

Session 3
TRAINING FEDERAL STATISTICIANS

**SURVEY AND STATISTICAL TRAINING
AND TRAINING STATISTICIANS:
FEDERAL COMMITTEE ON STATISTICAL METHODOLOGY (FCSM)
SUBCOMMITTEE INTERIM REPORT**

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1. Introduction

This paper presents an overview of the progress of the FCSM Subcommittee on Survey and Statistical Training and Training Statisticians since its inception in November 1995. It also introduces planned activities of the subcommittee to further its study of this topic in Federal statistical agencies. The subcommittee plans to prepare a final working paper in the coming year.

The second section presents the charter of the subcommittee: its background, charge, stakeholders, membership, and scope. The third section briefly reviews selected agency survey and statistical training programs. The fourth section discusses some subcommittee discoveries. The last section summarizes activities of the subcommittee to date.

2. Charter of the Subcommittee

2.1 Background

The topic of survey and statistical training received by statisticians was proposed to the FCSM by Monroe Sirkin and David Williamson for study by a working group. A somewhat larger group met to clarify the topic for subcommittee study. Maria Gonzalez asked me to chair the subcommittee. Subcommittee members were identified through the FCSM and the committee was first convened in November 1995, meeting every 4 to 6 weeks since then.

2.2 Charge to the Subcommittee

The subcommittee was charged to document and compare survey and statistical training programs of Federal agencies. They were asked to provide baseline measures of these programs and to assess the strengths and weaknesses of these programs for statisticians. The subcommittee was directed to provide guidelines for agency self-improvements of these programs and for interagency coordination and collaboration in providing these programs. There was an expectation that the subcommittee would discover ideas that were worth sharing and identify areas of future need or improvement.

The subcommittee was asked to look toward the future by defining future needs, resources to meet those needs, and potential for collaborations between agencies. The subcommittee was also asked to identify areas where the Joint Program in Survey Methodology (JPSM) might enhance its contributions to the Federal statistical agencies. The subcommittee was directed to prepare a final report documenting its findings and making recommendations to improve survey and statistical training for statisticians.

2.3 Stakeholders and Customers

There are several important organizational stakeholders for the subcommittee -- the Federal Committee on Statistical Methodology chartered by the Office of Management and Budget (OMB), the Statistical Policy Office at the Office of Management and Budget, and the Committee on National Statistics of the National Academy of Sciences. These organizations are interested in the status of statistical training, in assessing the skills of the Federal statistical workforce, and in developing strategies to meet current and emerging training needs of that workforce.

The Federal statistical agencies are viewed as having a particular interest in this topic as survey and statistical training is relevant to a large proportion of their workforce. The agencies of particular focus are those represented on the Council of Statistical Agency Administrators chaired by Katherine Wallman, and those represented by members of the Federal Committee on Statistical Methodology. However, there might be other Federal agencies with a smaller contingent of statisticians who would have interest in the topic. The management of these agencies were considered to be the ultimate customers for the products of the group.

The Joint Program in Survey Methodology and other academic institutions and professional societies, particularly in the Washington, DC, area should be interested in the results of the subcommittee's efforts. The information about survey and statistical training courses and unmet training needs will help academic institutions and training providers plan their curriculum and courses.

2.4 Membership

The membership of the subcommittee consists of representatives from seven agencies and the Joint Program on Survey Methodology. The members are from the Bureau of Labor Statistics (BLS) (Nathan Howard), Bureau of the Census (Romeo Munoz, Nancy Bates), Centers for Disease Control and Prevention (David Williamson, Russ Roegner, George Ryan), Energy Information Administration (EIA) (Carol French, Renee Miller), National Agricultural Statistics Service (NASS) (Linda Raudenbush), National Center for Education Statistics (NCES) (Samuel Peng), National Center for Health Statistics (NCHS) (Monroe Sirkin and Joyce Crossman), and the Joint Program in Survey Methodology (Nancy Mathiowetz). I serve as chair of the subcommittee. During the first seven months of the subcommittee's existence, Denise Myers served as secretary while she was on detail to the OMB Statistical Policy Office from NASS. We have a combination of agency managers, practicing statisticians, agency training officers, and academic statisticians as committee members.

2.5 Scope

The first dilemma the subcommittee faces was to define its scope. The subcommittee was directed to address training received by statisticians employed by Federal agencies. Several questions immediately arose. What training was relevant to statisticians? Who are statisticians? What Federal agencies were interested in training received by statisticians?

In order to address these topics we decided to review training programs at several agencies. We hoped that a review of this training would help the subcommittee to identify those areas that would be of particular interest for training statisticians and for the customer Federal agencies.

3. Review of Agency Programs

We began our investigation with reports from each agency represented on the subcommittee. We discovered that agencies fairly universally offered training in new software (word processing, spreadsheets), general office skills (writing, presentations, team work), supervision and management, and personal development. After some discussion, we decided not to focus on these types of training opportunities because the needs are not different for statisticians than for other non-quantitative professionals in the workforce. We also discussed whether we should include training in statistical computing. We decided to include those courses where the statistical content was an important factor in the course material. Highlights of the agency review included the following findings.

3.1 Bureau of Labor Statistics. BLS developed a training plan for mathematical statisticians based on six technical Knowledge, Skills, and Abilities (KSAs). Additionally, BLS identified 3 KSAs for supervisory level positions and 3 more for management level. Training was also identified for the supervisory and management KSAs. BLS set priorities for different levels of training. Training needed to perform the current job had first priority; training that was expected to have an impact on how the current job was done had second priority; training expected to have an impact on future jobs had third priority. Priorities will be considered in determining training eligibility.

BLS provides in-house training, and also supports academic training. A particular example of in-house training was a six-month series of courses on quality management. BLS supports employees attendance in JPSM courses and degree programs as well as other academic course training.

3.2 Census Bureau. The Census Bureau supports academic training for staff on an individual course basis and for students at JPSM on a half-time basis. It also occasionally sponsors in-house statistical courses in topics such as variance estimation, time series, and categorical analysis taught by Census Bureau staff who are experts in these topics. Three years ago a mathematical statistician career development program was initiated.

In 1986, the Census Bureau developed a several-day orientation program and a six week course entitled Professional Skills Development. All professional employees took the course during their first year of employment at the Census Bureau. During the course the employees designed and conducted a survey, giving them hands-on experience in all aspects of a survey. These courses have not been held in the past 3 years due to an insufficient number of entry level employees. There are plans to revise these courses to meet expected future needs.

3.3 Centers for Disease Control and Prevention. The Applied Statistics Training Institute sponsors short-term (2-1/2 day) training courses across the country to focus on data issues related to current public health concerns. The CDC offers courses specific to its program area (e.g. Introductory Biostatistics, Epidemiology for the Non-Epidemiologist, Introduction to Methods for Public Health Program Evaluation, Utilization of Data by the Public Health Manager, Marketing Information to Policymakers: How Statisticians can produce what Politicians Want). They also offer more standard survey and statistical courses (e.g. Basics of Survey Research, Introduction to Survey Sampling, Small Area Analysis). They have also recently developed a Quantitative Methods Career Enhancement Program for their statisticians.

3.4. Energy Information Administration. The professional workforce at EIA includes industry specialists, operations research analysts, economists, survey statisticians, mathematical statisticians, computer specialists, and others. EIA participates in formal classroom training. It also has special training provided by its Office of Statistical Standards. These courses are specific to needs of individuals working in the energy industry (e.g. Determinants of Long-Run Energy Demand, Intermediate Econometrics, Commodity Pricing of Natural Gas, FEDWORLD Internet System).

3.5 National Agricultural Statistics Service. The NASS is very conscious of career development and training its professional statisticians. All employees have Individual Development Plans (IDPs). IDPs are standardized for each professional series with the opportunity to provide individual training opportunities. The agency has developed a formal week-long orientation program and a series of agricultural survey and estimation training program for all its statisticians. These courses cover specifics of agricultural survey design, data collection, and processing at several experience levels. The NASS has long supported a program of full-time academic training at the graduate level for mathematical statisticians, computer scientists, and survey methodologists.

3.6 National Center for Education Statistics. The NCES has a training program for staff to provide skills in statistical design, analysis, and project management. These courses are either taught by agency staff with a particular expertise or outside experts. The NCES has a unique program of training for external data users to promote effective and correct use of NCES data. Data users often are also data providers, so the training assists in improving data quality. Instructors are internal experts or known experts in a field.

3.7 National Center for Health Statistics. The NCHS supports academic programs for its staff, including participation in the JPSM courses and degree program. The NCHS also conducts in-house training. The NCHS brings in vendors to teach technical courses. The agency has developed a training database and has collected training costs systematically since 1995.

4. Discoveries

The review of agency training programs helped the subcommittee to focus the task of the group. We discovered that the training that was most relevant for the topic included both survey and statistical training relevant to the collection and publication of official statistics. We also discovered that this training was relevant to a broad group of quantitative professionals and one series of support staff working at statistical agencies. Thus, we decided to include as "statisticians" individuals classified in a number of series: mathematical statisticians (GS-1529), survey statisticians (agricultural, economic, demographic, health, education -- GS-1530), survey methodologists (GS-1530), quantitative social scientists (economists, sociologists, psychologists, anthropologists, demographers and other researchers), health scientists and biostatisticians, program analysts, operations researchers (GS-1515), and the support series of statistical assistants (GS-1531).

We discovered, however, that survey and statistical training provided to others who are not employees but who have some connection with the statistical or survey operations of a Federal agency was also of interest. The individuals receiving the survey or statistical training could include several types: interviewers, data providers, data users, or collaborators (clients).

The subcommittee review revealed several agency career development programs for statisticians, and two that were specifically designed for mathematical statisticians. The subcommittee felt that other agencies might benefit through knowledge of these career development programs. They each had aspects that had proved to be very effective and might well be adapted to other agencies. The subcommittee decided to provide information on these career development programs in the working paper.

The subcommittee discovered many good ideas that need to get broader visibility because they are applicable to other organizations. To do this, the subcommittee decided to include case studies of selected statistical agency training programs in the working paper. Greater knowledge of current agency training programs has given the subcommittee some synergistic ideas for collaborating in the area of training. The subcommittee plans to develop these ideas further in the working paper.

The review also demonstrated the need to have a common data set to make comparisons between agencies. The subcommittee felt that it would be desirable to have similar information on the scope and cost of agency survey and statistical training for employees, on the number of agency participants, and some information on survey and statistical training for non-agency employees. This information would help agencies gauge their performance in relation to other organizations. The subcommittee plans to collect this information from all the "customer Federal statistical agencies" previously mentioned.

5. Activities of the Subcommittee

Early in the tenure of the subcommittee, I discussed subcommittee plans with the chartering parent committee -- the Federal Committee on Statistical Methodology. I also met with the Council of Federal Statistical Agency Administrators to solicit support, additional subcommittee members, participation in later data collection, and interest in the end product.

The subcommittee collected written information on the workforce training of statisticians. We did a literature search using resources of the subcommittee members and the Internet. We contacted statistical agencies in other countries, receiving, in particular the training and development handbook for methodologists at Statistics Canada. We also communicated with the American Statistical Association Committee on Statistical Education to let them know of our project and to receive information they had on workforce statistical training. Nancy Mathiowetz worked with a JPSM student to prepare an annotated bibliography of the papers and documents that we discovered. This annotated bibliography will be in our working paper.

We obtained a copy of the Washington Area Alliance for Education in Survey Methods Consolidated List of Graduate Course Offerings for 1996-97. This includes information for American University, George Mason University, Georgetown University, George Washington University, University of the District of Columbia, JPSM at the University of Maryland, and the U.S. Department of Agriculture Graduate School. We plan to highlight this information in the working paper.

As was previously mentioned, the subcommittee reviewed agency training programs to determine the scope of project. As we were doing this we also reviewed agency training databases to determine what information was available. We identified software and databases that were more desirable and will highlight those in the working paper. We also identified information that was particularly relevant for comparisons between agencies --average training costs and average number of training opportunities per

employee, amounts and kinds of training provided and to whom, and total cost and the cost as a percent of program budgets. The subcommittee developed a questionnaire that will go to the agencies represented on the FCSM and the Statistical Agency Heads to request data on training costs, courses, and numbers of attendees for both employees and nonemployees. We will also get a distribution of classification types of employees attending specified courses and grade level of employees.

The subcommittee also recognized that we would not be able to obtain information from agency training databases on employee satisfaction with training opportunities for present work assignment, for keeping up with technology, and for career development. We were aware of an opportunity to collect information on employee perception of various aspects of their organization on the 1996-97 JPSM Practicum Survey of Organizational Climate being conducted at 10 of the Federal statistical agencies. The subcommittee proposed questions for the Practicum Survey that would provide insight into employee satisfaction with training.

The subcommittee is presently in the process of defining the content of the working paper report. We expect it to include statistical comparisons of survey and statistical training at Federal statistical agencies, case studies of survey and statistical training programs for employees, descriptions of career development programs for statisticians, descriptions of survey and statistical training provided by Federal statistical agencies for nonemployees, recommendations to improve training opportunities, identification of areas of collaboration across the statistical system to address future needs, and an annotated bibliography of workforce survey and statistical training.

The subcommittee played an active role in organizing this session at the COPAFS Conference. We wanted to share with the conference attendees some of the ideas that we have gleaned from our efforts thus far. We hoped that this would stimulate your thinking and provide for an increased exchange of ideas and information. In particular, we wanted to present information on the exciting career development programs for statisticians uncovered in our review of agency training to encourage other agencies to consider such programs. We also wanted to stimulate our thinking about future skill needs for statisticians in our agencies and to begin to identify those training needs.

FEDERAL STATISTICAL CAREER DEVELOPMENT PROGRAMS

1. National Agricultural Statistics Service -- Fred S. Barrett

1.1 Abstract

The National Agricultural Statistics Service (NASS) recruits and trains entry level professionals mostly in its 45 State Statistical Offices (SSO). NASS's career development and training program is designed to progress entry level statisticians (GS grades 5-7-9) to Senior SSO Statisticians (GS-12) in a noncompetitive environment. (See Attachment A for Statistician/ADP Career Training Paths). This paper describes the core training program and the competitive training programs available for employees seeking the GS-13 career level and above.

1.2. Agency Training Program

The National Agricultural Statistics Service is the primary statistical agency in the Department of Agriculture. The agency needs employees that have broad agricultural experience with special skills in survey design and administration, knowledge of data analysis and estimation procedures, and computer data processing. NASS's training program is designed to develop and improve the individual's knowledge, skills and abilities while enhancing the overall agency performance. All professional employees participate in a broad-based training and work program that introduces them to several disciplines and possible career paths. NASS expands this broad-based training with a number of competitive formal training opportunities designed to fill highly technical and specialized positions which are critical to the organization.

NASS believes a successful training program must be tailored to the individuals recruited and the career path opportunities made available to them. NASS recruits are hired mostly as GS-7's with Bachelors degrees or GS-9's with Masters degrees. They are generally classified into one of three disciplines, agricultural statisticians, mathematical statisticians, or computer specialists. All recruits must meet the minimum requirements of a Bachelor of Science degree. Agricultural statisticians must have at least 15 semester credits of mathematics and statistics, of which 6 credits must be statistics, plus 9 additional credits in other physical or social sciences. Experience in agriculture is very desirable. Mathematical statisticians must have at least 24 semester credits in mathematics and statistics, of which 12 must be mathematics and 6 statistics. A Masters degree in mathematics or statistics is preferred. Computer specialists must have 30 semester credits in computer science and mathematics.

Each new recruit will have a career path that is noncompetitive to the GS-12 journeyman level. The length of the training from entry to journeyman is about 6 years. To progress beyond GS-11 requires a second assignment in another State Office. Once the GS-12 journeyman level is reached, the statistician is expected to have a working knowledge of agriculture, an understanding of statistical concepts and applications, the ability to conduct surveys, be skilled in the use of basic computer software, and be able to operate in a LAN environment. They are also expected to have the ability to write and speak effectively, be able to plan assignments, and delegate work. During this training period each person will be offered the opportunity to cross-train in either of the other two disciplines.

1.3. Noncompetitive Training Program

The following are the chronological steps of noncompetitive career development and training for new professionals at NASS.

Office Orientation: The basic orientation is intense during the first two weeks and then continues for several months. The employees study materials on the agency mission and its history. They review agency and office policies and administrative procedures and they are trained to use their computer workstation as well as getting acquainted with the LAN operations. They are given their first work assignments and their performance elements and standards on which they will be evaluated.

Individual Development Plan (IDP): Each individual starts with a generic IDP that prescribes all the basic elements required of everyone to reach GS-12 along with the career goals and aspirations of the individual. In addition, the supervisor and employee are to specify training and development needs that meet the employee's objectives and are in accord with the agency goals and staffing needs.

Headquarters Training and Orientation: Groups of new employees come to Headquarters for a week of training. They receive an overview on all aspects of NASS survey and estimation procedures, and participate in an Agricultural Statistics Board simulation. They are also given a briefing on current research activities and computer operations. They become acquainted with the Headquarters environment and meet the Headquarters staff, as well as meeting with top management in a question-and-answer session.

On The Job: Learning while working is the most important element of NASS's training program. Opportunities are provided to travel with the State Office managers and senior statisticians to agricultural meetings, field days and commodity meetings. These meetings help increase their knowledge of agriculture and acquaint them with the agricultural industry. They are given assignments requiring them to conduct survey interviews and do crop observations. Their workloads and responsibilities are gradually increased in accordance with their performance and promotions. They will generally work in their first State Office for at least four years, and during this time they are expected to have different assignments in at least two of the three major functional areas of responsibility which are surveys, estimates, and systems services.

Basic Concepts Training: All new statisticians attend formal training sessions on NASS survey procedures, estimates and analysis, and yield measurement. These are usually four-day training sessions conducted by the Headquarters Survey Training Group. Basic concepts are taught and everyone is expected to know and understand these basics regardless of their current assignments.

Advanced Survey and Estimation Training: Statisticians who have completed the basic concepts and are assigned major responsibilities for either surveys or estimates are provided formal training on specific topics. These are usually four-day sessions conducted by the Survey Training Group. This training is directed toward specific actions and programs that are designed to give the participants the knowledge and skills to perform these activities at the full performance level.

Special Survey Training: Statisticians assigned to special and more complex surveys are provided training specific to that survey. This training covers all topics involved in conducting the survey including list building, sampling, questionnaire design, training of enumerators, data collection, editing, data analysis, summarization, and publication.

Senior Statistician Workshops: When a statistician reaches the journeyman level, they are often designated as the technical leader for one of the operational groups. When this occurs, they will periodically attend workshops along with their counterparts from other State Offices. These workshops emphasize project planning, coordination of office activities, and overall project management. This training involves sharing of ideas and interaction among participants and Headquarters technical leaders.

Professional Training: Statisticians are encouraged to engage in professional training opportunities such as college courses, seminars, toastmasters, and self-development training provided by local institutions or the NASS resource library. NASS pays for all such training, provided the training is related to the overall mission of the agency. The IDP is used to identify specific employee training needs and indicate appropriate professional training.

Pre-supervisory Training: A specially designed course has been developed by the USDA Academy at Texas A&M University to meet the unique needs of NASS statisticians and computer specialists. Training topics include values clarification, workplace diversity, stress management, effective meetings, presentation techniques, team building, communication, change, and ethics. In addition, NASS requires all of its statisticians and computer specialists to attend at least 80 hours of supervisory/management training.

Mathematical Agricultural Career Enhancement (MACE): The MACE program is a combination of "on-the-job" and formal educational program designed to permit agricultural statisticians to become cross-qualified as mathematical statisticians and mathematical statisticians to become cross-qualified as agricultural statisticians. Applicants accepted into MACE will complete the portion of the IDP's for both the agricultural statistician and mathematical statistician required for classification in the respective series.

Computer/Agricultural Career Enhancement (CACE): The CACE program is designed to permit computer specialists to become agricultural statisticians and to permit agricultural statisticians to become computer specialists. Applicants accepted into the CACE program complete the portion of the IDP's for both the agricultural statistician and computer specialist required for classification in the respective series.

1.4. Competitive Training Programs

When NASS professionals have completed their first year and are making satisfactory progress on their IDP, they have the opportunity to apply for certain competitive training programs. These programs include:

Full-Time Graduate Education Program: To be eligible, employees must attain the GS-9 level with at least one year of experience and be performing in a superior manner with satisfactory progress on their IDP. The full-time training programs provide at least one year of graduate level academic training. Agricultural statisticians, mathematical statisticians, and computer specialists are competitively selected for these training programs and, upon successful completion of the training, are placed noncompetitively in GS-13 headquarters positions. Selected candidates are given a new IDP which include any "warm-up" courses required. They are generally relocated to an SSO near a university with a NASS-approved graduate program. They must meet the selected educational institutions qualifications for admission to graduate school.

The full-time graduate level training programs are:

(1) **Mathematical Statistician:** This program is designed to provide education for agricultural and mathematical statisticians in advanced statistics and statistical theory to become highly-trained mathematical statisticians.

(2) **Information Technology:** This program is primarily designed for computer specialists to provide training in software engineering, telecommunications, or management information systems. However, the program is open to agricultural and mathematical statisticians who have a strong interest and background in computer systems and information technology.

(3) **Survey Methodology:** This program is designed for agricultural statisticians and mathematical statisticians to receive advanced training in survey methodology. Participants attend the Joint Program for Survey Methodology at the University of Maryland.

Career Development Intern Program (CDIP): The CDIP program is designed to provide accelerated training and career enhancing experiences for agricultural statisticians in State Offices. The training program is designed to prepare statisticians for specific assignments in Headquarters at the GS-13 level. Agricultural statisticians can apply as GS-11's when they are expecting a relocation to their second State Office assignment. They will be expected to maintain a full workload assignment in the SSO and complete all the IDP requirements for the GS-13 position targeted.

1.5. Summary

NASS's training program up to the journeyman level is designed to provide each professional employee with a broad base training in agriculture, statistics, surveys, and computer science. This gives the employee the opportunity to choose the career path most suited to their skills and abilities, but also offers them the opportunity to switch career paths. Everyone receives similar training and career development opportunities that allows them to compete for competitive technical positions at the GS-13 level in Headquarters and supervisory and management positions after a Headquarters assignment. This program has been very successful in providing NASS with a highly trained staff of agricultural statisticians while at the same time providing a source of specialized mathematical statisticians and computer specialists who have State Office experience.

2. Bureau of the Census -- Charles P. Pautler, Jr.

2.1 Introduction

The Census Bureau highly values its employees and works hard to have staff developmental programs that help both to train and retain our most valuable asset. Two such programs are the Joint Program in Survey Methodology (JPSM) at the University of Maryland and the Census Bureau's Mathematical Statistician Intern Program. This paper focuses mainly on the Intern Program since most readers are very familiar with the Joint Program.

2.2 Census Bureau's Commitment to JPSM

The Census Bureau makes a strong commitment to the JPSM since it is such an important component in our approach to training tomorrow's statisticians. When the first class of JPSM students was formed in September 1993, the Census Bureau saw the opportunity to have our staff trained specifically in the ways of the Federal Statistical System, and to have the classes focused on the methodologies that in some ways are unique to the Government methodologist. There is a commitment and burden on the organization to have a valued employee away from work about half time for three years--and to pay their full salary during this time along with tuition, books, and local travel. There was much discussion as to whether or not the Census Bureau could afford such an investment and to what extent, but the realization was that we could not afford not to be involved. Since the beginning, the Census Bureau has competitively selected 6 employees each year to start the program, and today has 19 students enrolled full-time in JPSM. In addition, several staff are supported in taking one course a semester, plus the Bureau has actively participated in the numerous short courses offered by JPSM. We are also very pleased to have our first 5 graduates from the program. Two of them followed the math stat track and three the social analyst track. This Spring, we are expecting 7 more graduates with 3 from the math stat track and 4 from the social scientist track. Our attrition from the program has been due to personal circumstances such as maternity, one person went to another Federal agency, and only one person decided that the program was not a good fit for her circumstances.

As statisticians, we are all into evaluation and measurement of results. However, in the case of the JPSM, it is probably too early to say if we have made a good investment and, in some cases, we may never know. Some may say that the fact that the staff we are selecting for the program are graduating and staying with the Census Bureau is proof of results. However, all students sign a commitment to Federal employment equal to 3 times the amount of time released to take courses so, at this time, no student has repaid that commitment. Others may say that the graduates will have to contribute significantly for many years before we can declare success, and how we measure significant contributions is a problem within itself. The students are pleased with the quality of their education and enthusiastically support the program. The students report that they come back to their jobs with new insights and techniques to apply to their work. It is also very clear that they are effectively networking amongst themselves and with students from other agencies. These staff are eagerly sought after by Census Bureau managers to fill vacancies and to accept positions of further responsibility.

2.3 Mathematical Statistician Intern Program

The Census Bureau started the program three years ago at the same time the JPSM was coming online. The two programs were seen as complimentary and yet appealing to two different universes of staff, and fulfilling two different missions. In general, the participants in the Intern Program already have a Masters Degree plus, in many cases, several more graduate level courses. The general profile of the participants has been staff who have had 5 years or more experience at the Census Bureau, who had worked in only one division, who were about 30 years old, and who were generally recognized as the best in their peer group. Competition for one of the four intern positions selected each year has been intense.

The Intern Program was established with 5 objectives:

- o Identify staff for the fast-track to the GS-13 level and perhaps later management assignments.

- o Provide exposure to each of the Census Bureau program areas--economic, demographic, decennial census, and statistical research.
- o Provide opportunity for statistical assignments that require different areas of knowledge.
- o Provide opportunity for professional growth through formal paper preparation and presentation in a professional forum.
- o Provide enhanced training opportunities to meet career goals.

Implementation of the program has had the following features:

- o Competitive selection which has involved intensive group interviewing by the Associate Director for Methodology and Standards, the senior mathematical statistician from each of the four program areas, and a division chief selected each year from each of the subject areas.
- o One-year assignments in each program area where the intern has not had experience. Thus, with the four program areas previously listed, the Intern Program normally lasts three years for most interns.
- o Presentation/participation at the annual ASA meetings. This is an important benefit since competition to attend ASA meetings is very intense amongst other staff. The interns automatically are expected to prepare a paper and go to the meetings.
- o Each intern is assigned one of the four mathematical statistician division chiefs as a mentor. Regular meetings are held between the intern and the division chief, and individual development plans are prepared.
- o Increased exposure to senior staff. Quarterly meetings for all interns with the Associate Director for Methodology and Standards and the four mathematical statistician division chiefs are held. Usually a member of the Executive Staff is invited to come and talk about their program area.
- o Increased training opportunities. With the crunch on training funds the past few years, this has proven to be a valuable benefit of the program, as interns have been given priority for training money. Numerous JPSM short courses have been taken with these training funds, along with personal development type courses.
- o When rotated to another area, the interns have been given priority for assignments that can be completed in a year and lead to an ASA paper.
- o Experience in working as a group on a broader management or organizational problem. For example, the interns recently worked together to prepare a proposal for reorganizing the Census Bureau mathematical statisticians.

Intern Program Results/Positives: Overwhelmingly, the interns have been very pleased with the program and enthusiastically support it. On a personal level, it has been very beneficial for them with the implementation features I have just listed, and the program continues to meet the objectives that management set when the program was established. In addition, we are seeing the benefits of increased communication across the Bureau as the interns ban together for numerous networking opportunities, and take back to their respective branches news from across the Bureau. For example, they have regular luncheons without senior management involvement, and the group assignment to propose a Census Bureau mathematical statisticians' reorganization provided an excellent bonding experience.

Although senior management originally discussed giving the interns their first opportunities to obtain supervisory experience through the rotational assignments, this has not materialized for several reasons. However, the interns are seeing and taking notice of the various management styles they are being exposed to, and these differing styles are discussed and compared during their informal meetings.

Another positive from management's viewpoint is the increased pool of highly qualified staff to fill our future vacancies. We have already seen this positive as we have filled three GS-13 level positions with former interns.

Intern Program Concerns/Issues: Even though senior management has been generally pleased with the progress of the Intern Program, there have been valid issues and concerns raised by managers across the Bureau. These include:

- o When a division has a person selected for the Intern Program and that person leaves the division to start the rotational assignments, the programs of the division are affected because the divisions have not been able to back-fill the vacated position. With many staffs down to only a few people, one person leaving is a significant loss of resources.
- o Although most managers support the objectives of the Intern Program, several believe that we have created twelve positions that are not providing prime value to the programs of the Census Bureau. It has become a question of whether or not we can support the "luxury" of this program.
- o Some managers believe that we are sending a negative message to other staff members in the units that the interns are assigned to by giving the interns priority in assignments. These managers make the argument that there are other deserving employees in the units who should be given these assignments.
- o Some managers express the concern that we have created a caste system. Given that we are, in effect, creating four new GS-13s every year, will there be any promotion opportunities for the GS-12s who choose to dedicate themselves to becoming expert in one of the more complicated surveys of the Bureau or who choose a rotational and development program of their own?
- o In the view of some managers, we have put more focus on the people than on the programs that are the primary purpose of the Census Bureau.
- o And from our personnel division comes the concern that when the interns complete the program, there will not be a permanent GS-13 position available for them to fill.

None of these concerns/issues are trivial and, in some cases, the emotions run deep. With the first interns completing their three years this fall, we had no problem in finding permanent positions for them to fill. In fact, there were more positions than interns. It can also be argued that we have taken every step possible to rotate the interns to positions of the greatest need throughout the Census Bureau, but that is of little solace to the manager who ends up with one less resource. Of course, it is true that there is always a learning curve when a new person enters any position and, with the one-year assignments, there is the constant overhead of the learning curve, but senior management does not believe that this price is too high an investment in the future of the Census Bureau.

The issue of opportunity for those who are not a part of the Intern Program is a little harder to measure and difficult to demonstrate. In the past year, there have been job postings at the GS-13 level that all could apply for and were not filled by an intern. It is sure to happen in the future that there will be positions that an intern will be placed in and the manager to which this happens will surely feel that he/she was not given the opportunity to select who they wanted for the position. There will be some deserving employee who was not a part of the Intern Program who could have possibly done quite well in that position. All employees know about the Intern Program and all have the opportunity to apply for it and to be selected in the competitive process. It is the belief of senior management that through the Intern Program there will be a better pool of candidates who, through broadening work experiences, will be better equipped to fill the vacancies of the future.

2.4 Conclusion

The Census Bureau recognizes that its highly trained and specialized staff is its most valuable asset. Creating staff development programs to train and retain these staff is in the best interest of the Census Bureau. To that end, the Census Bureau has significantly supported and participated in the Joint Program in Survey Methodology at the University of Maryland by selecting six staff members each year to begin the three-year program on a full-time basis. All expenses, plus a full salary, are paid while releasing the student half-time to attend classes. In addition, the Census Bureau has created the Mathematical Statistician Intern Program. In this program, four people are competitively selected each year to begin three one-year rotations to program areas they have not previously worked in. Special training, assignments, and a mentor are significant parts of the Intern Program.

Both programs are a current burden on the organization, and issues and concerns have arisen about these investments in the future. However, both staff development programs are viewed positively and seen as vital components in preparing and retaining a highly technical pool of staff to provide both the technical and managerial leadership necessary for the Census Bureau of the next millennium.

3. Centers for Disease Control and Prevention -- G. David Williamson and Donald R. Betts

3.1 Abstract

We have developed the Quantitative Methods Enhancement Program (QMEP) at the Centers for Disease Control and Prevention (CDC) in response to the recent emphasis on reinventing government and to a need to provide alternative career development training for statisticians. In addition, the program is designed to

sustain and enhance statistical capacity within CDC. The QMEP is an innovative career enhancement alternative for CDC statisticians and other scientists who have a strong career interest in statistical and other quantitative methods. The program provides employees with a unique opportunity to move temporarily to another group within CDC to acquire new skills and understanding of specific analytic methods from CDC experts in such areas as Geographic Information Systems (GIS), longitudinal data analysis, meta analysis, risk assessment, sample survey analysis, and small area methods. We describe the joint development and management of QMEP by CDC's Statistical Advisory Group, the Human Resources Management Office, and the Statistics and Epidemiology Branch of the Epidemiology Program Office. We also discuss the goals, assets, and process of the program, and our plans to expand it for interagency participation.

3.2 Introduction

In a January, 1989 memorandum, the Associate Director for Science, Centers for Disease Control and Prevention (CDC), established CDC's Statistical Advisory Group (SAG) in recognition of the increasingly important role statistics and statisticians play in fulfilling the agency's mission. The SAG was asked to act in an advisory role to CDC's Office of the Director on statistical issues, to oversee and coordinate CDC-wide statistical activities, and encourage communication among statisticians and other scientists at CDC. In 1991 the SAG cosponsored CDC's Planning Retreat for Epidemiologic and Statistical Methods in Public Health to produce a plan for maintaining and developing expertise in statistical and epidemiologic methods essential to preserving CDC's national leadership role in assessment of health status and in public health practice. One of the high priority recommendations from the retreat was enhanced recruitment and retention of statisticians and other data analysts with expertise in methods to analyze public health data. This recommendation, coupled with the reinvention/reengineering environment in government fostered by the 1993 National Performance Review, became the impetus for us to consider innovative ways to provide positive reinforcement for deserving CDC employees who have a strong career interest in analytic methods.

In December, 1993 the SAG convened a focus group comprised of CDC statisticians, management analysts, and personnel experts to discuss and lay the foundations for an internal rotation program which would identify outstanding employees who demonstrate interest and promise in analyzing public health data and temporarily reassign them to another group within

CDC to acquire and develop new statistical skills. During the next year, the focus group and others in CDC's Epidemiology Program Office (EPO), the group which provides personnel to coordinate and support much of the SAG activities, discussed and revised the original proposal for the methods rotation program. The resulting proposal was one which provides alternative career development training for statisticians and, at the same time, sustains and enhances the statistical capacity within CDC. Now, with approval and support from SAG, the Statistics and Epidemiology Branch of EPO, and CDC's Human Resources Management Office, we introduce the Quantitative Methods Enhancement Program (QMEP).

3.3 Program Description

The purpose of QMEP is to provide an innovative career enhancement opportunity for CDC and Agency

for Toxic Substances and Disease Registry (ATSDR)¹ scientists. The program facilitates professional growth and development for statisticians and other data analysts, assists in maintaining and strengthening CDC's capacity in analytic methods expertise, and promotes retention of CDC scientists.

The QMEP provides CDC employees with a unique opportunity to temporarily be assigned to another group at CDC to acquire new skills in specific analytic methods from CDC experts on current statistical methods (for example, generalized estimating equations, meta analysis, neural networks, risk assessment, sample survey analysis, and small area estimation). The program consists of 1) a competitive application process that is used to match an applicant with a mentor, 2) an internship training period, and 3) an evaluation of the program experience by the intern, mentor, and sponsoring Center, Institute, or Office (CIO) of CDC. It is anticipated that the intern will be released from all job duties during the time of participation in the program.

The QMEP is open to health and mathematical statisticians and to other scientists who have a strong career interest in statistical and epidemiologic analytic methods. Applicants must be permanent employees of CDC with a minimum of two years service in the agency, and must have secured approval from supervisors to participate in the program. Applicants should be at the GS-11/12/13 (or CO-04/05 level for Commissioned Corps employees), and have received a rating of "Excellent" (or "D" for Commission Corps employees) or higher on their most recent end-of-year personnel evaluation.

Each applicant must submit to HRMO a current position description, including job series and grade, CIO, and location; curriculum vita; name, address, and phone number of immediate supervisor; and one page memo that addresses the following topics:

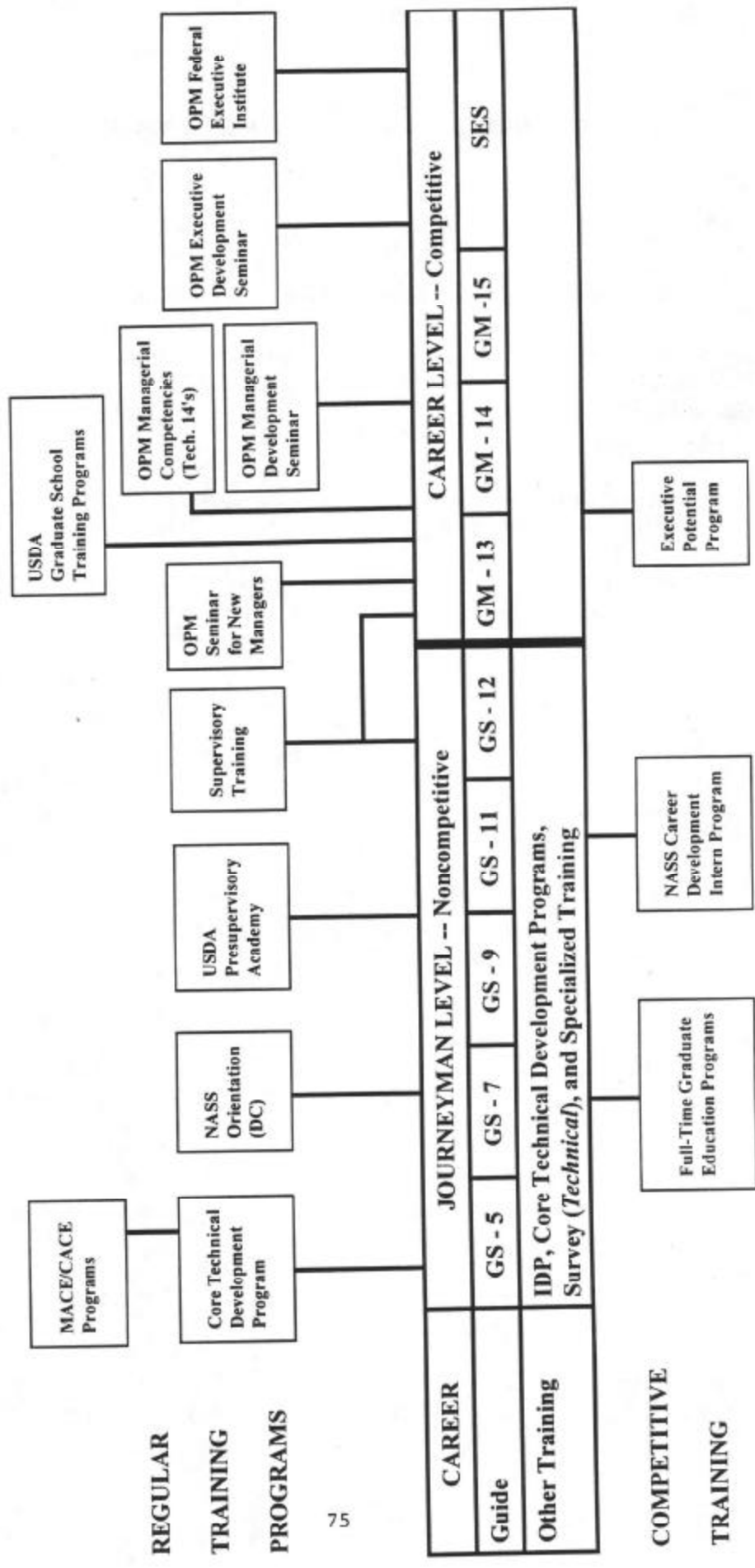
- Reason for applying to program
- Specific methods area(s) in which to learn new skills or knowledge
- Primary learning objective(s)
- Description of how assignment will benefit career goals
- Description of how new or enhanced skills will benefit sponsoring CIO.

After a SAG subcommittee screens applicants, prospective applicants will receive a listing of available projects/methods areas and associated mentors for the program. Mentors will be located throughout CDC, including locations other than Atlanta, where CDC is headquartered. Subsequently, mentors and applicants will interview each other and rank their choices, and a matching process will be used to team selected program participants with mentors. A maximum of three applicants will be selected for the initial year of the program, depending on qualifications and availability of interns and mentors.

The duration of the training is variable, depending on the length of projects. Generally, enhancement assignments will be four months to one year. The QMEP, modelled after CDC's long-term training program, calls for the applicant's sponsoring CIO to provide the FTE and salary support throughout the training period, but there is flexibility in this arrangement and exceptions to this model should be mutually agreed upon by CIOs. The intern will return to their CIO upon completion of training.

¹ Future reference to CDC includes ATSDR because the QMEP applies to both agencies and allows participation between those agencies.

NASS STATISTICIAN/ADP CAREER TRAINING PATHS



STATISTICAL SKILL REQUIREMENTS AND TRAINING NEEDS FOR THE 21ST CENTURY

Panel Discussion

1. National Agricultural Statistics Service -- Comments by Rich Allen

When Cynthia Clark first asked me to be on this panel, I interpreted the topic very broadly as "what knowledge would we want our staff to have?". I was reminded of the search for knowledge in *The Hitchhiker's Guide To The Galaxy* by Douglas Adams. What the characters in the book were seeking was the answer to: **LIFE, THE UNIVERSE, AND EVERYTHING**

While we can't assume our staff will have all of that knowledge, my first point is that well-rounded staff members will be more valuable than narrower, more technically trained individuals.

As an aside, *The Hitchhiker's Guide* had words of encouragement for supervisors. On the cover--in friendly letters--was the message: "DON'T PANIC"

1.1 Basic Assumptions

Everyone in 21st century statistical offices will need good computer literacy skills. Those must extend to the ability to efficiently link files across different software packages. I do mean everyone since the support staff role in the future will involve applying the same software as do statisticians. Organizations must decide what software packages will be supported with training and upgrades. Staff members will then be able to write extensions and improvements which can be shared throughout the organization.

Sampling knowledge will become even more important in the future, particularly for organizations which historically focused mainly on census-type techniques.

1.2 Specialized Skills

Speaking from an economic statistics viewpoint, I see three related skill requirements as being very important to good quality national and small area agricultural statistics. The first is knowledge of techniques for handling large data bases. It will not be possible, nor wise stewardship of public resources, to collect new data for all applications. Previous survey and administrative data will be linked with newly collected data for many statistical efforts.

Whenever data files are linked or individual firms contacted on a repetitive basis, there will be data relationships which seem to be invalid. These may be due to changes in respondents for the same unit, corrections of earlier responses, new respondent-interviewer nonsampling errors, or a multitude of other reasons. Being able to interpret and adjust for these "MESSY DATA" situations is the second requirement for publishing consistent statistics.

The third requirement is the ability to link data together and develop statistical profiles. An operation profile, based on previous information, can quickly identify current reporting problems, can speed up edit

and summary operations, and can sometimes minimize the amount of new data to be collected. NASS has had great success with statistical profiles for all Federally-inspected slaughter plants. Based on a plant's own data, the profile "knows" what livestock species are handled, what weight ranges are usually processed, the general volume level per week, and even what days of the week the plant operates. By using the profile in an on-line edit, it is now possible to concentrate data collection on the few large plants and, by processing whatever small plants do come in quickly, to use the profile for all missing plants to estimate the actual weekly slaughter one week earlier than using only conventional methods. This type of profiling will be valuable in reducing future respondent burden.

1.3 Most Important Considerations

In giving the knowledge topic more consideration, I came to the conclusion that there are two very important emphasis for the future.

The first of these I like to call **Statistical Thinking**. The American Statistical Association, the Washington Statistical Society, and others have done a lot to promote Quantitative Literacy (QL). QL focuses on the importance of working with mathematical relationships. Statistical thinking is the proper application of statistical tools and techniques. For instance, there will be continued advances in computer software and it will be possible to automatically run many test and analyses--even if they are not appropriate. Thus, it will be vital to analyze all factors and properly direct our staff's efforts. Improvement in statistical thinking comes from experience, from practicum type course work, and from listening to other people's experiences at technical presentations and symposia such as this one.

My final topic is not new. However, as telecommunication speed increases, as data users have more processing power, and as businesses consolidate and focus on international issues, **Communication** will become even more important in order to provide accurate, timely information. Particularly for statistical organizations relying on voluntary cooperation, it will be vital to communicate with respondents--in their "language"--and build close relationships. As we use more technology, we must develop better communication within units, across statistical organizations, and with respondents and data users.

2. Bureau of Labor Statistics -- Comments by Cathryn Dippo

When contemplating the topic of statistical skill requirements for the 21st century, I began with the obvious--everyone will have access to a computer. This train of thought led to a list of issues, including:

What skills are needed to use a computer and existing software?

What skills are needed to facilitate the adoption of new environment?

How can the work environment be changed to enhance/promote more efficient use of computers?

What skills are needed to promote innovation or the design of even better tools for increasing productivity and job satisfaction?

Presumably, few people would quibble over whether or not these questions are issues or not; more than likely, the natural inclination would be to just say the list is incomplete.

But what if I change the wording only slightly:

What skills are needed to use **statistics** and existing **statistical** software?

What skills are needed to facilitate adoption of new **statistical** environment?
(One would hope that the adoption of various TQM and continuous quality improvement philosophies would result in a more statistically-based production environment.)

How can the work environment be changed to enhance/promote more efficient use of **statistics**?

What skills are needed to promote innovation or the design of even better **statistical** tools for increasing productivity and job satisfaction?

The questions are still just as relevant, if not as obvious. This leads me to two observations:

The issues related to statistical skill requirements for the 21st century are not really different from those for any other skill.

In some ways, statistical skills cannot be separated from other skills. This may be obvious with respect to computer skills, but it is also true of communication skills.

If I had to pick one statistical skill requirement that deserves special attention, it would be an ability to communicate about statistics. In these remarks I focus on just two of many aspects of communication about statistics--fundamental concepts and metadata. By fundamental concepts of statistics, I mean the ideas of uncertainty, probability, variation, bias, and relevance. These notions are not well understood by the population at large, including the vast majority of people working in statistical agencies. And those who have a good grasp of the concepts are often poor at communicating them to others, myself included. For example, when someone asks me what the unemployment rate was last month, I do not automatically say 5.2 percent plus or minus .2, or that I'm 90 percent confident that the unemployment rate is somewhere between 5.0 and 5.4 percent. By metadata, I mean all the background information on concepts, question wording, sample design, data collection procedures, estimation methods, etc. that give a number meaning and that should be used in determining a particular statistic's fitness for a specific use.

Communication about statistics is one of our most important tasks. Whether you are an interviewer trying to gain the cooperation of respondents, a methodologist discussing alternative procedures, or an analyst conveying survey results to the public, it permeates your work.

And, if we look to the 21st century, in the near term, what one factor is most likely to have a major effect on communication in our work lives? The Internet. The creation of the Internet is often likened to the invention of the printing press. The printing press provided a means for communicating with more people than was possible previously. The same is even more true of the Internet. In little over a year, the number of downloads from the BLS web site has increased to more than 800,000 per month, and we can expect the number of users of statistics to continue to grow. Many of these new users will be less knowledgeable than

current users. For example, the Federal One-Stop Statistics web site will point people to agencies and statistics that may be unknown to them.

If the staff at Federal statistical agencies are to cope well with the expanding customer base for statistics, they must be prepared to communicate both the fundamental concepts of statistics and statistical metadata to the public. Already, those responding to telephone inquiries at BLS note that there are more questions about concepts and survey methods (metadata) and fewer requests for just a number. While it is important for these information providers to be knowledgeable about the statistics (both the numbers and the metadata needed to give the numbers meaning), it is imperative that these people recognize that the statistics are just estimates, that they are surrounded by uncertainty, and that they communicate the uncertainty, along with the estimates, to the user.

We also need to do more than just **hope** that Internet statistics users will look or call for the metadata needed to interpret the statistics. We need to be **pro-active** in designing effective means of communicating both metadata about the statistics and the basic concepts of statistics within the web sites themselves.

While I am confident about what basic skills are needed, I have no answers on how to achieve the goal of a statistically literate staff in a statistical agency, much less society. I do believe we need seminars and classes in basic concepts; classes without formulae that do include exercises in writing and speaking about statistics. Such classes would be better if we had a manual or book like Victor Cohn's *News and Numbers*, but written for the statistics provider. Or, maybe we need a prescriptive counterpoint to *How to Lie with Statistics*. Whatever the mechanism, there is a clear need for making sure staff have a firm grasp of the fundamental concepts of statistics and the skills necessary for communicating these concepts to others.

I also believe that one very effective means of learning is to put yourself in someone else's shoes. Try conducting research on a topic via Internet. One quickly learns that a whole new set of skills are needed on how to find pertinent information, how to use some not very user-friendly interfaces, how to assess the quality of information from unknown sources, etc. Everyone in a statistical agency should have these skills. Interviewers should be encouraged to have a usernet group for discussing how to convert refusals and to learn what's new in other field organizations. Methodologists and computer scientists should be able to access Statistics Sweden's current best methods for improving response rates or the functional specifications for the Australian Bureau of Statistics data warehouse. Analysts should know how to assess the quality of a new statistic vis-à-vis a similar one from several years ago or in another survey or census, either in the U.S. or from another country.

When using the Internet for research, one quickly begins to recognize deficiencies. Methodological metadata is in very short supply. This brings us to the ubiquitous chicken and the egg problem of statistical skills. Which comes first: methodological metadata or the skills necessary to prepare and/or use metadata? If we do not provide users with response rates and estimates of variance, how can we expect them to use them? If users do not know how to use response rates and estimates of variance to assess a statistic's quality, why should we expect them to want us to provide them?

I would like to be a firm believer in the basic concept of the *Field of Dreams*, that is, "Build it and they will come," but I have my doubts when it comes to statistical metadata. What if no one knew anything about baseball, and someone built a field and placed some balls and sticks on it? (That is analogous to providing statistics without metadata.) Eventually, people would start playing a game, but would it be

baseball? Now, what if, in addition, a book of rules were provided in hieroglyphics, along with the balls and sticks? (That is similar to providing metadata to people who do not know how to read or use it.) Again, without the Rosetta Stone, the probability is not very high that we will get the chance to see baseball as we know it. In our case, the statistical skills associated with knowing how to read and use metadata are the Rosetta Stone. Building metadata repositories, incorporating the production of quality measures into survey production systems, etc. are insufficient in and of themselves. If we want data users, be they inside or outside agency walls, to demand and make use of metadata, we need to begin defining and transferring the skills needed to understand and use survey metadata.

To sum up, statistical communication skills are the key to giving statistics meaning. In the 20th century, we have developed considerable expertise in producing statistics. If we are to make major advances in the 21st century, we need to develop similar expertise in communicating statistical information--both the fundamental concepts of statistics and survey metadata.

3. National Science Foundation -- Written comments made by Jeanne Griffith were not available

4. Bureau of the Census -- Comments by Paula Schneider

4.1 Skill Assessment

Last December, CB formed a council to assess this topic (Strategic Planning Council on Organizational Resources, SPCOOR) comprised of union representatives, managers from all program areas, Regional Offices and Data Preparation Division in Jeffersonville)

SPCOOR mission: design an action plan to improve training and development programs

To accomplish this:

- Evaluate and inventory current training programs

- Identify corporate skill needs

- Examine competencies required by jobs

Bottom Line: We must identify skills needed in the future AND skills no longer needed.

4.2 What are we finding?

Advanced-level technical skills in statistics and survey methodology will continued to be valued:

- Masters-level preparation is needed for many jobs in both areas.

Hiring at the Master's/Phd level and/or additional training through the JPSM are both ways of obtaining employees with these skill levels.

Technical skill needs will be driven by new technologies. Smaller budgets and changing customer expectations will force the Census Bureau to embrace new technologies for collecting, processing and disseminating data. These include, for example, the computer assisted information technologies of computer assisted telephone interviewing (CATI), computer assisted personal interviewing (CAPI), Internet (using computer assisted self administered questionnaires -CSAQ, or for data dissemination), and touchtone data entry (TDE).

The way in which work is organized will change radically:

Jobs giving way to roles (employees will be assigned work not on the basis of job description but rather on basis of need for skill sets and role expertise. Employees will become more like independent contractors).

Fewer employees will be needed, but they must possess higher skill levels and a broader range of skills.

Future training and development needs MUST include non-technical as well as technical. Non-technical skills are becoming increasingly important as statisticians find themselves working in organizations shaped by following trends:

A more diverse work force,

Greater use of teams, partnerships, and networks,

Increasing premium on ability to meet customers' needs for tailored products/services.

4.3 What does this mean for future training/skill requirements?

More cross-training (Subject matter specialists <---> Statisticians),

Broader array of skills (e.g., programming skills AND statistics skills),

Workforce of generalists rather than specialists (e.g., questionnaire designers who can also program the automated instrument they "design"),

Increased computer-literacy in all areas (e.g., internet HTML programming, data analyses, expanded use of administrative records requires new computer programming skills to match and unduplicate records),

Training must reflect new census methodologies (e.g., new uses of sampling for nonresponse follow-up, continuous measurement, etc., requires knowledge of variance estimation software like VPLX, CPLX, SUDAAN (not just SAS anymore).

Technical expertise in topics for corporate research (e.g., time-series, population projections, small area estimation).

4.4 Two examples that we're heading in the right direction:

Joint Program in Survey Methodology (JPSM -- University of Maryland, University of Michigan, Westat)

Offers broad-based training in all aspects of survey data collection...result=more cross-training.

For mathematical statisticians: Increases knowledge of social survey methodologies (e.g., questionnaire design, pretesting methods -- cognitive interviews, behavior coding, focus groups, mode effects, non-sampling error,

For survey statisticians and social scientists: Increases knowledge of statistical survey methodologies (e.g., sampling techniques, statistical data analyses).

JPSM short-courses: offers concentrated training to all agency employees in specific areas (e.g. questionnaire design, variance estimation, context effects).

Mathematical Statistician Internship Program - Competitively selects the "best" and then trains them in each of the Bureau's program areas.

4.5 Where do we go from here?

Use SPCOOR report to plan/design future training,

Continue programs that "groom" future managers and achieve cross-training such as the JPSM, and the intern program,

Continue to promote idea of corporate hiring across program areas.

Statistical Skill Requirements for the 21st Century

Cathryn S. Dipbo, Bureau of Labor Statistics

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Statistical Skill Requirements and Training Needs for the 21st Century

Panelist: Paula J. Schneider

- Last December, Census Bureau formed a council to assess this topic (Strategic Planning Council on Org. Resources, SPCOOR)

(comprised of union representatives, managers from all program areas, Regional Offices and Data Preparation Division)

- SPCOOR mission: design an action plan to improve training and development programs

- To accomplish this:

- 1) evaluate and inventory current training programs
- 2) identify corporate skill needs
- 3) examine competencies required by jobs

Bottom Line: We must identify skills needed in the future AND skills no longer needed.

What are we finding?

- 1) Advanced-level technical skills in statistics and survey methodology will continue to be valued:
 - Masters-level preparation is needed for many jobs in both areas.
 - Hiring at the Master's/Phd level and/or additional training through the JPSM are both ways of obtaining employees with these skill levels.

- 2) Technical skill needs will be driven by new technologies. Smaller budgets and changing customer expectations will force Census Bureau to embrace new technologies for collecting, processing and disseminating data.

Example: Computer Assisted Info. (CAI) technologies:

- CATI
 - CAPI
 - Internet (CSAQ surveys, data dissemination)
 - TDE
- 3) The way in which work is organized will change radically:
 - jobs giving way to roles (employees will be assigned work not on the basis of job description but rather on basis of need for skill sets and role expertise.

Employees will become more like independent contractors).

- fewer employees will be needed, but they must possess higher skill levels and a broader range of skills.
- 4) Future training and development needs **MUST** include non-technical as well as technical. Non-technical skills are becoming increasingly important as statisticians find themselves working in organizations shaped by following trends:
- a more diverse work force
 - greater use of teams, partnerships, and networks
 - increasing premium on ability to meet customers' needs for tailored products/services

What does this mean for future training/skill requirements?

- More cross-training:
(Subject matter specialists <---> Statisticians)
- Broader array of skills
(e.g., programming skills AND statistics skills)
- Workforce of generalists rather than specialists
(e.g., Questionnaire designers who can also program the automated instrument they "design")
- Increased computer-literacy in all areas
(internet HTML programming, data analyses)
- Training must reflect new census methodologies
(e.g., new uses of sampling for NRFU, Continuous Measurement, etc., requires knowledge of variance estimation software like VPLX, CPLX, SUDAAN (not just SAS anymore).

(e.g., expanded use of administrative records requires new computer programming skills to match and unduplicate records)

- Technical expertise in topics for corporate research
(e.g., time-series, population projections, small area estimation)

Two examples that we're heading in the right direction:

**1) Joint Program in Survey Methodology
(JPSM University of Maryland)**

- Offers broad-based training in all aspects of survey data collection...result = more cross-training.
- For Math Stats: Increases knowledge of social survey methodologies, e.g.,
 - Q'nnaire Design
 - Pretesting Methods (cog. interviews, behavior coding, focus groups)
 - Mode Effects
 - Non-sampling error
- For Survey Stats, social scientists: Increase statistical survey knowledge, e.g.,
 - sampling techniques
 - statistical data analyses
- JPSM short-courses: offers concentrated training to all employees in specific areas (q'nnaire design, variance estimation, context effects).

2) Math-Stat Internship Program

- Competitively selects the "best" and then trains them in each of the Bureau's program areas.

Where do we go from here?

- Use SPCOOR report to plan/design future training
- Continue programs that "groom" future managers and achieve cross-training:
 - Math Stat interns
 - JPSM cohorts
- Continue to promote idea of Corporate Hiring across program areas