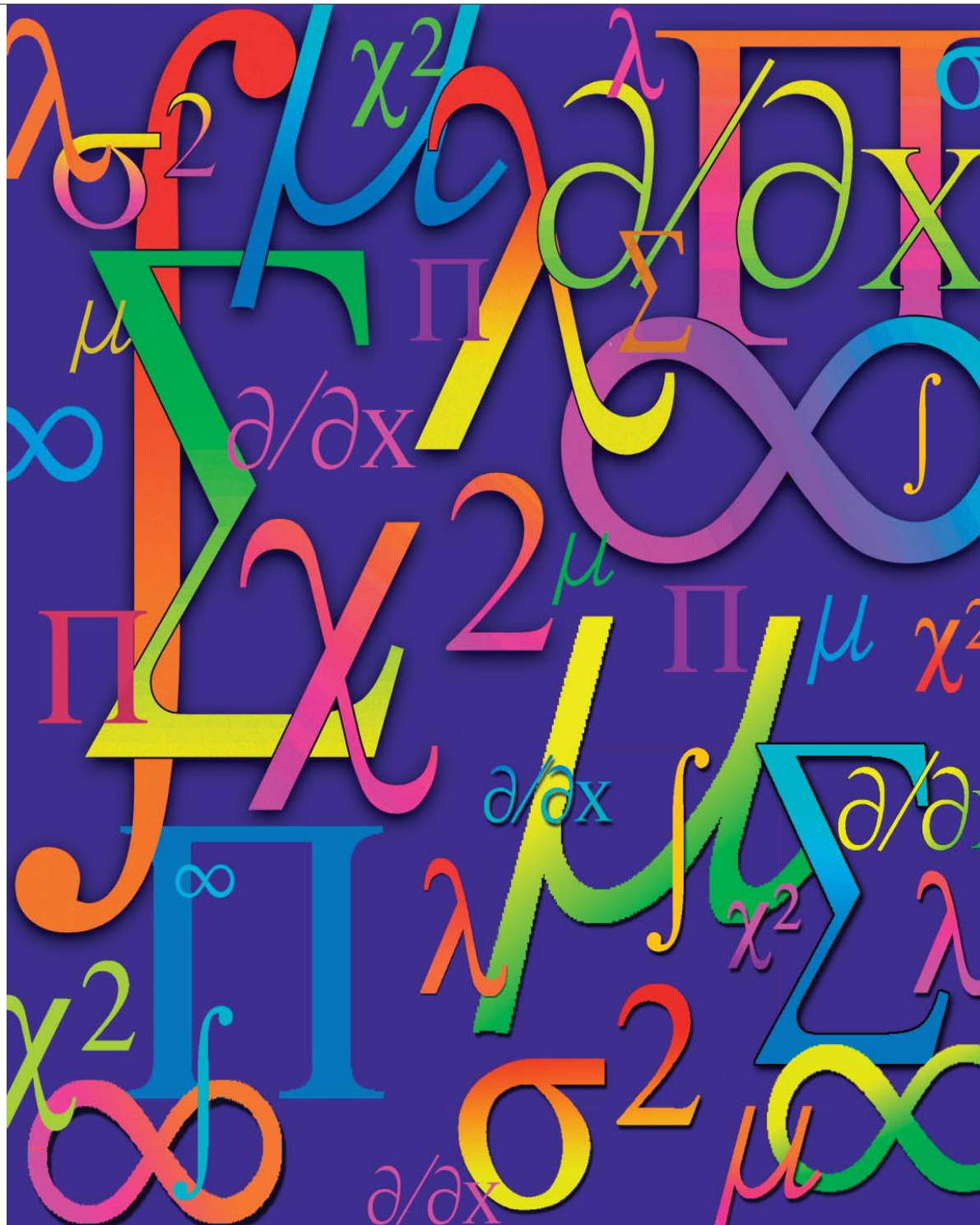


# Research Opportunities at the U.S. Census Bureau

*The ASA/NSF/Census Bureau Research Fellow Program*

Issued August 2007

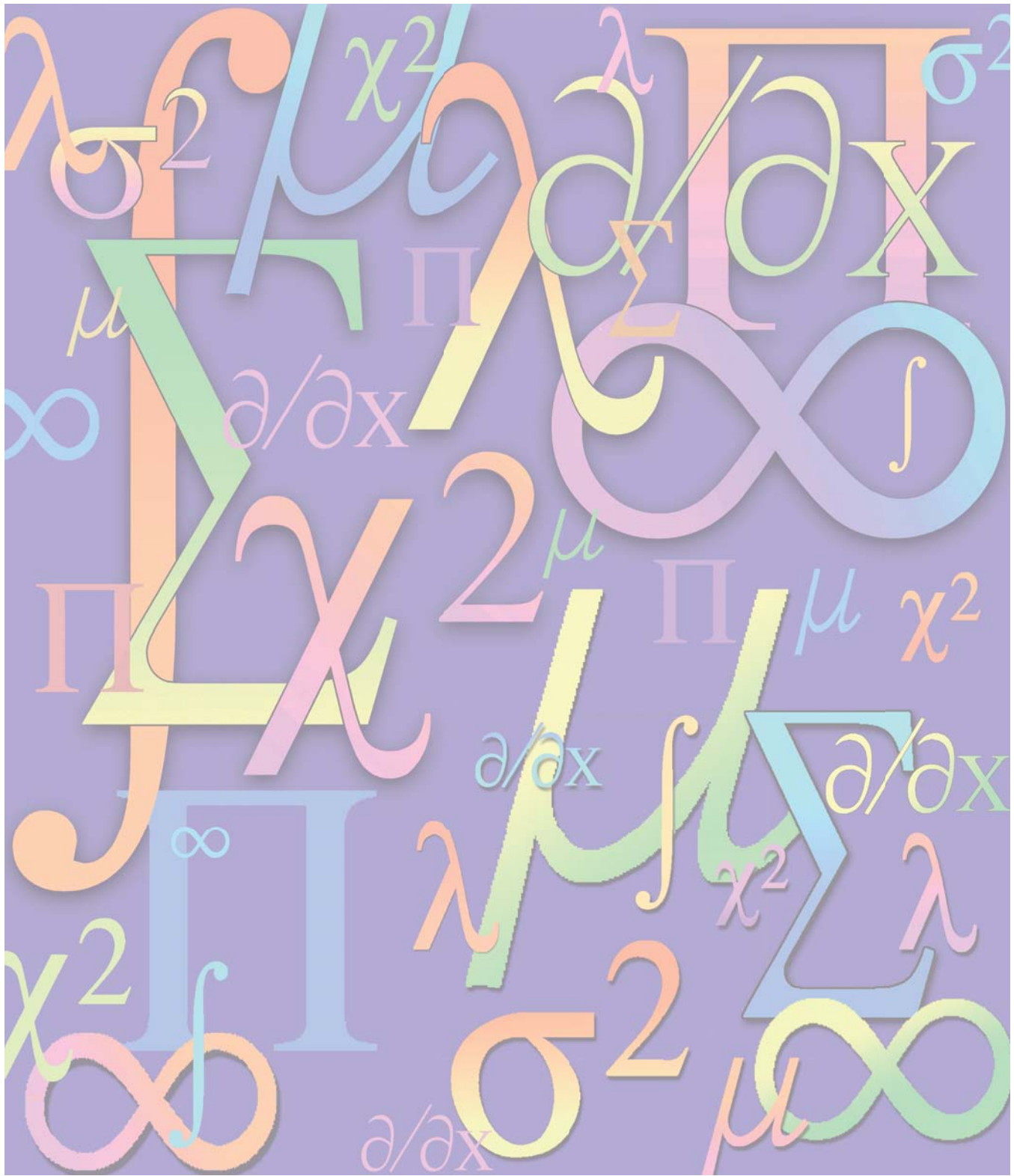
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U.S. Department of Commerce  
Economics and Statistics Administration  
U.S. CENSUS BUREAU







**Economics and Statistics  
Administration**

**Cynthia A. Glassman,**  
Under Secretary  
for Economic Affairs



**U.S. CENSUS BUREAU**

**Charles Louis Kincannon,**  
Director

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# ASA/NSF/Census Bureau Research Fellow Program

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## Program Description

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The ASA/NSF/Census Bureau Research Fellow Program helps to bridge the gap between government and academic science. This approach brings researchers closer to the production of the data sets relevant to their research. The program allows senior statisticians, social scientists, computer scientists, geographers, and others to come to the U.S. Census Bureau as Research Fellows for a period of 6 to 12 months to use Census Bureau data sets and interact with Census Bureau staff. Some of the access to data may be supplemented by use of the Census Bureau Research Data Centers.

Applicants for fellowships should have recognized research records and considerable expertise in their areas of proposed research. The proposed projects may be in any area related to Census Bureau methodology or data. Research topics of interest to the Census Bureau are cited in this brochure.

We also encourage proposals in other areas relevant to Census Bureau data or methodology. Applicants must submit detailed research proposals for competitive

evaluation. A Program Review Board composed of staff from the Census Bureau and members of academic associations relevant to the areas of research review the applications and select the Fellows for the program.

We encourage researchers to seek further support from the National Science Foundation (NSF) for their work begun under, or stimulated by, the research program. Such support requires applying to NSF for a regular project grant. Information about procedures for submitting proposals to NSF should be requested soon after entering the research program. If such continuing research is funded, it may continue at the Census Bureau or at an academic or supporting institution.

*See Administrative Information for the application procedure.*

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## About the Census Bureau

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The Census Bureau is the largest general-purpose statistical agency in the United States. By conducting

*Direct questions about fellowships or research topics to any of the following program representatives at the Census Bureau, Washington, DC 20233.*

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\* General Statistical Methodology includes, but is not limited to, improving or introducing new methodology in: disclosure avoidance, small area estimation, time series, seasonal adjustment, sampling and estimation, survey design, modeling, demography, record linkage, editing, imputation, usability (human-computer interactions), questionnaire design, cognitive testing, interviewer behavior, language/sociolinguistics, and ethnographic methods.

censuses and surveys of households, individuals, business firms, and governments, the Census Bureau produces demographic and economic statistics. These statistics count and profile the people and institutions of the United States and their interaction with the rest of the world. Specifically, the Census Bureau conducts censuses and sample surveys in the areas of population, housing, manufacturing, business (wholesale trade, retail trade, and services), mineral industries, construction, finance, transportation, governments, and foreign trade.

The Census Bureau produces data for publication and use by other government agencies, academia, and the general public. By conducting surveys for other government agencies, the Census Bureau actually collects and tabulates much of the data these agencies publish. Examples include the National Health Interview Survey for the U.S. Department of Health and Human Services, the American Housing Survey for the U.S. Department of Housing and Urban Development, the National Crime Victimization Survey for the U.S. Department of Justice, the Manufacturing Energy Consumption Survey for the U.S. Department of Energy, and the Consumer Expenditure Survey for the U.S. Department of Labor. In addition, the Census Bureau makes extensive use of other federal agencies' administrative records in compiling its statistical data. The Census Bureau has garnered the reputation as the "fact finder for the nation." The annual *Census Catalog and Guide* is the best reference on the Census Bureau's programs. This reference contains a product overview and index, abstracts of products released since 1980, ordering information and forms, lists of sources of assistance, and an informative series of facts on Census Bureau programs. The publication is available in local libraries and from the Customer Service Center, Marketing Services Office, U.S. Census Bureau, Washington, DC 20233-1900, 301-763-4636.

The Census Bureau also conducts its own methodological and subject-matter research aimed at improving its data production programs. Current broad research areas include statistical standards, survey design and estimation, evaluation and quality assurance, confidentiality, nonsampling errors, automation, data analysis, time series analysis, statistical computing, and organizational research.

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## Advantages of This Program

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By conducting research projects at the Census Bureau, the researchers have a unique opportunity to make major advances in methodology and applications in many areas. These areas include, but are not limited to, the problems suggested under the Research

Topics discussed in this brochure. This opportunity is unique for three reasons: (1) researchers are given Census Bureau special sworn status; (2) researchers can work directly with Census Bureau staff who are most familiar with the data and with methods of producing the data; and (3) researchers have the opportunity to become more familiar with federal statistical agencies and resources in the Washington, DC, area. Special sworn status permits the researchers to access nonpublic survey microdata relevant to their project. This is particularly advantageous as microdata are not generally released because of the legal requirement to protect respondent confidentiality. Researchers with special sworn status will have the same responsibility as employees to protect the confidentiality of Census Bureau data.

In addition to access to a variety of demographic and economic data sets and collaborations with internationally recognized researchers, Fellows have access to state-of-the-art facilities: (1) Census Bureau Research Data Centers, (2) Cognitive Testing Laboratory, (3) Usability Testing Laboratory, and (4) computing capabilities including a recently acquired 64 Processor, 320 Gigabyte Memory, 70 Terabyte, Disk Storage SGI ALTIX BX2 <research1.srd.census.gov>. This 64 Processor System, available to Fellows, enables computationally intensive statistical methods for missing data, record linkage, modeling of large data sets, and data mining.

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## Research Topics

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### RESEARCH TOPIC A: DECENNIAL CENSUS COVERAGE

#### Problem

The decennial census suffers from errors due to omission of people who should be counted and to erroneous enumerations of people, the latter including enumeration of people who should not be counted at all, enumeration of people in the wrong place, and enumeration of people multiple times (duplication). These problems are substantial. For example, there were an estimated 5.8 million duplicates in Census 2000. Coverage measurement of Census 2000 was afflicted by some of the same problems. The 2000 Accuracy and Coverage Evaluation Survey (A.C.E.) was unable to accurately determine some people's places of residence, resulting in an underestimate of erroneous enumerations, many of which were duplicates. In fact, the failure of the A.C.E. to identify a substantial number of the census duplications as erroneous enumerations was a primary reason the 2000 A.C.E. estimates were viewed as inadequate for coverage adjustment of the Census 2000 results.



## Discussion

The goals of this research are to reduce coverage errors in the census, and also to improve the Census Bureau's understanding of these errors by improving census coverage measurement. Specific topics for research include the following:

- 1) Research to prevent and correct for duplication at all stages of the census and coverage measurement process, from address list development to final coverage estimation.
- 2) Research to improve determination of Census Day residence:
  - a) Development and testing to improve the survey instruments and questions, including alternative presentations and formulations of residence rules.
  - b) More basic research on errors in, e.g., recall and reporting of moves and other problematic residence situations.
  - c) Cognitive and qualitative research and field experiments to evaluate the impact of survey questions on the quality of census coverage measurements.
- 3) Development of coverage measurement methods for group quarters.
- 4) Statistical research on improving coverage estimates, including separate estimation of census omissions and erroneous enumerations.

Topics (1) and (2) aim at improving the data collected in both the census and in census coverage measurement. Topic (3) aims at addressing the Census Bureau's lack of knowledge of the coverage of the group quarters population. Topic (4) seeks to improve coverage measurement, particularly in regard to providing more realistic estimates of omissions and erroneous enumerations than have previously been available. Accomplishing these tasks would further the Census Bureau's understanding of census coverage issues, helping the Census Bureau to improve future censuses.

### **RESEARCH TOPIC B1: NONRESPONSE— DEMOGRAPHIC SURVEYS**

#### Problem

Survey nonresponse rates have been increasing, leading to concerns about the accuracy of (demographic) survey estimates. For example, from 1990 to 2004 initial contact nonresponse rates have approximately doubled for selected household surveys, including the

Consumer Expenditure Quarterly (from 12 percent to 23.3 percent), the Current Population Survey (from 5.7 percent to 10.1 percent), and the Survey of Income and Program Participation (from 7.3 percent to 14.9 percent). Errors introduced by unit nonresponse may bias survey estimates when nonresponse is high and those who participate in surveys are different from those who do not. Standard nonresponse adjustment procedures typically assume that nonrespondents are similar to respondents, but the literature does not always support this assumption.

## Discussion

General topics for research include:

- 1) Strive to increase response rates by improving data collection procedures. Research on data collection procedures may develop methods for increasing response rates (or at least preventing further decreases) either generally or for specific surveys. This would be a true improvement, however, only if methods developed to increase response do not simultaneously degrade the quality of the data collected. Efforts to increase response rates also can lead to higher costs of data collection due to additional interviewer training and various incentive programs.
- 2) Strive to better understand the nature of nonresponse and its effects on data quality. Doing some targeted follow-up of nonrespondents may yield information on how nonrespondents differ from respondents, as may obtaining information from other sources (such as administrative records) that contain information also collected in a survey (assuming that the records can be linked). Such information could be used to develop a better scientific understanding of the nature of survey nonresponse. It may also be useful for research on Topics 1 and 3.
- 3) Develop better procedures to adjust for nonresponse. If nonresponse rates cannot be reduced to negligible levels, the Census Bureau will need to evaluate current nonresponse adjustment procedures and do research to develop improved procedures. Possibilities to explore include comparing hot deck and model-based imputation procedures, and exploring models for nonignorable nonresponse. The Census Bureau should also pursue implementation of methods for survey variance estimation that account for error due to imputation.

Success on Topic 1 would reduce field costs and improve the accuracy of the Census Bureau's estimates. Success on Topic 2 would let the Census Bureau better inform data users about data quality and limitations, and would also facilitate work on Topics 1 and 3. Success on Topic 3 would improve the accuracy of the Census Bureau estimates and/or the relevance of its variance estimates.

## **RESEARCH TOPIC B2: NONRESPONSE— ECONOMIC SURVEYS**

### **Problem**

Maintaining or improving response rates is an ongoing goal and constant challenge for economic surveys. Response rates for the 2002 Economic Census declined from 1997.

Response rates for current surveys range from approximately 30 percent to 95 percent. Response in the 2002 Economic Census was 84 percent, with a target of 86 percent for the 2007 Economic Census.

### **Discussion**

Improving the response rate in the 2007 Economic Census is a strategic goal. Response rates for the Economic Census and selected other surveys are critical Program Assessment and Rating Tool (PART) performance measurements.

The Economic Directorate of the Census Bureau believes that reducing respondent burden is key to improving response. Ongoing research and assessments are underway using such techniques as cognitive testing, respondent debriefings and usability testing for economic survey data collection instruments. Nevertheless, several issues remain to be addressed.

- What are the attributes of respondent burden from the respondent's perspective? Are these measurable? What are the measures? Are the components reducible via survey design? If so, how? To what degree do current activities reduce respondent burden?
- Does the hypothesized relationship between respondent burden and response rates indeed exist? How can this relationship be defined and measured?
- What activities can/should be undertaken to evaluate the effect of burden reduction on response rates? What are their costs and benefits?

Of specific interest is how effective the following strategies are in reducing burden:

- Tailoring questionnaires by company size.

- Aligning data requests with companies' accounting practices and record-keeping systems.
- Developing a company-centric approach for data collection from large companies.
- Developing more effective electronic reporting options that respondents will use.

Response may be positively affected by follow-up strategies. The effectiveness of current follow-up strategies needs to be systematically evaluated. Few directorate resources have been devoted to keeping up with recent discoveries or advances in response motivators. Research into new or alternative strategies and their effectiveness in economic surveys is needed.

Results from both lines of research—burden reduction and follow-up strategies—would benefit the economic programs through improved response rates, which could improve data quality by reducing potential non-response bias. Improvements would help the Census Bureau in its attempts to meet the Office of Management and Budget's (OMB) new response rate standards and its own PART targets. More effective follow-up strategies have the potential to result in significant cost savings in conducting economic surveys. (For example, the 2002 Economic Census follow-up costs exceeded \$1.5 million.)

## **RESEARCH TOPIC C: REPORTING UNIT RESEARCH—ECONOMIC SURVEYS**

### **Problem**

A problem for economic surveys is the potential mismatch between the Census Bureau's definition of statistical (reporting) units and the structural units of a company. The organization of a company's records may make it more difficult or impossible for the respondent to provide data according to the Census Bureau's desired statistical units. This could lead to poor quality estimates. For example, companies in some services industries cannot report data by geographic area for products or services distributed via a network.

The extent of problems associated with reporting unit definitions is, to some degree, unknown or unclear, as they are not routinely assessed for economic programs. Research is needed to evaluate the effect of mismatches on published statistics. If changes in reporting units are overlooked, the potential consequences are severe. The Census Bureau's economic censuses and surveys collect data or process administrative data representing 180,000 multi-unit enterprises encompassing 1.7 million establishments, 5.5 million single unit establishments, and 17.6 million nonemployers.

## Discussion

Proper definition of statistical units is key to obtaining high quality economic statistics and minimizing respondent burden. This will be facilitated through research to:

- Assess company record-keeping practices.
- Assess the quality and utility of administrative data.
- Assess how administrative data can be more fully used to identify structural changes.
- Improve the timely identification and incorporation of administrative data into Census Bureau programs.
- Assess how definitions used for administrative data compare with those used for survey data and how these compare with data available in company records when administrative and survey data are used to develop statistical estimates.
- Identify the correct respondent(s) for the requested data (noting that multiple sources may be required).
- Assess the effectiveness of the Customer Relationship Manager program.
- Design efficient processes to aid data-gathering when multiple data providers are needed.

Benefits for the Census Bureau from research would include:

- Timely updates to the Business Register with timely impact on sample frames.
- More efficient/effective communication with respondents, improving the timeliness of data reporting, which could lead to earlier publication and dissemination of data products.
- Improved data quality when reporting among multiple data providers is better facilitated.
- Burden reduction through effective use of administrative data, potentially improving response rates and reducing the costs of nonresponse follow-up.

## **RESEARCH TOPIC D: EDITING—ECONOMIC SURVEYS**

### Problem

The Census Bureau needs objective measures to assess whether its programs are over-editing their data. Over-editing has cost and quality implications. It can lead to resource problems, in terms of programmer

development time and analyst review time. Equally important, it can be viewed as a quality problem—are the Census Bureau’s editing procedures truly improving the reported data or are they (subtly) biasing the data based on preconceived notions of what the Census Bureau believes to be “correct?” Should the Census Bureau be identifying the failure as a problem to begin with? Finally, many Economic Directorate programs subject the same data sets to several stages of review, with some of these stages having possibly minimal impact on the final tabulated data. This has both cost and quality implications.

At a minimum, all Economic programs should:

- Calculate edit-failure rates by respondent and by classification variable value.
- Implement and use audit trails.
- Develop Standard Operating Procedures for analysis of both sets of measures (hopefully using statistical quality control procedures).

This problem affects most programs in the Economic Directorate of the Census Bureau. The key issue is that the directorate has no standard set of objective measures of the efficacy of edits and their associated review processes. In fact, one of the charges to the Business Process Improvement Team’s Edit Efficiency subteam was to outline the type of auditing needed in the future, and to identify five pilot programs to test these audits.

The Census Bureau believes that the overall cost of editing and multistage review is high; though there is no specific cost information available. With objective measures in place, the cost and quality issues could be assessed. The Edit Efficiency subteam identified a potential savings of 10 percent of the resources allocated to data analysis in each of the six programs given the recommendation to calculate edit-failure rates and in each of the nine programs given the recommendation to measure the effect of edit process on the resultant data.

### Discussion

The Economic Directorate needs a method to analyze the editing process and evaluate the quality of the edits and related review processes so that it can eliminate or modify the existing procedures and conduct research on ways to improve specific edits, such as macro-editing and selective editing.

If research could help solve this problem, the Census Bureau would be changed as follows:

- It would reduce the time spent on the overall editing process while maintaining or improving tabulated data quality.
- It would free the analysts to actually do analysis.
- The Economic Directorate would have a more defensible approach to edit-review processing.
- It would promote the development of repeatable procedures that could be implemented by outside-data users, consistent with the OMB Quality Information guidelines.

### **RESEARCH TOPIC E: PRERELEASE REVIEW OF DEMOGRAPHIC DATA**

#### Problem

Data review of continuing surveys, such as the Current Population Survey (CPS), take a significant amount of time and resources. With the implementation of the American Community Survey (ACS), this data-review work threatens to overwhelm staff. Currently, ACS data review takes about 6 calendar months, during which time about 25 people work from 25 percent to 75 percent of their time on review of the data and data products. As ACS expands to review of full implementation data and adds Puerto Rico, group quarters, and 3- and 5-year product lines, it will not be possible to complete the work within the current review time frame without dramatically diminishing its quality.

The dimensions of the problem are huge:

- 1) The large-scale size and cost of getting review done.
- 2) Completing reviews efficiently and on time.
- 3) Making the mundane/routine parts of review simple and direct to do.
- 4) Keeping analysts focused on what is a highly tedious task.
- 5) Codifying behavior of routine review activities, perhaps using automation and standardized tools.

#### Discussion

If the Census Bureau were to solve this problem, there would be benefits. Review would become more efficient. The frequency of errors would be reduced and problem situations would be more easily identified. Staff members would be freed for more useful activities, reducing burnout. If gold standard processes can be identified, they can be applied to other programs, thus paying for these innovations over time.

With more focused and structured review, it is possible that ACS products could be reviewed and cleared in far less time and using fewer human resources.

### **RESEARCH TOPIC F: SURVEY ESTIMATION**

#### Problem

Research to improve survey estimation techniques, including evaluation of alternative estimation strategies, is needed to keep up with changing circumstances, such as increased nonresponse and demands for small-domain estimators. The continued development of the ACS poses new challenges for estimation because the nature of the estimation problems it faces are different from those of other surveys, even the census long-form sample. (ACS estimates are desired for traditionally small domains from a very large national sample available yet without corresponding 100 percent census counts in most years.)

The Census Bureau identified a general problem as well as several specific problems in this area. The general problem is that while the Census Bureau's design-based estimation paradigm was developed and works well for estimation in certain situations with large samples (e.g., for many national level estimates), it does not work so well when pushed beyond this realm (e.g., into small area estimation, dealing with large amounts of missing data, dealing with outliers, etc.). In such settings, other approaches (e.g., model-assisted or model-based estimation) may offer opportunities for improvement. Movement in this direction is hampered, however, by such things as tradition, bureaucratic obstacles, lack of staff knowledge of other approaches, and difficulties with implementing a new approach in the Census Bureau's production environment. Addressing this general problem will require additional staff training (e.g., via available short courses), perhaps complemented by recruiting of new staff with backgrounds in alternative estimation approaches, as well as devoting attention to resolving bureaucratic and other obstacles to implementing new or different estimation methods.

#### Discussion

Particular survey estimation problems identified for research include the following:

- 1) Study optimum use of population and housing unit controls for the ACS and other surveys.
- 2) Investigate bias and uncertainty in pop controls with an eye to developing error estimates for pop estimates; also, study the impact of these errors on survey estimates.

- 3) Do research on estimators that incorporate administrative data to improve ACS estimates for very small areas.
- 4) Do research on improving small area estimation for other Census Bureau survey applications (SAIPE, SAHIE, etc.).
- 5) Investigate the feasibility of using model-based or model-assisted estimation techniques in the monthly residential construction program (to use additional information from the large sample of building permits to improve estimation of housing starts, completions, and sales).

The Census Bureau can link the general and specific problems by noting the potential of other estimation approaches to address the specific problems just noted. For example, model-assisted estimation, in the form of generalized regression estimation, potentially can reduce the variance of direct ACS estimates without appreciably adding bias, providing a potentially useful tool to assess the average bias in the controls noted in 1) and 2). It is also relevant to the problem noted in 3).

#### **RESEARCH TOPIC G: MEASUREMENT ERROR RESEARCH AND PREVENTION**

##### **Problem**

Recent Census Bureau experience points to measurement errors (that is, errors of observation arising from the interviewer, the respondent, the questionnaire, or the mode of data collection) as major sources of inaccurate and inconsistent data. In Census 2000, the coverage reinterview failed to identify a large fraction of the duplicate enumerations in the census (see Decennial Census Coverage Topic A.2) due to inaccurate measurements of Census Day residency. In 2000, the percentage of Hispanics reporting their race as White was 48 percent in the census and 63 percent in C2SS, perhaps due to differences in survey mode and interviewer training. Subtle and untested changes in the Hispanic-origin question in Census 2000 led to loss of detailed origin information for about 12 percent of Hispanics in the mailout universe.

##### **Discussion**

The errors can be very large, and their origins are not always well understood. Very large and poorly understood discrepancies undermine the credibility of census data more broadly.

Many questionnaire design flaws that give rise to measurement errors can be identified and corrected through pretesting. (For example, the flaws in the Hispanic origin question in Census 2000 would prob-

ably have been caught had the final version been cognitively tested.) Research to evaluate and improve pretesting methods is needed to support the Census Bureau's policy of testing all questionnaire changes. Basic research is needed to better understand sources of measurement errors. For example, why were moves and second residences unreported and/or unreliably reported in coverage reinterviews? It is necessary to understand the reasons for such errors in order to correct them.

- 1) Carry out research on the sources and magnitude of measurement errors.
  - a) Evaluate data quality, through regular compilation of data quality indicators (e.g., item nonresponse rates), regular or special evaluations (reinterview, record check studies), and studies of respondent difficulties and misinterpretations (e.g., cognitive interviews, respondent debriefing studies).
  - b) Evaluate effects of mode of data collection on quality and comparability of survey data in order to develop guidelines for standardizing survey instruments across modes.
  - c) Conduct research on fundamental sources of survey measurement problems (e.g., recall error), drawing on theory and methods in relevant scientific disciplines, such as psychology and linguistics (see also Topic J).
- 2) Conduct developmental research and methodological studies to support measurement error reductions through improved questionnaire design and procedural improvements.
  - a) Develop and qualitatively test questionnaire revisions designed to solve the problems identified in step (1).
  - b) Conduct field experiments to evaluate solutions.
  - c) Develop translation methods and protocols.
- 3) Evaluate and further refine questionnaire pretesting methods.

Several benefits would follow if the Census Bureau were to solve this problem. The Census Bureau could produce more complete, consistent, and higher quality data, with less time and cost devoted to editing and review (See Topic D, Editing Economic Surveys, and Topic E, Prerelease Review of Demographic Data). A better understanding of the nature and causes of measurement error would support development of improved statistical estimates and better data collection instruments and techniques. It would also help avoid the

major data problems that now cause occasional embarrassment and (when they still occur) would help the Census Bureau to explain them more credibly.

## **RESEARCH TOPIC H: RESEARCH ON TIME SERIES METHODS AND SEASONAL ADJUSTMENT**

### Problem/Discussion

Currently the Census Bureau's Economic Directorate collects data for more than 1,400 monthly and quarterly economic data series and uses time series analysis methods for seasonal adjustment of over 1,000 of them. However, time series analysis and modeling techniques could also be employed for other purposes, e.g., to assist in editing, imputation and estimation, and to improve the Census Bureau's published measures of statistical uncertainty. Research in the following areas, while not motivated by what are presently perceived as major problems, nevertheless represent opportunities for improvement that could help the Census Bureau save time and effort and improve the quality of published estimates. For most of these topics, the change to current Census Bureau procedures—implementation—poses a greater challenge than does doing the research. Also, for these topics it is generally not possible to estimate the extent of the benefits without further exploratory trials or research.

- 1) Compare time series forecasts with tabulated data for the most recent period to identify values that may require an edit response. This may reduce the tremendous labor cost currently required for editing to maintain economic data quality. This approach has been implemented in the Foreign Trade Division (FTD) and the Service Sector Statistics Division (SSSD), but might also be beneficial in other areas.
- 2) Develop statistical measures of uncertainty (e.g., variances or descriptive statistics for revisions) for seasonally adjusted estimates.
- 3) Develop and apply models for sampling error autocovariances, for possible use in such things as improving survey estimates, doing model-based seasonal adjustment, or developing variances of seasonally adjusted estimates.

Topics 2 and 3 are related. Providing measures of uncertainty in the Census Bureau's estimates is very important, but, in most cases, the Census Bureau currently provides variance estimates only for the Census Bureau's original, unadjusted data. Uncertainty measures specifically for the seasonally adjusted data would be more relevant (though research should also investigate how different these would be from those for the unadjusted data).

- 4) Use time series forecasting procedures to address issues with systemic delayed reporting of data. Some work has been done here and at Statistics Netherlands on this topic, but more research is needed.
- 5) Further investigate modeling of and adjustment for time-varying trading-day effects. Close to half of the Census Bureau's 1,000+ seasonally adjusted series have trading-day effects, and for some of these series, especially the SSSD's series, the Census Bureau expects that the trading-day patterns change over time. Crude methods are currently used to deal with this problem. More refined methods based on time series models have shown promise, but more research is needed, including investigation of how prevalent the problem is.

## **RESEARCH TOPIC I: DISCLOSURE AVOIDANCE METHODS**

### Problem/Discussion

The Census Bureau wants to protect the confidentiality of its respondents' information, as required by Title 13 of the U.S. Code, while releasing as much high quality data to the Census Bureau's users as possible. In order to do so, the Census Bureau needs to develop new and improved disclosure avoidance methods. For demographic data, the goal is to counter the growing potential to identify individuals based on the expanding amount of personally identified information on the Internet. For economic data, the goal is to reduce the number of table cells that are suppressed while maintaining data protection. In addition, the Census Bureau is releasing new types of data products such as maps and indices, requiring new disclosure avoidance methods. The Census Bureau should also document the basis for existing disclosure avoidance methods and evaluate the effects of all of the methods on data quality.

These activities would involve considerable effort because of the vast amount and great variety of data products the Census Bureau releases. This problem is important to the Census Bureau because disclosure protection is required by law, because publicized disclosure could result in decreased response rates, and because disclosure avoidance procedures affect the quality of all of the Census Bureau's data products. Moreover, the Census Bureau promises respondents that the Census Bureau will protect the confidentiality of their information. In short, improved disclosure avoidance methods would benefit the Census Bureau in terms of releasing more high quality data while avoiding disclosure.

## RESEARCH TOPIC J: INVESTIGATION OF LINKS OF CENSUS BUREAU PROBLEMS TO BEHAVIORAL SCIENCE RESEARCH

### Discussion

Progress in many of the behavioral sciences has been rapid in recent years. These disciplines include several areas in psychology, cognitive neuroscience, and linguistics. For example, the basic science in memory, language, attitudes, and affect has each progressed far beyond the understanding of these areas by most statisticians and survey methodologists. The value of basic science in memory seems self-evident, but the scope of current results and open questions—familiar to readers of *Science*, *Nature*, and a large number of neuroscience and psychological journals—appear virtually unknown to survey researchers. Although sociolinguists are represented in small numbers in survey research, the Census Bureau lacks a critical number of researchers who can represent the current findings from the study of syntax, linguistic pragmatics, or psycholinguistics. Social and cognitive psychologists are revising the conceptual understanding of attitudes, but the implications of these changes appear unrecognized by survey researchers. Advances in the study of affect now touch many other areas of psychology, including cognitive psychology.

Incorporating new knowledge from these fields could potentially improve the Census Bureau's censuses and surveys. Development of more coherent theory (e.g., of survey response or of recall failure in surveys) may be furthered if survey methodologists are exposed to the scope of relevant developments in the behavioral sciences. "Building a bridge to the behavioral sciences" may help the Census Bureau realize some of the potential benefits to its work from the recent developments in these fields. Several suggestions are offered:

- 1) Develop models more closely aligned with current behavioral science and test the models using past data or new experiments.
- 2) Current survey research staff (particularly younger staff), especially those in the behavioral sciences or related disciplines, may be encouraged to keep up in their fields and read in some related disciplines. This could be enhanced by making modest investments in appropriate books and key journals for the library and by encouraging staff to write papers or present informal talks reviewing relevant developments in the behavioral sciences.
- 3) Fund outside researchers in the behavioral sciences to work on problems relevant to the Census Bureau's applications. This is more likely to be successful if the outside researchers have agency collaborators who already have a working knowledge in the same field.

## RESEARCH TOPIC K: RESEARCH TO IMPROVE POPULATION ESTIMATES

### Problem

Discrepancies noted in comparisons of population estimates to Census 2000 results identified the need to improve the annual estimates of international and internal migration. In addition, the use of detailed annual population estimates as controls on estimates from the ACS imposes new requirements on the population estimates. This research will examine alternative data sources and improved use of the ACS data to estimate international and internal migration.

### Discussion

Increased use of detailed population estimates as the basis for funding mechanisms and as controls for the ACS has led to increasing scrutiny on the data, methods, and results of the detailed population estimates, especially in the most vulnerable areas of international and internal migration. If these identified issues continue to remain unresolved, the reputation of the overall Census Bureau will be affected.

- 1) The proposed research on international migration will focus on measuring the annual inflow of migrants to the United States, using selected data from the annual ACS. Estimating the annual outflow of migrants from the United States requires research into the development and validation of new methods combining statistical modeling with demographic data sources. Research on internal migration will focus on integrating new data sources and statistical modeling to identify and reduce bias inherent in the current methods to measure internal migration.
- 2) Research is needed on measuring population on a current residence basis and on developing models to reconcile the current residence population with the usual residence population.
- 3) Research will examine bringing additional data sources into the subnational population estimates. These sources will include the ACS, but might also include administrative sources on employment and taxes.
- 4) Research is needed on improved methods to achieve integrated and consistent population estimates at different levels of geography. The current approach begins at the county level, with the estimates controlled only at the national level. Control at other levels and a more integrated approach are possible.

Improvements in the annual measurement of international and internal migration will lead to improved population estimates and survey controls, which can improve estimates from numerous demographic surveys, especially the ACS. This would enhance the overall quality of Census Bureau products and the agency's reputation.

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## Additional Research Topic

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### **MICRODATA PROJECTS ON INNOVATION, TRADE, AND COMPETITION**

#### Problem/Discussion

The Census Bureau's Center for Economic Studies would like to expand its current research and data construction efforts in four specific areas: innovative activities, multinational corporations and globalization, entrepreneurship, and the role of geography in economic modeling.

The Census Bureau is actively seeking ways to measure innovative activities in the U.S. economy using existing Census products and potentially through the development of new products. Understanding the impact of innovation on economic performance requires reliable data on the inputs and outcomes of innovative activities and not just measures of whether innovation has taken place. This project will explore ways to improve measurement of innovative activities, their outcomes, the factors that influence them, and our ability to compare these activities and their outcomes across countries.

Multinational Corporations (MNCs), those businesses operating in more than one country, are a small share of U.S. manufacturing firms but account for a much larger share of the manufacturing workforce. Understanding them, together with the importing and exporting activity of all U.S. firms, is critically important to understanding the population of businesses as well as the impact of globalization on the U.S. economy. The Bureau of Economic Analysis (BEA) conducts annual surveys of Foreign Direct Investment in the U.S. and U.S. Direct Investment Abroad. This project will link the BEA data on MNCs with a variety of economic censuses, surveys, and administrative records programs that provide data on domestic business activities as well as imports and exports.

The Census Bureau is also interested in developing tools in the form of both linked data and empirical models to study entrepreneurship and the role of small and young businesses. As new administrative and survey data become available and are linked to existing

longitudinal datasets, researchers can more accurately and completely describe entrepreneurial activities.

Another important area of research is the role of geography in economic modeling (e.g., in defining geographic markets and measuring the impact of disasters). The Economic Census is the primary program through which the Census Bureau published detailed statistics on business activity by detailed geographic unit, such as place or Zip Code®. Beginning in 2007, latitude and longitude information will enable researchers to customize the unit of geographic analysis for each industry and determine how existing geographic measures affect the results of economic modeling.

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## Administrative Information

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### **Conditions of Appointment and Benefits**

Research Fellows will conduct their research at the Census Bureau in Suitland, MD, a suburb of Washington, DC. While participating in the program, they are to follow normal Census Bureau policies and practices. The researchers are reimbursed by the American Statistical Association (ASA) and are on a guest worker arrangement with the Census Bureau, or they are paid under other arrangements with the Census Bureau.

The stipends received by researchers in this program are commensurate with their qualifications and experience. Fringe benefits and travel allowances are negotiable. Usually, the Census Bureau can negotiate retention of fringe benefits with the permanent employer.

The duration of the fellowship appointment is flexible; the usual term is 6 months to 1 year. Extensions to appointments, appointments split into two separate terms, and part-time fellowships are also possible.

Census Bureau computing resources available to the researchers include Unix servers and workstations, DEC minicomputers, and various personal computers. Computer networks also provide internal electronic mail, as well as access to the Internet through our isolated server workstation. Other support provided to researchers includes technical and secretarial support, library facilities, a travel allowance, and interaction with the Census Bureau's professional staff. Funds are also available to accommodate specialized needs for computer software and hardware. The researchers who work with Census Bureau computing equipment are subject to a routine security clearance. The researchers must take an oath of nondisclosure and complete confidentiality and security training prior to accessing any Title 13 data.



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## Application Procedure

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The following information is required of all fellowship applicants:

1. A curriculum vitae.
2. The names and addresses of three references who may be contacted.
3. Three copies of a detailed research proposal to include the following:
  - a. Short descriptive title for the project.
  - b. Any additional agency's fellowship program the applicant may be applying to in addition to the Census Bureau (i.e., BLS or NCES).
  - c. Abstract of one-half page or less that summarizes the project.
  - d. Proposed term (approximate dates).
  - e. Background information on research topic with references.
  - f. Statement of relevant work already accomplished by the researcher.
  - g. Proposed research plan with sufficient detail for evaluation of expected results.
  - h. Significance of expected results.
  - i. Advantages of conducting the research at the Census Bureau.
  - j. Requirements for research support and work facilities.
  - k. Budget required for appointment including:
    - salary costs for term of appointment
    - benefits
    - research assistance costs
    - hardware costs
    - travel costs.

Note: The following are not eligible for these fellowships: U.S. federal government employees, members of review boards of ASA-sponsored fellowship programs, and members of the Board of Directors of ASA.

Applications for the ASA/NSF/Census Bureau Research Fellow Program should be sent to:

Ms. Joyce Narine  
ASA/NSF/Census Bureau Research  
Fellowship Program  
American Statistical Association  
732 North Washington Street  
Alexandria, VA 22314-3415  
E-mail: joyce@amstat.org

The application deadline is December 10.  
Final decisions will be made by March.



