that had been fairly stable over the previous decade. The number of physicians in 1989 was 1,939 compared to 1,974 in 1979, which was a change of –1.8%. Of all the occupational categories, the highest number of budgeted position vacancies was 157 or 22% for public health physicians. For physician epidemiologists there were 11 vacancies or 20% of budgeted positions for that category. The physician administrator vacancies were 44 or 11.5% of budgeted positions. Some of the reasons cited by SHAs for the problems in recruiting physicians included salary level, lack of qualified applicants, and geographic location. While the data could not answer the question of whether staffing was adequate to meet public health needs, the report reiterated the conclusion held by many that a shortage of qualified public health professionals existed. Evidence was offered in terms of the SHA vacancy rates as well as the persistence of many adverse health indicators reflecting gaps in public health services.

Public health issues were regularly addressed in DHHS's Reports to Congress on Health Personnel.

The *Sixth Report* (DHHS, 1988, pg.11-24) underscored the need for more physicians trained in public health and preventive medicine, especially physician epidemiologists. The same was echoed in the *Eighth Report* (DHHS, 1991, pg. 44), adding that public health problems are more severe in minority populations yet few minority professionals choose careers in public health. At this point more and more mention was made of the lack of comprehensive workforce data in public health. The *Seventh Report* (DHHS, 1990, pg. IV-F-1) stated that instead of adequate, timely data on public health professionals, there is reliance on judgment of experts. The more comprehensive surveys conducted in the early 1980's were gradually abandoned. Harmon (1996, pg. 9) suggested some factors contributing to the termination of such studies: the complex array of professions and occupations within public health, poor response rates to surveys, delays in reporting the data, lack of standard terminology, problems with study validity, and high costs. Harmon had been asked by DHHS to review USPHS activities in training and education for public health because there was lack of focus and coordination around such efforts. The study found significant shortages in a variety of public health fields including preventive medicine and a shortage of faculty in the 25 accredited Schools of Public Health and 14 other accredited graduate programs. One of the recommendations was to increase resources for tracking the public health workforce.

COGME, in a number of its reports, also addressed the issue of shortages in preventive medicine. The Council in its *First Report* (COGME, 1988) was persuaded that the GMENAC assessment remained valid, particularly in light of public concerns about environmental and occupational health risks. They remarked that the number of preventive medicine training programs had not increased and the number of qualified applicants exceeded the number of available positions by a factor of four. The *Third Report* (COGME, 1992) noted that the virtual absence of GME funding posed a barrier to training; at that time only 13 preventive medicine residency programs were receiving Title VII training grants, as compared to 20 in 1983. The *Fourth Report* (COGME, 1994) recommended as a national goal that the percentage of physicians trained and certified in a number of specialty fields, including preventive medicine, should be increased. The *Sixth Report* (COGME, 1995) urged that medical education curricula include population-based medicine, epidemiology, ambulatory and managed care, and preventive medicine.

STUDIES IN SPECIFIC AREAS WITHIN PUBLIC HEALTH

Specific areas within public health have received a some research attention. Gunn et al. (1989) surveyed state epidemiologists in 46 states in 1983. They identified 224 state health department epidemiologists, approximately 1.1 epidemiologists per million population. Fifty-seven percent were physicians; they focused mainly on general epidemiology and communicable disease programs. Based on overall findings and collective experience, they concluded that state health departments have too few epidemiologists to address the wide variety of important public health problems facing communities. One of the recommendations was that each state health department have at least four epidemiologists (including one or more physician epidemiologists) and that the epidemiologist-to-population ratio not be less than 1 per million.

Castorina and Rosenstock (1990) tried to determine future training needs for physicians in occupational and environmental medicine based on goals established by the Institute of Medicine. Looking at previously published estimates and currently available data, they produced revised estimates. Need was estimated to be 4,600 to 6,700 physicians (board-certified or eligible or with special competence in occupational and environmental medicine). Supply was estimated to be 1,200 to 1,500. To address a deficit of 3,100-to-5,500 physicians, an increase in graduate specialty training 3 to 5 times the current maximum capacity was recommended.

Cordes (1996) surveyed directors of General Preventive Medicine and combined General Preventive Medicine/Public Health programs in the U.S. that listed such emphases in the *Directory of Preventive Medicine Residency Programs in the United States and Canada.* Of the 14 programs surveyed, over 50% included occupational and environmental medicine training opportunities. Commenting on the Castorina and Rossenstock data, Cordes felt that the 4,600-to- 6,700 needs figure was an underestimate because it did not include the additional demands for occupational physicians by industry and public health agencies.

STUDIES ON GRADUATES FROM PREVENTIVE MEDICINE RESIDENCIES

Some of the most in-depth studies done in the 1990s have been done on graduates of preventive

Glass

TABLE 1

Percentages of Preventive Medicine Residencies (PMR) Graduates From Various Categories of PMR Programs, 1979 - 1989

Type of PMR Program	*No. of Programs*	*% of All PMR Grds*
CDC	1	14%
Public Health School	8	38%
Medical School	23	33%
Health Department	9	12%
Military	2	4%

medicine residencies (PMRs), who form a smaller subset of the total group of physicians doing public health work. This physician subset is an easily identifiable group that has been studied by professional associations, often with support of governmental agencies.

The most recent extensive study was done by Battelle (Hersey et al., 1992), under contract by CDC and HRSA, which surveyed PMR graduates between 1979 and 1989. The study focused on graduates of the 43 PMRs in general preventive medicine (GPM), public health (PH), and combined GPM/PH because two-thirds of all graduates go into these specialty groups. The purpose was to determine what types of work they do in order to determine training needs. The response rate was 75%, or 797 out of 1,070 PMR graduates from residencies at CDC, schools of public health, medical schools, health departments, and the military. Analyses were conducted for graduates from the categories of PMR programs noted in Table 1.

The results indicative of leadership were presented as follows:

- **Program Development, programs initiated**
  - 24% infectious disease prevention and control
  - 21% AIDS/STDs
  - 18% chronic disease
  - 11% maternal and child health
- **Program Management**
  - 33% of grads between 1979 and 1984 managed programs in public health, community health or preventive medicine, handling a mean budget of $22.3 million and supervising a mean of 260 staff.
- **Research**
  - 59% were engaged in research to prevent and control disease.
- **Clinical Preventive Medicine**
  - 68% of graduates from non-CDC PMRs were involved in patient care and 80% of those activities involved primary care or clinical preventive medicine.

Some of the other findings of the Battelle study were that the training setting often became the employment setting; in other words, graduates from CDC tended to work in government, graduates from health departments tended to work in health departments, and so forth. It should also be noted that PMR graduates remained heavily involved in public health; of those graduating between 1979 and 1989, 90% remained involved in public health or preventive medicine and 56% devoted more than three-quarters of their average work week to these activities. Regarding board certification, 45% of PMR graduates reported board certification in preventive medicine. Board certification was highest among graduates from military PMRs (88%) and health department PMRs (55%). Graduates from non-CDC PMRs were more likely to become board certified in preventive medicine if they were not already board certified in a clinical specialty and if they believed board certification in preventive medicine conveyed job advantage. The report also discussed funding through Title VII of the Public Health Service Act. Those PMRs receiving training grants had more than doubled their number of graduates. But the number of programs supported decreased from 20 in 1983, when funding began, to 13 at the time of the report.

Liang et al. (1995) reviewed the Battelle data and highlighted PMR graduates' degree of involvement in management. Sixty-four percent of those who worked in state and local health departments were responsible for administering a program in public health, community health, or preventive medicine, supervising a median of 60 staff and managing a median budget of $4.0 million. Twenty-six percent of those in the Federal government and 24% of those in medical care also were involved in administering programs. Some of the limitations of the Battelle study were discussed. There was no attempt to verify the self-reported responses, and non-responses were not random. Non-respondents were more likely to work in international settings and the subset of CDC non-respondents was more likely to work in medical care settings and be non-federal employees. Consequently, it was felt that PMR graduates' contributions to international health and to health care delivery were underestimated and the number of PMR graduates in the Federal government was overestimated.

DATA FROM THE AMA MASTERFILE

The AMA Masterfile has long been used as a source for physician workforce data. In an early Report to Congress (DHHS, 1982), that source was used to indicate that the number of physicians self-designating in preventive medicine declined from 8,349 in 1963 to 6,031 in 1978. Preventive medicine physicians comprised 3.2% of all active specialty-classified physicians in 1963, decreasing to1.6% in 1978 (pg 197). In 1978, 42% were board certified in preventive medicine. Most were employed in government: 32% in local, 25% state, and 9% federal agencies (pg. 198).

Using data from the latest edition of AMA's *Physician Characteristics and Distribution in the US* (1999) and doing some additional calculations, Lane (1999) presented comparative data from 1970 to 1997. In 1997, federal and non-federal physicians self-designating in aerospace medicine, general preventive medicine, occupational medicine, and public health in total numbered 6,885, down from 7,734 in 1970. When viewed as the percentage of all U.S. physicians, there was a steady decline from 2.3% in 1970 to 0.9% in 1997 (pgs. 20-21). In terms of work activities in 1997, direct patient care comprised 58.2% of their activities compared to 82% for all U.S. physicians. Administration or management was 28% of their time compared to 2.1% for all U.S. physicians (pg. 57).

PHYSICIAN SATISFACTION AND INCOME DATA

Many have speculated on why more physicians aren't going into public health or preventive medicine. Low levels of remuneration and prestige relative to other medical specialties have long been cited as reasons (1982, pg. 193). Returning to the Battelle data from 1992, Salive (1997) sought to analyze the data specific to physician satisfaction. Survey information was complete for 778 PMR graduates who completed programs between 1979 and 1989. The majority of physicians in the group were white and male; 32% were female and 14% were minorities. Their primary work affiliation was evenly divided among Federal government, state and local government, academia, and medical care. Thirty-one percent were in administrative positions and 54% in academic positions. A typical work week averaged 50 hours. While the overall job satisfaction rate was high, 88% claiming to be either satisfied or very satisfied, differences existed according to primary work affiliation. Federal government employees had the highest mean satisfaction rating for job overall, research opportunities, and time to pursue outside interests. Those in medical care settings had the highest ratings for respect with which they are held by other physicians and for the sense of making a contribution to people's lives. With regard to income, 68% earned between $50,000 and $100,000. Satisfaction with income was highest in the settings of private business and the military; it was lowest in academia. The researchers noted that by 1997, the time of article publication, major health system changes had already taken place which would probably result in different physician ratings.

Job satisfaction assessment includes measurement of salary, income, or earnings. Such information is not regularly reported for public health/preventive medicine physicians because they form such a small specialty group among all U.S. physicians. The journal, *Medical Economics*, for example, conducts an annual earnings survey of physicians but those in public health/preventive medicine are so few in number as to fall into the category of "other." Similarly, the AMA's *Physician Socioeconomic Statistics* is based on a randomly selected group of 4,000 physicians from the AMA Masterfile. So few would be physicians in public health/preventive medicine that any report for such a group would be fraught with error.

The data available on incomes of preventive medicine physicians have generally come from professional associations. The American College of Preventive Medicine (ACPM) sponsored a study (Salive, 1992) of the earnings of preventive medicine physicians. Using the December 1989 AMA Physician Masterfile, the researchers mailed a survey that was delivered to 6,979 physicians. The response rate was 54%. Seventy-one percent of respondents were working full time, with median earnings of $85,000 (mean of $90,000). Among those full-time, relatively higher earnings were associated with being male, aged 45 to 64, board certified in preventive medicine, and having clinical, business, or industrial sources as major income sources rather than governmental agencies or academic institutions. More specifically for full-time respondents:

- Physicians board-certified in Preventive Medicine with other boards ($96,900) and without other boards ($95,700) averaged more than those with other specialty boards only ($91,700) and considerably more than those not reporting board certification ($82,200).

- Region of residence was a factor with the highest salary in the mid-Atlantic region (mean $103,700) and the lowest in foreign sites and U.S. possessions (mean $67,100).
- Percentage of respondents stating the source of more than 50% of their earnings:
  - 48% stated the government; their mean income was $78,800
  - 11% academic, mean income $85,400
  - 13% clinical, mean income $102,400
  - 28% other (business/industry, private organizations), mean income $106,700.
- There was a $27,999 mean earnings gap between the private and public sectors which could contribute to the difficulty of recruiting well-qualified physicians into government.

A total of 285 respondents worked part-time and their response rate was 79%. This group was older and included more women, compared to those working full-time. Their mean earnings in 1989 was $41,000. Salive also compared median net incomes in 1989 across various specialities, using the AMA's Socioeconomic Monitoring System. The median net income of preventive medicine physicians ($85,000) was lower than that reported by family physicians ($90,000), pediatricians ($93,000), and internists ($120,000).

Salary data have been collected by ASTHO (1998) on state health officials who are the directors and commissioners for health. Physicians are included in this group but they do not make up the majority. Their last survey of membership, 57 states and territories in 1997, yielded a response rate of 84%. The following data include salary information that is not specific to physicians but to the larger group of state and territorial health officials:

- 26% of respondents had both MD and MPH degrees; 5% had MD degree only.
- Governors continue to be those who determine the vast majority of State and Territorial Health Officials' salaries and appointments.
- Salaries have increased since the 1995 survey, primarily at the lower end. In 1995 salaries ranged from $54,000 to $157,000 (average $102,273). In 1997 salaries ranged from $67,500 to $160,000 (average $105,353).
- In 1992, 28 states and territories required a physician for the health official position; in 1997, the figure was 26. What changed was an increasing requirement that physicians have something more than just an MD degree. Fewer entities required an MD only, but more required an MD plus a) MPH experience, b) board certification or state licensure, c) MPH or experience in public health, MPH and experience in public health or board certification.

ASTHO's survey also included data on salaries according to years of experience in public health, salaries according to the salary determining authority, fringe benefits, and how these officials are removed from their positions.

ENUMERATION STUDIES IN THIS DECADE

The National Association of County and City Health Officials (NACCHO) and Centers for Disease Control and Prevention (1995) focused on data relating to local health department (LHD) jurisdiction, personnel, annual expenditures, policy and planning activities, LHD data collection, agency services, health and safety complaints and requests, and top executive positions. The *1992-1993 National Profile of Local Health Departments* was the last full report of NACCHO in its ongoing effort to provide comprehensive information about LHDs, defined as "administrative or service units of local or state government, concerned with health, and carrying some responsibility for the health of a jurisdiction smaller than the state." Of 2,888 LHDs comprising the study population, completed surveys were received from 2,079 (72%). Of the responding LHDs, 79% had a full-time top agency executive. Thirty-seven percent of these executives had a medical degree (MD, DO, DVM, DDS); 25%, a medical degree alone, 11%, a medical degree and a graduate public health degree, and 1%, a medical degree and selected graduate degree. In a companion document, *1992-1993 National Profile of Local Health Departments Serving Big Cities* (NACCHO and CDC, 1995) 41 LHDs were noted as serving big cities: 19% serving jurisdictions of 250,000 to 499,999; 445 serving 500,000 to 999,999; and 37% serving 1,000,000 or more. Of the top agency executives in LHDs serving big cities, 63% had a medical degree: 18%, a medical degree alone, 35%, a medical degree and graduate public health degree, and 10%, a medical degree and selected graduate degree. NACCHO's last survey was in 1996-1997, but only a limited research brief was published.

Gerzoff and his colleagues at the Centers for Disease Control and Prevention (1999) re-examined the 1992-1993 NACCHO data, focusing on the

staff of the 2,888 LHDs surveyed. Usable data, provided by 66% of respondents, were categorized according to population size served by the LHD: small, less than 50,000, medium, between 50,000 and 500,000, and large, greater than 500,000. Physicians generally were not part of the small LHDs. The median number of physicians in the large LHDs was 4 while that in the mid-sized was 1. The data on the percent of LHDs of varying sizes to have at least one full time physician were 4% for small, 16% for medium, and 37% for large. Also provided were budgeted and vacant positions for the 1,892 LHDs. For the physician job category, there were 2,615 budgeted positions of which 177 were vacant yielding a vacancy rate of 7%. The physician vacancies were 3% of the total LHD vacancies. Acknowledged limitations were that real demand may be greater than vacancy rates. Moreover, reasons for vacancies were not examined nor was there any attempt to assess the qualifications of those filling the positions.

In another study, Gerzoff and Richards (1997) again used the 1992-1993 NACCHO data but focused on the changing composition of LHD directors. For this analysis, the 1,817 responding LHDs were headed by 1,491 executives. Five percent of the executives (75) served two LHDs. Data specific to physicians were:

- 32% of executives (483) held either an MD (97%) or DO (3%) degree.
- Of MD executives, 30% (146) also had advanced public health degrees and 17% (82) were board certified in preventive medicine.
- 77% of the 693 LHDs led by an MD (535) required the degree for the position.
- 50% (481) were full-time.

Table 2 depicts the variation that existed with regard to the size of the jurisdiction. Furthermore:

- Using 9 geographic divisions defined by the Bureau of Census, states in the West North Central region had the smallest overall percentage of MD executives, 13%.
- The 483 MD executives were distributed in the following jurisdiction types:
  - 56% (273) county
  - 18% (89) city-county
  - 8% (38) town/township
  - 7% (35) city
  - 8% (41) multi-county region
  - 1% (7) unknown
- Work activities:
  - 12% (58) of MD executive spent more than 25% of their time providing clinical services, but this varied according to size of jurisdiction:
- Jurisdictions of 50,000 or less–14% (35 of 258)
- Jurisdictions of 250,000 or more–8% (7 of 85)

Some of the factors contributing to the placement of non-physicians in health department executive positions were need for personnel educated in social sciences, business administration, and management; nonmedical administrators' success in hospitals, LHDS, and other settings; lower costs of nonmedical health directors; short supply of physicians in rural areas; and a small proportion of physicians wanting careers in public health agencies.

Recent information on local health department requirements (Hershey, 1999) indicates enormous variation among states. Of 49 states assessed, 15 required heads of local health departments have an MD degree. But even with these 15, the situation isn't completely straightforward. Alabama, for example, has had difficulty filling positions with physicians and uses non-MD administrators who are overseen by a state health official who is an MD. Michigan requires an MD degree, but only for localities with populations over 150,000. New York requires for populations over 250,000 both an MD and MPH. While the statute in California mandates an MD requirement for health officers, many are supervised by administrative health directors who are non-MDs.

The Washington, Wyoming, Alaska, Montana, and Idaho (WWAMI) Center for Health Workforce Studies reported in November, 1999, the results of a study of LHDs to determine the supply and types of public health personnel in predominantly rural Idaho and Wyoming. While the two states had very different structures, the composition and supply of

TABLE 2

Variation in Numbers of Local Health Department (LHD) Executives With MD Degrees, Based on Jurisdiction Size, 1992 - 1993

Jurisdiction size	*Ratio of Full-Time MD Execs to Other Execs*	*% of MD Execs Part-time*
Less than 50,000	0.07	77%
50,000 to 250,000	0.28	26%
More than 250,000	1.4 to 1	2%

the local public health workforce in each state was very similar. At the local level, public health was primarily a nursing function. The mean physician FTE per 100,000 population in LHDs was 0.08 in Idaho and 0.59 in Wyoming (Richardson et al, 1999).

A promising approach to the collection of public health workforce data was exemplified by Kennedy et al. (1999) who did a relatively comprehensive study at the state level in order to support workforce planning and policy making in Texas. A two-step methodology was used that had been developed by the American Public Health Association (APHA) under contract to BHPr in the mid 1980s. The purpose of the study was to develop estimates of the public health professionals in 1995 who are employed in agencies that provide population-based public health services. In Phase One a questionnaire was responded to by 81% of the 388 chief executives of a variety of organizations (official state public health, environmental health, mental health, and substance abuse agencies; other state and regional agencies that have subsidiary units providing public or environmental health services; local health departments; other community-based agencies; and private, nonprofit, or voluntary agencies). The data were used to develop a different questionnaire for use in Phase Two with a random sample of 2,425 employees. The questionnaires, based on the APHA's use of three criteria (type of work setting, type of work performed, and type of position), were revised in terms of the work activities and work settings to make them more compatible with public health functions. The APHA set of occupational titles was also used. The methods of data analysis, quite complex and not fully described, involved weighting of employee responses in the second phase to reflect the population from which the sample was drawn. And estimates made after the first phase were duly readjusted in light of data from the second phase that was at variance.

The study estimated that in 1995 there were 17,700 public health professionals employed, representing approximately 3% of the state's total health workforce. (In 1980 the estimated figure was 7%.) Of the public health workforce, about 55% were employed in agencies that provide population-based public health services. Only an estimated 7% of public health workers had formal education in public health. The estimate of physicians in the public health workforce, by occupational title, was 273 or 3.5% of the total public health workforce. While the report did not provide in-depth information about physicians, it would be possible with the existing data set to retrieve that information (personal communication with Dr. Kennedy). The state of Texas has commissioned another study of the public health infrastructure, but at the city and county levels. A major setting where physicians do public health is the health department.

DIFFICULTIES IN COLLECTING DATA ON PHYSICIANS IN PUBLIC HEALTH

Workforce studies of physicians in public health are plagued with the same sort of problems facing studies of the public health workforce in general. Some of the problems have already been mentioned. There is no consensus as to a definition of "public health" or "public health physician." Physicians in public health are extremely variable in their work settings, work functions, and public health training. Rowitz (1999, pg. 102) points out that there is no agreed upon classification scheme in studying the public health workforce that is clear, concise, and has mutually exclusive categories. Classification systems have varied criteria, some based on what a professional does, some on the population served, some on professional qualifications, and others on the underlying skills required (DHHS, 1997, pg. 7). A lack of strictly defined physician scope of practice, no national examinations, and no licensure requirements limit efforts to estimate supply (DHHS, *9th Report to Congress*, 1993, pg. 93). Moreover, there is no one association that can provide a single list of physicians who do public health work.

The search for appropriate indicators of workforce requirement is ongoing. Some studies have used vacancy rate as an indicator, although it has its limitations. Budgeted vacancies often reflect legislation and other government initiatives, and hiring is influenced by the economy and the public's perceptions about national health needs and economic trends (DHHS, 1982, pg. 38).

NEED FOR PHYSICIANS IN PUBLIC HEALTH

Physicians have held leadership positions since the beginning of this country's public health movement (DHHS, 1982). Their roles have included: laboratory, clinical, and field researchers providing the information basis for public health measures; consultants and administrators to public health programs; providers of personal health care; and faculty members of training programs for public health personnel (pg. 188). In 1988, the *Sixth Report to Congress* (DHHS) stated that physicians trained in

public health sciences are uniquely qualified for leadership in practice, research, and faculty roles identified as being in short supply (pg. 11-21).

Many in the field, conceding that public health physicians have an image problem, can suggest a litany of reasons. Public health efforts have commanded a relatively small portion of the health industry. The American public doesn't necessarily have the broader view; to them good health care means good medical care. Most health care providers focus on disease treatment in individual patients and are not aware of what public health/preventive medicine physicians have to offer in terms of a population-based approach. Preventive medicine and public health have low visibility in undergraduate and graduate medical education.

While some suggest that physicians are too expensive a commodity to be doing public health, others suggest that physicians are the individuals with the broad view necessary for public health leadership. It has also been claimed (Liang, 1995) that public health physicians understand the forces that influence physician behavior and because 80% of health care costs is determined by how physicians practice medicine, public health physicians can play a key role in controlling costs. They can serve as bridges between individual physicians and the larger organization by interpreting medical and cost-effectiveness data.

CURRENT EFFORTS IN PUBLIC HEALTH/PREVENTIVE MEDICINE

Without actual enumeration data regarding supply and requirements, the field is generally proceeding in its efforts to improve undergraduate medical education in this specialty. An effort of The Association of Teachers of Preventive Medicine (ATPM), begun in the 1980's, culminated in *An Inventory of Knowledge and Skills Relating to Disease Prevention and Health Promotion* (ATPM, 1991) which is intended to guide medical school curriculum development. More recently, ATPM and BHPr in collaboration have developed a set of *Core Competencies in Disease Prevention and Health Promotion for Undergraduate Medical Education* (Pomrehn et al, 2000, pg. 11) based on the *Inventory* and are developing an operational guidance for schools of medicine to enhance the teaching of prevention as it applies to various clinical disciplines (ATPM, 1999).

At the graduate level, a set of competencies for the three specialty areas of preventive medicine was developed under a HRSA contract (Lane,1995), building upon a set of core competencies already developed by the American College of Preventive Medicine (ACPM). The project also developed performance indicators for assessing competencies in preventive medicine residents. While much of the training efforts have occurred in the realm of PMR programs, it has been recognized that these programs provide limited training opportunities and there is a lack of incentive to fill the job market from these training programs (Tilson and Gebbie, 1998, pg. 3).

Recognizing the importance of preventive medicine and population-based medicine in medical education, Pomrehn et al (2000, pg. 6) assert that Departments of Preventive Medicine or their equivalents can provide the "unifying institutional framework to integrate prevention both vertically and horizontally throughout the entire medical education continuum."

FUTURE WORKFORCE PROJECTS

The Public Health Workforce: An Agenda for the 21st Century: Full Report of the Public Health Functions Project (DHHS, 1997), as mentioned in the earlier section on "Definitions," has set a tone for future studies of the public health workforce. The Public Health Functions Steering Committee, building on the core functions (assessment, policy development, assurance) identified in *The Future of Public Health* (Institute of Medicine, 1988), developed its ten "Essential Public Health Services." The Steering Committee in 1994 commissioned the Subcommittee on Public Health Workforce, Training, and Education to provide a profile of the current public health workforce and make projections for the next century. It was recommended, however, that the Steering Committee should continue to serve as the locus for oversight and planning for development of an adequate public health workforce to deliver essential services. A standard taxonomy should be used to identify the size and distribution of the public health workforce in official agencies (health, environmental health and protection, mental health and substance abuse; local, State, and national) and private and voluntary organizations. Efforts should be coordinated with the Bureau of Labor Statistics to enhance uniformity in occupational classification reporting.

DHHS, in its effort to obtain better public health infrastructure data at the federal, state, and local levels, commissioned The Lewin Group (1997) to develop a comprehensive data strategy to characterize

the public health infrastructure. The charge was to assess information needs, identify and evaluate existing data sources, develop alternative strategies for responding to identified gaps in available data. The Group emphasized the importance of building on the existing efforts of professional organizations such as NACCHO, ASTHO, and the Public Health Foundation. Surveys should be designed and fielded jointly at the state and local levels so that the relative contributions of each are fully explored and integrated. Such data should be supplemented with case studies in select small communities to provide the detailed, complex, qualitative data about the structure, nature, and scope of the public health infrastructure. The Group had a different view regarding the ten "Essential Public Health Services." While useful in describing what public health does, they do not serve as a useful reporting framework because the current national public health system is not structured, organized, or funded around them. It was suggested that one Federal government agency assume a long-term commitment to be the focal point in the effort to study the public health infrastructure.

As part of their work, The Lewin Group conducted site visits in ten states to understand what infrastructure data currently exists and how infrastructure-related data currently flow within local jurisdictions, to the state level, and within state agencies. They looked at existing data sources and found that few provide macro-level information that summarizes the basic structure, capacity, and functioning of public health organizations and many sources were "one time only" studies. Much of what state and local public health agencies have is expenditures data and human resource data located in personnel files. Some states like New York and Missouri appear to have been innovative in attempting to survey their local health departments to determine range of public health services.

CONCLUSIONS

There is only limited information regarding U.S. physicians in the public health workforce that is in-depth and current. Surveys of the preventive medicine residency graduates by the ACPM have provided some descriptive information. An approach to assessing a wider number of physicians in public health has been to use the AMA Masterfile list of physicians who self-designate as public health or preventive medicine physicians. Other limited sources of data include ASTHO, which surveys state and territorial health departments; NACCHO, which surveys local health departments; and ASPH, which is able to report on graduates of schools of public health.

Based on the available data, it appears that the number of physicians in public health/preventive medicine is steadily decreasing, although, it is not entirely clear what their total number is. Neither has there been consistent data on where these physicians are employed. Some studies suggest that governmental agencies at a variety of levels are the largest employers, but others suggest that not to be the case. Public health physicians as a group are involved in a variety of health-related activities. They do considerably more administration and management than U.S. physicians in general, but are top executives only in local health departments that have the largest jurisdictions. Only 15 states require that heads of the local health departments have MD degrees. Many public health physicians are involved in clinical work, although not to the same degree as other physicians.

The salaries of preventive medicine/public health physicians are at the low end as compared to physicians in other specialties, with physicians in private industry and business commanding the highest earnings. Board certification in preventive medicine seems to convey some remunerative advantage, contrary to what many public health physicians think. More is known about those completing preventive medicine residency programs; little is known about those who graduated from schools of public health; and virtually nothing is known about those who have had no formal training in public health.

The workforce area of physicians in public health is an area that has not received a great deal of public policy support. This may, in part, be due to public health/preventive medicine physicians not engaging in clinically reimbursable activities to the same extent as most of their physician colleagues. Yet, there are societal health needs as far as leadership in population health and preventive medicine that can only be met by physicians with specialized training in public health competencies.

RECOMMENDATIONS

The area of physicians in the public health workforce is in need of public policy attention. Our recommendations focus on two domains. The first recommendation focuses on a proposed study to gather more comprehensive data on the number of physicians performing unique public health functions. The second recommendation relates to a variety of funding mechanisms to increase support

for residency training in public health and preventive medicine.

First Recommendation

We recommend an enumeration study of public health/preventive medicine physicians who across several states, with an in-depth examination of the unique public health functions these physicians perform. This study should:

(a) Use the two-step research approach Dr. Virginia Kennedy used in Texas to develop estimates of public health professionals in agencies that provide population-based public health services. While Dr. Kennedy's methodology examined public health professionals broadly, it would be applicable to a study of physicians as a subgroup.

(b) Enlist the expertise and data collection capability of HRSA's regional workforce centers.

(c) Involve a variety of government and professional organizations in research planning, including, but not be limited to, the Centers for Disease Control and Prevention, American College of Preventive Medicine, Association of Teachers of Preventive Medicine, Association of Schools of Public Health, and Association of State and Territorial Health Officials.

Second Recommendation

We recommend funding for training physicians in preventive medicine.

(a) Increase Title VII funding to support more Preventive Medicine residents and faculty and provide more faculty development for physician faculty in these residency programs.

(b) Include preventive medicine residency training in Medicare's GME financing system. It needs to be recognized that promotion of preventive medicine and population health are relevant to the health care of the Medicare population.

(c) Extend eligibility for National Health Service Corps scholarships to preventive medicine residents, with the proviso that they work in state and local health departments to promote population health.

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