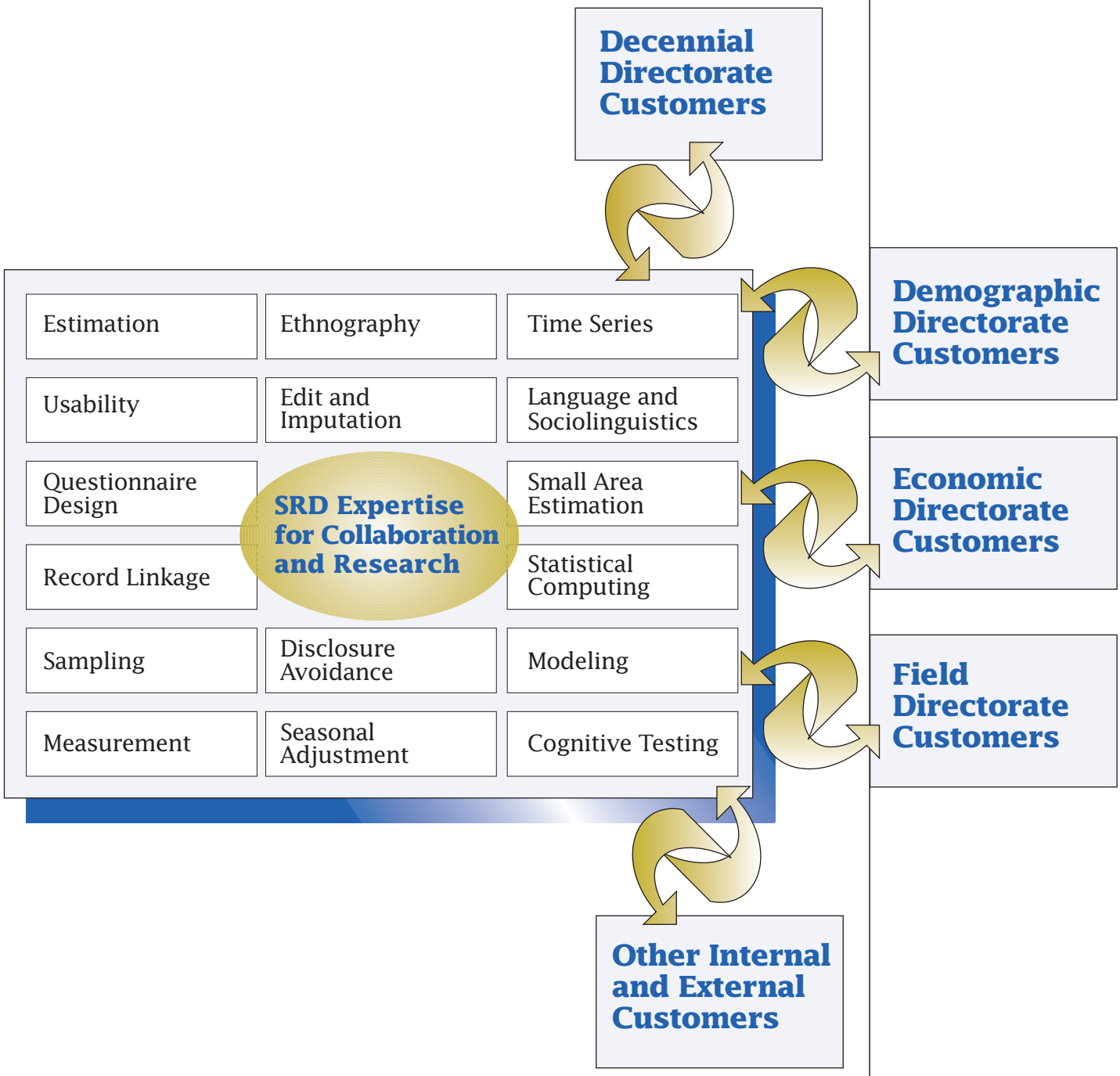
Annual Report *of the* Statistical Research Division

Fiscal Year 2008



U S C E N S U S B U R E A U

Helping You Make Informed Decisions

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

We help the Census Bureau improve its processes and products. For fiscal year 2008, this report is an accounting of our work and our results.

Statistical Research Division

Highlights of What We Did…

As a technical resource for the Census Bureau, each researcher in our division is asked to do three things: *collaboration/consulting*, *research*, and *professional activities and development*. We serve as members on teams for a variety of projects and/or subprojects.

Highlights of a selected sampling of the many activities and results in which Statistical Research Division staff members made contributions during FY 2008 follow, and more details are provided within subsequent pages of this report:

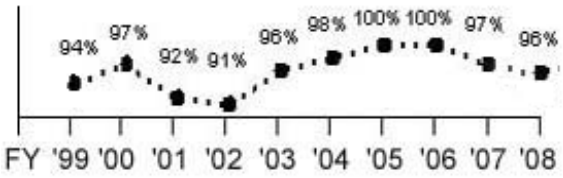
- developed, with Synectics (a contractor), a prototype of the remote microdata analysis system. [Staff tested the system to find and eliminate disclosure problems for tables, regressions, and correlation coefficients.]
- further developed the technique of using noise addition for economic tables. [Staff used this method to protect Non-Employer data, Census of Island Areas, Survey of Business Owners, and Commodity Flow Survey products.]
- built imputation models that can be used to generate synthetic microdata and tables. [Staff is using this technique for the American Community Survey (ACS) Group Quarters data and planning its use for Census 2010 Group Quarters data.]
- developed improved statistical methodology for nonparametric spectral peak detection.
- improved asymptotic variance estimation for model-based seasonal adjustment diagnostics with research into signal extraction diagnostics.
- completed a preliminary evaluation of spatial models using 2000 Census data on household size.
- developed stepwise regression methodology and software to compare predicted and observed estimates of ACS characteristics for use in the review of 3-year data.
- used calibration to compensate for missing data in the Survey of Research and Development in Industry (SRDI).
- developed maintainable SAS and Visual BASIC software to create generalized, integrated Current Population Survey (CPS) ASEC Race, Hispanic, Older, and Gender tables for 2007 data and beyond.
- completed 14 expert usability reviews of Web sites; completed 5 usability evaluations; and completed accessibility evaluation of 2 Web sites and 9 software applications.
- facilitated the conduct of 33 pretesting activities across the decennial, demographic, and economic areas under the Generic Clearance with the Office of Management and Budget.
- completed the research on cognitive testing of an American Community Survey (ACS) multilingual brochure in five languages (English, Spanish, Chinese, Korean, and Russian).
- completed the research on cognitive testing of the 2010 Census questionnaire in five languages (English, Chinese, Korean, Russian, and Vietnamese).
- under the R&D Contracts, awarded 14 new task orders, processed 28 modifications on active task orders, and completed 13 task orders.
- demonstrated exceptional speed of the *BigMatch* matching software.
- obtained preliminary results suggesting that Event History Calendar methods offer great potential for maintaining sufficient data quality in a 12-month reference period Survey of Income and Program Participation (SIPP) interview.
- used 2005 ACS data instead of 2006 CPS ASEC data in the Small Area Income and Poverty Estimates (SAIPE) state models for 2007 production. [The model based estimates gave substantially lower variances for the small states.]

How Did We Do...

For a tenth year, we received feedback from our sponsors. Near the end of fiscal year 2008, our efforts on fifty-seven of our program (Decennial, Demographic, Economic, External) sponsored projects/subprojects with substantial activity and progress and sponsor feedback (Appendix A) were measured by use of a Project Performance Measurement Questionnaire (Appendix B). Responses to all fifty-seven questionnaires were obtained with the following results (The graph associated with each measure shows the performance measure over the last ten fiscal years):

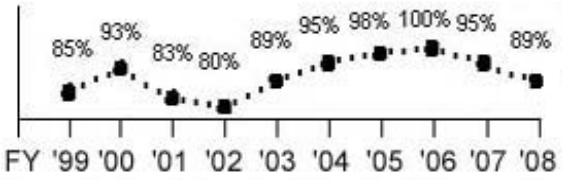
Measure 1. Overall, Work Met Expectations

Percent of FY2008 Program Sponsored Projects/Subprojects where sponsors reported that overall work met their expectations (agree or strongly agree) (55 out of 57) . . 96%



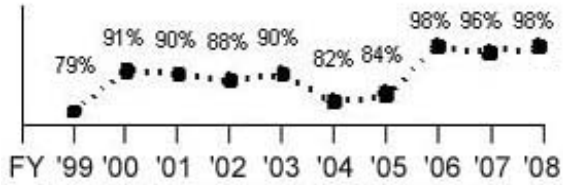
Measure 2. Established Major Deadlines Met

Percent of FY2008 Program Sponsored Projects/Subprojects where sponsors reported that all established major deadlines were met (40 out of 45 responses) 89%



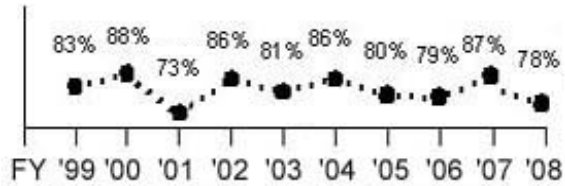
Measure 3a. At Least One Improved Method, Developed Technique , Solution, or New Insight

Percent of FY2008 Program Sponsored Projects/Subprojects reporting at least one improved method, developed technique, solution, or new insight (54 out of 55 responses) 98%



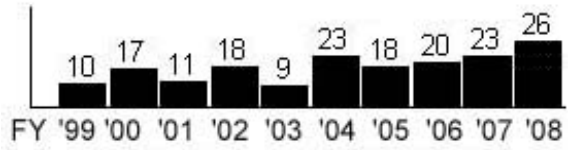
Measure 3b. Plans for Implementation

Of these FY2008 Program Sponsored Projects/Subprojects reporting at least one improved method, technique developed, solution, or new insight, the percent with plans for implementation (42 out of 54 responses) 78%



Measure 4. Predict Cost Efficiencies

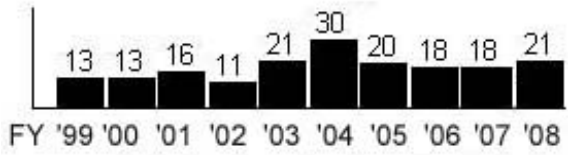
Number of FY2008 Program Sponsored Projects/Subprojects reporting at least one "predicted cost efficiency" 26



From Section 3 of this ANNUAL REPORT, we also have:

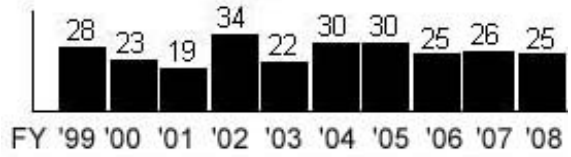
Measure 5. Journal Articles, Publications

Number of peer reviewed journal publications documenting research that appeared (12) or were accepted (9) in FY2008 21



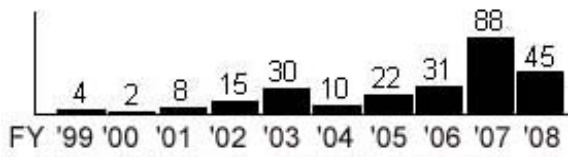
Measure 6. Proceedings, Publications

Number of proceedings publications documenting research that appeared in FY2008 25



Measure 7. Division Research Reports/Studies, Publications

Number of division research reports/studies publications documenting research that appeared in FY2008 45



Each completed questionnaire and associated details are share with appropriate staff to help improve our future efforts.

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1. COLLABORATION

1.1 – 1.2 DECENNIAL TOPICS (Decennial Projects 5210801 and 5210802)

A. Census Questionnaire Design Features

The project represents ongoing research in using the behavior coding method to analyze interviewer/ respondent interactions in order to evaluate the decennial Nonresponse Followup (NRFU) questions in the 2008 Census Dress Rehearsal. (The 2004 and 2006 NRFU instruments were also evaluated using this method.) The redesign of the 2008 instrument for the handheld computer was informed by the 2004 and 2006 behavior coding, cognitive testing, usability testing, and observational study results. Though the handheld computer will not be used in 2010, the findings from the research leading up to this point are documented in Childs, J. H. (2008). "2010 NRFU Questionnaire Development: From the 2004 Census Test to the 2008 Dress Rehearsal." *Statistical Research Division Study Series (Survey Methodology # 2008-5).* U.S. Census Bureau. This paper chronicled the pretesting work conducted on the NRFU in our division prior to 2008, including cognitive and usability testing, behavior coding, and an observational study (all in English and Spanish). Key findings included: 1) The difficulty for both interviewers and respondents of using a flashcard booklet; this finding lead to the development of a new "Information Sheet" that will replace the flashcard booklet in the 2010 Census, and that has been successfully tested in cognitive and usability testing; 2) A topic-based approach to gathering demographic data worked better than the person-based approach. This information was used to re-design the 2010 NRFU instrument when the handheld computer was dropped; and 3) Respondents had difficulty with residence rules presented on a flashcard. We tested a question-answer sequence to presenting the rules that worked much better. Though this was not adopted for 2010 in the absence of the handheld computer, it will be used next decade as we prepare for the 2020 Census.

Additionally, during FY 2008, staff pretested the revised paper NRFU and Update Enumerate (UE) questionnaire via cognitive and usability testing. Key findings include that the layout of the questionnaire was very hard for the interviewer to manage, necessitating that Field Division research ways to facilitate handling it. Many other findings dealt with areas in which training will need to be improved to help interviewers resolve situations that are likely to occur in the field. Field Division has agreed to make these modifications to the training materials. Additionally, improvements were made to the questionnaire wording based on cognitive testing findings and recommendations.

Staff: Jennifer Hunter Childs (x34927), Patti Goerman, Theresa DeMaio, Laurie Schwede, Leticia Fernandez, Matt Clifton, Nathan Jurgenson, Dawn Norris, Anissa Sorokin, Mikelyn Meyers

B. Short Form Questionnaire Content Other Than Race and Ethnicity

This project involves participation in decennial content team meetings, including Content and Forms Design IPT, Housing Unit OIT, NRFU Instrument Subteam, Mode Consistency Subteam, and Census Program for Evaluations and Experiments (CPEX) Methods Team. It also includes cognitive pretesting of census questionnaires.

During FY 2008, staff conducted cognitive testing of the Be Counted form. A number of problems were uncovered with the cognitive testing, particularly concerning the gathering of address data. Several respondents misreported house numbers by including a house number and an abbreviated street name into the "Street Address Number" field. Respondents did not realize they would be asked to report street name separately, and this caused them to repeat information on the form or to cross out information. Respondents who used a PO Box often supplied that information instead of their physical address. And, finally, respondents experiencing homelessness failed to mark the checkbox indicating that they did not have an address on April 1. This would cause processing problems, especially if they failed to provide a complete address, which was the case for several respondents. The other notable problem with the form was a misunderstanding of the whole/partial household question that is used for the primary selection algorithm (PSA). Respondents answered this question inconsistently and unreliably. This could cause the PSA to delete forms that actually represent partial households that were not otherwise enumerated. As a result of these findings, and after many meetings to discuss the implications, changes were made to the address fields for the 2010 Be Counted form.

Staff also conducted cognitive testing of the 2010 census mailing materials including the advance letter, initial cover letter, reminder card, replacement cover letter, outgoing envelope, and return envelope. Results of the testing showed that: 1) the return envelope was the most problematic piece tested. Respondents did not notice the two instructions on the envelope about how to put the form inside, and they had different expectations about what should show through the window; 2) respondents did not notice the website underneath the 2010 Census logo referring them to the Census Bureau website on the advance letter, despite noticing the logo itself; 3) respondents felt that the materials did not contain sufficient information for households in need of assistance due to limited English-language ability; and 4) respondents noted that inability to complete the form might be a reason for not mailing back the initial questionnaire, and suggested that the paragraph about telephone assistance on the reminder card should be added to the replacement cover letter. As a result of these

findings, changes were made to the font and instruction placement of the instructions on the return envelope. Therefore, the website was moved from the bottom on the letter into the text to be more noticeable to respondents.

Staff also conducted cognitive testing of the Enumeration of Transitory Locations (ETL) form. The testing showed the following: 1) the address question caused problems for the respondent because they often did not know the address of the transient location and/or their site number. Additionally, it was suspected that the placement of the address question might be causing problems with the roster question; and 2) the roster question caused problems for the respondent because it was not phrased as a question and because the flow of questions from the household count question was interrupted by the housing questions. A report documenting the results of the testing is in preparation.

Staff: Terry DeMaio (x34894), Jennifer Beck, Jennifer Hunter Childs, Leticia Fernandez, Nathan Jurgenson, Dawn Norris, Lorraine Randall, Laurie Schwede

C. Development of Race and Ethnicity Questions

Staff will participate in planning and pretesting alternative versions of the race and ethnicity questions used in the Decennial Census. We will develop proposals for cognitive testing of new question formats in conjunction with decennial staff and will lead or engage in cognitive research as needed.

During FY 2008, staff met with Decennial Statistical Studies Division and Population Division representatives about several options for experimental panels for the 2010 CPEX, including combined race and Hispanic origin questions, revised examples for the race and Hispanic origin questions, and a multiple response instruction for the Hispanic origin question. Staff conducted a literature review of past research on these topics and provided some initial recommendations on the questionnaire design. In addition, staff prepared a document justifying the recommendation to test changes to these items in Spanish along with English. In preparation for the cognitive testing of these experimental forms, staff drafted research designs to show possible distribution of respondents across race/ethnic groups for various sample sizes and advised project sponsor about ways to set up contracting for the project.

Staff: Leticia Fernandez (x36050), Jennifer Hunter Childs, Patricia Goerman, Nathan Jurgenson

1.3 LANGUAGE PLANNING AND DEVELOPMENT (Decennial Project 5210803)

Staff members participate in an inter-divisional Decennial Task Force, called the Language Integrated Product Team (IPT), which focuses on developing and planning the Language Program for the 2010 Census, pre-census tests, and the Dress Rehearsal. In addition, staff members in our division provide consultation and technical support in the design, development and conduct of research for Decennial language-related projects.

During FY 2008, staff worked as technical leaders and collaborators on the cognitive testing of the 2010 Census form in five languages (English, Chinese, Korean, Russian, and Vietnamese). Staff worked as the Census Bureau research analysts, providing technical guidance and coordination for the contractor (RTI). Staff participated in the following activities: 1) review of translations of the 2010 Census form; 2) development of the cognitive interview protocol; 3) translation of interview protocol; 4) cognitive interview training for language experts; 5) implementation of cognitive interviews in English and Chinese; 6) summary and report of research results; and 7) formulation of recommendations for improvement of translations. This project resulted in numerous improvements to the 2010 Census form in non-English languages.

In addition, we have worked on the cognitive testing of the Spanish Coverage Measurement Personal Interview instrument. During this fiscal year, staff presented final recommendations to the sponsor and wrote up a report on problems with the Spanish translation of group quarters (GQ) terms included in the Census Coverage Measurement (CCM) instrument, including recommendations on how to reword these terms. Staff presented the document to representatives from the CCM area, GQ, and the Population Division. Based on feedback and comments from these areas, staff created a consolidated recommendations document which was presented to the project sponsor. Staff also worked on the write-up of the final project report.

This fiscal year, staff served as reviewers for the Spanish and Chinese terms contained in the new Decennial Language Reference Dictionary. We provided comments on multiple drafts of the dictionary and attended meetings to discuss the project.

In addition, staff reviewed and provided comments on various Spanish and Chinese language Decennial forms and questionnaires.

Finally, staff served as critical reviewers on the 2007 National Census Test (Census Bilingual Forms Study) initial draft report and the 2008 Bilingual Form Assessment Study Plan. We reviewed and provided comments on both documents.

Staff: Patricia Goerman (x31819), Yuling Pan, Leticia Fernandez, Matthew Clifton, Mikelyn Myers

1.4 DATA COLLECTION PLANNING AND DEVELOPMENT (Decennial Project 5310801)

A. Data Collection With Handheld Computers with Voice Recognition Technology

In preparation for the 2010 Decennial Census, the Census Bureau is conducting tests on collecting addresses

and performing follow-up operations using Hand Held Computers (HHCs). The small display on the HHC presents potential problems to persons using a stylus who do not have a steady hand when inputting data or selecting an icon or an option from a drop-down menu. Industry now uses HHCs with voice recognition technology to aid data entry in warehouse inventory applications. Provided that the item of interest is large enough to see, screen size has no effect on voice recognition data entry and offers the user improved flexibility to perform their tasks.

During FY 2008, staff conducted a literature review of design considerations for best usage of both the pen stylus and speech data entry modes. Costs and requirements for hardware and software will be studied. Research revealed specialized cursors could be programmed to assist the user when speech input is not practical. Cursors could be used to minimize hand movement and increase usability on crowded screens. Performance of different cursor types was tabulated and compared to speech input. Depending on the length of text, speech input is not always faster than a cursor selection. Results of this research were presented at the International Field Directors and Technologies Conference in May 2008 and were posted on the conference web site.

Staff: Larry Malakhoff (x33688)

B. Usability Input to the Field Data Collection Automation (FDCA) Program

Staff was requested to perform path testing of the handheld computer (HHC) nonresponse followup (NRFU) instrument.

During FY 2008, staff attended reviews of testing conducted by the contractor to evaluate the usability of screen designs for the handheld computer (HHC) in the context of simulated Nonresponse Followup (NRFU) operations; consulted with Field Division staff concerned about the Person Interview (PI) Reinterview (RI) portion of the instrument design; and provided comments on screen designs for use by office-based supervisors of the NRFU field operation. We attended demonstrations of software and screen designs developed for the NRFU HHC and for the PI/PIRI operations.

Staff performed path testing of the HHC NRFU instrument, and found the following issues: variable names are used in data tables instead of actual words; code numbers for language spoken are an unnecessary burden on the user; and throughout the instrument there is blue text embedded in the bold black text which is to be read out loud to the respondent, and which is sometimes italicized, and has either parentheses or square brackets surrounding it. The use of both parentheses and brackets is problematic; the designer should use either square brackets or parentheses, but not both. Additionally, we recommend the blue text be always consistently presented in a different font because color-blind users will see it as black.

Staff: Larry Malakhoff (x33688), Jennifer Hunter Childs, Betty Murphy

C. Usability Review of the NRFU Paper Form

The Usability Team is evaluating the Nonresponse Followup (NRFU) paper form which will be used in the Decennial Census in 2010. The paper form has not been tested in the field since it was used in 2000. Usability testing will be one of the only opportunities (in conjunction with cognitive testing) to provide user feedback on what works and what does not work with the form.

Working together with the NRFU paper form team during FY 2008, the Usability Team created a test plan for the study which included specific scenarios that would target problem areas of the form and modified the Questionnaire for User Interaction Satisfaction (QUIS) to fit the paper version of the form. Cognitive staff prepared the training materials and received approval from Field for training materials. Usability staff recruited and ran 19 participants for the study. The Usability Team wrote a report of the usability results and recommended solutions. Usability staff presented the results to the NRFU paper form team.

One of the major findings from the study was that individuals struggled with holding the forms and binder. Some participants dropped all of the items during the interviews, while many just felt and appeared awkward in managing the items. The current tri-fold form encourages flipping and awkwardness as it is much larger than the binder enumerators use. In addition, due to the size of the form, some individuals folded the pages back to align the names on the left side with questions on the right side of the form. This folding is of concern as it can interfere with data capture if creases are in the same areas as data. The struggling with the form and binder also leads to longer questionnaire completion times. The primary recommendation was to design a new form to address these issues, which the usability lab staff did. This new design keeps the form from hanging off the edge of the binder while the user records answers to questions that need the household members' names referenced. In addition, this new design eliminates folding that occurred in testing due to the need to reference names on the left side of the page. Neither the order of administering the questions nor the question numbers have changed with this new design. In addition staff recommended that enumerators should use a clipboard and/or larger binder that fits the entire questionnaire on its surface.

Staff: Erica Olmsted-Hawala (x34893), Jennifer Romano, Elizabeth Murphy, Jennifer Hunter Childs, Dawn Norris, Nathan Jurgenson

D. 2010 Census Internet Form Accessibility Evaluation

Staff was requested to perform accessibility testing on the 2010 Internet form in preparation for the 2010 Census.

During FY 2008, staff began testing with InFocus evaluation software and started the manual process of eliminating the false positives using the JAWS screen-reader software. Initial findings reveal that name and date of birth elements do not have labels. A report is being written and will be submitted to the *SRD Study Series*.

Staff: Larry Malakhoff (x33688), Elizabeth Murphy

1.5 SPECIAL PLACE/GROUP QUARTERS (GQ) PLANNING AND DEVELOPMENT (Decennial Project 5310808)

Group Quarters Operational Integration Team (OIT) for 2008 Dress Rehearsal

The Group Quarters Enumeration Operational Integration Team (GQE OIT) develops detailed plans, procedures, schedules, and operational assessments for the Group Quarters Enumeration (GQE) in the 2008 Dress Rehearsal.

During FY 2008, staff participated in GQE OIT meetings. We reviewed and commented on 1) methods for processing usual home elsewhere (UHE) cases; 2) methods for dealing with GQE adds; 3) operational documents; 4) Individual Census Report (ICR) formatting; 5) layout and presentation of the Usual Home Elsewhere address fields; 6) questionnaires;7) access letters; 8) the risk register; 9) 2010 Census assessments; and 10) proposed 2010 Census CPEX experiments for testing in group quarters. We participated in discussions on whether Group Quarters newly identified in the ACS should be added to the MAF.

Staff: Laurie Schwede (x32611)

1.6 STATISTICAL DESIGN AND ESTIMATION (Decennial Project 5610802)

A. Decennial Editing and Imputation

[See Projects 0351000 and 1871000 (B), General Research - Statistical Methodology**]**

B. Decennial Record Linkage

[See Projects 0351000 and 1871000 (A), General Research - Statistical Computing Methodology]

C. Decennial Disclosure Avoidance

The purpose of this research is to develop disclosure avoidance methods to be used for publicly available decennial census and American Community Survey (ACS) data products. Emphasis will be placed on techniques to implement disclosure avoidance at the stage of processing. Disclosure research will be conducted on alternative methods to protect both tabular data and microdata from the decennial census and the ACS. Methods will be developed, tested, evaluated, and documented. We will also aid in the implementation of the methods.

During FY 2008, new staff members became familiar with the data swapping methodology and software used to protect both decennial census tables and ACS tables. There was extensive communication with Decennial managers and data processing staff regarding specifications for the version of the swapping program to be used for 2010 Census and for the Dress Rehearsal. New specifications were sent to DSPO staff. The key information contained therein was a specification of the input data file. There is one input file for each state. It contains one record for each household in the state, with a specified format. The output from the swapping program is a set of pairs of household control numbers, which are swapped in the last stage of processing prior to release of the set of planned 100% tables. In order to ensure that we currently have a copy of a working swapping program, tests were run against 2 input files used for Census 2000. The swapping program is working as expected, although we will be improving its documentation and possibly other aspects in coming months.

Staff developed a synthetic data method that will be used to protect Group Quarters data for 2010 Census. We focused on Summary Files 1 and 2 from Census 2000 to determine which records have a disclosure risk. A SAS program was written to implement the method. The program is well documented, and a flow chart is being developed to summarize the syntax of the algorithm. The program is being enhanced to allow the user to choose any number of input variables and to make the program more efficient.

The ACS data swapping program was updated and improved to include several new features. Staff added the use of historical ACS data files for the selection of records for swapping. As a result, the more historical data that is used, the fewer records are selected for swapping for any given selection criteria. To ensure that a sufficient number of records are selected for swapping, several new selection criteria were added. Along with ensuring sufficient swapping numbers, these criteria also allow us to better identify and swap more records at higher risk of disclosure. Along with adding new selection criteria, the matching algorithm was also updated and improved. The changes allow for more flexibility in prioritizing different types of swaps and improve the efficiency of the program. Additional information was added to output summary files in order to monitor the performance of these new features.

Staff finished developing an R program that uses partially synthetic data to protect the confidentiality of ACS Group data. It was successfully run in production. Staff satisfactorily finished testing the disclosure avoidance modules that were designed for the ACS GQ data 2007. Staff met with several analysts from the Housing and Household Economic Surveys Division (HHES) and collected all the data editing guidelines from the Decennial Statistical Studies Division (DSSD) and HHES staff. Staff incorporated those guidelines into the

modules in order to facilitate the editing process. All of the HHES's analysts' requirements for data quality were satisfied, and work was completed ahead of schedule. The editing/imputation and disclosure avoidance processes are now more streamlined and their implementations should run smoother than ever before. Staff compiled a list of parameters, pertaining to the ACS GQ disclosure avoidance procedure. These parameters can be reset to offer greater possibility for disclosure avoidance protection and/or better data utility. Future research would reset the parameters and measure both disclosure risk and data utility.

Staff prepared a budget for the development of a new Advanced Query System (AQS)/Microdata Analysis System (MAS) that will allow users to create their own tables and regression analyses from 2010 Census and ACS data. Staff drafted a memo on next steps for the MAS and another on MAS confidentiality rules.

Staff documented an example of how a microdata record can be reconstructed from a set of linked tables. This information will be useful for future disclosure protection of ACS tables and microdata. Staff prepared documentation for the Data Stewardship Executive Policy (DSEP) Committee on this potential disclosure risk and made a presentation at one of its meetings to help defend a Disclosure Review Board ruling.

Staff: Laura Zayatz (x34955), Paul Massell, Elizabeth Ransom, Marlow Lemons, Adam Persing, Rolando Rodríguez, Jason Lucero, Asoka Ramanayake, Lisa Singh, Bimal Sinah, Tapan Nayak

D. Census Unduplication Research

The goal of this project is to conduct research to guide the development and assessment of methods for conducting nationwide matching and unduplication in the 2010 Decennial Census. One of the major problems is how to incorporate the effects of name frequency into the unduplication procedures. Our staff also provides assistance in specifying and reviewing output from the matching and unduplication procedures for test Censuses and eventually for Census 2010. We began this project in May of 2004.

During FY 2008, staff continued running matching and modeling procedures on the data from the 2000 census. The system controlling the execution of *BigMatch* on the 2000 Census was improved to make more efficient use of multiple processors. The improvements are summarized in the draft *SRD Research Report* "Managing Large Production Matching on Multiple Processors," by Edward Porter. Two reports analyzing results from runs based on the matching and modeling specifications from the 2006 Census Test were released as *SRD Research Reports*: "Initial Results from a Nationwide *BigMatch* Matching of 2000 Census Data" and "Additional Results from a Nationwide Matching of 2000 Census Data," by Michael Ikeda and Edward Porter. The results suggest that problems with apparent false matches are concentrated in the most common surnames and the most common Hispanic surnames. However, name frequency does not appear to have much effect when there are multiple links of reasonable quality between housing units or when the phone number matches. Staff also analyzed results from a national matching based on the 2008 Dress Rehearsal specifications. We found that the pattern of results from the 2008-based matching are generally similar to those from the 2006-based matching. Staff then analyzed results from a new national matching that uses only three *BigMatch* matching passes compared to seven for the 2008-based matching. It runs substantially more quickly than the 2008-based matching but produces generally similar results after preliminary rules for evaluating links are applied. Staff also ran several variations of a national matching that adds a fourth *BigMatch* matching pass. The four-pass matching maintains most of the improvements in *BigMatch* running time while adding links in a specific category of links where the three-pass matching system has a shortfall compared to the 2008-based system. Staff also participated in the headquarters review of the output from the 2008 Dress Rehearsal Coverage Followup (CFU) Duplicate Person Identification (DPI) system. Based on the examination of the 2008-based national matching and the Dress Rehearsal CFU DPI output, additional rules were proposed for the handling of Residual Person Links and GQ Person Links in the match modeling process. The new rules would allow us to eliminate the headquarters review for these links.

Staff: Michael Ikeda (x31756), Ned Porter

1.7 COVERAGE MEASUREMENT PLANNING AND DEVELOPMENT (Decennial Projects 5610803)

A. Coverage Measurement Research

Staff members conduct research on model-based small area estimation of census coverage, and they consult and collaborate on modeling coverage measurement.

During FY 2008, staff completed preliminary study of the usefulness of including random effects in small area models of coverage. This work has been highlighted in the National Academies of Science report *Coverage Measurement in the 2010 Census* and has also been documented in a refereed journal. Continued use of random effects to effectively model housing unit and block/cluster effects, as well as marginally insignificant interaction effects, is ongoing.

Staff continued collaboration with staff in the Decennial Statistical Studies Division (DSSD) on logistic modeling of coverage estimation. This group has demonstrated that logistic modeling of coverage effects is a viable alternative to post-stratification.

Additionally, staff completed work for staff in DSSD on evaluating standard methods of nonignorable nonresponse imputation methodology to impute enumeration status of "insufficient data for matching" records. This work is part of a DSSD project that will use ignorable nonresponse methods. A report is being

prepared for DSSD's January 2009 External Expert Review Panel.

Staff: Don Malec (x31718), Jerry Maples

B. Accuracy of Coverage Measurement

2010 Census Coverage Measurement Research conducts the research necessary to develop methodology for evaluating the coverage of the 2010 Census. This includes planning, designing, and conducting the research, as well as analyzing and synthesizing the results to evaluate their accuracy and quality. The focus is on the design of the census coverage measurement survey and estimation of components of coverage error with secondary emphasis on the estimation of net coverage error. The estimation of overcount and undercount separately has not been done for previous censuses because of the difficulty of obtaining adequate data for unbiased estimates. The first attempt to implement the new methodology is with data from the 2006 Census Test.

During FY 2008, our staff provided technical expertise and experience in the planning and implementation of coverage measurement research for the 2010 Census. This included serving on three teams formed to plan and implement census coverage measurement research for the 2010 Census in the 2006 Census Test, the 2008 Dress Rehearsal, and with data from Accuracy and Coverage Evaluation Revision II and Census 2000. Staff also provided expertise by serving on an Executive Steering Committee Subgroup formed to identify high-level research topics and questions for the 2010 Census Program for Evaluations and Experiments.

Our staff investigated the error structure for the estimates of components of census coverage error, omissions and erroneous enumerations. The estimator planned for omissions is the sum of the erroneous enumerations and the net error, which is estimated by the dual system estimate of population size minus the census count. The 2010 Census coverage measurement survey interviewing and matching operations are more complicated than for previous censuses, in an attempt to rectify the problems with the estimates of coverage error for Census 2000 as well as the new estimates of component errors. The study focused on the implications of the error structure for a dual system estimator (DSE) based on poststratification. When viewing the poststratum estimates, some of the enumeration sample (E-sample) data error that is present in the estimate of erroneous enumerations and, therefore, the dual system estimator may offset in the estimate of omissions. Since the 2010 plans call for using the logistic regression estimator, and it will use continuous variables, the error structure is very complicated and cannot be expressed in closed form. However, the error structure for the poststratified estimator does provide insight about the error structure in the logistic regression estimator.

Our staff reviewed the Interim Report by the National Academies of Science Panel on the 2010 Census Program for Evaluations and Experiments that contained recommendations for experiments to conduct during the 2010 Census and prepared recommendations for the Executive Steering Committee to consider. The preparation included hosting a visitor from Statistics Canada to discuss the feasibility of one of the Panel's recommendations, an experiment with the Reverse Record Check (RRC) methodology used to evaluate the coverage of the Canadian census. Through this visit and other internal Census Bureau discussions, our staff identified major issues that make the success of the RRC method unlikely.

Staff: Mary Mulry (x31759)

C. Questionnaire Wording and Automation Team

The purpose of this project is to design the coverage measurement survey instruments for the 2010 Census. These instruments will gather enough data to measure both person and household coverage of the 2010 Census. The independent coverage operation for 2010 is called Census Coverage Measurement (CCM). In preparation for 2010, there was a 2006 Test of the automated Person Interview (PI) and paper-based Person Followup (PFU) coverage measurement operation in specific sites in conjunction with the 2006 Census Test. Both these instruments were used to measure person coverage. As part of the 2008 Dress Rehearsal, there was a test of the Independent Listing Book (ILB). Because of the 2008 Dress Rehearsal delay and changes in high-level management decisions about the development of the CCM instruments, there were not full tests of the PI, PFU, or initial housing unit followup forms (IHUFU) during Dress Rehearsal. Rather, there was a mini-test of IHUFU in the winter of 2008, and there are plans for a test of 2008 PI and mini-test of 2008 PFU in the spring of 2009. There are no plans to use the data collected in these tests for estimation; rather, these are tests of the instruments. The PI test will include the tests of the operations.

Our goals during FY 2008 were to revise the 2008 ILB for 2010, to revise the 2008 IHUFU for 2010, to revise the 2006 PFU for 2008, and to provide support as the Decennial Statistical Studies Division (DSSD) created the 2008 PI.

Because of changes made to the management of the CCM operation and the 2008 Dress Rehearsal delay, the only CCM instrument that was tested fully in Dress Rehearsal was the ILB. Because of travel restrictions, planned respondent debriefing evaluations by our staff and DSSD staff on the ILB were cancelled. Based on interviewer debriefing results, NPC comments, two observer's results, data tabulations run by DSSD, and CCM OIT decisions, staff assisted in making changes to the 2008 ILB for 2010. Since the CCM IHUFU operation was cancelled for 2008 DR, DSSD ran a mini-test of the operation. Staff was not involved in the test, but staff has consulted on changes to the IHUFU for 2010 based on lessons learned from the mini-test.

With regard to the 2006 Census Test, this fiscal year staff documented the Person Followup (PFU) observation

and respondent debriefings findings in a formal report: "#2006-D7-13, Subject: 2006 Census Coverage Measurement Person Followup Interview: Trip Report." (January 2007.) Prepared by Beth Nichols, Jennifer Hunter Childs, Joanne Pascale, Laurie Schwede, Julie Bibb, Vicki Smith, Sandy Norton, Jamie Burnham and Patricia Sanchez. Additionally, staff analyzed a sample of audiotaped 2006 PFU cases and forms and drafted a report outlining areas of the form that could be improved. Staff assisted in revising the PFU form based on these data and recommendations and conducted two rounds of in-house usability testing with the PFU form to finalize the form for the 2008 mini-test.

Staff conducted cognitive testing of the 2008 Spanish Person Interview and made many recommendations that were accepted. Staff also reviewed and commented on the 2008 PI specification and the instrument on the Technology Management Office (TMO) testers menu.

Staff: Beth Nichols (x31724), Jennifer Hunter Childs, Dawn Norris, Patti Goerman, Nathan Jurgenson, Anissa Sorokin

1.8-1.9 COVERAGE IMPROVEMENT PLANNING AND DEVELOPMENT/ EVALUATION PLANNING COORDINATION
(Decennial Projects 5610805 and 5610806)

A. Decennial Privacy Research

The purpose of this project is to serve on and assist the work of the Privacy Policy and Research Committee (PPRC), and to conduct research to assess public opinion on privacy-related issues, including the increased use of administrative records to assist Decennial Census enumeration.

During FY 2008, staff participated in the meetings of the 2010 Integrated Communication Plan (ICP) Research Group, chaired by Nancy Bates (DIR). Staff played a key role in developing and carrying out the analyses used to segment the population for the 2010 Census communications campaign and in preparing the audience segmentation report. We also contributed secondary analysis of the Census 2000 NORC survey data to estimate the return on investment (ROI) of the 2000 communications campaign. Both the audience segmentation and the ROI results are being used by the 2010 communications campaign contractor, Draftfcb, to develop the 2010 campaign. In addition, we reviewed and provided comments on several internal research efforts which have focused on trying to anticipate 2010 self-enumeration issues through an examination of Census 2000 and ACS results. We also reviewed and commented on materials prepared by DraftFCB, the prime contractor for the 2010 ICP effort, including such things as focus group plans, draft outreach "platforms," and a centerpiece of the research effort, the "Census Barriers and Motivations Survey" questionnaire.

On the PPRC, in addition to attending and participating in the group's regular monthly meetings, staff participated in a special meeting of the PPRC to review the group's charter and to consider its future direction, where we offered two food-for-thought contributions: (1) Over the past several years we have focused most of our attention on the "P" (policy) part of our middle name, and very little on the "R." What is the appropriate role of the PPRC with regard to privacy-related research? (2) All agree that strong privacy/confidentiality protection is absolutely essential, and that past weaknesses and vulnerabilities were in need of correction. But policies to protect privacy place real burdens on Census Bureau staff, and on our ability to carry out our core mission. What is the proper role of the PPRC with regard to ensuring that the pendulum has not swung too far? How do we promote an appropriate balance between carrying out our core mission and protecting respondent privacy/confidentiality?

As a result of this work, the following report was posted to the Statistical Research Division website: Landreth, A., Gerber, E., and DeMaio, T. (2008), "Report of Cognitive Testing of Privacy and Confidentiality-Related Statements in Respondent Materials for the 2010 Decennial: Results from Cognitive Interview Pretesting with Volunteer Respondents," *Research Report Series (Survey Methodology #2008-4).* Statistical Research Division, Washington, D.C.: U.S. Census Bureau.

Staff: Jeff Moore (x34975), Anna Chan, Terry DeMaio, Mary Mulry

B. Development of Questionnaires for Decennial Coverage Improvement

We will consult on the development of questions and questionnaires designed to improve within household coverage in the Decennial Census. We will participate in the development and pretesting of household and individual-level coverage questions in the decennial short form and the Coverage Followup (CFU) reinterview instrument.

During FY 2008, staff worked on two of the 2010 Census Program for Evaluations and Experiments (CPEX) experiments with CFU staff. The first was to develop and pretest experimental questions that will be added to a sample of CFU interviews in 2010. These questions are meant to help explain respondents' discrepant behavior when one of the coverage questions is marked on the initial census return, but no one in the household is marked as a potential add or delete during the CFU interview or when a duplicate is identified in the data, but not mentioned in the interview. Staff conducted cognitive interviews with these questions and presented results and recommendations to the CFU team. Modifications were made to the wording of the experimental questions, predominately to make them less sensitive. Staff also worked on developing an experimental undercount question for the CPEX program. This will be cognitively tested by staff during the next fiscal year.

Staff: Jennifer Hunter Childs (x34927), Laurie Schwede, Leticia Fernandez, Matt Clifton, Mikelyn Meyers, Anissa Sorokin, Virginia Wake

C. Evaluations, Experiments, and Assessments Operational Integration Team (EEA OIT)

The purpose of the EEA OIT is to facilitate planning and timely implementation of 2008 Census Dress Rehearsal and 2010 Census evaluations, experiments, and assessments. The group specifies the general scope of the 2008 Census Dress Rehearsal Assessment Program, questions to be answered, and the date when the final results are needed to inform 2010, and also presents recommendations to the Census Integration Group. The group ensures that program integration and implementation of the 2010 Census Program of Evaluations and Experiments (CPEX) meets the guidance provided by the Executive Steering Committee and prepares the 2010 Census Program for Evaluations and Experiments Master Plan.

During FY 2008, our division's representative served as 1) Co-Advocate with Larry Cahoon for Coverage Improvement Evaluations and Experiments in the 2010 CPEX program and as 2) the Evaluation Consultant for her proposed 2010 CPEX comparative ethnographic evaluation of enumeration methods and coverage in hard-to-enumerate race/ethnic groups. She designed a preliminary research proposal for this study and presented an informal talk on this evaluation to the CPEX Executive Steering Committee at the January 2008 offsite meeting. At the request of these executives, she expanded the scope of the proposal and the number of field sites (7-9) to cover each of the major race/ethnic groups as well as a mixed, "quasi-control" site with a generalized population. She has also been asked by decennial staff to consider expanding the focus of this study to include a component to identify factors respondents use in self-identifying their race. She will discuss this with staff in the Population Division and the Decennial Statistical Studies Division. She participated in EEA meetings, responded to requests by team members, and provided feedback to division colleagues with CPEX evaluations.

Staff: Laurie Schwede (x32611), Tommy Wright

1.10 AMERICAN COMMUNITY SURVEY (ACS) (Decennial Project 5385860)

A. ACS Questionnaire Design Measurement

This project provides technical and research support for the development and improvement of ACS data collection instruments used in all modes of data collection available in the ACS. Staff members serve on inter-divisional working groups and provide technical support in the design and conduct of questionnaire design research for the ACS.

During FY 2008, staff continued to attend inter-divisional working groups and continued to provide technical support.

Staff: Patti Goerman (x31819), Yuling Pan, Laurie Schwede

B. ACS Missing Data and Imputation

This project undertakes research and studies on missing data and imputation for the American Community Survey.

During FY 2008, this project aimed to impute missing socioeconomic variables in the National Assessment of Educational Progress (NAEP) data files using Census long form and American Community Survey (ACS) data. Staff selected imputation models with different combinations of geographic and demographic variables. Staff implemented statistical matching algorithms to match records from the NAEP files to ACS and SEDF files. A major drawback with these matching algorithms is the lack of enough donor records for ten random donors' draws. Dropping some blocking variables in the imputation model still does not yield enough cases for random draws. The National Center for Education Statistics (NCES) decided to use a different approach based on geographical distance. Staff created cumulative ACS and SEDF extract files for searching surrounding areas for possible matches. The new expanded areas will provide a larger domain for searching possible matches to NAEP data records.

Staff: María García (x31703), Yves Thibaudeau

C. ACS Group Quarters (GQ) Item Imputation and Micro Data Disclosure Avoidance Research

See project "C. Decennial Disclosure Avoidance" (1.6 Statistical Design and Estimation).

D. ACS Language Research

This project provides technical and research support for addressing language issues in ACS data collection instruments and supporting documents. Staff members serve on inter-divisional working groups and provide consultation and technical support in the design and development of language research for the ACS.

During FY 2008, staff members continued to be active members of the ACS Language Team. In collaboration with a contractor (RTI International), we completed two multilingual projects: cognitive testing of the ACS Multilingual Brochures in five languages (English, Spanish, Chinese, Korean, and Russian), and cognitive testing of the ACS CAPI survey letters and information brochures in six new languages (Arabic, French, Haitian Creole, Polish, Portuguese, and Vietnamese). Staff worked as the Census Bureau research analysts, providing technical guidance and management for the contractor (RTI). We provided technical supervision to the projects and participated in the following activities: 1) review of translations of ACS materials, 2) development of cognitive interview

protocols, 3) translation of interview protocols, 4) cognitive interview training for language experts, 5) conducting cognitive interviews in English, Spanish, and Chinese, 6) summary and report of research results, and 7) recommendations for improvement of translations. In collaboration with the contractor, we completed the final reports on these two projects, summarizing findings and lessons learned from the research. Our research findings demonstrate that:

- Some terms or concepts were inaccurately translated in target languages which caused confusion or fear (e.g., survey, confidentiality).
- Survey letters and documents in Asian languages violate the communicative norms of proper sequencing of topic and background information, since Asian languages prefer to present major points at the end of a discussion due to politeness concerns. This caused Korean and Vietnamese respondents to miss some main messages in ACS documents, which follow the English pattern of presenting major points as "topic sentences."
- Non-English-speaking respondents were very confused over some basic concepts of surveys (e.g., paper questionnaire vs. telephone interview, survey vs. census) due to their lack of survey experience in their home countries. This led to confusion of some key messages in the ACS documents, including the mandatory nature of the survey and data uses.

These two projects resulted in many improvements to the English text as well as the translations of these survey materials.

During FY 2008, we also launched the project to pretest the ACS Spanish CAPI/CATI instrument. Staff worked as the Census Bureau research analysts, providing technical guidance and management for the contractor (RTI). We completed Phase 1 cognitive testing of the questions in the ACS Spanish CAPI/CATI instruments and made recommendations to revise problematic terms. The revised terms were further tested in Round 2 interviews. We will proceed to Phase 2 of the project in FY09.

We also drafted a checklist to provide guidance for the use of interpreters in field interviews. This is the initial step towards developing the Census Bureau guidelines for the use of interpreters. The checklist is under review by the ACS language team.

Staff members also served as reviewers for the Spanish, Chinese, and Russian translations of ACS materials. Staff provided comments and suggestions for ACS letters and telephone messages in Spanish, Chinese, and Russian.

Staff: Yuling Pan (x34950), Patti Goerman, Leticia Fernandez, Virginia Wake, Anissa Sorokin

E. ACS Applications for Time Series Methods

This project undertakes research and studies on applying time series methodology in support of the American Community Survey.

During FY 2008, staff continued a consultation with the ACS Office, whereby various multi-year estimates are made compatible. Staff investigated cases in the ACS database where the methods are plausible and implausible, including making comparisons between multi-year estimates for different geographies. Staff also contributed to a paper giving an overview of the American Community Survey for the American Statistician, and developed a short paper on the properties of simple moving averages for a meeting on the American Community Survey.

Staff: Tucker McElroy (x33227)

F. ACS Variances

The purpose of this short-term project is to compare variances for survey totals based on several alternative methods of controlling to population totals in the ACS.

Throughout the first three quarters of FY 2008, staff worked in cooperation with Decennial Statistical Studies Division (DSSD) and ACS staff on the planning of a DSSD project evaluating variances of ACS estimates at the level of weighting-area by demographic class, based on alternative methods of applying population controls using ACS C2SS data versus the corresponding Decennial 2000 totals as targets. This work consisted of planning discussions and data analyses implemented in parallel with analyses by DSSD staff, tabulating results on bias, variance, relative bias, and average relative MSEs for alternative population control methods at the level of weighting area by demographic cells. These data analyses supported Census Bureau Advisory Committee of Professional Associations testimony by the Census Bureau and a 2008 Joint Statistical Meeting paper by DSSD staff on performance of the alternative population controls. Additionally, staff explored possibilities for further, new adjustments to the standard ACS population control method, suggested by data analyses correlating the ACS-estimate tracking errors (population-controlled estimates minus 2000-census target values) and difference of raw ACS estimates (with no population controls) minus updated 1990 Census values.

Staff separately worked on related theoretical research into the validity of Balanced Repeated Replication (BRR) variance estimators for survey-weight-adjusted totals produced using misspecified nonresponse adjustment cells. This work, entitled "BRR versus inclusion-probability formulas for variances of nonresponse adjusted survey estimates," was shared widely through publication and at professional meetings, including at an ASA session Census Bureau Advisory Committee of Professional Associations (CACPA) in October 2008. The practical results of this research, summarized in the CACPA testimony, concerned the likely magnitudes of bias in BRR variance estimates in surveys weight-adjusted for nonresponse by a misspecified model (i.e., with respect to the wrong set of adjustment cells), where

the cell intersections across the split PSU's used in BRR are not perfectly balanced.

Staff: Eric Slud (x34991), Yves Thibaudeau

G. ACS Data Products – Display of Variability Measures

This project has two parts: (1) determine which measure of variability should be displayed for each ACS data product and how it should be displayed; and (2) for the web, develop a simpler and clearer description of variability measures and how they can be used with ACS data products.

During FY 2008, staff revised definitions of standard error, margin of error, and confidence bounds to accompany ACS data products that were developed, reviewed, and sent to the ACS Office for its use. Staff revised several times the web survey form about the use of ACS variability measures and preference for CV or confidence bounds in the data products. Staff also wrote materials for the OMB review process and letters for the initial and reminder emails. The survey was initially sent to a sample of the ACS Alert email list. Due to a combination of undeliverable email addresses and a low response rate, it was then sent to the remainder of the list to get enough respondents for analysis. The survey has been completed and data are being prepared for analysis.

Staff: Lynn Weidman (x34902), Kathy Ashenfelter, Betty Murphy

H. ACS Additional Mail Test

This new inter-divisional ACS team is planning a split-panel test to determine if response rates of mail nonrespondents without known phone numbers can be improved by means of an additional mailing. If successful, this could cut the workload during the final CAPI phase, saving time and money and improving the accuracy of the data. The three proposed test treatments include: sending an additional postcard with a motivational message, mailing a third questionnaire with a revised cover letter, and using the current method.

During FY 2008, the objective was to develop and cognitively test (for a future split-panel test) a new reminder postcard and new replacement questionnaire package cover letter targeted to ACS mail nonresponders for whom we lack phone numbers. These nonresponders bypass the phone phase and fall into the most costly personal visit pool. We conducted cognitive interviews, analyzed the data, and presented the findings. In addition to the basic cognitive testing, we proposed, and the group accepted, these innovations: 1) do a "split-panel" cognitive test of alternative "carrot" and "stick" motivational messages to see which works better; 2) test an enlarged green postcard and find out if respondents prefer white or salmon; and 3) identify and use the specific characteristics of actual ACS nonresponders to recruit respondents. For this study and the field of survey methodology, we demonstrated that: 1) the most effective message combines carrot and stick elements, emphasizing the mandatory message without citing Title 13 specifically; 2) green is effective, and slight color brightness differences may affect respondent reactions to forms (brighter is better); and 3) strong messages may cause ordering effects when ranking multiple materials, even when the message order was randomized to prevent such effects. (More detail is available in our American Association for Policy Opinion Research paper in the *JSM Proceedings volume*, "'Carrot' or 'Stick' Approach to Reminder Cards: What Do Cognitive Respondents Think?") We present more findings in the "Final Report on Cognitive Testing of Reminder Cards and a Revised Replacement Package Cover Letter: The ACS Additional Mailing Project." We found that, as a result of seeing our new mailing, all but two respondents said they would complete and submit the ACS form before the CAPI list-cutoff date (which, if they do this while in an actual ACS sample, is the outcome we seek with this new mailing). More than two-thirds of our respondents said they would feel comfortable about calling the phone number on the form to request assistance. Eight of fifteen preferred responding by mail, five preferred responding by phone and two expressed no opinion. The message of consequences—that a Census Bureau representative might come to their home to do a personal visit if the form were not received soon—was effective; a sizeable number of respondents said this would motivate them to respond quickly by mail or phone to prevent such a visit to their homes.

Staff: Laurie Schwede (x32611) , Lorraine Randall

I. ACS Website: Card-sorting Study

The purpose of this study was to identify a user-centered information architecture of the American Community Survey (ACS) domain of the Census.gov Web site. The goal for the project was to come up with a basis for a re-design of the site using the technique of card-sorting.

Working together with the ACS staff during FY 2008, staff members brought in four novice participants for the closed sort, which was the second round card-sorting study. Participants were encouraged to place 16 predetermined subheading-level terms under 6 high-level terms, and then the 95 terms into the subheading-level categories. The subheading-level and high-level categories were derived from the results of the open sort (from the first round of testing which was conducted in calendar year 2007). The results show that terms were consistently placed in many of the same high-level categories as in the first round which helps validate the soundness of the terms; we concluded that the 16 subheading categories are usable link categories for the main page of the ACS web site. The 16 subheading categories are as follows: use the ACS, information on the population/housing, specific information on the population/housing, community profile, FAQs, questions about the ACS, what areas get surveyed, handy informational tools, things of interest related to the data, get to the data, putting data into tables, make year-to-year

comparisons, definitions of terms, list of topics, specialized data/statistical considerations, and timeline. A final report was written and sent to the client.

Staff: Erica Olmsted-Hawala (x34893), Alex Trofimovsky, Betty Murphy

J. AFF/ACS Low-Fidelity Usability Study

The purpose of this study was to get user feedback on the release of the 2008 August and November American Community Survey (ACS) data on the American FactFinder (AFF) prototype Web site pages. The site was testing the usability of the content and user comprehension of data that is released in stages with Poverty and Income data available in August and all data content available by November. The development team was interested in getting user feedback on the help content of the 1-year and 3-year estimates which are new product releases from the ACS and about which the concern was that users may not understand what a 3-year estimate was or when to use it over the 1-year estimate.

During FY 2008, staff worked with American FactFinder staff to create tasks. We recruited and ran six novice and six expert users through the task scenarios. Staff wrote a quick report and met with the clients to discuss findings and recommendations. Two primary examples of the usability findings with recommendations include 1) In the August data sets pages, users did not understand that not all the data was available. We recommend that the page directly states what content is available, e.g., "Get the latest Poverty and Income data," 2) In the 2005-2007 Fact Sheet (November), users experienced some confusion about what the 3-year estimate was, as well as confusion about the tab label. We recommend that the page give feedback on what and why we are putting out the 3-year estimates. Some possible text to use include: "We accumulate data over 3 years so we can estimate it more accurately." "We combined our data over three years" to indicate that the 3-year data was a single number for each data point. Or that we have "accumulated data for all 3 years."

Staff: Erica Olmsted-Hawala (x34893)

K. ACS Multiyear Estimates: User Guidelines for Choosing Between 1-, 3-, and 5-year Estimates

Working with Decennial Statistical Studies Division (DSSD) staff, we developed website documentation that describes and compares 1-, 3-, and 5-year ACS estimates and their standard errors, discusses their usage, and presents corresponding examples.

During FY 2008, staff from DSSD and our division continued to modify and expand the paper "Statistical Issues and Interpretation of the American Community Survey's One-, Three-, and Five-Year Period Estimates." An analysis of standard errors of 1-year estimates of the total and percentages from the 2006 ACS was completed by staff. Guidelines were developed on when it is appropriate to use 1-year estimates of counts or percentages based on the precision desired, an area's population, and what proportion the estimate is of the size of the area. Similar guidelines were developed for other types of estimates based on the first two of these criteria. These results constitute the final section of the paper. Similar draft guidelines were developed for choosing between 3- and 5-year estimates using the Multiyear Estimates Study data. The paper will be released as an *ACS Research Memorandum* and on the ACS website. Several other pages with general information about multiyear estimates will be linked to this document as the main source of information on their statistical properties. Staff from our division and DSSD coauthored the paper "Interpretation and Use of American Community Survey Multiyear Estimates," which was submitted to *The American Statistician*.

Staff: Lynn Weidman (x34902), Michael Ikeda

L. ACS 3-year Estimates: Methods for Analyst Review

An interdivisional team is developing rules, combinations of rules, and systems for implementing a tool to allow efficient analyst review in 2008 of the first ACS 3-year estimates for geographies of less than 65,000. The purpose of the review is to clear the estimates for public release, but at the same time identify 'unusual' estimates and understand why they should or should not be released. One SRD staff member is on this team.

During FY 2008, staff proposed and developed the only review rule that for a given measure in a geography looks at whether its value makes sense, based on the values of related measures in the same geography. This is accomplished by determining if it is an outlier via comparison of its actual value with a value predicted by a linear regression. The logit of a measure that is a percentage is used when it is the dependent variable in a regression. Staff developed and implemented the rule in production, using stepwise regression in SAS proc REG. A staff member participated in weekly team meetings and contributed to discussions on various facets of the review process.

Staff: Lynn Weidman (x34902), Julie Tsay

M. ACS: Usability Input for Release of Multi-Year Estimates in American FactFinder

Staff met several times with a team from the American Community Survey Office (ACSO) about improving customer usability for the release of the new one-, three-, and five-year estimates through American FactFinder (AFF). Staff assisted this team in designing a line of research to improve users' experience with finding data using 1- vs. 3- and 5-year estimates in AFF. Although the research plan originally involved a data user survey followed by usability testing, the sponsor ultimately decided not to conduct the survey and to postpone testing beyond FY 2008 because the new AFF Web site was not ready for testing.

During FY 2008, the American Community Survey Office (ACSO) began the tiered release of new ACS 1-year, 3-year, and 5-year estimates. ACS data have been published by the Census Bureau since 1996, and the one-year data are collected over one year and are equivalent to the current ACS data. Because of difficulties with maintaining confidentiality for smaller communities (less than 20,000 and less than 65,000), ACS data were not previously available for these communities. The 3-year and 5-year estimates will differ somewhat from the previously published estimates in that they represent three or five years of data collection; this method provides a sample large enough to make estimates for the smaller areas. These data are new products that have never been released by the Census Bureau before, but they will be added to the existing American FactFinder (AFF), which could cause user confusion. This study was designed to examine 1) whether users understood and would correctly use a 3-year estimate, 2) whether users recognized that this estimate is different from all other ACS products, 3) whether users knew when to use the 3-year estimate and when to use the 1-year estimate, and 4) whether users understood the plan for a staggered release of data in September 2008 (1-year estimates), December 2008 (3-year estimates), and by the end of 2010 (5-year estimates).

Staff: Kathleen Ashenfelter (x34922), Elizabeth Murphy

N. ACS: 2005 and 2006 Item Nonresponse Rates

The Census Bureau calculates and publishes item allocation rates for all data items collected in the American Community Survey as part of its data quality measures. However, these rates are actually composed of two separate components of item nonresponse—items that can be assigned a value through the use of related items on the survey questionnaire and items that require a statistical procedure to allocate the value of the missing item. The published allocation rates combine the two measures into one rate. It is desirable to look at both components separately and to see if these rates vary across mode of data collection, individual items, geography, certain population groups, location of call centers (for data collected by CATI), and other items. In addition to the item nonresponse rates, a completeness index can be computed for the entire questionnaire and examined by the same levels as the item nonresponse rates.

During FY 2008, computer programs were written to calculate allocation rates, assignment rates, and total item nonresponse rates for all published questionnaire items from the 2005 and 2006 American Community Survey. The rates were also computed by interview mode—mail, CATI, and CAPI—and included the 2006 General Quarters population data for the first time. The results were documented in a paper entitled "Item Nonresponse Rates for the 2005 and 2006 American Community Survey by Interview Mode," which is being reviewed for inclusion in the *SRD Research Report Series*.

Staff: Pam Ferrari (x34993)

O. ACS Data Reliability Indicator Project

The usability team designed a series of usability evaluations of a new method of displaying the ACS data tables. The new feature to be tested was a color-coded indicator of the reliability of the data. The purpose of the testing was to examine how well the data-reliability indicator worked for users (especially as compared to the current ACS data tables without the indicator) and to identify any problems that actual users might have with the data tables. The data reliability indicator was based on the Coefficient of Variation (CV), which is defined as the standard error of an estimate divided by the mean of that estimate. Another purpose of this testing was to examine whether users would notice and use the Margin of Error (MOE) when answering questions about the estimates from the table. This second testing goal was based on the observation that although the margin of error (MOE) is currently provided with each estimate, the MOE is routinely ignored by ACS data users. This low-fidelity testing is the first round in a series of planned tests that are part of a larger research project focused on Data-Confidence Indicators.

During FY 2008, staff designed a usability test and provided input to the development of prototypes of a color-coded data reliability indicator for the ACS data tables. For this round of testing, each prototype was defined by the number of "levels" that its data reliability indicator uses. Specifically, the two-level indicator has the levels "blank" and "use caution" (yellow). The three-level indicator includes the levels "good" (green), "fair" (yellow), and "poor" (red). Finally, the four-level indicator has the levels "excellent" (green), "good" (yellow), "fair" (orange), and "poor" (red).

The first round of usability testing on the three prototypes of the proposed Data-reliability indicator took place from September 29 to October 2, 2008. Testing with twelve internal participants occurred in the Usability Suite at Census Bureau Headquarters. Three participants performed all of the tasks for three pairs of current tables (e.g., no indicators) and nine participants completed all of the tasks using the proposed table prototypes with the indicators.

Among other findings, the results indicate that users of the tables are more likely to notice and use a measure of reliability when the indicators are present. Additionally, participants preferred the three- and four-level indicators over the two-level indicator. Further rounds of usability testing are planned for the coming year. The results of this series of testing will influence future versions of the ACS data tables if such an indicator is added.

Staff: Kathleen Ashenfelter (x34922), Elizabeth Murphy

P. ACS Messaging Project

The purpose of this project is to develop and test new messages on ACS letters and a brochure to alert ACS respondents in 2010 that they are required to respond to

both ACS and census questionnaires. In 2000, ACS response rates were affected by the 2000 Census environment. Until March 2000, ACS response rates rose as a result of census publicity, but they fell for the rest of the year after respondents also received their census forms, particularly around Census Day. The aim of this project is to try to avoid these drops in response rates in 2010 by informing ACS respondents that they will be receiving both forms and need to complete both.

During FY 2008, staff participated in ACS messaging meetings to develop the forms and define the cognitive testing project. We reviewed draft text for the letters for housing units and for group quarters. We developed the cognitive protocol, sent it out for team review and incorporated comments. We began recruiting and assembling cognitive interview folders with the eight mailings. Cognitive testing will begin in October.

Staff: Laurie Schwede (x32611), Anissa Sorokin, Patti Goerman, Lorraine Randall

1.11 CURRENT POPULATION SURVEY (CPS) / ANNUAL SOCIAL AND ECONOMIC SUPPLEMENT (ASEC) TABLES (Demographic Project 1443000)

Staff provided technical consultation services and programming support for the redesign and content of SAS programs that produce the table packages for the 2007 Current Population Survey (CPS) Annual Social and Economic Supplement (ASEC) that will feature information at the national and regional levels for special population/topics.

During FY 2008, and after replicating the ASEC 2006 published tables, staff developed maintainable SAS and Visual BASIC software to create generalized, integrated Race, Hispanic, Older, and Gender tables to support ASEC for 2007 and beyond. The challenge was not to calculate summary statistics, but to create Excel tables with exacting row and column formats, titles, and footnotes, with superscripted footnote calls. The resulting tables also had to comply with *Section 508*. In the process, staff collaborated with the Population Division (POP) to ensure the consistency and accuracy of the Excel table shells into which the summary statistics were populated.

Staff developed an innovative method to solve a problem that stumped both the SAS Branch at the Census Bureau and SAS Support in Cary, NC. Most of the 188 tables were constructed during FY 2008 to the satisfaction of the sponsoring division. Additionally, the SAS software was demonstrated to the satisfaction of the sponsoring division in FY 2008. The resulting software generates tables that will require no post-processing. This is critical during the Decennial, when senior staff in POP will be engaged in mission-critical activities. As junior staff will be able to generate the required period throughout the Decennial period, this will result in substantial cost efficiencies to the Population Division.

Staff: Aref Dajani (x31797), Pam Ferrari, Tom Petkunas

1.12 USE OF THE EMPIRICAL BAYES APPROACH IN THE HOUSING UNIT METHOD FOR POPULATION ESTIMATES (Demographic Project TBA)

Staff investigated the use of Empirical Bayes (EB) methods for estimating the change across years in county level occupancy rate (%occ) and persons per household (pph). The product of these two is then used as an estimate of change in housing unit population across years.

During FY 2008, approximate Census 1990 and 2000 longform estimates of %occ, pph, and their variances were recalculated using base sampling rates instead of final weights. Corrected approximate theoretical variances of Census 1990 and 2000 longform pph estimates using base weights with a simple nonresponse adjustment were determined and calculated. National and state stepwise regressions were run to determine the fixed effects to use in the new pph mixed models. New mixed models were fit by SAS, but it still could not handle the size of the national models. We wrote and implemented software in R that was able to do this successfully. For 17 states we were unable to obtain non-zero variance component estimates for pph. Reduction in the variance of estimates, especially for pph, is obtained with the EB procedure. A project report was prepared as an *SRD Research Report* and has been sent to POP.

Staff: Lynn Weidman (x34902), Don Malec, Julie Tsay, Rob Creecy

1.13 DATA INTEGRATION (Demographic Project 0906/7374)

The purpose of this research is to identify microdata records at risk of disclosure due to publicly available databases. Microdata from all Census Bureau sample surveys and censuses will be examined. Potentially linkable data files will be identified. Disclosure avoidance procedures will be developed and applied to protect any records at risk of disclosure.

During FY 2008, staff looked into datasets that were available on datamarts that extended to occupations, prescription drugs, and hobbies. Software documentation for an *SRD Research Report* was submitted titled "Software for Web-Mining available Databases." The software creates a web page for easy access to the data products available on listfinder.directmag.com. A result was that single word requests to the website produced the most efficient results. In addition, software was developed to extract and perform simple linkages to determine vulnerability of at-risk files. Running the software on a potentially released file of microdata identified a subset of the file which could be used to identify individuals using a minimal amount of data. Also, results of this exercise assisted in the selection of

publicly available databases. Staff tested potentially released microdata files. The files were tested for disclosure by linking data to previously released files. Staff performed subsequent data analysis to determine the viability of the masking of data. Confidential results written of these linkages were submitted for publication in the Census Confidential Report Series. Additional software was developed to assist in the statistical analysis and data were submitted to the Disclosure Review Board and was approved.

Staff: Ned Porter (x31798), Adam Persing, Lisa Singh

1.14 QUICK TURNAROUND PRETESTING OF HOUSEHOLD SURVEYS (Demographic Project 1440555)

This project involves pretesting new or revised series of questions for insertion into household surveys. The projects are of the short-term, quick turnaround variety rather than long-term research efforts to redesign a survey. Methods used include cognitive testing and other techniques as appropriate.

During FY 2008, staff completed and distributed the final report of cognitive pretesting on the National Crime Victimization Survey (NCVS) Identity Theft Supplement. The results showed that respondents think about their identity theft incidents as a single unit, and when they are asked separately about actual identity thefts and then attempted identity thefts, they tend to overreport incidents of actual identity thefts. Respondents had a very strict definition of what it means to know something about the person who misused their information and were reluctant to incriminate people, which resulted in underreports of knowledge of information about the identity thief. Also, respondents consistently misinterpreted the sponsor's definition of an information breach and were unable to accurately report whether they had been the victim of an information breach. Revisions to address these problems were incorporated into the supplement when it was fielded.

Staff also completed a round of cognitive interviews to test revised National Crime Victimization Survey Internet Predation questions (the first round of interviews was conducted last year). Results showed the following: 1) overall, these revised questions seemed to work well, and the question revisions seemed to solve the major problems we observed during the first round of cognitive interviews; 2) the questions posed problems for respondents who used the Internet for gaming activities, because of the complex and interactive nature of these activities; and 3) as with the previous set of questions, respondents may not report continuing friendships, etc., with online strangers when answering these questions. Questionnaire revisions to address problems have been accepted for the Internet predation questions, but the timeline for fielding them has not been finalized.

Staff provided comments on the protocol for the Current Population Survey Unbanked and Underbanked Supplement research, which is being conducted by the Demographic Surveys Division (DSD) under contract.

Staff began conducting cognitive testing of newly-proposed questions for the NCVS School Crime Supplement.

Staff: Terry DeMaio (x34894), Jennifer Beck, Debbie Miller

1.15 MIGRATION SUPPLEMENT TO THE CURRENT POPULATION SURVEY (Demographic Project TBA)

This project conducts cognitive pretesting for a new supplement for the August Rotation of the 2008 Current Population Survey (CPS). The supplement contains five sections, and its primary objective was to gather data that are currently unavailable to analysts. If successful, these new data will fill a critical gap, permitting a more complete understanding of the migration and emigration patterns of CPS sample households.

In FY 2008, staff executed the project plan as scheduled, and led the cognitive pretesting efforts of this project. Two rounds of cognitive interviews were conducted with respondents residing in households containing foreign-born residents or residents with whom the respondents lived a year ago and who were living abroad at the time of the interview to (1) pretest the survey and document respondents' ability to comprehend and to respond to the survey questions as designed; and (2) to provide recommendations for question wording revision. Results from the first testing served as recommendations for question wording revisions for Round 2 of cognitive testing.

Overall, the findings in our initial round of cognitive interviews suggested that some of the sections required major revisions on some items while other sections required only minimal revision for a few items. In particular, the questions in the Year of Entry Section were difficult for respondents to comprehend and respond to without interviewers' probing. Respondents had problems that reflected question order effects, inadequate response options, and ambiguous and problematic terms (such as "stay" or "live"). The concept "one year ago" was problematic in the One Year Ago Section. The questions in the Residents and Emigrants Abroad Section did not accurately differentiate persons who were listed on the roster versus those who were no longer household members. In the Transfers Section, ambiguous concepts such as 'monetary exchange,' 'abroad' and '(types of) money' were difficult for respondents to comprehend. Revisions were made and tested in the second round of interviews. Results showed that very few difficulties were found with the revised questions and the supplement worked well as a whole. A total of 25 cognitive interviews was completed and summarized. All the recommendations for questionnaire revision were incorporated into the migration supplement questionnaire,

which was fielded in August 2008. Details can be found in the final report titled "Report on the Cognitive Pretest Study for the Current Population Survey's New Migration Supplement Questions."

Staff: Anna Chan (x38462)

1.16 RE-ENGINEERED SURVEY OF INCOME AND PROGRAM PARTICIPATION RESEARCH (Demographic Project 1465001)

Re-Engineered SIPP Methodological Research

This project conducts long-term methodological research to evaluate the Survey of Income and Program Participation (SIPP), and to inform the design of the re-engineered SIPP, which will eventually replace the current SIPP program. The two major components of this project are (1) the evaluation and documentation of the impacts of the many and substantial revisions to the 2004 panel SIPP questionnaire made as a result of the multi-year SIPP Methods Panel research and development effort; and (2) the development of instruments and procedures for the new re-engineered SIPP program, which will replace SIPP starting in 2011 or 2012.

During FY 2008, staff served on several re-engineered SIPP planning groups: the Content Group, the Survey Group, the Integration Group (comprised of the several re-engineered SIPP subgroup chairs), and the general planning group known simply as "The Group." Staff also chaired the Research Group, which focused on planning and implementing a field test of 12-month event history calendar (EHC) interviewing methods to replace the current 4-month reference period, three-times-per-year approach. The Research Group worked with a contractor, RTI International, to develop and test a prototype paper-and-pencil EHC instrument and an accompanying interviewer training package. That work was completed, generally successfully, in the fall. We devoted substantial time late in the year to improving the RTI-produced forms, modifying training materials to reflect those changes to the forms, implementing other improvements, and working through the myriad of details requiring attention in order to implement an EHC field test. The field test consisted of a direct comparison of information gathered using a prototype paper-and-pencil EHC instrument, with a 12-month reference period, and data gathered from the same set of respondents in three successive SIPP interviews, covering the same period, but using in each case a 4-month reference period. The field test was carried out in April through June in Illinois and Texas. A total of 1,630 EHC interviews were conducted, for a response rate of approximately 91%. We created an MS-Access database system to capture field test data, and five summer interns were brought into the project to assist with data entry and analysis tasks. (One staff member focused primarily on data capture from respondent and FR debriefing forms, and on analyses of data from the forms filled out by observers of the field test EHC interviews.) Debriefing sessions were held with EHC field test FRs in both sites. Arrangements are largely in place to use administrative records as an objective data quality yardstick for a few of the characteristics measured in both SIPP and the EHC.

Staff presented two papers (and co-authored a third) at a special Census Bureau/University of Michigan-sponsored conference on EHC methods, December 5-6, 2007, as follows:

Moore, J. (2007), "Seam Bias in the 2004 SIPP Panel: Much Improved, but Much Bias Still Remains." The key finding from this research is that questionnaire design changes in the 2004 SIPP panel—in particular, the widespread use of dependent interviewing procedures—have significantly and substantially reduced seam bias compared to the previous (2001) panel, but are far from having eliminated the problem. The paper calls for a rigorous examination of new interviewing methods to improve the quality of retrospective reports in the re-engineered SIPP such as event history calendar interviewing, which, unlike a standard "question list" questionnaire, is explicitly designed to exploit basic features of the organization of human memory.

Pascale, J. and McGee, A. (2007), "A Multi-Method Evaluation of the Use of an Event History Calendar." A key finding of this research is its illumination of how "landmark events" are actually used in an EHC interview, and the substantially greater usefulness of individually-generated personal landmarks as opposed to those imposed from the outside by survey designers. Another SIPP-related paper is the following:

Moore, J. and Fields, J., (2008), "The SIPP Event History Calendar Field Test: Analysis Plans and Preliminary Report, August 2008," background paper prepared for the meetings of the ASA/SRM SIPP Working Group, Alexandria, VA, September 16, 2008. Major results: (1) Interviewer training on EHC methods appear to have been successful. (2) FRs completed interviews at 1,627 of the eligible 1,792 sample addresses, for a response rate of 91%. Among adults (age 15+) enumerated in interviewed households, the individual EHC interview rate was approximately 99%. Approximately 86% of EHC-interviewed adults in the field test sample component of primary interest continuing wave 10-11-12 cases were matched to a SIPP respondent, and thus to a set of SIPP interview data for the same CY2007 time period. (3) Other evaluation data sources include respondent debriefing forms and interviewer debriefing forms (one per interviewed household, interviewer debriefing focus groups (one in Dallas, two in Chicago), and interview observation reports for each observed EHC interview in 75 observed households (n=145).

Staff: Jeff Moore (x34975), Stephanie Burres, Anna Chan, Kenny Merritt, Debbie Miller, Dawn Norris, Joanne Pascale, Brandon Tolson, Cynthia Tooley

1.17 SIPP MEASUREMENT OF WEALTH: ASSETS/LIABILITIES IMPUTATION RESEARCH/SOFTWARE DESIGN (Demographic Project 7558111)

This project undertakes research and implementation of methods for compensating for missing data in the wealth topical modules of the Survey of Income and Program Participation (SIPP).

During FY 2008, staff identified structural flaws in the SIPP PUFF files for the 2004 panel. Staff found that the imputation of business value was decoupled from the imputation of business debt, which led to severely distorted estimates for these two items. Staff helped the Housing and Household Economic Statistics Division identify repairs for the inconsistencies. The Demographic Surveys Division reprocessed the PUFF files using the new specifications. Staff programmed new applications for the imputation of property value/mortgage, mobile home value/debt, individual checking account and joint checking account. The applications use SAS Proc IML to ensure each missing value case had a hot-deck donor as opposed to getting a "cold deck" donor, which is usually not representative of the universe in the scope of the survey.

Staff completed the research and application project of Assets/Liabilities Imputation, and new software for the imputation of property value/mortgage, mobile home value/debt, individual checking account and joint checking account was delivered to the Social Security Administration. The new software better identifies the in-scope universe for each of the imputation applications. As a result of this project the Demographic Survey Division made important modifications to the edit system for processing the wealth topical module of SIPP. Staff conducted additional research on imputing core SIPP items longitudinally using transition probabilities between waves. Staff developed a method to estimate the sizes of subdomains based on their past history, and presented results at the 2008 Joint Statistical Meetings.

Staff developed a method to forecast the sizes of labor-status subdomains based on the history of person transitions between subdomains. Examples of person transitions are persons transiting from the "not on layoff" subdomain to the "on layoff" subdomain. The proposed estimator for forecasting sizes of subdomains is model-based and can deal with cases of missing data for the current subdomain information. The general form of the method is that of an aggregated estimator. This implementation is an extension of the method proposed by Pfeffermann and Skinner (1998). The improvement in our method over that of Pfeffermann and Skinner provides for tools to estimate the variance of the projected size of the subdomain under study; Pfeffermann and Skinner's method was focused mostly on accounting for measurement error and did not provide for a way to estimate the variance. In its aggregate form, the estimator's variance can be estimated with the method of Laplace (Thibaudeau & Slud 2008). The proposed estimator is also available in a non-aggregated form. This form of the proposed estimator is obtained by implementing a Markov chain Monte Carlo (MCMC) to produce multiple imputation, as described by Little and Rubin (2002). The particular for the MCMC in this situation is an extension of the method of Laplace used for estimating the variance of the aggregated estimator. Then a variance estimate for the multiple imputation estimator is available by implementing a special case of Rubin 's (1987) formula.

To implement the variance estimation method based on the method of Laplace proposed by Thibaudeau and Slud (2008), it is necessary to test for weight ignorability. To carry out such tests, staff compared the MLE to the weighted MLE (WMLE) for the components of the basis for the loglinear subspace defined by a loglinear model. The basis can be used also to evaluate the relative efficiency between the WMLE and MLE. This last test is important because the WMLE is always consistent for the solution of the population likelihood equation. So it is worth taking a risk by using estimators based on the MLE instead of the WMLE, only if there is a substantial improvement in efficiency. The proposed method makes it possible to assess such an improvement. The results are documented in *ASA Proceedings* (Thibaudeau and Slud 2008).

Staff: Yves Thibaudeau (x31706), Julie Tsay, Eric Slud

1.18 CIVIC ENGAGEMENT SUPPLEMENT TO THE CURRENT POPULATION SURVEY (Demographic Project TBA)

A new supplement on civic engagement was proposed for the Current Population Survey (CPS) by the Corporation for National and Community Service (CNCS.) The primary objective of the supplement would be to gather information on the level of social capital and the extent to which American communities are places where individuals are active citizens. Staff conducted two rounds of cognitive interviews to test proposed questions for the supplement and submitted the following final report to the Demographic Surveys Division: Rothgeb, J., Okon, A., and Dusch, G. (November 6, 2007), "Voting and Civic Engagement (VCE) Supplement to CPS: Cognitive Testing (Round 1) Summary Report."

Staff: Jennifer Rothgeb, Gianna Dusch (DSD), and Aniekan Okon (DSD)

1.19 2010 NSCG RESEARCH TO MODEL FIELD OF DEGREE INFORMATION FOR COLLEGE GRADUATES IN THE ACS (Demographic Project TBA)

The goal of this project was to predict the 142-category Field of Degree (FOD) for insertion on the 2005-2006 ACS files. FOD will be used by the staff of the Demographic Statistical Methods Division (DSMD) as an aid to formulating a design for the 2010 National

Survey of College Graduates using the ACS sample as a sampling frame for the National Survey of College Graduates (NSCG).

During FY 2008, staff completed the project and documented the results in the *SRD Research Report* "Research To Model Field Of Degree Information For College Graduates." Accomplishments in the project include successful application and evaluation of Classification Tree procedures for predicting both FOD and nonresponse, a demonstration that the Classification Tree approach can predict as well as alternative methods by using a much small dimensioned model, and the development of tailored software so that DSMD can apply the model to new data using SAS code generated from R. DSMD plans on using both the predicted FOD and predicted nonresponse as part of their design development.

Staff: Don Malec (x31718), Elizabeth Huang, Lynn Weidman

1.20 SAMPLE REDESIGN (Demographic Project 4000801)

Following each decennial census a new sample design is put in place for each of the Census Bureau's demographic surveys. Our division assists the Demographic Statistical Methods Division (DSMD) in performing research to determine how to improve the efficiency of these sample surveys through a coordinated joint redesign.

During FY 2008, a staff member was on the 2010 Sample Redesign Optimal Sample Design Strategy Team led by the DSMD. He investigated the properties of a no-PSU design and estimated a rough cost model that showed this option is likely to increase the cost compared to the current design. The team looked at overall approaches using or not using primary sampling unit (PSU)-based designs and finalized a report with recommendations for the next phase of study.

Staff: Lynn Weidman (x34902), Michael Ikeda

1.21 RESEARCH FOR SMALL AREA INCOME AND POVERTY ESTIMATES (SAIPE) (Demographic Project 7165000)

The purpose of this research is to develop, in collaboration with the Data Integration Division (DID), methods to produce "reliable" income and poverty estimates for small geographic areas and/or small demographic domains (e.g., poor children age 5-17 for counties). (The Small Area Income and Poverty Estimates (SAIPE) branch is now in DID, but was previously in the Housing and Household Economic Statistics Division.) The methods should also produce realistic measures of the accuracy of the estimates (standard errors). The investigation will include assessment of the values of various auxiliary data (from administrative records or surveys) in producing the desired estimates. Also included would be an evaluation of the techniques developed, along with documentation of the methodology.

During FY 2008, we used 2005 American Community Survey (ACS) data instead of 2006 Current Population Survey (CPS) Annual Social and Economic Supplement (ASEC) data in the SAIPE state models for 2007 production. With its much larger sample size, the direct ACS estimates were clearly adequate for the larger states (and were changed very little by the models), but we found that the models gave substantially lower variances of the estimates for the smallest states. We examined the regression diagnostics for the models and performed the quality checks for the production of state estimates.

We investigated alternative forms of the food stamp (FS) participation rate regression variable used in the SAIPE state poverty ratio models. This included investigating alternative one-year time frames for defining the variable (which involves summing outlier adjusted FS participants over 12 months and dividing this by a suitably weighted average of two July population estimates occurring in and adjacent to this 12 months period). This study involved models fitted to Census 2000 data and to ACS data for 2005-2007, and augmented a study done years ago with models fitted to 1990 census data. Results were somewhat mixed, but overall tended to support the previous conclusion that the exact time frame used was not critical, and also suggested that the current time frame being used produced reasonably close to the best fit. We also investigated replacing our FS participation rate variable with either (i) a participation rate in the free and reduced price lunch program, or (ii) a modification of the FS participation rate published by Mathematica, Inc. that attempts to measure FS participation among people eligible for FS, rather than as just a fraction of the total state population. The first of these led to somewhat poorer model fits, but the second improved the fit for using ACS 2005 data but not for ACS 2006 data. Also their dependence on survey data means the adjustments contain sampling error. We thus are not making this adjustment of FS regression variable for 2008 SAIPE production.

IRS tax poverty shares were used for the first time in the 2007 SAIPE production of school district estimates via the Minimum Change methodology outlined in Maples and Bell (2007) (in the *SRD Research Report Series*), instead of census share model to improve the school district poverty estimation procedure. We provided support to DID for the production run and assisted with the data quality checks on the production of the school district estimates.

We proposed a method that can be used in non-census years to calculate the coefficient of variation (CV) for the estimates of the number of children in poverty for school districts. The point estimates used were those from the Minimum Change methodology mentioned above. Additionally, we attempted to empirically quantify the possible improvement in CV that might be made by improving the geocoding process to reduce the

percentage of non-geocoded exemptions. Comparisons of CVs were made against the Census long-form CVs from 2000 and 1990. Details of the report will be in the *Statistical Research Division Research Report* on "Calculating Coefficient of Variation for the Minimum Change School District Poverty Estimates and the Assessment of the Impact of Non-geocoded Tax Returns" by Maples.

We investigated models that apply small area estimation techniques to the estimated sampling error variances for county level poverty estimates from the ACS (single year data). The goal is to reduce the huge variability observed in the design based sampling error variance estimates, especially among the smaller counties, equivalently the counties with smaller sample size. Currently we have two competing small area models for the design based variance estimates. Comparisons revealed that the choice of model changed the model-estimated variances enough to appreciably affect the results from the SAIPE county poverty model. It was decided that further investigation of these or other alternative variance models is needed before choosing a model and moving this methodology into the production environment.

One issue that arose for the variance modeling is that little seems to be known about the distributional properties of the successive difference replication variance estimator being used in ACS, especially when the sample size is small. A simulation study was conducted on the replicate sample variance estimates with various sample sizes, each with 1000 samples drawn from each of several assumed populations (Normal, Bernoulli, Poisson). We investigated the simulation results to see whether the distribution of the variance estimates can be approximated by a scaled chi-squared distribution and, if so, with what degrees of freedom. The results showed that the chi-squared approximation works well for normally distributed data for virtually all sample sizes. However, for data with a Bernoulli or Poisson distribution (which may be more realistic when modeling poverty), the chi-squared approximation works well for large sample sizes, but not so well for small sample sizes (with worse results for the Bernoulli than the Poisson distribution). The simulation results are being used to guide us in specifying the parametric variance models mentioned in 5.

We are in the process of examining a new benchmarking procedure developed by Datta and Ghosh, using state level CPS poverty models for illustration. The benchmarking procedure for these models (which have since been supplanted by models for ACS data) is to ratio adjust the model estimates so the resulting national total number in poverty agrees with the corresponding CPS direct national estimate. This approach produces benchmarked estimates with less variability (as implied by the model) than the underlying true state population quantities. The alternative method developed by Datta and Ghosh benchmarks to achieve agreement of both the national estimate of number poor and agreement of the variability of the state estimates. We are using the CPS data, instead of the current ACS data, to illustrate the benchmarking procedure because there exists historical series of CPS state estimates to be used to compare the implications of different benchmarking criteria. It is also true that doing the benchmarking with ACS data would be less interesting because the ACS state model makes very little difference to the direct ACS estimates for most states.

Staff: Elizabeth Huang (x34923), Jerry Maples, William Bell (DIR)

1.22 SMALL AREA HEALTH INSURANCE ESTIMATES (SAHIE) (Demographic Project TBA)

At the request of staff from the Data Integration Division (DID), our staff will review current methodology for making small area estimates for health insurance coverage by state and poverty level.

During FY 2008, staff reviewed methodology used for county-level model as well as draft web-page descriptions of both state and county models. Staff also contributed to discussions with DID on the development of defensible methods of benchmarking small area estimates to higher level estimates.

Staff: Don Malec (x31718), Elizabeth Huang

1.23 EDITING METHODS DEVELOPMENT (Economic Project 2370854)

Investigation of Selective Editing Procedures for Foreign Trade Programs

The purpose of this project is to develop selective editing strategies for the U.S. Census Bureau foreign trade statistics program. The Foreign Trade Division (FTD) processes more than 5 million transaction records every month using a parameter file called the Edit Master. In this project, we investigate the feasibility of using selective editing for identifying the most erroneous records without the use of parameters.

During FY 2008, we researched the feasibility of using score functions for ranking failing records earlier in the editing process. This process would allow a more efficient target of records for review and lead to an expected reduction in rejects. The domain of records for the current research is the full data set rather than the set of edit failing records. The objective is to reduce the number of rejects by using selective editing techniques for identifying the most erroneous records without the use of the Edit Master parameter file. The selective editing legacy software uses only reject files to determine criteria for selective editing processing. The assumptions and procedure are different when considering the full data set. We re-wrote and adjusted the selective editing legacy routines to assign scores to all records (not only rejects). We completed testing for all commodity sections for one cycle. For evaluating the procedures, we matched manual review referrals using the selective editing program to

analysts' referrals using the Edit Master. Evaluation results are not consistent with expected results: for all testing sections, the program assigns analysts' follow up priority for at most 30% of the Edit Master rejects. This indicates we are not tracking most of the erroneous records. Our further research indicates that these disappointing results are due to our inability to properly match the two files. During production, the unique identifiers needed for the matching operations are recycled through each cut. This leads to conflicting results when processing through the selective editing software. The Foreign Trade Division (FTD) is restructuring its Export Processing system, taking into account the need to store identifiers before recycling through the next cut which will allow the selective editing process to consistently match to the outputs from the export reject files.

Staff: María García (x31703), Yves Thibaudeau, Alison Gajcowski (FTD), Rachelle Reeder (FTD)

1.24 DISCLOSURE AVOIDANCE METHODS (Economic Project 2470851)

The purpose of this research is to develop disclosure avoidance methods to be used for Census Bureau publicly available economic data products. Emphasis will be placed on techniques to implement disclosure avoidance at the stage of data processing. Disclosure avoidance research will be conducted on alternative methods to cell suppression for selected economic surveys. We will also aid in the implementation of the methods.

During FY 2008, and because of a recommendation of the Census Advisory Committee (specifically the American Economic Association representatives), opinions of economists who are sophisticated users of *County Business Patterns (CBP)* and other Census economic data were solicited. Their input was useful in the staff's determination of the most useful form in which to present cell value distortion information when noise is used for disclosure avoidance. Staff worked to develop metadata about noise infusion that will be linked to the webpages for the tabular releases from economic programs that use noise. This metadata will appear on the web pages that provide the released tables. It will explain to data users the legal requirement to protect business data and how this is accomplished by suppressing sensitive cells and using noise to protect the published cell values.

The needs of data users for noise level information for individual cell values must be considered along with the need to protect the confidentiality of the data. Several noise meetings have addressed the exact form of the noise flag system for unweighted data (e.g. NE and *CBP* programs). It has been decided that each economic program that produces tables based on unweighted microdata will need to specify the degree of perturbation (i.e., distortion) that each cell value has undergone as a result of adding noise to the underlying microdata. A system of noise flags was agreed to by the noise research team and the Disclosure Review Board. The system involves determining a set of 2 noise distortion cutoffs (e.g., one flag for noise distortion less than 2%, another flag for distortion less than 5%, etc). Each published cell value will be assigned a noise flag; all sensitive cells (according to the p% rule) will be suppressed. Each program that uses distortion level cutoffs can choose cutoffs values that are most suitable to its data. However, only a small number of choices are allowed.

For weighted survey data, the measure of noise distortion at the cell level will likely be incorporated into a total uncertainty measure for the cell that includes sampling variance and all other measurable sources of uncertainty (e.g., other types of weights unknown to users). For those economic programs that use (sample) weighted data (e.g. Commodity Flow Survey), there was much discussion about the best way to provide noise distortion information to users. It was decided to extend the currently used sampling variance to include a 'noise variance.' For cells with a medium or large sampling weight, the noise variance is a small percentage of the total uncertainty variance for the cell. However, when the sampling variance is small (i.e., close to 1) the noise variance may be the major contribution to the total variance. Mathematical statisticians from the economic directorate decided what formula to use for the combined variance.

Staff worked with the Economic Planning and Coordination Division (EPCD) on determining how the use of protective noise for economic tables would affect the accuracy of certain quantities of interest to researchers of this data. In particular, we used graphical methods to show that trend information could safely be released by the Census Bureau. This supplementary trend information would allow researchers to calculate trend values that were more accurate than the values they could calculate directly from noisy cell values. Staff continues to investigate and document the effects of noise on longitudinal trend data. The analysis of 2004 vs. 2005 *CBP* data protected by noise has led to the general consensus that noise does not harm trend data.

The noise research group is organizing all of the technical work about the use of protective noise and all of the implementation details. Since there are now various forms of EZS noise and various ways noise interacts with rounding schemes, it is useful to have a single document that lists the choices that each economic program has made regarding the use of noise. For example, each program has decided if it will use the standard EZS noise (now called "random EZS") or the more involved form of noise called "balanced EZS." The noise group also worked to specify the workload structure for the major components of noise work for all economic programs that are likely to use noise within the next 3 years. The noise procedure was used for Non-Employer Statistics, Census of Island Areas, Commodity Flow Survey, Survey of Business Owners, and *County Business Patterns.*

Staff: Laura Zayatz (x34955), Paul Massell, Elizabeth Ransom, Marlow Lemons, Adam Persing, Jason Lucero,

Asoka Ramanayake, Lisa Singh, Tapan Nayak, Bimal Sinha

1.25 TIME SERIES RESEARCH (Economic Project 2370852)

A. Seasonal Adjustment Support

This is an amalgamation of projects whose composition varies from year to year, but always includes maintenance of the seasonal adjustment and benchmarking software used by the Economic Directorate.

During FY 2008, seasonal adjustment and X-12-ARIMA support was provided to OECD, European Central Bank, Bank of Canada, Bank of England, Bank of Spain, Bundesbank, Banco de Portugal, Citicorp, Brevan Howard, Juno Lighting Group, IIT, URS-Austin, Credit-Suisse (Brazil), Ender Solutions, Hendyplan, Business Cycle Research Institute, SAS, Beacon Economics, NORC, Bureau of Labor Statistics, U.S. Department of Energy, Department of Transportation, Colorado Department of Labor, New York State Dept. of Banking, Office of National Statistics (UK), Australian Bureau of Statistics, Statistics Sweden, Statistics Canada, INSEE (France), INDEC (Argentina), ITESM (Mexico), Statistics New Zealand, Government of Argentina, Korean National Statistical Office, Lehigh University, University of Virginia, Université Paris II Panthéon-Assas, Ecole Polytechnique de Tunisie, and Vrije Universiteit.

In addition, staff provided support to staff from the Office of Statistical Methods and Research for Economic Programs (OSMREP) to discuss methodology developed at the Bureau of Economic Analysis concerning the source of revisions due to seasonal adjustment and how it compared to what is done at the Census Bureau, as well as options for seasonally adjusting the supply of new homes (which consists of the ratio of U.S. Homes For Sale to U.S. Total Sold). Staff also worked with OSMREP staff to track down differences found by Services Division in seasonal adjustment runs with 0.2.10 and 0.3, which were related to an error fixed in the seasonal moving average procedure and pointers in the extreme value identification procedure. Staff taught two time series classes, which were well-attended by seasonal adjusters at the Census Bureau.

Staff: Brian Monsell (x31721), Tucker McElroy, David Findley (DIR)

B. Seasonal Adjustment Software Development and Evaluation

The goal of this project is a multi-platform computer program for seasonal adjustment, trend estimation, and calendar effect estimation that goes beyond the adjustment capabilities of the Census X-11 and Statistics Canada X-11-ARIMA programs, and provides more effective diagnostics. This fiscal year's goals include: (1) developing a Windows programming interface for the X-12/X-13 seasonal adjustment software in collaboration with analysts from the Bank of Belgium; (2) finishing a version of the X-13ARIMA-SEATS program with accessible output and improved performance so that, when appropriate, SEATS adjustments can be produced by the Economic Directorate; and (3) incorporating further improvements to the X-12-ARIMA/X-13A-S user interface, output and documentation. In coordination and collaboration with the Time Series Methods Staff of the Office of Statistical Methods and Research for Economic Programs (OSMREP), the staff will provide internal and/or external training in the use of X-12-ARIMA and the associated programs, such as X-12-Graph, when appropriate.

During FY 2008, staff repaired minor defects found in the X-12-ARIMA source code affecting the processing of files with blanks in their names, writing accessibility codes into the X-12-ARIMA output, saving outlier iteration files, initializing a variable in the outlier identification procedure, and making minor corrections in the routine that generates normality statistics for regARIMA models. Staff also reduced convergence problems in the automatic model identification procedure by fixing two problems related to the differencing identification procedure. Staff implemented other improvements into the X-12-ARIMA and X-13A-S seasonal adjustment software, including (a) producing a summary of outlier t-statistics held to zero in tables output by the automatic outlier identification routine at the request of analysts from Services Division, (b) added an almost argument for specifying the differential for almost outliers in Version 0.3 at the request of Services Division, and (c) changed the default tables and number of decimals printed out by the program for certain tables when additive seasonal adjustment is specified at the request of the Time Series Methods Staff.

Staff continued to develop the X-13A-S seasonal adjustment software, incorporating changes made in the latest versions of SEATS which was shown to cause minor differences in the output of the program. Staff also implemented an automated test for the significance of length of month or leap year regressors in regARIMA models and options that performed a log-normal correction of forecasts or regARIMA models when a log transformation is selected and removed the constant term from a regression-adjusted original series. The software was revised to improve the speed of generating sliding spans and revisions history results using the SEATS seasonal adjustment method; these improvements increased the speed of generating these diagnostics by a factor of 8. Staff implemented several changes to the spectral estimation procedures of the X-13A-S program to compute AR spectrum from coefficients derived from OLS regression, generate alternate trading day spectral frequencies for monthly and quarterly series, and evaluate different procedures for identifying peaks in the spectrum. Spectral options were also bundled into a new spectrum spec, rather than have spectrum options scattered between the series and composite spec.

Staff generated a 64-bit version of X-12-ARIMA for European Central Bank for their testing purposes,

updated X-12-ARIMA source code used in the DEMETRA package distributed by Eurostat, and made changes in the source code of X-13A-S to allow it to be compiled by the Gnu Fortran 77 compiler used by the Bureau of Labor Statistics. Staff also developed Linux versions of the seasonal adjustment software, and made available to staff in the Economic Statistical Methods and Programming Division, for testing purposes, Linux source code that could be compiled on their Linux machines.

Staff: Brian Monsell (x31721), Christopher Roberts, David Findley (DIR)

C. Research on Seasonal Time Series - Modeling and Adjustment Issues

The main goal of this research is to discover new ways in which time series models can be used to improve seasonal and calendar effect adjustments. An important secondary goal is the development or improvement of modeling and adjustment diagnostics. This fiscal year's projects include: (1) continuing research on seasonal adjustment diagnostics; (2) studying further the effects of model based seasonal adjustment filters; (3) making further improvements to the automatic modeling procedure of X-12-ARIMA Version 0.3 in collaboration with the Time Series Methods Staff; (4) determining if information from the direct seasonally adjusted series of a composite seasonal adjustment can be used to modify the components of an indirect seasonal adjustment; (5) studying the modeling of seasonality using Bayesian methods, and determining if using such a method is feasible for short time series; (6) evaluating and refining a nonlinear approach to seasonal adjustment using empirical mode decomposition; and (7) examining an approach for performing signal extraction for correlated components.

During FY 2008, and as part of the Time Series Research Groups work for the last fiscal year, staff (a) investigated further the frequency domain effects of linear filters on nonstationary data; (b) continued work on empirical revision variances, conducting extensive empirical testing of these diagnostics, and modifying them to improve power by comparing the empirical power of the method with standard goodness-of-fit diagnostics; (c) developed two paradigms for recasting the X-11 seasonal adjustment filters into a finite-sample model-based signal extraction context, whereby time-varying filters could be obtained as well as signal extraction mean squared errors; (d) completed research on a nonlinear seasonal adjustment algorithm that generates seasonal adjustment estimates with less bias, thus counter-acting the typical downward bias in time series requiring Box-Cox transforms; (e) completed investigation of a new goodness-of-fit diagnostic based on the log spectral density; (f) examined the performance of a one-coefficient trading day model for flow series where daily weights for Monday through Saturday are considered the same and Sunday is different on a small group of 17 Services division series, showing that this model fit better than the default trading day model in X-12-ARIMA for 3 of the 17 series; (g) investigated variance estimation for processes with a unit root, which is pertinent to the modeling of economic data; (h) conducted empirical investigations of signal extraction goodness-of-fit diagnostics and frequency-specific seasonal time series models; (i) continued developing algorithms for extracting empirical modes as a non-model based seasonal adjustment method; (j) produced formulas and code to produce a seasonal adjustment estimate whose dynamics approximately match those of the target, which ameliorates the problem of negative seasonality, i.e., dips in the spectrum of seasonally adjusted data at seasonal frequencies; (k) began research on a Bayesian approach to modeling seasonal heteroscedasticity, whereby a model captures variation dependent on the calendar month and incorporates parameter and model uncertainty directly into parameter estimates; (l) extended theoretical results for signal extraction diagnostics to cover parameter uncertainty, and examined some finite-sample improvements to the sampling distribution via a skewness correction; software is being developed to implement these results; (m) examined an automatic ARIMA model selection procedure that uses an empirical information criteria, using pre-adjustments for calendar and outlier effects, and found that models identified by this procedure had more parameters than those identified by the current automatic model identification procedure in X-12-ARIMA, and also caused poorer seasonal adjustment revisions when used to extend series with forecasts prior to seasonal adjustment, (n) conducted joint research with colleagues at the University of Missouri to examine the effect of using country specific calendar regressors as used by Eurostat on U. S. Economic series, and found a number of manufacturing series that preferred the Eurostat method, and several series that preferred one coefficient trading day models over traditional trading day models.

Staff: Tucker McElroy (x33227), Brian Monsell, Christopher Blakely, Irma Hindrayanto, Christopher Roberts, William Bell (DIR), David Findley (DIR)

D. Supporting Documentation and Software for X-12-ARIMA and X-13A-S

The purpose of this project is to develop supplementary documentation and supplementary programs for X-12-ARIMA and X-13A-S that enable both inexperienced seasonal adjustors and experts to use the program as effectively as their backgrounds permit. This fiscal year's goals include improving the documentation of X-12-ARIMA, improving the documentation of X-12-ARIMA, rendering the output from X-13A-S accessible, and exploring the use of component and Java software developed at the National Bank of Belgium.

During FY 2008, our staff continued to work with a contractor to develop an accessible version of the *X-12-ARIMA Reference Manual* that will satisfy *Section 508* requirements. Staff members have finished evaluating the

accessible versions of the documents, and developed a report on what work is needed to make them fully accessible; a response from the contractor is necessary before the project can be completed. Staff also revised a utility that converts X-12-ARIMA output into accessible HTML, and a similar utility was developed to convert output files to XHTML. Another utility was written to convert X-13A-S spec files into spec files with the spectrum spec. Staff updated the Seasonal Adjustment Papers website, allowing access to several additional papers. Staff developed a Census Bureau contribution to a report dealing with modernizing seasonal adjustment software, specifically creating software modules for the X-12-ARIMA seasonal adjustment program.

Staff: Brian Monsell (x31721), Tucker McElroy

1.26 SURVEY OF RESEARCH AND DEVELOPMENT IN INDUSTRY, IMPUTATION AND SAMPLING RESEARCH AND SOFTWARE DESIGN (Economic Project 7497000)

This project undertakes research on the imputation of unreported mandatory items in the Survey of Research and Development in Industry. It also examines what estimators are more appropriate under alternative sampling plans; in particular, it evaluates using calibration estimators to compensate for missing data. The possibility of extending calibration to new sampling plans, such as balanced sampling, is investigated. Both traditional linear regression techniques and nonparametric regression techniques are examined.

During FY 2008, staff wrote software for imputing R&D investment for companies which do not report R&D in the current year of the survey, but reported R&D in a previous year of the survey. Staff implemented regression estimation techniques to perform the imputation. Staff is currently implementing the method of Xu, Shao, Palta, and Wang (2008) as an alternative method. This last method may be advantageous because it uses nonparametric regression to impute missing data, which may be more robust to extreme values.

Additionally, staff tested a program to produce synthetic data for release to outside researchers. The program is based on the same longitudinal regression approach as the imputation itself. Staff also initiated the generation of a synthetic data database for use by researchers outside the Census Bureau. The synthesis proceeds by regressing one of four available company level variables—total research and development investment, commercial R&D investment, federal R&D investment, or payroll and number of employees—for one year, on their values for the previous year. These variables are made available for years 2002, 2003, 2004 and 2005. The synthesis divides the universe into cells based on the pattern of response of medium and large R&D company over four years. There are 16 possible longitudinal data patterns. Only cases that have reported research and development expenditure for at least one year between 2002 and 2005 are synthesized. A nonparametric simulation using the program "Nonparsim" was carried through. The resulting synthetic data is undergoing quality checks before it is submitted to the Census Bureau Disclosure Review Board. Staff also implemented calibration estimation based on linear regression (Sarndal, Lundstrom 2005). R&D amounts from previous years are used as calibrator/regressor. This method effectively performs regression imputation. Staff compared the results with the current method and identified relative bias between the two methods, namely that the current method appears to underestimate R&D relative to calibration. Further research is needed to confirm the existence of the relative bias.

The salient feature of the data is the complexity of the specific pattern of the missing data configuration. Much of the intended research using the simulated data will focus on methods for missing data compensation. Therefore, it is important the simulation reflect the prevalence of the longitudinal missing data patterns observable from the raw data. To resolve this problem, staff deeply stratified the population prior to simulation, so that the features associated with a specific missing data pattern were reconstructed representatively in the specific stratum associated with the pattern.

Staff: Yves Thibaudeau (x31706), Jun Shao

1.27 REMOTE ACCESS - MICRODATA ANALYSIS SYSTEM (Strategic Planning and Innovation Project 0359999)

Researchers and sophisticated data users' demand for Census Bureau microdata, both for general research and programmatic needs, continues to grow. Microdata allows virtually any type of analysis, and it is the desired form of data that allows modeling. Internal Census Bureau microdata files contain levels of detail, and variables, which are not available in public use files. Methods are applied to reduce detail, both by suppressing and coarsening variables in public use files, in order to protect the identity of respondents and to ensure confidentiality of responses under Title 13 of the U.S. Code. As data on individuals accumulate, and identifiable public and commercial data becomes more and more accessible, the ability to publish quality microdata while maintaining a sufficient level of ambiguity is becoming an issue.

One solution is to allow researchers and public users to run models against internal microdata. The result of the model is the object of interest, not the underlying data. Over the past ten years, the Census Bureau's Disclosure Review Board (DRB) has examined model outputs from the Census Bureau's Research Data Centers (RDC) and they have been virtually without disclosure problems. This triggered the development of the Microdata Analysis System (MAS). MAS allows researchers to run analysis against internal microdata and view model results. At the

same time, it protects the underlying sensitive data by applying a number of confidentiality rules.

During FY 2008, staff worked with Synectics to finish the development of the Microdata Analysis System (MAS) prototype. Staff worked with contractors to coordinate the testing of the prototype of the MAS. A final report is available. Staff drafted memos on next steps for work on the MAS and a specification for confidentiality rules for the MAS. Those leaving the Disclosure Avoidance staff documented the state of MAS work thus far (document available upon request). Staff met several times with staff in DID to get the system up and running in FERRETT.

Staff attended numerous meetings and contributed to a research and budget proposal for continuing work on the Microdata Analysis System and a new version of the Advanced Query System as well as the development of a fully synthetic 2010 Census data file and fully synthetic ACS files.

Staff: Laura Zayatz (x34955)

1.28 POSTAL REGULATORY COMMISSION/ STATISTICAL CONSULTING (Statistical Research Division Project 8150000)

The work associated with this project entails the review of testimony, interrogatories, decisions, and other documentation relating to proceedings of the Commission in order to identify major statistical issues and provide relevant consultation. The consultation will include: 1) the briefing of the commissioners and other commission officials on the ramifications and desirable approaches to the identified statistical questions; and 2) the presentation of written summaries of the major findings from all assigned reviews.

During FY 2008, staff conducted technical reviews of proposals and related documentation and participated in methodology conferences associated with the Postal Service's recommendation for a comprehensive revision of the mail delivery performance measurement system. Staff also examined changes in the sample design for the City Carrier Cost System and assessed their potential effects on the program's estimation and analysis procedures.

Staff participated in several meetings designed to facilitate and assess progress in the development of the proposed new delivery service performance measurement system. We also reviewed the sampling, estimation and analysis methodology for the two principal service performance measurement alternatives, and recommended required revisions.

Staff: Leroy Bailey (x34917)

1.29 PROGRAM DIVISION OVERHEAD (Census Bureau Project 0251000)

A. Division Leadership and Support

This staff provides leadership and support for the overall collaborative consulting, research, and operation of the division.

Staff: Tommy Wright (x31702), Tina Arbogast, Pat Cantwell, Robert Creecy, Michael Hawkins, Gloria Prout, Stephanie Sheffield, Kelly Taylor

B. Research Computing

This ongoing project is devoted to ensuring that Census Bureau researchers have the computers and software tools they need to develop new statistical methods and analyze Census Bureau data.

During FY 2008, the SGI Altix (research1.srd.census.gov) underwent certification and accreditation (C&A) as part of CEN16 (Network Services). All federal information systems are required by law to undergo C&A, which involves a careful analysis of the risks to the system and the selection and implementation of security controls to mitigate those risks. During FY 2008, we scanned the system using the approved scanning tools from the Center for Information Security (CIS). We analyzed the scan results and, where possible, modified the system configuration to conform with the benchmark. All of the deviations from the benchmark which could not be remediated (mostly false positives and services required for the operation of the system) were documented, and their justifications were reviewed and approved by the authorizing official's designated representative. A second round of scanning – to verify the effect of remediation – is currently underway. We continue to provide additional information to the certification team for items that cannot be assessed by automated tools. Also in FY 2008, we were informed that the Census Bureau's blade migration schedule has changed. The current plan is to transition the SGI Altix to the Census Bureau's standard blade architecture using four 16-way Egenera blades. The migration is currently scheduled to begin in the first quarter of FY2009.

Staff: Chad Russell (x33215)

2. RESEARCH

2.1 – 2.2 GENERAL RESEARCH AND SUPPORT TOPICS
(Census Bureau Projects 0351000, 1871000)

Statistical Methodology

A. Disclosure Avoidance

The purpose of this research is to develop disclosure avoidance methods to be used for all Census Bureau publicly available data products. Emphasis will be placed on techniques to implement disclosure avoidance at the stage of processing. Methods will be developed, tested, evaluated, and documented. We will also aid in the implementation of the methods.

During FY 2008, staff members worked on reidentification studies for NESARC and for the Census Transportation Planning Package special tabulations from the American Community Survey. Details of this work are Census Confidential.

Staff attended numerous meetings and contributed to a research proposal for continuing work on the Microdata Analysis System and a new version of the Advanced Query System as well as the development of a fully synthetic 2010 Census data file and fully synthetic ACS files.

Staff worked to develop a new web site and a training module for the American Statistical Association's Privacy and Confidentiality Committee.

Staff tested a variety of modeling capabilities useful for the generation of partially synthetic microdata. The capabilities cover many of the types of variables encountered in many survey data sets. The capabilities include Generalized Additive models for continuous variables, Binary or Multinomial logistic regression models for dichotomous or polytomous variables, and Ordered Logistic or Probit regression for ordered factor response variables.

Staff worked with contractors to coordinate the testing of the prototype of the Microdata Analysis System (MAS). A final report is available.

Staff will extend a Census Bureau Dissertation Fellow's research in modeling disclosure risk probabilities when adjusting the number of Quantile Regression and Hot Deck synthetic data variables. Staff will also continue to research, evaluate, and update the current disclosure thresholds implemented on the Microdata Analysis System.

Staff: Laura Zayatz (x34955), Paul Massell, Elizabeth Ransom, Marlow Lemons, Adam Persing, Jason Lucero, Lisa Singh, Asoka Ramanayake, Tapan Nayak, Bimal Sinha, Rolando Rodríguez

B. Disclosure Avoidance for Microdata

Our staff investigates methods of microdata masking that preserves analytic properties of public-use microdata and avoid disclosure. During FY 2008, staff completed two research reports, submitted one paper to *Privacy and Confidentiality,* refereed several papers for several journals, wrote a new version of the modeling/synthetic-data-generation software, updated widely used lists of references on microdata confidentiality and reviewed methodology on epsilon-privacy. The new version of software for modeling/edit/imputation can be used for generating synthetic microdata, satisfying a combination of analytic constraints (margins in proper ranges for loglinear modeling) and confidentiality constraints (lower and upper bounds on many cell probabilities). The basic software is far faster than commercial software (suitable for contingency tables with upwards 5 million cells).

Staff: William Winkler (x34729), Yves Thibaudeau, William Yancey

C. Seasonal Adjustment (See Economic Project 2370852)

D. Nonresponse in Longitudinal Surveys

The purpose of this continuing project is to develop methodology to evaluate alternative (cell-based and logistic regression) models for nonresponse adjustment in longitudinal surveys, especially in the re-engineered SIPP.

During FY 2008, staff developed and delivered a talk on the computation and interpretation of metrics for the effectiveness of weight adjustments for attrition within longitudinal studies like SIPP, with the objective of judging between alternative models used for adjustment at the 2007 Federal Committee On Statistical Methodology (FCSM) Research Conference. (A paper is available at the FCSM website.) Additional research explored how the metric results on SIPP 96 data were affected by raking of the adjusted weights, as is done in SIPP production. Staff prepared a manuscript for journal submission, elaborating on the 2007 FCSM paper.

Staff: Leroy Bailey (x34917), Eric Slud, Julie Tsay

E. Household Survey Design and Estimation

The household surveys of the Census Bureau cover a wide range of topics but use similar statistical methods to calculate estimation weights. It is desirable to carry out a continuing program of research to improve the accuracy and efficiency of the estimates of characteristics of persons and households. Among the methods of interest are sample designs, adjustments for nonresponse, proper use of population estimates as weighting controls, and the effects of imputation on variances. (For some FY 2008 efforts, see projects 1.12 and 1.20.)

Staff: Lynn Weidman (x34902)

F. Sampling and Estimation Methodology: Economic Surveys

The Economic Directorate of the Census Bureau encounters a number of issues in sampling and estimation in which changes might increase the accuracy or efficiency of the survey estimates. These include

estimates of low-valued exports not currently reported, alternative estimation for the Quarterly Financial Report, and procedures to address nonresponse and reduce respondent burden in the surveys. Further, general simulation software might be created and structured to eliminate various individual research efforts.

During FY 2008, staff investigated methodology for treating an influential observation in the estimation of total revenue from the Monthly Survey of Retail Trade. (An observation is considered influential if the estimate of total monthly revenue is dominated by its weighted contribution. The goal is to find methodology that uses the observation but in a manner that assures its contribution does not dominate the total.) The departure of a team member slowed the investigation briefly, but a replacement was found and the new team has developed plans for future research.

Staff: Pat Cantwell (x34982), Mary Mulry

G. Research and Development Contracts

The Research and Development Contracts are indefinite delivery, indefinite quantity task order contracts for the purpose of obtaining contractor services in highly technical areas to support research and development activities across all Census Bureau programs. The contracts provide a pool of contractors to assist the Census Bureau in conducting research on all survey and census methods and processes to improve our products and services through FY2007. The prime contractors include educational institutions, university supported firms and privately owned firms that concentrate in sample survey research, methodology, and applications to create a pool of specialists/experts to tackle some of the Census Bureau's most difficult research. Many of the prime contractors are teamed with one or more organizations and/or have arrangement with outside experts/consultants to broaden their ability to meet all of the potential needs of the Census Bureau. These 5-year contracts allow Census Bureau divisions and offices to obtain outside advisory and assistance services to support their research and development efforts quickly and easily. The multiple contracts were awarded during FY2002 in six technical areas: 1) assessment, planning, and analysis; 2) data analysis and dissemination; 3) statistical analysis, 4) methodological research, 5) sub-population research, and 6) survey engineering.

During FY 2008, fourteen new task orders were awarded, twenty-eight modifications were awarded, and thirteen task orders were completed. To date, there have been eighty-one task orders awarded under the R&D 2007 contracts, with a monetary value of over $107 million (over $71 million obligated). The Master Contracts were extended twice for 6 months to allow additional time to award the next 5-year R&D contracts.

In addition, work continued on the solicitation and award of the next series of 5-year R&D contracts. A Pre-Solicitation conference was held on December 17, 2007 where interested vendors learned about the plans for the new contract and were given the opportunity to interact with program managers across the Census Bureau. Meetings were held with the Demographic, Economic and Decennial Directorates to discuss the upcoming solicitation, request their help in preparing the draft request for proposal and request participation in the evaluation of the proposals for the new contracts. Several meetings were held with the Census Bureau and Department of Commerce's Small Business Advocate to determine the best process for assuring small business participation in the R&D contract. The Request for Proposal, Statement of work, Source Selection Document, Acquisition plan, and Checklist for Review of contract services were drafted. We met with the Department of Commerce's Acquisition Review Board (ARB) on Aug. 21, 2008 and received conditional approval for release of the RFP. We have since responded to the ARB's concerns and we are awaiting final approval.

Staff: Ann Dimler (x34996), Michelle Danaher

H. Small Area Estimation

Methods will be investigated to provide estimates for geographic areas or subpopulations when sample sizes from these domains are inadequate.

During FY 2008, staff investigated the utility of using spatial modeling techniques to make annual tract-level estimates of vacancy rate and persons per housing unit for the ACS.

Data from the 1990 and 2000 Censuses and related tract boundary files for the tracts of the Delmarva peninsula were obtained for evaluation. At the population (Census) level, staff developed and evaluated unit-level models of both vacancy rate and person per housing unit. The unit-level models fit consisted of Poisson, modified Poisson, and modified geometric distributions. At the tract level, both a spatial model and a hierarchical model were fit to the data for comparison using WinBugs and GeoBugs. Results and comparisons of small area estimates based on a 2.4% sample have been made. Preliminary results suggest there may be a slight advantage to considering a spatial model for estimating vacancy rate but overall, there was very little difference between the spatial and non-spatial models considered. Other more focused spatial models may still be evaluated.

Staff: Don Malec (x31718), Pat Joyce, Lynn Weidman, Julie Tsay

Statistical Computing Methodology

A. Record Linkage and Analytic Uses of Administrative Lists

Under this project, our staff will provide advice, develop computer matching systems, and develop and perform analytic methods for adjusting statistical analyses for computer matching error.

During FY 2008, we completed a second version documentation for the variant of *BigMatch* that is being used during the 2008 Dress Rehearsal. Staff did a full production match of 300 million against 300 million (10^17 pairs). Using 40 of 64 CPUs on the Research1 computer, we completed a production match for the Dress Rehearsal Census in 63 hours. The software is approximately 80 times as fast as commercial software from IBM and 40-50 times as fast as parallel versions of matching software under development at Stanford University and Pennsylvania State University. We still maintain the highest accuracy of record linkage software with the types of lists in the Decennial Census or certain administrative lists.

Staff debugged a very subtle error in *BigMatch* that was causing errors in as many as 0.001% of the match projects (but only with an exceptionally small subset of pairs of records). The error was due to an exceptionally minor difference in the inline string comparison function used in the quick sort algorithm of Bentley and Sedgewick (ACM-SIAM 1993 Conference on Discrete Algorithms) and the standard C string comparison function strcmp().

Staff reviewed three recent papers on blocking methods. Staff wrote detailed comments related to two February 2008 documents by Statistics Canada on applications of record linkage to health statistics and epidemiology.

One staff member wrote two additional background documents on computer matching for a National Academies of Science committee that is studying voter registration databases.

One staff member and the Decennial Statistical Studies Division (DSSD) wrote new production software for 2010 PES-type matching. The software incorporates a new string comparator that effectively deals with scanning error. DSSD provided the test deck.

Staff: William Winkler (x34729), William Yancey, Ned Porter

B.1 Editing

This project covers development of methods for statistical data editing. Good methods allow us to produce efficient and accurate estimates and higher quality microdata for analyses.

During FY 2008, we researched methods for creating a set of edits for a given set of data. The edits are designed to improve the quality of the data. We reviewed background on existing methods for determining a set of edits. We researched easily implemented new methods based on statistical ideas of the aggregates used in analyses. For economic data we looked at ratios of highly correlated fields and examined whether records associated with the tails of distributions of ratios are actually in error and can be used to identify (most) erroneous items. We developed three separate measures for monitoring the quality of the edits. The measures include the number of edits needed for cleaning the data, the precision of an edit, and the proportion of records that are affected by an edit. We provide examples using an artificial database with a large number of errors by design. Staff wrote an *SRD Research Report* presenting details of this research ("Determining a Set of Edits," submitted for division internal review, Winkler and Garcia).

Staff: María García (x31703)

B.2 Editing and Imputation

Under this project, our staff provides advice, develops computer edit/imputation systems in support of demographic and economic projects, implements prototype production systems, and investigates edit/imputation methods.

During FY 2008, and with the help of the Manufacturing and Construction Division, we set up a database including frame information along with survey records. The database contains the information needed for imputing and editing missing or inconsistent items for the Survey of Research and Development (R&D), a semi longitudinal survey.

Staff developed experimental software to perform longitudinal imputation of R&D. The imputation method was based on calibration. A new method (Xu, Shao, Palta, and Wang, 2008) is currently being implemented. Staff presented the research at FCSM, and a paper was published in the proceedings. Staff researched the implementation of methods for compensating for missing data longitudinally in the Survey of Income and Program Participation. Staff experimented with three different methods for estimating the variance of nonresponse-adjusted estimators. The first two methods rely on Gibbs sampling and Markov chain Monte-Carlos. The third method relies on the method of Laplace, a Bayesian technique to approximate posterior variances.

Staff showed that "hybrid estimators" based on a forecasting approach are sometimes more efficient than the traditional Horvitz-Thompson (H-T) adjusted for missing data. The relative efficiency of the hybrid forecast estimator was about 30% relative to the adjusted H-T estimator. The results are documented in the *ASA Proceedings* (Thibaudeau and Slud 2008). Additional results on hybrid estimation in the context of SIPP were presented at the "Sample Surveys and Bayesian Statistics 2008" conference in Southampton, England, August 26, 2008.

Staff: Yves Thibaudeau (x31706), Robert Creecy, Jun Shao, Eric Slud

C. Developed Software Support – General Variance Estimation Development and Support

This project will develop new methods and interfaces for general variance estimation software including VPLX, WesVar, and SUDAAN. Our staff will provide training for variance estimation software applications, and will provide support for complex applications such as the Survey of Income and Program Participation and the Survey of Construction.

During FY 2008, staff continued to offer ongoing Hotline support for variance estimation software to the four program directorates at the Census Bureau. Staff continued to provide specific long-term support to the Manufacturing and Construction Division (MCD), in support of the Survey of Construction (SOC). After the departure of a former Senior Mathematical Statistician who was developer of VPLX, it was assumed that staff would assist in the timely transition of variance estimation software from VPLX to the package of choice for the internal customer. VPLX currently has three known internal customers and one known external customer: SOC for current use, the Current Population Survey (CPS) for historical data, the Survey of Income and Program Participation (SIPP) for historical data, and the Joint Center for Political and Economic Studies (www.jointcenter.org).

Staff: Aref Dajani (x31797), Ned Porter

D. Missing Data and Imputation: Multiple Imputation Feasibility Study

Methods for imputing missing data are closely related to methods used for synthesizing sensitive items for disclosure limitation. One method currently applied to both issues is multiple imputation. Although the two issues may be addressed separately, techniques have been developed that allow data users to analyze data in which both missing data imputation and disclosure limitation synthesis have been accomplished via multiple-imputation techniques (e.g., synthetic data). This project ascertains the effectiveness of applying multiple imputation to both missing data and disclosure limitation in the American Community Survey (ACS) group quarters data. Statistical models are used to generate several synthetic data sets for use within the multiple-imputation framework.

During FY 2008, this year we have emphasized the development of synthetic-data methods that produce data which automatically satisfy ACS edit requirements. Our experience with synthetic data for ACS group quarters has shown us that naïve synthetic data models will often produce data outside the bounds allowed by the edits. For the 2007 ACS group quarters sample, we met with analysts in the Population Division and the Housing and Household Economic Statistics Division to obtain edit consistency guidelines; we then used these guidelines to define modeling subdomains for our software. Current research is focused on using an array representation of the consistency guidelines to streamline the process of generating subdomains.

We have also started an investigation into the use of synthetic data methods for the 2010 Census group quarters population. Modeling strategies from ACS group quarters should be immediately applicable to the 100% items. The smaller set of variables in the census will limit modeling possibilities, but it will also decrease the number of multivariate estimates of concern and decrease the number of potential edit constraints. We will also ascertain the efficiency of our current methods when applied to a much larger (at least 50-fold) data set.

No plans exist currently for releasing multiple implicates for either the ACS or the census; however, we will still research the effect multiple imputation would have on variance estimates, as this would inform future decisions on the use of multiple imputation with synthetic data methods.

Staff: Rolando Rodríguez (x31816), Yves Thibaudeau

E. Modeling, Analysis and Quality of Data

Our staff investigates methods of the quality of microdata primarily via modeling methods and new software techniques that accurately describe one or two of the analytic properties of the microdata.

During FY 2008, and as a member of the National Academies of Science committee that is studying voter registration databases, one staff member helped create a questionnaire asking detailed background information related to State voter registration databases. The staff member also wrote background documents on elementary record linkage methods that could be quickly implemented and on list maintenance procedures with examples. The staff member helped create a draft interim report that contains recommendations for the Election Assistance Commission in time for possible use for the 2008 U.S. Presidential Elections.

One staff member completed generalized software for iterative fitting of complete-data contingency tables under linear constraints.

One staff member co-presented “Data Quality and Record Linkage Techniques” in a special Presidential Session at the Annual Meeting of the Society of Actuaries. The presentation was based on the 2007 Springer monograph of the same name that was co-authored by Thomas Herzog and Fritz Scheuren.

Staff received a very mathematical computer science Ph.D. dissertation (available online at <http://thesis.anu.edu.au/public/adt-ANU20080314.163155/index.html>) on set covering algorithms from Agnes Boskovitz of Australia National University. Boskovitz provides valid set covering algorithms and a new counter-example to the set covering algorithms of Garfinkel, Kunnathur, and Liepins (*Operations Research* 1986). Winkler (1995) provided the original counter-example. The methods very significantly generalize the methods of Winkler (1995, 1997) and Winkler and Chen (2002). There is no software associated with the new algorithms.

Our current Statistical Research Division set-covering algorithms (software), that use heuristics, may only generate all implicit edits in the situations where a survey form does not have skip patterns. The software is 100 times as fast as set covering algorithms developed by IBM for ISTAT (Barcaroli and Venturi 1997) using the methods of Garfinkel, Kunnathur, and Liepins. The set-covering software is a component of new generalized modeling/edit/imputation software (Winkler 2007a, 2008). Variants of the methods and software have been

used for statistical matching (Winkler 2006) and microdata confidentiality (Winkler 2007b).

One staff member completed a version of EM loglinear modeling software that places both the standard linear constraints on the data and various types of convex constraints. The additional convex constraints allow models that better conform for a variety of external benchmarks from other data and to account for mild departures from non-ignorable nonresponse. These are the first computational methods that build formal models for discrete data that include modern imputation (Little and Rubin 2002) and modern editing (Fellegi and Holt 1976; Winkler 2003, 1997). The generalized, parameter-driven software is the first to assure that imputed values satisfy edit constraints, preserve joint distributions according to formal models, and adapt the resultant microdata to known external, benchmark constraints. Computation of imputation variance for the microdata should be possible but may require extensions using some of the methods of Thibaudeau (2002). The new algorithms maintain the extreme computational speed improvements originally developed for statistical matching (Winkler 2006). Statistical matching (when examined in the proper perspective) can be considered a special case of the new modeling/edit/imputation methods.

One staff member provided extensive advice about methods and programming related to the ideas being investigated for the redesign of the samples for the demographic surveys. Staff provided advice on multi-variable methods that do not work. The only current methods that work are Winkler (2003) and Deville and Tille (2004) with the latter being preferred because of available R-software. The staff member also provided advice on why cluster sampling methods (Friedman & Rubin 1967) do not work in controlling the variances of several variables in most situations.

Staff members completed the draft *SRD Research Report* "Determining a Set of Edits." Most editing work has assumed that subject matter analysts (using typically ad hoc methods) provide a set of edits to individuals who are doing editing or implementing edit systems. There is some anecdotal evidence from empirical work at Statistics Canada and Statistics Sweden that statisticians (even without subject matter expertise) can design a set of edits (possibly somewhat similar to those from subject matter experts) that significantly out perform the edit systems designed by subject matter experts and implemented by a combination of subject matter experts and others. The issue is that the edited data need to effectively produce aggregates for publications and analyses in an efficient manner. Typically subject matter experts do not have the expertise to design a set of edits that systematically and efficiently 'improve' the final edited data. This paper provides methods for developing sets of edits that significantly reduce resources needed for editing while improving a set of aggregates needed to maintain valid analytic properties.

Staff: William Winkler (x34729), Rob Creecy, William Yancey, María García

Survey Methodology

A. Usability Research and Testing

On December 5, 2007, staff sponsored Census Usability Day with the following posters on display: Kathleen Ashenfelter, "Eye Tracking Research-An Overview"; Larry Malakhoff, "Accessible Software at the Census Buerau"; Erica Olmsted-Hawala and Carollynn Hammersmith, "Incorporating Information Architecture Activities into the Evolution of the U.S. Census Bureau's Web Site"; Michelle Rusch, "The Usability Study of the Census in Schools Web Applications for Grades K-6"; and Beth Nichols, "Usability of Interviewer Materials for the 2006 Census Coverage Measurement Person Followup."

A.1. Web Applications Accessibility

This project focuses on the accessibility of Internet and Intranet applications by blind and low vision users in accordance with the *Section 508* regulations.

AESDirect (Foreign Trade Division): AESDirect permits exporters to declare the value of goods they are sending to foreign countries. During FY 2008, staff followed up on recommendations made about the AESDirect web site in the accessibility report submitted to the Foreign Trade Division in 2007. Staff provided an alternative to the color coding scheme for mandatory, conditional, and optional data-entry fields with geometric symbols (red diamond, blue square, and black circle). The AESDirect web site conforms with the *Section 508* regulations.

Staff: Larry Malakhoff (x33688)

Support for X-12 Arima Documentation & Software (Statistical Research Division): Staff continued to review work done by NetCentric Logo to make X-12 Arima PDF documentation accessible. During FY 2008, staff found tables and plain text accessible, but equations and equation terms embedded within the text were not always accessible. Staff submitted the final corrected X-12 Arima PDF documentation specification to NetCentric Logo for their action. Staff performed a review on the final corrected documentation and found no errors.

Staff: Larry Malakhoff (x33688), Brian Monsell, Sara Wade

Title 13 Awareness E-Learning Application (Policy Office): This application permits Census Bureau staff to refresh their knowledge about working with Title 13 data. During FY 2008, the evaluation revealed that visual focus is not shown when tabbing and using the arrow keys and that users are directed to a "check answer" button which did not exist. This project is complete.

Staff: Larry Malakhoff (x33688), Mary Potter (Policy Office)

Classification Analytical Processing System (CAPS) (Economic Statistical Methods & Programming Division): This web site allows users to look up NAICS codes. Staff evaluated the CAPS portal web site. During FY 2008, this analysis revealed the CAPS header logo was not tagged with ALT text and the displayed label text and text vocalized by the screen-reader software did not agree. This project is complete and the report was submitted to the *SRD Research Report Series.*

Staff: Larry Malakhoff (x33688), Danny Lee (ESMPD)

Secure Message Center (SMC) (Systems Support Division): The SMC web site is to be used by survey respondents who need to communicate with the Census Bureau in a secure manner. The survey respondent could then send and receive messages in the SMC as needed. During FY 2008, the evaluation revealed links are read from right to left on the bottom of the screen and two sort functions are inaccessible on the mailbox screen. This project is complete and the report was submitted to the *SRD Research Report Series.*

Staff: Larry Malakhoff (x33688), Robert Brown (SSD)

Quality Information for Successful Printing II (QUISP2) Application (Decennial Systems Contract Management Office): This application enables inspectors to keep current on the quality control status of official Census Bureau forms and letters. During FY 2008, we documented that the application presents difficulties to individuals with color-blindness. Color by itself is used to distinguish between red, yellow and green status indicators. Accessibility can be improved by providing full keyboard access for those persons who cannot use a mouse for long periods of time and modifying graphs and charts for individuals with a color deficiency. The project is complete and the report was submitted to the *SRD Research Report Series.*

Staff: Larry Malakhoff (x33688), Darina Guenova (DSCMO), Kina Kovachev (DSSD)

StEPS E-Learning Application (Economic Planning and Coordination Division): During FY 2008, staff reviewed the StEPS E-Learning application for accessibility. The screen-reader software does not detect any text, buttons, radio buttons, or links. It will require a major effort to make it conform to *Section 508* regulations. The development software used may or may not be able to address all the issues. Therefore, accessibility testing will resume at a future date when this application is recreated using software development tools known to conform to *Section 508* regulations.

Staff: Larry Malakhoff (x33688), Joy Pierson (EPCD)

State Data Center (SDC) Application (Customer Liaison and Marketing Services Office): This website provides information to the State Data Center network. It serves three functions: 1) lists all SDCs so users can access local information; 2) provides links to PowerPoint slides and working papers presented at Census Bureau meetings; and 3) provides secure access to files that are used with other divisions programs (i.e., GEO – BAS and LUCA). During FY 2008, staff found that white and red balls used as bullets are tagged with an "o." The screen-reader user will hear "graphic o State and Governmental Programs Team." There is no indication of what significance the colors have. It is recommended that plain black text bullets, not graphics, are needed instead. Findings were provided to the sponsor and this project is complete.

Staff: Larry Malakhoff (x33688), Kathleen Ashenfelter, Alexander Trofimovsky, Allison Morgan, Betty Murphy

Census In the Schools (CIS) Application (Management Services Office): Children in grades K-5 would use this application to learn about what information the Census Bureau collects and how it is used. During FY 2008, the first pass at evaluating the CIS application was to identify which parts are inherently visual. These sections cannot be made to conform with Federal regulations, but equivalent alternatives could be created and made available to children who require it. It was found that the word-find, coloring, and matching game activities are all inherently visual. A quiz using radio buttons was recommended as an alternative to the word-find activity. The quiz section was not inherently visual, but did not read correctly, requiring the screen-reader user to navigate backwards to hear all the text. The quiz used a series of links instead of a radio button structure, which meant a screen-reader user could not determine what option they selected. A report was written and provided to the sponsor and submitted to the *SRD Research Report Series*.

Staff: Larry Malakhoff (x33688), Jeffrey Jones, Lisa Lawler, Cecelia Maroney (SSD), Vicki Glasier (MSO)

Decennial Census Challenge Computer Based Training (CBT) (Field Division): Census employees that will manage Census offices during the 2010 Census are required to take this CBT to become familiar with data collection and processing procedures. During FY 2008, this evaluation was a follow-up to work done in 2006. Some issues identified earlier were not resolved, such as inaccessible media player controls that require screen-reader users to navigate backwards to hear content, and an inaccessible PDF organizational chart. Several usability issues were also identified. Links are not presented in underlined blue and do not change to purple when visited. Asking users to print out a Job Aid document and "follow along" while listening to a narrator and also reading screen text will cause cognitive and sensory overload. Users may be confused why two different voices are used for the same pictured male

narrator in the modules "Early Part of the Road Trip" and "Conducting the 2010 Census." A report was delivered to the sponsor and this project is complete.

Staff: Larry Malakhoff (x33688), Robert Tomassoni (FLD)

Technology Resource Allocation & Control (TRAC) Application (Systems Support Division): This application allows users to manage their usage of official Census Bureau flash drives—checking in, checking out, loss, responsible persons, and extensions for use. During FY 2008, staff conducted an evaluation and found that column headers were not correctly associated with table data and status (checked, unchecked) was not available to users of screen-reader software. Focus was not visible when tabbing. Systems Support Division programmers addressed these issues and this project is complete.

Staff: Larry Malakhoff (x33688), Chris Boniface, Jon Shapiro (SSD)

Plan of Action and Milestones (POA&M) web site (ITSO): This web site permits users to check the status of IT projects. During FY 2008, staff contributed to an expert review on the ITSO website. Staff reviewed the accessibility of the site and found bar graphs without an equivalent accessible table, incorrect tabbing order, and some spelling errors which makes the content harder to understand.

Staff: Larry Malakhoff (x33688), Jenna Beck

A.2. Desktop Applications Accessibility

This project focuses on accessibility of desktop applications by blind and low vision users in accordance with the *Section 508* regulations. Desktop applications are either downloaded or sent to the respondent on disk.

Win X-12 Application (ADEP)**:** This graphical user interface permits users to submit batch jobs to the X-12 ARIMA application. During FY 2008, an accessibility evaluation was performed and one finding indicated that data entry labels were incompletely spoken by the screen reader software. Corrections were addressed from the accessibility evaluation, and the newest version of the software was delivered. A report was written and submitted to the *SRD Research Report Series.*

Staff: Larry Malakhoff (x33688), Demetra Lytras, Roxanne Feldpausch (ADEP)

MAF/Tiger Partnership Software (MTPS) Application (GEO)**:** This graphical user interface permits users to update Census addresses, boundary and annexation survey information, and school districts and participant statistical areas. This evaluation is a follow-up to work done in 2007. During FY 2008, we documented that this application cannot be fully accessible because it uses maps. However, recommendations were made about improving keyboard access. Recommendations about displaying an inverted triangle to inform users that a list was available were implemented, but a recommended right-click menu to minimize mouse movements was not included. This project is on hold until additional on-line modules become available for testing.

Staff: Larry Malakhoff (x33688), Brian Timko, Kathryn Wimbish (GEO)

PDF Data Tables (Systems Support Division): SSD requested an evaluation of PDF data tables coded by DeQue. During FY 2008, staff evaluated data tables in PDF format for accessibility. Testing revealed PDF tables coded by DeQue were built properly. However, PDF tables are slow to load, taking up to 2 minutes. SSD will reconsider usage of PDF tables in favor of HTML. Testing was also performed on a PDF manual which revealed errors in most of the tables. The main errors were that data were not matching their column headers and footnote superscripts were treated as numbers. This project is complete.

Staff: Larry Malakhoff (x33688), Laura Yax (SSD)

Data Ferret Hot Reports (Data Integration Division): DID was considering an application where users may select variables to create a data table by dragging and dropping variable onto a grid and requested an accessibility evaluation. Drag and drop actions are not accessible, so an alternative method needed to be established. During FY 2008, staff collaborated with DID staff to develop an alternative to drag and drop table creation used in the Hot Reports component of the Data Ferret application. A report was delivered to the sponsor.

Staff: Larry Malakhoff (x33688), Tracy Clarke (DID)

Nonresponse Followup Matching and Review Coding System (NRFU MaRCS) (DSSD): This system allows users to code NRFU forms. Staff met with Adam Davila of DSCMO to perform preliminary accessibility testing of the application to identify potential *Section 508* violations. Tables were not read correctly and focus did not visibly change when tabbing. This evaluation will continue when the application is fully programmed.

Staff: Larry Malakhoff (X33688), Adam Davila (DSCMO)

A.3. Census.gov Template Development

The purpose of this study is to develop a set of templates with a consistent and usable look and feel for the Census.gov website. The template is intended to be used by both the demographic and economic domains of Census.gov. Some of the techniques to develop the template include card sorting, low-fidelity prototype testing, and usability testing.

During much of FY 2008, the focus of the study was card sorting. Work included running two card sorting studies, an open and a closed sort. A sample of results from the two studies follow:

In Round 1, on average, users created 11 groupings or category piles. When we include the sub-category piles the users created, the average number of groupings increases to 15.6 category piles. We recommended 16 high-level category groups - this matches up with the average number of categories (high and sub level) that users created during Round 1. There was strong agreement on creating the following high-level category terms: Education, Poverty and Welfare, Voting and Politics, Occupation and Employment, Real Estate, Economy/Economic Indicators, Retail Sales, Geographical Areas, Business, Population Numbers, Health. In addition, with terms that did not fit easily into one category, the working group felt that a melding of categories might work. The team proposed adding the following: Your Money (aiming for the household income and expenses), Census and Surveys (to capture the terms that specifically referred to a census or survey), Society and Culture (for the different terms that include race, ethnicity, gender, culture, or social issues); More about your questionnaire (for the questions on filling out the Census and FAQ's); and Neighborhoods and Communities as well as the Geographic Areas (for the geography related concepts).

These high level terms were tested in Round 2 and the results indicated that some of the high level category labels worked, while others did not. Details follow:

- Nine of the 16 high-level categories labels appeared to work well for our users (i.e., Health, Education, Retail Sales, Real Estate, Business, Poverty & Welfare, Occupation & Employment, Your Money, and Economy, with Economic Indicators as a sub category). These categories were specific enough that users consistently placed many of the same terms in these piles. The economic related categories appeared to work for users. Many users mentioned that they felt the main terminology was economy or business related with other related categories on more of a sub-category level.
- Five of the high-level category labels do not appear to have worked (i.e., Census and Surveys, Population numbers, Society and Culture, Neighborhood & Community, Geographic Areas). It is likely that these categories were too broad and served as "catch all" categories. These categories need to be refined and further tested before going on the Census.gov web site homepage.

Staff: Erica Olmsted-Hawala (x34893)

A.4. Usability Study of the Census in the Schools Web Site

The Census in Schools (CIS) program promotes data literacy and increases awareness of Census Bureau products and activities by providing educators with teaching tools, resource materials, workshops, and other professional development opportunities. In addition to targeting teachers, the website will target students in grades Kindergarten (K)-12 by expanding the current Web site to include online activities for that age group. PIO is currently developing Web content customized for grades K-5. The Census in Schools (CIS) design team was interested in having usability lab staff evaluate the developing site with respect to its usability for primary aged school children.

CIS also anticipated recommendations for ways to improve the usability for the users. In this study, usability lab staff recruited children in grades K-6, conducted dry runs to evaluate the study's protocol, conducted the study, and identified areas of the site that worked for the children, as well as areas where they encountered usability problems and/or had low satisfaction. We recommended possible solutions for the problem areas. The following are just a few of the high-priority findings and recommendations documented in the FY 2008 report, "A Usability Evaluation of the Census in the Schools Web Site":

- For the Counting Way Page: Children wanted something interactive, something they could play with. They often went directly to the left-navigation panel and wanted to select another option because they did not immediately see something for them to do. We recommended that the page be made more interactive and that it provide a place for the children to enter a number after they have counted so that they can check their answers and/or get feedback.
- For the Kids Coloring Page: Children struggled to select the virtual crayons because there was not enough space on or around the crayon image that was sensitive to being selected. We recommended two ways to improve selectivity: 1) increase selection space surrounding the crayon and/or 2) increase the size of the crayon.
- For the Houses Coloring Page: Children had problems using the Houses Coloring Page because the shapes are too small. We recommended that the selection properties on very small items be made easy to color or that the houses be made larger.
- For the Memory Game: The rate for resetting cards is too slow. Some children tried to flip to the side of the page or clicked on another deselected card to try to speed things up. We recommended that the cards be made to flip faster when they reset, or that users be allowed to flip the cards back at their own pace.
- For the Word Find: Most kids did not understand how to highlight words at first. They usually did not figure it out until they were told to read the instruction. They typically did not look to read the text though unless told to do so. We recommended that no reading be required. Provide multiple ways to select to ensure that young users can figure out how to select. For example, allow them to select letter by letter if they should choose to drag the cursor over the word. In addition, provide a visual cue that indicates to them that they are selecting. For example, the letters might be highlighted as they are selected.

This Web site was also evaluated for accessibility by using diagnostic software and a popular screen reader. Accessibility findings and recommendations are documented in the final report. The sponsor accepted many of the usability and accessibility recommendations and directed the software contractor to implement them. This project has been completed, and a report of the study is published in the SRD report series.

Staff: Erica Olmsted-Hawala (x34893), Larry Malakhoff, Betty Murphy

A.5. Usability Study of the Monthly and Annual Wholesale and Retail Trade Web Site

The Monthly Wholesale Trade and the Annual Wholesale Trade domains, currently two different domains off of Census.gov are combining into one primary domain. Staff from the two different domains would like to have usability assistance as they undergo the development and improvement of the new domain of the Census.gov web site. The Wholesale Trade design team is interested in receiving iterative usability feedback and recommendations on improvement as it works on the development of the site.

During FY 2008, staff conducted two rounds of iterative low-fidelity usability testing. For the first round, staff recruited seven internal users to evaluate the Web site interface. The average accuracy score was 73%. The average user satisfaction score was 6.5 on a 9 point scale.

An example of a finding and recommendation from the first round follows: Participants struggled to find information while sifting through dense text. We recommend that text be written in a style that is appropriate for the Web. Writing for the Web includes short concise sentences and bulleted lists instead of dense paragraphs. For the second round of testing, staff recruited eight external participants. Results show that the terminology in the top navigation was too technical for the novice users. Several users struggled to understand what information was located in the Overview, Methodology, and Glossary pages. Compared to the first round of testing, user accuracy decreased from 73% (first round) to 45% (second round). Several explanations are possible for the decrease in accuracy in task completion. For one, the participants used during the second round of testing were external participants who were not familiar with Census Bureau terminology. Secondly, information added to the left-pane navigation may have encouraged participants to leave the Wholesale Trade Survey interface to find information to satisfy the task. The results of the evaluation were discussed with the Wholesale staff. The Wholesale staff made changes to the interface recommended by the usability staff. This project is complete.

Staff: Erica Olmsted-Hawala (x34893), Jenna Beck, Betty Murphy

A.6. 2007 Economic Census Web Site Redesign

Our division's role in this project was to provide usability and accessibility evaluations of prototype screen designs for the 2007 Economic Census Web site. To begin this project, management in the Economic Planning and Coordination Division (EPCD) asked our division to conduct an expert review of prototype screen designs for the 2007 Economic Web site. During FY 2008, we completed the expert review and provided a report to the customer. In our review of the front page design, we recommended moving the link for "Finding and Using Data" into a more prominent place, above the fold. We suggested that the site's designers clarify the importance of the American FactFinder (AFF) as the place to find economic data. Once the Web site was redesigned according to the Census Bureau's template for corporate look and feel, staff evaluated the usability of the new site. We found that most test participants missed the top navigation bar and recommended that the color scheme be adjusted to provide the greater visual contrast needed to attract users' attention. We recommended providing a search function specific to the site to help users get off to a good start. We provided a final report to the customer: "A Usability Evaluation of the Economic Census Web Site (*Human-Computer Interaction Memorandum Series #124/SSM-2008/11*).

Staff: Elizabeth Murphy (x34858), Jennifer Romano, Erica Olmsted-Hawala

A.7. Spatial Ability Research with Iowa State University

The purpose of this research is to continue the Census Bureau's investigations of the role of spatial ability in mediating the success of field personnel in performing computer-based tasks.

During FY 2008, staff reviewed Iowa State's evolving cognitive model of the address-listing tasks. We critiqued screen prototypes to be used in the address listing tasks. We reviewed storyboards and scenarios, as well as a detailed software specification developed by Iowa State to guide implementation of an experimental design. We reviewed plans for a user study with treatments to include (1) software that provides step-by-step guidance on what the user should be doing, and (2) software that has the same functionality, but provides no guidance in conducting the address-listing task. While awaiting results of the user study, we collaborated with Iowa State on a successful proposal to the National Science Foundation to investigate further the relationship between spatial ability and use of map-based software in field operations. The grant research will begin in FY2009.

Staff: Elizabeth Murphy (x34858), Kathleen Ashenfelter

A.8. Expert Reviews of Public Sites within Census.gov

As part of the effort to update the Census Bureau to a corporate look and feel, we have been asked by Systems Support Division (SSD), in conjunction with other

divisions, to conduct numerous reviews of various Web sites within Census.gov. An expert review is typically the first step in user-centered design of an existing user interface, and it is often followed by low-fidelity prototype testing and high fidelity usability studies. During the expert review, staff members look for usability and accessibility issues related to the visual design and navigation of the site. We focus on what we think would cause problems for users based on our understating of users and usability principles, as well as the *Section 508* federal regulations on accessibility. Documentation of expert reviews typically includes a ranked list of usability and accessibility problems along with recommendations for improvement. We generally meet with the subject-matter team before beginning a review and again to discuss our findings and recommendations. The sections below describe progress made in FY 2008 on 10 expert reviews.

A.8.a State and Metropolitan Area Data Book and the County and City Data Book

Staff conducted an expert review for the Administrative and Customer Services Division (ACSD) prior to the redesign of the Web sites for the State and Metropolitan Area Data Book and the County and City Data Book. This project involved providing creative and constructive guidance for the Local Area Statistics team that was redesigning and merging these two web sites. This expert review resulted in a report detailing positive features of the Web sites, usability issues identified by the staff, and recommendations for improvement of those issues and of the Web sites in general. After completing the expert review, staff met with the ACSD team to discuss recommendations. We had found usability issues with the site's layout, including problems with navigation and consistency of design. Staff recommended that site developers reorganize the existing format of site content to fit within the new Census Bureau template developed by the Systems Support Division (SSD).

Staff: Kathleen Ashenfelter (x34922), Elizabeth Murphy, Allison Morgan

A.8.b Governments Division Web Site

Staff members performed an expert review for the Governments Division (GOVS) and documented their findings and recommendations. For example, we found that the items in the left-navigation bar needed to be reorganized for clarity; misleading and inconsistent links needed to be relabeled in a meaningful and consistent manner; and accessibility issues, including data tables inaccessible to screen readers, needed to be addressed. We recommended systematic testing for compliance with the *Section 508* regulations on accessibility for persons with disabilities. We conducted usability testing on both the current GOVS site and a prototype site. Methods used included eye tracking and a "first-click" analysis to assess the user-interface design for its ability to lead users to a successful entry point at the beginning of a task. There was a 53 percent success rate for first clicks using the current site and a 34 percent success rate for first clicks on the prototype. Both the current site and the low-fidelity prototype exhibited confusing terminology, misleading navigation, and lack of clarity in the organization of information. Many participants commented on the need for a search capability, which is something that online users expect. Information overload was a common issue across participants in the usability testing, for both the current site and the prototype. User satisfaction was identical for both, yielding a mean of 3.1 on a 5-point scale where 1 meant highly negative and 5 meant highly positive. The many ratings given below the mid-point indicate the existence of usability problems. In our final report, we recommended adoption of the new Census Bureau template and a reconsideration of exactly what content to provide on this information-rich site. This work is documented in "Usability Evaluation of the Governments Division Public Web Site" (*Human-Computer Interaction Memorandum Series #125*, submitted to the *SRD Research Study Series*).

Staff: Kathleen Ashenfelter (x34922), Jenna Beck, Alexander Trofimovksy, Elizabeth Murphy, Lawrence Malakhoff

A.8.c Business and Industry Main Web Site

Staff members performed the expert review and completed their documentation of this review for an interdivisional customer-satisfaction team, chaired by the Service Sector Statistics Division (SSSD) and including representatives from the Economic Planning and Coordination Division (EPCD), the Governments Division (GOVS), the Foreign Trade Division (FTD), the Company Statistics Division (CSD), the Manufacturing and Construction Division (MCD), and the Customer Liaison and Marketing Services Office (CLMSO). We attended frequent team meetings and provided real-time usability feedback on interim prototypes. Our expert reviewers found the then-current main page to be structured in a confusing and complex manner based on multiple dimensions (e.g., sector, geography, time period, survey). Staff recommended using a simplified, topic-based approach. This review was documented in Ashenfelter, K. A., Olmsted-Hawala, E., and Murphy, E.D. (2008), "Expert Review for the Business & Industry Main Page." Staff briefed the team on our results and recommendations.

There followed a period of iterative prototyping and commenting by the team. We developed a test plan for evaluating two prototypes of a revised main page. Usability testing with these prototype designs began in early September 2008 and continued into the next quarter. The sponsor's goals for Web site redesign were (a) to make it easier for users to find and access data quickly; (b) to provide a better and more easily used organization to the site for a wide range of users; and (c) to improve user satisfaction scores related to this site.

Staff: Kathleen Ashenfelter (x34922), Erica Olmsted-Hawala, Elizabeth Murphy, Jenna Beck

A.8.d History of the Census Bureau -- Main Web Site

Staff members performed the expert review for the Administrative and Customer Division (ACSD) and documented their findings and recommendations. We found that the History Website has adopted the new look and feel of Census Bureau Websites, which provide a top-level and left-side navigation that increase the user's familiarity with the organization of information at the Census Website. All of the pages associated with the History Website provide plug-ins to the software needed to view information. We also noted areas in need of improvement. For example, reviewers found that links throughout the site are not underlined. Staff recommended underlining all links to indicate that the blue underlined text is clickable, as required by Census Bureau IT standard 15.0.2. Further, it was not clear to the reviewers whether the titles associated with the drop-down menu on the top navigation bar were buttons or labels. We advised the site sponsor that past usability testing of a Web site using the same drop-down functionality found users did not realize that such titles were buttons. If important information is accessible only through this functionality, it is likely that users will fail to find the information. For the site to avoid this potential usability issue, we recommended that site design follow the conventions of the Census Bureau's other public Web sites and add a vertical line between the drop-down arrow and the button. This familiar visual cue will help users to understand that the titles are also buttons with an accompanying drop-down menu. This expert review was documented in a memorandum to the customer: Morgan, A., and Beck, J. (2008), "Usability Expert Review for the History Website."

Staff: Elizabeth Murphy (x34858), Allison Morgan, Jenna Beck

A.8.e Economics Main Web Site

Staff members conducted two expert reviews and documented their findings and recommendations. For example, one of the primary navigation links, Release Schedule, is an instance of internal terminology that external users will not understand. Staff recommended changing the phrase "Release Schedule" to "Data Release Schedule." The final expert review was documented as follows: Morgan, A., Beck, J., Trofimovsky, A., and Murphy, B. (2008). "Usability Expert Review for the 2007 Economic Census Website."

Next, we developed a plan for usability testing, which included eye tracking. Usability testing was conducted toward the end of FY 2008. Most of seven participants commented that the layout of the Web site was clear. Participants liked the consistency of the top navigation and the left navigation. The overall accuracy score was 56 percent. Accuracy scores ranged from 30 percent to 90 percent across users and from zero to 86 percent across tasks. The average time to complete each task was 2.63 minutes, which was well within the set goal of four minutes or less. Test participants were able to complete the tasks in an efficient manner. However, only 39 responses (56 percent) were correct and included in this calculation. The average satisfaction score was 5.93 on a 9-point scale, where 1 meant very unsatisfied and 9 meant very satisfied. Although the mean was above the mid-point of the scale (5.0), it was not *well* above the mid-point, which was the goal set for the Web site. Even though the means were quite high for satisfaction by question, some individual participants' mean ratings were quite low. Ratings below the mid-point of the scale indicate the presence of usability issues that may affect other users. Eye-tracking results demonstrated that participants did not always look at the important areas of interest on the screen and often missed the main link to the American FactFinder, which is where they needed to go for the Economic Census data. Staff recommended design changes to increase the usability of this site and presented their report to the client in the Economic Planning and Coordination Division (EPCD): Romano, J., and Murphy, E. (2008). *A Usability Evaluation of the Economic Census Web Site* (HCI Memorandum Series #124/*Statistical Research Division Study Series (Survey Methodology #2008-11).*

Staff: Elizabeth Murphy (x34858), Allison Morgan, Jenna Beck, Jennifer Romano, Alexander Trofimovsky

A.8.f Survey of Business Owners Main Web Site

Staff conducted the review and documented their findings and recommendations. Staff briefed the Company Statistics Division (CSD) on major findings and recommendations. For example, the content on the Web site was written in a paragraph style suited for reading from paper, but not suited for the Web. There was too much dense text throughout the site. Staff recommended reducing the amount of text and allowing the user to skim short, bulleted lists and links to more information. We also recommended considering a complete redesign for the site based on the Census Bureau's new template for look and feel. Results and recommendations of the expert review were documented in a memorandum prepared for CSD by Trofimovsky, A., Beck, J., Murphy, E.D., Hammersmith, C., and Goldberg, R. (2008). "Usability Expert Review for the Survey of Business Owners (SBO) Web Site."

Staff: Elizabeth Murphy (x34858), Alexander Trofimovsky, Jenna Beck, Carollynn Hammersmith (SSD), Robin Goldberg (SSD)

A.8.g About Us/Census Home Page

Staff conducted the review and documented their findings and recommendations, including the following: Because the site's design was inconsistent with the new Census Bureau template, its designers were encouraged to adopt the new template to reduce user confusion.

Additionally, the approach to navigating the site was found to be unclear and inconsistent; the buttons in the top navigation bar take users off the Geography site; and the site lacked a consistent navigational design across the site and add search functionality, which users expect. The site was credited for its use of a readable, sans serif font and for its correct presentation of links: Unvisited links are blue and underlined; visited links turn purple to aid the user's memory. These features comply with the Census Bureau's requirements in IT Standard 15.0.2. Results and recommendations were documented in Beck, J., Romano, J., and Murphy, E. D. (2008). "Usability Expert Review for the Census Bureau Geography Web site."

Staff: Elizabeth Murphy (x34858), Jenna Beck, Jennifer Romano

A.8.h Sites for the State Data Centers (SDCs) and Census Information Centers (CICs)

Staff conducted and documented expert reviews of SDC and CIC site pages specifically targeted for review by the Customer Liaison and Marketing Services Office (CLMSO). We identified both the strengths and potential usability issues identified with the sites. On the positive side, we found, for example, that the SDC Web site used white space to provide visual relief between the blocks of text. A high-priority usability issue for the SDC site was the use of outdated HTML code. To correct this defect, we recommended that site developers refer *to IT Standard 15.0.2* and use XHTML code when redesigning the SDC page. The CIC page was written in XHTML code, in compliance with IT Standard 15.0.2 and the new Census "look and feel." Because the text on the CIC page was dense and structured in paragraph form, we recommended that site designers reduce the amount of text on the screen and make key information readily available. For instance, paragraphs should be formatted as bulleted lists to make them easier for users to scan through and to decrease the amount of material the user must examine. Findings and recommendations were briefed to a meeting of representatives from the SDCs and CICs, which was held at Census Headquarters. During this meeting, it became clear that the users never go to one of the pages targeted for expert review. Revelations like this one drive home the need for actual user participation in Web site evaluations. Attention turned to consulting with the sponsors about site redesign and preparing a test plan for the usability evaluations to be conducted with volunteers when the next SDC/CIC meeting is held in October, 2008.

Staff: Kathleen Ashenfelter (x34922), Elizabeth Murphy, Allison Morgan, Jenna Beck

A.8.i Geography (GEO) Division's Web Site

Staff conducted the review and documented their findings and recommendations, including the following: Because the site's design was inconsistent with the new Census Bureau template, its designers were encouraged to adopt the new template to reduce user confusion. The approach to navigating the site was found to be unclear and inconsistent; buttons in the top navigation bar take users off the Geography site; designers need to create a consistent navigational design across the site and add search functionality, which users expect. The site was credited for its use of a readable, sans serif font and for its correct presentation of links: Unvisited links are blue and underlined; visited links turn purple to aid the user's memory. These features comply with the Census Bureau's requirements in *IT Standard 15.0.2*. Results and recommendations were documented in Beck, J., Romano, J., and Murphy, E. D. (2008). "Usability Expert Review for the Census Bureau Geography Web site."

Staff: Elizabeth Murphy (x34858), Jenna Beck, Jennifer Romano, Erica Olmsted-Hawala

A.8.j Usability Study of the 2010 Census Web Site

The purpose of this study is to identify usability problems and successes in an ongoing and iterative way with the 2010 Census web pages, a domain off of Census.gov. This domain is unusual in that as 2010 approaches, the audience and content will change. Taking these characteristics into account will be of primary importance when designing and modifying the interface. Staff ran a usability study with two different user groups, the general public and the Census "partners" who are more involved, whether with their work or community outreach, with the 2010 Census preparations. An example of a usability finding and the recommendation follows: The site gave the impression that the content and main message of the 2010 Census Web site was directed towards internal Census Bureau employees rather than focused on external users, such as the general public. We recommended that they refocus the content on general and partner users by moving the important information that is currently buried under the "About 2010" tab up so that users see this content, or how to get to this content, immediately upon entering the site. Additionally recommendations included keeping the left-hand link into the "Recent news" but do not highlight the "Top Story"; saving this space for more important information for your general and partner users; making the FAQs into actual questions; and changing the wording of the link "2010 Census is different" to something along the lines of "What is New about the 2010 Census?"

Staff: Erica Olmsted-Hawala (34893), Eleanor Gerber

A.9. Expert Review of Internal Web Site for the Information Technology Security Office (ITSO)

Prior to conducting the expert review, staff learned that the current ITSO Web site was in the process of a redesign, which was to replace the current site with an updated version of the prototype that we went on to inspect. The ITSO team reported receiving feedback that the current, internal Web site provides users with basic information about the Census Bureau's computer systems

but that finding the information can be time consuming and difficult. The following goals were established for the expert review of this site: (a) To identify areas of the prototype not arranged in a logical way; (b) to identify issues that may cause users difficulty in finding information; and (c) to ensure the Web site is accessible to visually impaired users. Upon reviewing partial, prototype material provided by the ITSO team, we found that the text on the Web site was written in a style appropriate for the Web (e.g. short bulleted sentences). Further, the Web site succeeded in presenting a reasonable amount of information and not overwhelming the user. We found several areas in need of improvement, for example: Information on the main page was hard to follow because of too much white space between terms and their descriptions. To correct this issue, we recommended eliminating the extra white space and improving readability by moving descriptions closer to the terms.

The accessibility review found several issues, for example: The Job Access With Speech (JAWS) screen reader voiced links in the correct tab order when up and down arrows were used, but not when the tab key was used. For example, "A to Z" and "FAQ" and "Site Map" were presented visually as a sequence of three terms, but when the tab key was used, the screen-reader user heard "A to Z," "Site Map," "Press enter to skip horizontal navigation bar," "FAQ," "FAQ." The skip-link instruction is supposed to be voiced before any of the other links are read. We recommended that the tab key follow the correct tab order to increase the accessibility of this application for people with visual impairments. Staff documented their findings and recommendations in the following memorandum: Beck, J., Morgan, A., Malakhoff, L., and Murphy, E. (2008). **"**Usability Expert Review for the Information Technology Security Office Web Site."

Staff: Elizabeth Murphy (x34858), Jenna Beck, Allison Morgan, Lawrence Malakhoff

A.10. Web Governance Video/Multimedia Working Group

The purpose of this multi-divisional working group is to develop technical standards and policies for any and all video or multimedia projects to be used/deployed on census.gov. These technical standards, specifications, and policies will allow for a consistent approach and governance of multimedia use on Census.gov. We will promote the responsible use of video and multimedia across census.gov to help illustrate what our numbers mean - in effect, bringing our numbers to life for the general population. This will be accomplished by facilitating the use of video and multimedia across census.gov and by identifying potential uses of video and multimedia via Census programs.

During FY 2008, the group met to discuss the video standard the Census Bureau should use to disseminate our information. We agreed on Flash due to problems with QuickTime from Apple and Media Player from Microsoft. We investigated establishing a Census Bureau channel on the commercial web site YouTube as another means to reach the public about Census programs. The Census channel would have links back to Census.gov, where accessible videos with captions would be available. Staff determined the primary search box on YouTube is inaccessible and recommended we report this fact to Google, the owner of YouTube. We also studied posting content on iTunes and hulu.com.

Staff wrote a short paragraph on the VLC (video LAN client) media player. It is a media player, similar to RealPlayer and the new Adobe media player. It is open source, but does not really have the same sort of market penetration that Adobe Flash enjoys (90-95% rate for the Flash 9 player, the most current at this time). The VLC media player is not an application we can use at this time.

Staff conducted accessibility reviews of Google Video, Hulu, YouTube, and Yahoo Video. Yahoo Video was the only website with an accessible media player. Staff conducted an accessibility review of the Flash Picture Wall, intended to display promotional images. It was determined that this application could be made accessible with a few minor changes: 1) Focus should already be on the picture in the upper left corner; 2) Tab navigation should go along the rows, left to right, top to bottom; and 3) When focus changes, we should hear any ALT text associated with the image.

Staff consulted with the group to create a questionnaire for users preference for placement of text captions for video and recommended steps needed for outreach to Flash developers to learn about new programming techniques. Staff also collaborated with other working group members to develop *Section 508* standards for Flash media development.

Staff: Larry Malakhoff (x33688)

B. Questionnaire Pretesting

This project involves coordinating the Census Bureau's generic clearance for questionnaire pretesting research. Pretesting activities in all areas of the Census Bureau may use the clearance if they meet the eligibility criteria.

During FY 2008, 36 letters involving 5,440 respondent burden hours were approved by the Office of Management and Budget for pretesting activities for census and survey questionnaires and procedures. Staff also gave two presentations on pretesting as part of the Demographic Surveys Division Training Program.

Staff: Terry DeMaio (x34894)

C. Questionnaire Design Experimental Research Survey 2006 (QDERS)

QDERS 2006 is an omnibus survey designed to facilitate independent research related to questionnaire design issues and other survey methodology issues. The QDERS 2006 was conducted from the Hagerstown Telephone Center. The focus of the 2006 QDERS is an

questionnaire design experiment examining different ways to determine a person's place of residency on Census day.

During FY 2008, staff completed its analysis of the two demographic questions within the 2006 QDERS. Staff did not find the same level of inconsistent relationship to age data (e.g., reporting "father" rather than "son") in QDERS as others have found in other census environments. Additionally, the edit to correct for inconsistent data did not prove burdensome. Staff also found little overt confusion with a question that confirms an age in the past rather than confirming current age, but the former question takes respondents significantly longer to answer. See Nichols and Childs (2007), *Statistical Research Division Research Report (Survey Methodology #2007-39).*

Staff worked with analysts in the National Processing Center as they completed residence status coding of the QDERS data and QC of the coding. Staff worked on general statistics from QDERS to compare/contrast to the production data from the 2006 Person Interview (PI). The same questions were asked in both surveys. QDERS was a nation-wide RDD survey (excluding Alaska and Hawaii) and the PI was a personal visit site test. Staff prepared and presented a paper titled, "RDD versus Site Test: Mode Effects on Gathering a Household Roster and Alternate Addresses" at the AAPOR conference. This paper compared general statistics from the RDD QDERS to compare/contrast to the site test data from the 2006 Person Interview (PI). Very similar questions were asked in both surveys. As expected, the demographics of the populations differed in keeping with the literature, with the RDD being older and containing more owners than the Site test. The statistic of interest, which was mobility (as measured by how many addresses a person stayed at during the year) didn't vary as much as expected between the two populations.

Staff: Jennifer Hunter Childs (x34927), Beth Nichols, Rolando Rodríguez, Aref Dajani

D. Language: Interdisciplinary Research on Language and Sociolinguistic Issues Relevant to Survey Methodology

There is a need for both qualitative and quantitative interdisciplinary research on how to best develop and successfully use non-English language collection instruments and other survey materials. Interdisciplinary research is also needed to determine the quality of the data that respondents with little or no knowledge of English provide the Census Bureau using both English and non-English language data collection instruments.

During FY 2008, our staff worked collaboratively with researchers in academia and survey research organizations on cross-cultural issues in survey interviews and translation methods. Specifically, we studied the following problems: 1) cross-cultural communication norms and survey interviews, 2) the use of interpreters in survey interviews, 3) language and cultural effects on conducting cognitive interviews in non-English languages, 4) methods to encourage survey participation from speakers of languages other than English, and 5) creation of best practices for the management of non-English language cognitive testing research.

We completed two invited papers and one additional paper on cross-cultural issues in cognitive interviews and pretesting methods. We presented these three papers at the 2008 International Conference on Survey Methods in Multilingual, Multiregional and Multicultural Contexts. We also worked on a paper examining the effects of ACS advance materials across the English-speaking and Chinese-speaking populations, and a paper on the behavior coding of the NRFU instrument in Spanish and English. These two papers were presented at the 63rd American Association for Public Opinion Research Annual Conference.

In addition, staff was invited to deliver a keynote speech on the methodology for politeness research across cultures at the 4th International Symposium on Politeness Research. Staff developed a book proposal on "Politeness in Historical and Contemporary Chinese Communication." Based on peer reviewers' recommendations, the Continuum International Publishing Group offered a book contract to staff to work on the project.

We have also collaborated with researchers in universities and research institutions worldwide to co-organize panel proposals for the 11th International Pragmatics Conference and the 2009 International Symposium on Face and Politeness; both panel proposals have been accepted. These two panels will bring together distinguished scholars in the field of discourse analysis and politeness research to examine issues on discourse theory and practice. Staff will contribute to the two panels by serving as the lead organizer, refereeing abstracts, and by contributing three papers on discourse analysis of non-English-speaking respondents interview behavior and the study of refusal by non-English-speaking respondents.

Staff collaborated with researchers at RTI to work on a paper examining English and Korean cognitive interview characteristics. The paper was accepted for presentation at the MAPOR 2008. We are also working closely with an international group of researchers who are members of the Comparative Survey Design and Implementation (CSDI) group, on the development of interpretation guidelines. Our staff also participates in the Interagency Language Roundtable meetings for discussion of translation, interpretation, and language proficiency testing issues.

Staff: Yuling Pan (x34950), Patti Goerman, Jennifer Hunter Childs, Anna Chan, Virginia Wake

E. Training for Cognitive Interviewing

Our staff will train members of other divisions in the Census Bureau to carry out cognitive interviewing and

provide consultation and support for projects. During FY 2008, nine staff members were trained in cognitive testing methods this quarter. Most worked on an optional practice report in addition to the required training.

Staff: Jennifer Hunter Childs (x34927), Patti Goerman, Terry DeMaio

F. Research on Cognitive Testing of Non-English Language Survey Instruments

Staff is currently engaged in writing up results of a study designed to test and identify best practices for conducting cognitive interviews with Spanish-speaking respondents. We tested both widely accepted and new techniques and probes (e.g., "What does the term foster child mean to you in this question?") with Spanish-speaking respondents of high and low educational levels. The research was based on a segment of the CAPI version of the American Community Survey. All data collection and research was completed in FY2007 but staff continues to write methodological papers based on the results of this research.

During Fiscal Year 2008, staff submitted an abstract for a special edition of the journal *Field Methods* and began work on a paper to be submitted to the journal for consideration.

Staff: Patricia Goerman (x31819)

G. Interviewer-Respondent Interactions

Survey nonresponse rates have been increasing, leading to concerns about the accuracy of (demographic) sample survey estimates. For example, from 1990 to 2004, initial contact nonresponse rates have approximately doubled for selected household sample surveys including the Current Population Survey (CPS) (from 5.7% to 10.1%). While mailout/mailback is a relatively inexpensive data collection methodology, decreases in mailback rates to censuses and sample surveys mean increased use of methodologies that bring respondents into direct contact with Census Bureau interviewers (e.g., field representatives) using CATI (computer assisted telephone interviewing) or CAPI (computer assisted personal interviewing). CAPI can include face-to-face or telephone contact. Unsuccessful interviewer-respondent interactions can lead to increased costs due to the need for additional follow-up, and can also decrease data quality.

During FY 2008, staff completed a third exploratory study (mostly open-ended questions) of the current behavior of Current Population Survey (CPS) interviewers, called Field Representatives (FRs). This study collected and analyzed data from 37 CPS FRs; two earlier studies focused on FR behaviors reported by CPS Coordinators and Supervisors and CPS Senior FRs. The 37 FRs reported behaviors that tended to fall into four broad categories: (1) administrative, task-oriented behaviors that focused on case management, organization, appearance, and scheduling; (2) self-directed behaviors that focused on appearance and attitude; (3) interview behaviors that focused on interactions with a potential respondent; and (4) behaviors, attitudes, and recommendations that were more general. The FRs tended to report more behaviors that were unsuccessful at gaining cooperation. The FRs also tended to report more interview and administrative behaviors than any of the other types of behaviors.

Also, we received 512 (95%) questionnaires with responses from the 540 questionnaires (mostly multiple-choice questions) that were sent to FRs in the same third exploratory study. Editing and imputation rules were developed based on a review of the returned questionnaires, and a computerized database was developed to capture these responses.

Staff: Tommy Wright (x31702), Kathleen Ashenfelter, Jennifer Beck, Tom Petkunas

H. Research on Cognitive Testing of Housing Questions from the American Community Survey (ACS) and the American Housing Survey (AHS)

As part of a postdoctoral research fellowship, staff conducted a study designed to understand sources of measurement error in number of rooms and number of bedrooms measures in the ACS, housing quality measures from the AHS, and neighborhood quality measures from the AHS. The main goal of this research was to determine the extent to which cognitive difficulties in answering these questions may bias indices of dwelling unit density, housing inadequacy, and neighborhood quality.

During FY 2008, staff submitted a draft of a postdoctoral research report entitled "Measurement of Housing Quality and Neighborhood Quality in the American Community Survey (ACS) and the American Housing Survey (AHS)"; reported to OMB on major findings of research conducted under the generic clearance; and presented findings. Work on this project within our division is now complete.

Staff: George Carter, III (x31774)

I. Q-Bank: A Database of Pretested Questions

Q-Bank was developed through an interagency committee, led by the National Center for Health Statistics (NCHS), of which the Census Bureau is a member. The objective of Q-Bank is to have an online interagency database of pre-tested survey questions and research results obtained primarily from cognitive interviews. The database is maintained at NCHS and is guided and used by other participating Federal statistical agencies, including the Census Bureau. Q-Bank serves many purposes. When survey questions and questionnaires are being developed, Q-Bank can be used by survey methodologists and subject matter experts to search through previously tested questions. Q-Bank provides a forum to catalog our cognitive testing reports in a manner that is easy to search by content or subject

matter. Q-Bank also will allow us to produce meta-data about our pretesting findings. And, finally, Q-Bank will be an additional resource for analysts to interpret survey data. Q-Bank has just reached the production phase and is currently being populated with cognitive test reports which is necessary before it becomes available to a broader audience.

During FY 2008, our staff actively participated on the interagency Q-Bank steering committee, making decisions about the continued development of the database. Staff worked with NCHS on finalizing the programming of the Q-Bank to incorporate establishment and self-administered surveys and on identifying the searchable fields in the database. Our staff also worked on ensuring intercoder reliability of reports - several reports were coded and/or reviewed for inclusion in the Q-Bank database. We also began to discuss how to best incorporate pretests of questionnaires in non-English languages.

Staff: Jennifer Childs (x34927), Jennifer Beck, Dawn Norris, Patricia Goerman

J. Health Insurance Measurement

The U.S. health care system is a patchwork of public and private programs and plans, thus there are no definitive centralized records on the number of individuals without insurance. Researchers must rely on surveys for this estimate, and the Current Population Survey (CPS) is the most widely-cited source for this statistic. It is not without its critics, however, and recent official reports have included caveats regarding the data quality. The purpose of this research is to identify particular features of the CPS questionnaire that are associated with measurement error, and to explore alternative designs to reduce that error.

During FY 2008, staff investigated and focused on one design feature that is suspected to be problematic: the calendar year reference period. Thus there was an interest in developing and testing an "integrated" set of questions that would capture both current status and status during the previous calendar year. Staff first conducted a review of relevant literature on memory and recall. Then staff consulted with individuals at the State Health Access Data Assistance Center and various state agencies to learn more about if and how they collect data on health insurance status during the previous calendar year, and whether they had any findings on the data quality of this information. These findings were used in tandem with general background literature on measurement error in health insurance surveys in order to develop an alternative questionnaire design which integrated questions on current and past year status. Staff then conducted informal testing (with friends, family and colleagues) and made repairs to the instrument prior to "live" testing with paid respondents. Next cognitive testing training was conducted with four staff members in the Data Integration Division, and 36 interviews were conducted. Summaries and analysis are continuing.

Staff: Joanne Pascale (x34920)

K. Emerging Social Trends on Household Structure and Living Situations, Race/Ethnicity, and Linkages to Enumeration Methods and Coverage

In 2006, the National Academies of Science (NAS) Panel on Residence Rules recommended that the Census Bureau establish a trends office with an ongoing research program on social trends, enumeration methods, and coverage. This program would include monitoring emerging social trends and their impact on the accuracy of basic residence information and census coverage. It would also include developing, conducting, and synthesizing new research to suggest changes in enumeration methods and improve census coverage. Specifically recommended ongoing research topics include: "research on changing factors influencing people's attachments to locations where they are counted," "living situations," "large households," "sources of omissions in the census, as well as duplications," and "questionnaire strategies" (NRC 2006: 175-178).

Our census and survey data reveal changing social trends in terms of household structure, living situations, immigration, race/ethnic growth rates, and other factors. Our successive decennial census coverage measurement programs document persistent trends in differential coverage for race/ethnic populations, some age/sex groups, and persons with weak ties to households.

Consistent with the NAS recommendations, there are three aims for this ongoing research project. The first is to identify and study changing social trends in household structure, living situations, and residence patterns. The second is to analyze how these interact with race/ethnicity, enumeration methods, coverage errors, and other factors. The third aim is to suggest research to improve enumeration methods. Both qualitative and quantitative methods are being used. This project builds on previous ethnographic evaluations of decennial censuses: the "Behavioral Causes of Census Undercount Project" in the 1990 Census and the "Complex Households and Relationships in the Decennial Census and in Six Race/Ethnic Groups Project" in Census 2000 and the resulting book co-edited by Schwede, Blumberg, and Chan, *Complex Ethnic Households in America* (2006). It also builds on coverage studies using demographic analysis and dual systems estimation and qualitative studies to identify types of households and persons missed or erroneously enumerated. The project involves consultation and collaboration with social scientists, demographers and statisticians.

During FY 2008, we finalized the *SRD Research Report,* "A New Focus: Studying Linkages Among Household Structure, Race/Ethnicity, and Geographical Levels, with Implications for Coverage."

We matched and analyzed four sets of data for 31 households in the 2006 Census Site Test to prepare a paper on types and sources of coverage error on the Cheyenne River Sioux Indian Reservation. Data sources included: 1) Update/Enumerate rosters matched to 2)

Census Coverage Measurement Personal Interview rosters, matched to 3) audiotapes and observations of CCM PI interviews and 4) qualitative debriefings conducted in 14 of those households. The first finding from this research was the identification of possible census and CCM coverage errors: a) three likely census omissions and one potential census omission, b) 2 CCM PI omissions (later corrected), c) one new cross-household match that the CM matching system did not identify, d) three other cross-household duplications (with removal of erroneous enumerated persons), and e) seven other unmatched, unresolved census people (for whom, in a real census, residence and enumerations probabilities of correct enumerations and errors would be calculated). The second finding was the identification of a new living situation in which coverage errors may occur: children below college age on Indian reservations sleeping at a boarding school, or school dorm from Sunday to Thursday nights and their relatives' homes on the weekends. The difficulty is that we do not conduct enumeration in boarding schools for those younger than college age. If the household respondent does not roster the child with this living situation, the child is not picked up in any other operation and would be omitted from the census. The third finding is that this new method of combining observation and taping of production interviews with immediate qualitative debriefings to resolve residence rule and coverage ambiguities is very useful for identifying problems with the survey instrument, with respondent-interviewer interaction, and for identifying and resolving coverage ambiguities. We propose to use this method in our 2010 CPEX Evaluation of enumeration methods and coverage. These and other results are documented in our *Joint Statistical Meetings Proceedings* paper, "Using Multiple Methods to Identify Types and Sources of Coverage Error on an American Indian Reservation."

We proposed, developed, and conducted a special component study to test the Enumerator Questionnaire (EQ) on an Indian reservation, where the form will be used in the 2010 Census Update/Enumerate Operation. This was part of the wider NRFU/U/E cognitive and usability testing project. We trained a Navajo liaison to administer the EQ, to introduce the study, and to obtain consent to tape; additionally, we explained our role as cognitive debriefer. Together, we selected a "random drive" sample around the reservation. We completed 10 cold-call cognitive interviews in Navajo homes, divided among traditional hogans, trailers, Navajo subsidized housing, and private housing. Significant findings from the reservation component include: 1) mistrust of the U.S. government and non-Indians is palpable, so a 2010 Census office should be located on this reservation and staffed and run, as much as possible, by Navajos; 2) Navajo recall and/or willingness to report exact birthdates and ages of other household members so critical to matching were not as high as hoped (this might produce higher coverage error rates unless addressed); and 3) most respondents in the rural areas gave distance-based addresses (e.g., 6 miles northeast of Chapter House) that do not provide specific-enough criteria to precisely locate the same residence later (this might also increase coverage error rates). Preliminary results are in "2010 Enumerator Questionnaire Cognitive and Usability Test Findings and Recommendations," by Childs, Romano, Schwede, DeMaio, et al., August 12.

Staff developed the first typology of complex/non-complex households and compared the 1990 and 2000 census distributions to document the sizeable and growing proportion of complex households in the US. This research is based on customized census data on specific relationship combinations compiled by Frank Hobbs and presented in the appendix of his Special Census 2000 Report, "Examining American Household Composition: 1990 and 2000" (2005). We discovered and documented that complex households comprised 18.4% of all US households in 1990 and rose to 21% of all households in Census 2000. These are the first documented results of the trend of growth of complex households, which we had hypothesized but heretofore could not benchmark.

Staff prepared and submitted successive proposals for comparative ethnographic research on enumeration methods and coverage for race/ethnic groups as 2010 Census CPEX evaluation C.14. This proposal was officially approved as a 2010 CPEX Evaluation.

Staff presented an invited talk to the inter-divisional 2010 American Indian/Alaska Native Implementation Team, "American Indian and Alaska Native Household Structure at the National and Local Levels" in February.

Staff: Laurie Schwede (x32611)

Research Assistance

This staff provides research assistance, technical assistance, and secretarial support for the various research efforts.

Staff: Tina Arbogast, Gloria Prout, Lorraine Randall

3. PUBLICATIONS

3.1 JOURNAL ARTICLES, PUBLICATIONS

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McElroy, T. and Politis, D. (2008). "A Fine-Tuned Estimator of a General Convergence Rate," *Australian New Zealand Journal of Statistics*, 50, 1-11.

Nichols, E. and Childs, J. (In Press). "Respondent Debriefings Conducted by Experts: A Technique for Questionnaire Evaluation," *Field Methods.*

Pan, Y. (In Press). "Review of Kádár, Dániel Z. Terms of (Im) Politeness: A Study of the Communicational Properties of Traditional Chinese (Im) Polite Terms of Address." *Journal of Politeness Research.*

Pascale, J. (In Press). "Assessing Measurement Error in Health Insurance Reporting: A Qualitative Study of the Current Population Survey," *Inquiry*.

Pascale, J. and McGee, A. (In Press). "Using Behavior Coding to Evaluate the Effectiveness of Dependent Interviewing," *Survey Methodology*.

Pascale, J., Roemer, M., Resnick, D. (In Press). "Medicaid Underreporting in the CPS: Results from a Record Check Study," *Public Opinion Quarterly*.

Winkler, W. E. (2008). "Data Quality in Data Warehouses," in *Encyclopedia of Data Warehousing and Mining*, 2nd Edition (J. Wang, ed.), Information Science Reference, Hershey, PA.

3.2 BOOKS/BOOK CHAPTERS

Goerman, P. and Caspar, R. (In Press). "Development of Best Practices for Managing the Cognitive Pretesting of Multilingual Survey Instruments." In *Survey Methods in Multinational, Multiregional, and Multicultural Contexts*, (eds. Hardness, J., et al.), Berlin: Wiley Press.

Malec, D. and Müller, P. (2008). "A Bayesian Semi-Parametric Model for Small Area Estimation." In *Pushing the Limits of Contemporary Statistics: Contributions in Honor of Jayanta K. Ghosh*, (eds. S. Ghoshal and B. Clarke), Institute of Mathematical Statistics, 223-236.

Massell, P., Zayatz, L., and Funk, J. (2007). "Protecting the Confidentiality of Survey Tabular Data by Adding Noise to the Underlying Microdata: Application to the Commodity Flow Survey." In *Privacy in Statistical Databases, CENEX-SDS International 2006 Conference Proceedings, Lecture Notes in Computer Science 4302*, (eds. Josep Domingo-Ferrer, Luisa Franconi), New York: Springer.

Pan, Y. (2008). "Cross-cultural Communication Norms and Survey Interviews," in *It's the Dragon's Turn – Chinese Institutional Discourse(s)*, (eds. H. Sun and D. Kadar), Berne: Peter Lang, 17-76.

Pan, Y. and Kádár, D.Z. (In Press). *Politeness in Historical and Contemporary Chinese Communication.* London: Continuum International Publishing Inc.

Winkler, W. E. (In Press). "Record Linkage," in *Sample Surveys: Theory, Methods and Inference*, (D. Pfefferman and C.R. Rao, eds.).

3.3 PROCEEDINGS PAPERS

2007 American Association for Public Opinion Research Meeting, Anaheim, CA, May 17-20, 2007.
2007 Proceedings of the American Statistical Association.

- Carter, G. and Schwede, L. (2007). "Is This a Mobile Home or a Monastery?: Differentiating Group Quarters from Housing Units with a Validation Questionnaire," 3831-3835.
- Gerber, E. and Landreth, A. (2007). "Respondents' Understanding of Confidentiality in a Changing Privacy Environment," 3842-3849.
- Goerman, P. and Caspar, R. (2007). "A New Methodology for the Cognitive Testing of Translated Materials: Testing the Source Version as a Basis for Comparison," 3949-3956.
- Mulry, M. and Keller, J. (2007). "Investigation of the Relationship Between Census Mail Response and the Partnership and Marketing Program," 3856-3863.
- Nichols, E. and Childs, J. (2007). "Respondent Debriefings Conducted by Experts: A New Qualitative Methodology for Questionnaire Evaluation," 3809-3816.
- Pan, Y., Landreth, A., Hindsdale, M., Park, H., and Schoua-Glusberg, A. (2007). "Methodology for Cognitive Testing of Translations in Multiple Languages," 3801-3808.
- Pascale, J., Roemer, M., and Resnick, D. (2007). "Medicaid Underreporting in the CPS: Results from a Record Check Study," 3941-3948.

2007 Joint Statistical Meetings (American Statistical Association), Salt Lake City, Utah, July 29-August 2, 2007.
2007 Proceedings of the American Statistical Association.

- Beaghen, M. and Weidman, L. (2007). "Statistical Issues and Interpretation of the American Community Survey's One-, Three-, and Five-Year Period Estimates," 3034-3041.
- Childs, J., Nichols, E., Dajani, A., and Rothgeb, J. (2007). "A New Approach to Measuring Residence Status," 2752-2759.
- Hawala, S. (2007). "Partially Synthetic Data to Avoid Disclosure from ACS-GQ Data," 2976-2978.
- McElroy, T. (2007). "Extending X-11 to Handle Finite-Sample Effects and Generate Signal Extraction MSEs," 934-944.
- McElroy, T. and Holan, S. (2007). "Model-Based Diagnostic Tests Based on the Log Determinant of the Sample Covariance Matrix," 945-952.
- Rodriguez, R. (2007). "Synthetic Data Disclosure Control for American Community Survey Group Quarters," 1439-1450.
- Thibaudeau, Y., Mulrow, J., and Shao, J. (2007). "A Study of Basic Calibration Estimates and Their Variance Estimators in Presence of Nonresponse," 2744-2751.

Proceedings of the Federal Committee on Statistical Methodology Conference, Washington, D.C., November 5-7, 2007.

- Hawala, S. and Funk, J. (2007). "Model Based Disclosure Avoidance for Data on Veterans."
- Massell, P. and Funk, J. (2007). "Recent Developments in the Use of Noise for Protecting Magnitude Data Tables: Balancing to Improve Data Quality and Rounding that Preserves Protection."
- Steel, P. (2006). "Mediated Access for Secure Census Bureau Data."

Proceedings of the Joint UNECE/Eurostat Work Session on Statistical Data Confidentiality, Manchester, UK, December 17-19, 2007.

- Zayatz, L. (2007). "New Implementations of Noise for Tabular Magnitude Data, Synthetic Tabular Frequency and Microdata, and a Remote Microdata Analysis System."

Proceedings of the BSF/DIMACS/DyDAn Workshop on Data Privacy, Rutgers University, New Brunswick, NJ, February 4-7, 2008. (www.dimacs.rutgers.edu/Workshops/DataPrivacy/program.html)

- Massell, P. and Funk, J. (2008). "Protecting the Confidentiality of Tables by Adding Noise to the Underlying Microdata."

Proceedings of the Advertising Research Foundation (ARF), Re: Think, Advertising Research Foundation, New York, NY, March 31 – April 2, 2008.

- Bates, N. and Mulry, M. (2008). "Predicting Return on Investment across Population Segments in a Social Marketing Campaign."

Proceedings of the 2008 AAPOR Conference, New Orleans, May 14-18, 2008.

- Goerman, P., Childs, J., and Clifton, M. (2008). "Explaining Differences in Inter-coder Reliability between English and Spanish Language Behavior Coding Research."

Proceedings of the Second International Total Survey Error Workshop, Research Triangle Park, NC, June 2-4, 2008.

- Mulry, M. (2008). "Error Structure in Estimates of Census Coverage Error Components."

Proceedings of the International Conference on Survey Methods in Multinational, Multiregional, and Multicultural Contexts (3MC), Berlin, Germany, June 25-28, 2008.

- Childs, J. and Goerman, P. (2008). "Multilingual Questionnaire Evaluation and Development through Mixed Pretesting Methods: The Case of the U.S. Census Nonresponse Followup Instrument."

Proceedings of the 2008 Institute of Electrical and Electronic Engineers(IEEE) Professional Communication Society, Montreal, Quebec, July 14, 2008.

- Olmsted-Hawala, E. (2008). "Information Architecture: Strategies for Analysis of Card-sorting Data for Organizing Information on the Census Bureau Web Site."

Proceedings of the Thirtieth Annual Meeting of the Cognitive Science Society, Washington, D.C., July 22-26, 2008.

- Ashenfelter, K.T., Boker, S., Waddell, J., and Vitanov, N. (2008). "Coordination and self-symmetry of verbal and nonverbal behaviors during face-to-face dyadic conversation."

3.4 STATISTICAL RESEARCH DIVISION RESEARCH REPORTS

<http://www.census.gov/srd/www/byyear.html>

RR (Computing #2007-02): María M. García, Alison Gaicowski, and Andrew Jennings, "Selective Editing Strategies for the U.S. Census Bureau Foreign Trade Data," December 10, 2007.

RR (Computing #2008-01): Bor-Chung Chen, "Stochastic Simulation of Field Operations in Surveys," February 19, 2008.

RR (Statistics #2007-13): Scott Holan, Tucker McElroy, and Sounak Chakraborty, "A Bayesian Approach to Estimating the Long Memory Parameter," October 19, 2007.

RR (Statistics #2007-14): John A. D. Aston, David F. Findley, Tucker S. McElroy, Kellie C. Wills, and Donald E.K. Martin, "New ARIMA Models for Seasonal Time Series and Their Application to Seasonal Adjustment and Forecasting," October 18, 2007.

RR (Statistics #2007-15): Tucker McElroy, "A Nonparametric Method for Asymmetrically Extending Signal Extraction Filters," November 13, 2007.

RR (Statistics #2007-16): Tucker McElroy and Scott Holan, "Goodness-of-Fit and Badness-of-Fit Diagnostic Tests for Time Series Models," November 13, 2007.

RR (Statistics #2007-17): Laura Zayatz, "New Implementations of Noise for Tabular Magnitude Data, Synthetic Tabular Frequency and Microdata, and a Remote Microdata Analysis System," November 14, 2007.

RR (Statistics #2007-18): Elizabeth T. Huang and William R. Bell, "An Empirical Study on Using CPS and ACS Survey Data in Bivariate State Poverty Models," November 16, 2007.

RR (Statistics #2007-19): William E. Winkler, "Analytically Valid Discrete Microdata Files and Re-identification," December 10, 2007.

RR (Statistics #2007-20): María M. García, Alison Gajcowski, and Andrew Jennings, "Selective Editing Strategies for the U.S. Census Bureau Foreign Trade Data," December 10, 2007.

RR (Statistics #2007-21): William E. Winkler, "Examples of Easy-to-Implement, Widely-Used Methods of Masking for which Analytic Properties are not Justified," December 29, 2007.

RR (Statistics #2007-22): Michael Ikeda and Edward Porter, "Initial Results from a Nationwide *BigMatch* Matching of 2000 Census Data," December 29, 2007.

RR (Statistics #2008-01): Tucker McElroy, "A Nonlinear Algorithm for Seasonal Adjustment in Multiplicative Component Decompositions," February 21, 2008.

RR (Statistics #2008-02): Mike Ikeda and Edward Porter, "Additional Results from a Nationwide Matching of 2000 Census Data," March 5, 2008.

RR (Statistics #2008-03): Theodore Alexandrov, Silvia Bianconcini, Estela Dagum, Peter Maass, and Tucker S. McElroy, "A Review of Some Modern Approaches to the Problem of Trend Extraction," March 28, 2008.

RR (Statistics #2008-04): Tucker McElroy and Thomas Trimbur, "On the Discretization of Continuous-Time Filters for Non-Stationary Stock and Flow Time Series," April 15, 2008.

RR (Statistics #2008-05): Tucker McElroy and Marc Wildi, "Signal Extraction Revision Variances as a Goodness-of-Fit Measure," July 2, 2008.

RR (Statistics #2008-06): Patrick J. Cantwell, "Rotation Designs and Composite Estimation in Sample Surveys: Part 1. Motivating Their Use," September 30, 2008.

RR (Statistics #2008-07): Lynn Weidman , Robert Creecy, Donald Malec and Julie Tsay, "Exploration of the Use of Empirical Bayes Procedures for Estimating Changes in Occupancy Rate and Persons Per Household," September 30, 2008.

RR (Statistics #2008-08): William Winkler, "General Methods and Algorithms for Modeling and Imputing Discrete Data Under a Variety of Constraints," October 3, 2008.

RR (Statistics #2008-09): Elizabeth Huang, Donald Malec, and Lynn Weidman, "Research to Model Field of Degree Information for College Graduates, Using the 2003 NSCG File with Linked Census 2000," September 30, 2008.

RR (Survey Methodology #2007-38): Laurie Schwede, "A New Focus: Studying Linkages Among Household Structure, Race Ethnicity, and Geographical Levels, with Implications for Census Coverage," November 5, 2007.

RR (Survey Methodology #2007-39): Elizabeth Nichols and Jennifer Hunter Childs, "Respondent Debriefings Conducted by Experts: A New Qualitative Methodology for Questionnaire Evaluation," October 3, 2007.

RR (Survey Methodology #2007-40): Joanne Pascale, Marc I. Roemer, and Dean Michael Resnick, "Medicaid Underreporting in the CPS: Results from a Record Check Study," December 27, 2007.

RR (Survey Methodology #2007-41): Anna Y. Chan and Jeffrey C. Moore, "Report on the New Type 2 People Questions: A Pretesting Study for the Re-Engineered SIPP," December 18, 2007.

RR (Survey Methodology #2008-01): Elizabeth Nichols, Jennifer Hunter Childs and Rolando Rodríguez, "2006 QDERS: Demographic Questions Analysis," January 2, 2008.

RR (Survey Methodology #2008-02): Joanne Pascale and Alice McGee, "A Multi-Method Evaluation of the Use of an Event History Calendar," February 19, 2008.

RR (Survey Methodology #2008-03): Jeffrey C. Moore, "Seam Bias in the 2004 SIPP Panel: Much Improved, but Much Bias Still Remains," February 25, 2008.

RR (Survey Methodology #2008-04): Ashley Landreth, Eleanor Gerber and Theresa DeMaio, "Report of Cognitive Testing of Privacy- and Confidentiality-Related Statements in Respondent Materials for the 2010 Decennial: Results from Cognitive Interview Pretesting with Volunteer Respondents," March 28, 2008.

RR (Survey Methodology #2008-05): Aniekan Okon, Jeffrey C. Moore, and Nancy Bates, "Census Bureau" vs. "Unknown Caller": Caller-ID Displays and Survey Cooperation," April 8, 2008.

RR (Survey Methodology #2008-06): Yuling Pan, Marjorie Hinsdale, Alisu Schoua-Glusberg, and Hyunjoo Park. "Cognitive Testing of ACS Multilingual Brochures in Multiple Languages," July 24, 2008.

RR (Survey Methodology #2008-07): Jennifer Hunter Childs and Patricia L. Goerman. "Multilingual Questionnaire Evaluation and Development through Mixed Pretesting Methods: The Case of the U.S. Census Nonresponse Followup Instrument," September 26, 2008.

RR (Survey Methodology #2008-08): Jennifer Beck. "Field Representative experiences with the Current Population Survey: Pilot Study Results," September 30, 2008.

3.5 STATISTICAL RESEARCH DIVISION STUDIES

<http://www.census.gov/srd/www/byyear.html>

SS (Computing #2007-1): Bor Chung Chen, "CANCEIS Experiments of Edit and Imputation with 2006 Census Test Data," December 10, 2007.

SS (Survey Methodology #2007-27): Patricia Goerman, "Census Bilingual Questionnaire Research Final Round 2 Report", October 21, 2007.

SS (Survey Methodology #2007-28): Theresa DeMaio, Jennifer Beck, and Dawn Norris, "Report of Cognitive Research to Develop the 2008 NCVS Identity Theft Supplement," December 3, 2007.

SS (Survey Methodology #2008-01): Patricia Goerman, Rachel Caspar, Georgina McAvinchey, Rosanna Quiroz and Mandy Sha, "Census Bilingual Questionnaire Research Final Round 1 Report," February 27, 2008.

SS (Survey Methodology #2008-02): Yuling Pan, Ashley Landreth, Marjorie Hinsdale, Hyunjoo Park, and Alisu Schoua-Glusberg, "Methodology for Cognitive Testing of Translations in Multiple Languages," February 19, 2008.

SS (Survey Methodology #2008-03): Lawrence Malakhoff, "An Accessibility Evaluation of the Classification Analytical Processing System Application," May 2, 2008.

SS (Survey Methodology #2008-04): Lawrence Malakhoff, "An Accessibility Evaluation of the WIN X-12 Application," May 2, 2008.

SS (Survey Methodology #2008-05): Jennifer Hunter Childs, "2010 NRFU Questionnaire Development: From the 2004 Census Test to the 2008 Dress Rehearsal," April 30, 2008.

SS (Survey Methodology #2008-06): Lawrence Malakhoff, "An Accessibility Evaluation of the Secure Message Center Application," May 19, 2008.

SS (Survey Methodology #2008-07): Lawrence Malakhoff, "An Accessibility and Usability Evaluation of the QUISP II Application," August 7, 2008.

SS (Survey Methodology #2008-08): Jennifer Beck, "NCVS Pretesting Activities on the Proposed Internet Predation Questions: Focus Group Results," September 30, 2008.

SS (Survey Methodology #2008-09): Jennifer Beck and Theresa DeMaio, "Second round cognitive pretesting on the proposed Internet predation questions for the National Crime Victimization Survey: Results and recommendations," September 30, 2008.

3.6 OTHER REPORTS

Beck, J. and Murphy, E. (2008). "Wholesale Trade Usability Study: Round 1." *(HCI Memorandum Series #115).*

Beck, J. and Murphy, E. (2008). "Wholesale Trade Usability Study: Round 2." *(HCI Memorandum Series #122).*

Chan, Anna. "Report on the Cognitive Pretest Study for the Current Population Survey's New Migration Supplement Questions," April 30, 2008.

Childs, J.H., and Gerber, E. "2008 Be Counted Form: Respondent Problems Encountered in Cognitive Testing," August 13, 2008.

DeMaio, T., Beck, J., and Norris, D. "Report of Cognitive Research to Develop the 2008 NCVS Identity Theft Supplement," November 5, 2007.

Ellis, Y., and Schwede, L. "Evaluation of the Redesigned Questionnaire for the Children in Custody Census," October 3, 2008.

Goerman, P.L., Childs, J., and Simmons, D. "Coverage Measurement Instrument Spanish Translation of Group Quarters Terms," April 8, 2008.

Nichols, E. and Childs, J. H. "Census Coverage Measurement Person Followup Interview: Trip Reports: January 2007." *DSSD 2010 Census Coverage Measurement Memorandum Series #2006-D7-132006,* November 6, 2007.

Romano, J. and Murphy, E. (2008). "A Usability Evaluation of the Economic Census Web Site." (*HCI Memorandum Series #124/ Division Study Series SSM2008/11*).

Romano, J., Murphy, E., Olmsted-Hawala, E., and Childs, J. H. (2008). "A Usability Evaluation of the Nonresponse Followup Enumerator (NRFU) Questionnaire Form." *HCI Memorandum Series #125,* September 25, 2008

Rothgeb, J., Okon, A., and Dusch, G. "Voting and Civic Engagement (VCE) Supplement to CPS: Cognitive Testing (Round 1) Summary Report," November 6, 2007.

Rusch, M., Smith, B., Olmsted-Hawala, E., Murphy, B., and Malakhoff, L. (2008). "A Usability and Accessibility Evaluation of the Census-in-the-Schools Web Site." (*HCI Memorandum Series #120*).

Schwede, L. "Rostering, Residence Rules, and Coverage: Where We've Been and Where We're Going." October 14, 2008.

Schwede, L., Carter III, G., and Jocuns, A. “Results of Cognitive Testing of the Other Living Quarters Validation Questionnaire (OLQVQ).” September 29, 2007.

Trofimovsky, A., Beck, J., Murphy, E. D., and Ashenfelter, K. T. (2008). “Usability Evaluation of the Governments Division Public Web Site.” (*HCI Memorandum Series #126*).

Trofimovsky, A. and Murphy, E. (2008). “Implementing Information Architecture on the American Community Survey Main Page” (*HCI Memorandum Series #114*).

4. TALKS AND PRESENTATIONS

Workshop on Ensuring Access and Confidentiality Protection for Highly Sensitive Data, Institute for Social Research, University of Michigan, October 3, 2007.

- Laura Zayatz, "Disclosure: Deciding What Gets Out."

2007 User Focus Usability Professionals' Association (UPA) DC 2nd Annual Conference, Washington DC, October 12, 2007.

- Erica Olmsted-Hawala, "Incorporating Information Architecture Activities into the Evolution of the U.S. Census Bureau's Web Site."

Special Presidential Session, Society of Actuaries, Washington, D.C., October 15, 2007.

- William E. Winkler, "Data Quality and Record Linkage Techniques."

Washington Statistical Society (WSS), Washington, D.C., October 16, 2007.

- Paul B. Massell, "Protecting the Confidentiality of Tables by Adding Noise to the Underlying Microdata."

George Washington University School of Public Health, Graduate Level Methods Class Invited Seminar, Washington, D.C., October 22, 2007.

- Laurie Schwede, "How You Can Link Qualitative and Census Data: Using Our Complex Family Types Study as a Guide."

Institute of Electrical and Electronic Engineers (IEEE), Saratoga, NY, October 22, 2007.

- Erica Olmsted-Hawala, "Card Sorting, Information Architecture and Usability."

Federal Committee on Statistical Methodology Research Conference, Arlington, VA, November 5-7, 2007.

- Jeremy Funk, "Model Based Disclosure Avoidance for Data on Veterans."
- Paul Massell, "Recent Developments in the Use of Noise for Protecting Magnitude Data Tables: Balancing to Improve Data Quality and Rounding that Preserves Protection."
- Tucker S. McElroy, "Compatible Trends for ACS Data."
- Brian C. Monsell, "The X-13A-S Seasonal Adjustment Program."
- Mary H. Mulry, "Discussion of the session 'Estimation Issues.'"
- Yuling Pan, Ashley Landreth, Alisú Schoua-Glusberg, Marjorie Hinsdale, and Hyunjoo Park, "Effects of Language and Culture on Interpretation of Translated Confidentiality" and "Mandatory" Survey Messages."

Conference on the Event History Calendar Method, Washington, D.C., December 5-6, 2007.

- Jason Fields and Jeff Moore, "Description of Plans for a SIPP Calendar Validation Study: Study Design and Analysis."
- Jeff Moore, "Seam Bias in the 2004 SIPP Panel: Much Improved, but Much Bias Still Remains."
- Joanne Pascale and Alice McGee, "A Multi-Method Evaluation of the Use of an Event History Calendar."

Joint UNECE Eurostat Work Session on Statistical Data Confidentiality, Manchester, UK, December 17-19, 2007.

- Laura Zayatz, "New Implementations of Noise for Tabular Magnitude Data, Synthetic Tabular Frequency and Microdata, and a Remote Microdata Analysis System."

Washington Statistical Society (WSS), Washington, D.C., January 16, 2008.

- Joanne Pascale, "Medicaid Underreporting in the CPS: Results from a Record Check Study."

BSF/DIMACS/DyDAn Workshop on Data Privacy, Rutgers University, New Brunswick, NJ, February 4-7, 2008. (abstracts and slide presentations will be online at www.dimacs.rutgers.edu/Workshops/DataPrivacy/program.html)

- Paul Massell, "Protecting the Confidentiality of Tables by Adding Noise to the Underlying Microdata."

Washington Statistical Society, New York, New York, February 7, 2008.

- William E. Winkler, "Analytically Valid Discrete Data and Re-identification."

National Science Foundation Conference on Name Matching, Arlington, VA, February 29, 2008.
- William E. Winkler, "Overview of Name Matching."

Advertising Research Foundation (ARF), Re: Think, New York, New York, April 2, 2008.
- Nancy Bates and Mary H. Mulry, "Predicting Return on Investment Across Population Segments in a Social Marketing Campaign."

Washington Statistical Society, Washington, D.C., April 15, 2008.
- Sam Hawala, "Assessing Disclosure Risk, and Preventing Disclosure, in Microdata," presentation with J. Neil Russell, National Center for Education Statistics; Michael Weber, Internal Revenue Service; and Sonya Vartivarian, Mathematica.

Meeting of the China Chapter of the International Usability Professionals Association, Shanghai, People's Republic of China, April 18, 2008.
- Elizabeth D. Murphy, "Integrating Usability with Project Plans for Software Engineering."

George Washington University School of Public Health, Graduate Level Methods Class Invited Presentation, Washington, D.C., April 21, 2008.
- Laurie Schwede, "Using Qualitative and Quantitative Methods: A Case Study of Household Structure and Race/Ethnicity."

Seasonal Adjustment - Introductory Course, Luxembourg City, Luxembourg, April 21-24, 2008.
- Brian C. Monsell, "The X-12-ARIMA and X-13A-S Seasonal Adjustment Program."

2nd Annual Probability and Statistics Day, Department of Mathematics and Statistics, University of Maryland, Baltimore County, April 25-26, 2008
- Aref N Dajani, Pamela W. Ferrari, Thomas F. Petkunas, and Edward H. Porter, "Nit Picky Random Sampling."

A Two-Day Workshop on Bayesian Methods that Frequentists Should Know, Statistics Consortium, The University of Maryland College Park, April 30-May 1, 2008
- Donald Malec, "Application of Bayesian Methods in Small Area Estimation."

Annual Meeting of the American Association for Public Opinion Research (AAPOR), New Orleans, Louisiana, May 14-18, 2008.
- Nancy Bates and Mary H. Mulry, "Building a Segmentation Model to Target the 2010 Census Communications Campaign."
- Anna Chan and Yuling Pan, "Effects of Advance Materials: A Comparison Between Native English Speakers and Chinese Speakers."
- Jennifer Hunter Childs, "Gathering Data from Non-Responders."
- Theresa DeMaio and Jennifer Beck, "Developing Questionnaire Items to Measure Identity Theft."
- Patricia Goerman, Jennifer Hunter Childs, and Matthew Clifton, "Explaining Differences in Inter-coder Reliability between English and Spanish Language Behavior Coding Research."
- Elizabeth Nichols, Jennifer Hunter Childs, and K. Linse, "RDD vs. Site Test: Mode Effects on Gathering a Household Roster and Alternate Addresses."
- Dawn Norris, Jennifer Hunter Childs, and Elizabeth Nichols, "Enhancing Validity and Reliability of Data Gathered by Paper-Administered Personal Interview Questionnaires."
- Joanne Pascale, "Health Insurance Measurement: A Synthesis of Cognitive Testing Results."
- Laurie Schwede, "'Carrot' or 'Stick' Approach to Reminder Cards: What Do Cognitive Respondents Think?"

International Field Director's and Technologies Conference, New Orleans, LA, May 20, 2008.
- Larry Malakhoff, "Using Voice Recognition Technology & a Modified Pen Cursor to Improve Usability of Handheld Computers."

Second International Total Survey Error Workshop, Research Triangle Park, NC, June 3, 2008.
- Mary H. Mulry, "Error Structure in Estimates of Census Coverage Error Components."

Census Information Centers/State Data Centers Steering Committee, U.S. Census Bureau, Washington, D.C., June 4, 2008.

- Kathleen T. Ashenfelter, "Expert Review of Census Information Center and State Data Center Web Sites: Preliminary Usability Findings."

International Conference on Survey Methods in Multinational, Multiregional, and Multicultural Contexts (3MC), Berlin, Germany, June 25-28, 2008.

- Jennifer Hunter Childs and Patricia Goerman, "Multilingual Questionnaire Evaluation and Development through Mixed Pretesting Methods: The Case of the U.S. Census Nonresponse Followup Instrument."
- Patricia Goerman and R. Caspar, "Development of Best Practices for Managing the Cognitive Pretesting of Multilingual Survey Instruments."
- Yuling Pan, Ashley Landreth, Alisu Schoua-Glusberg, Marjorie Hinsdale, and Hyunjoo Park, "Cognitive Interviewing in Non-English Languages: A Cross-cultural Perspective."

4th International Symposium on Politeness Research: East Meets West - Advances in Politeness Research, Budapest, Hungary, July 2 – 4, 2008,

- Yuling Pan, Invited keynote entitled "Beyond the Form of Linguistic Presentation: Approach to Politeness across Cultures."

Institute of Electrical and Electronic Engineers (IEEE), Montreal, Quebec, July 14, 2008.

- Erica Olmsted-Hawala, "Information Architecture: Strategies for Analysis of Card-sorting Data for Organizing Information on the Census Bureau Web Site."

Annual Meeting of the Cognitive Science Society, Washington, D.C., July 22-26, 2008.

- Kathleen T. Ashenfelter, "Coordination and self-symmetry of verbal and nonverbal behaviors during face-to-face dyadic conversation."

Joint Statistical Meetings, American Statistical Association, Denver, CO, August 3-7, 2008.

- Christopher Blakely, "Using Besov Spaces and Empirical Mode Decomposition for Seasonal Extraction in Nonstationary Time Series."
- Scott Holan and Tucker McElroy, "A Bayesian Approach to Estimating the Long Memory Parameter."
- Tucker McElroy, "Negative Seasonability and the Reduction of Dips in the Spectrum of a Seasonally Adjusted Time Series."
- Brian Monsell, "A Modification to Khandakar and Hyndman's ARIMA Model Selection Algorithm Using an Empirical Information Criterion."
- Mary Mulry, Bruce Spencer, Tom Mule, Nganha Nguyen, and Eric Schindler, "Direct Estimates as a Diagnostic for Dual System Estimators Based on Logistic Regression."
- Laurie Schwede, "Using Multiple Data Sources to Identify Types and Sources of Coverage Errors on an American Indian Reservation."
- Eric Slud and Yves Thibaudeau, "Bias of BRR Variance Estimation in Surveys Weight Adjusted for Nonresponse."
- Yves Thibaudeau and Eric Slud, "Using Post-Stratification to Adjust Horvitz-Thompson Estimation and Balanced Repeated Replication for Nonresponse in Longitudinal Surveys."
- William Winkler, "General Methods and Algorithms for Modeling and Imputing Discrete Data under a Variety of Constraints."
- William Yancey, William Winkler, and Edward Porter, "Fast Record Linkage of Very Large Files in Support of Decennial and Administrative Records Projects."
- Laura Zayatz, "New Ways to Provide More and Better Data to the Public While Still Protecting Confidentiality."

7th International Conference on Social Science Methodology RC33, Naples, Italy, September 1-4, 2008.

- Jennifer H. Childs, "Guidelines for Designing Questionnaires for Administration in Different Modes."
- Alice McGee and Joanne Pascale, "Using a combination of methods to evaluate ELSA's Event History Calendar."

ASA/SRM SIPP Working Group, Alexandria, VA, September 16, 2008.

- Jeff Moore and Jason Fields, "The SIPP Event History Calendar Field Test: Analysis Plans and Preliminary Report, August 2008."

BSF/DIMACS/DyDAn Workshop on Data Privacy, Rutgers University, Newark, NJ, September 19, 2008.

- Paul B. Massell, "Ensuring that Statistical Data Do Not Reveal Too Much about the Underlying Private Data."

5. STATISTICAL RESEARCH DIVISION SEMINAR SERIES

Seminar Series Team: Aref Dajani, Richard Griffin (DSSD), Paul Massell, Barbara Palumbo, Laurie Schwede, Katherine Thompson (ADEP)

Nanda Srinivasan, Cambridge Systematics, Inc., "Partial Data Synthesis for Small Area Tabulations," October 2, 2007.

George Andrews, The Pennsylvania State University, "Introduction to Number Theory and Modelling the Average Running Time of Computer Programs," November 8, 2007.

Guillermo Mendez, Arizona State University, "Tree-Based Methods to Model Clustered Data," November 8, 2007.

George Carter III, SRD, U.S. Census Bureau, "Measurement of Housing Quality and Neighborhood Quality in the American Community Survey (ACS) and American Housing Survey (AHS)," November 15, 2007.

Frances Morphy, Fellow, Centre for Aboriginal Economic Policy Research, The Australian National University, "The Indigenous Enumeration Strategy in the Australian National Census: A Critical Appraisal," November 27, 2007.

Bor-Chung Chen, SRD, U.S. Census Bureau, "Stochastic Simulation of Field Operations in Surveys," November 29, 2007.

Joseph Kang, The Pennsylvania State University, "Causal Inference by Semiparametric Imputation," December 4, 2007.

Song X. Chen and Cheng Yong Tang, Iowa State University, "Local Post-Stratification and Estimation in Dual System Accuracy and Coverage Evaluation for US Census," December 13, 2007.

Christopher D. Blakely, SRD, U.S. Census Bureau, "Extracting Intrinsic Modes in Stationary and Nonstationary Time Series Using Reproducing Kernels and Quadratic Programming," January 30, 2008.

Paul Beatty, National Center for Health Statistics, "Experiments on the Optimal Design of Complex Survey Questions," January 31, 2008.

James Holmes, Former Acting Director, U.S. Census Bureau (The Wise Elders Program), "A View From the Field," February 5, 2008.

Mark Palumbo, Indiana University of Pennsylvania, "Using Cognitive Predictors for Evaluation," March 28, 2008.

Bimal Sinah, University of Maryland, Baltimore County, "Statistical Meta-Analysis-A Review," April 15, 2008.

Jason Lucero, University of New Mexico, "Leptoconops Cateri vs. Leptoconops Torrens: The Comparison of Two Similar Fly Species," April 17, 2008.

Jon Krosnick, Stanford University, "The Challenges of Measuring Facts Accurately in Surveys: Small Changes in Question Wording Can Make a Difference," April 29, 2008.

Don Adams, Former Assistant Director of Economic Programs, U.S. Census Bureau (The Wise Elders Program), "Different Directorates, Not So Different Approach," May 8, 2008.

Getaneh Yismaw, Southern Methodist University, "Statistical Analysis of High-Throughput Screening Data from a Lung Cancer Experiment," May 13, 2008.

David Dolson, Statistics Canada, "Assessment of Coverage Error in the 2006 Canadian Census," May 13, 2008.

Jennifer Huckett, Iowa State University, “Synthetic Data Methods for Disclosure Limitation,” June 19, 2008.

Tapan K. Nayak, The George Washington University, “Randomized Response Surveys, the Post-Randomization Method and Statistical Disclosure Controls,” July 2, 2008.

Lisa Singh, Georgetown University, “Mining Data Without Knowing Who’s Who,” July 9, 2008.

Theresa DeMaio, SRD, U.S. Census Bureau, “Cognitive Pretesting to Improve Surveys and Censuses,” July 28, 2008.

Diane K. Willimack, ADEP, U.S. Census Bureau, “The Effects of Survey Design Features and Economic Conditions on Business Survey Response Rates,” July 29, 2008.

Paul Beatty, National Center for Health Statistics, “The Design and Evaluation of Complex Survey Questions,” July 30, 2008.

Nancy Bates, U.S. Census Bureau; Mary Mulry, SRD, U.S. Census Bureau; and Linda A. Jacobsen, Population Reference Bureau, “Segmenting the Population for the Census 2010 Integrated Communications Campaign,” July 31, 2008.

Nadarajasundaram Ganesh, National Opinion Research Center, “Small Area Estimation: Spatial Modeling and Prediction,” August 19, 2008.

Patricia L. Goerman, SRD, U.S. Census Bureau, “Management of the Pretesting of Multilingual Survey Instruments: Development of Best Practices,” August 25, 2008.

Patrick Joyce, University of Connecticut and U.S. Census Bureau, “Small Area and CAR Spatial Modeling,” August 26, 2008.

Yuling Pan, SRD, U.S. Census Bureau, “Sociolinguistics and Multilingual Survey Research,” August 26, 2008.

Malay Ghosh, (ASA/NSF/Census Research Fellow) University of Florida, “Bayesian Benchmarking in Small Area Estimation,” September 3, 2008.

Laura Zayatz, U.S. Census Bureau, “New Ways to Provide More and Better Data to the Public While Still Protecting Confidentiality,” September 9, 2008.

Elizabeth Nichols and Jennifer Hunter Childs, SRD, U.S. Census Bureau. “Respondent Debriefings Conducted by Experts: A Technique for Questionnaire Evaluation.” September 30, 2008.

6. PERSONNEL ITEMS

6.1 HONORS/AWARDS/SPECIAL RECOGNITION

Silver Medal Award, U.S. Department of Commerce

- ***Brian Monsell*** - for his contributions to the development of the U.S. Census Bureau's X-12-ARIMA seasonal adjustment software, which is used by national and international statistical offices and central banks around the world; his contributions include programming much of the software, providing extraordinary support to users from the public and private sector, and making contributions to the methodology, all over a period of more than sixteen years.

Bronze Medal Award, U.S. Bureau of the Census

- ***Jennifer Childs*** – for applying methods and theories from the social science disciplines to survey measurement and implementation; her accomplishments include development and implementation of a program of pretesting and evaluation of data collection instruments for the census and coverage measurement operations.
- ***Patti Goerman*** – for applying methods of social science and linguistics to survey methodology and implementation; her accomplishments include development and implementation of a program of pretesting Spanish – language questionnaires for census data collection, and adapting the methodology of cognitive interviewing to monolingual Spanish respondents.
- ***Paul Massell*** – for the development and evaluation of innovative techniques in disclosure avoidance for establishment tabular data in support of economic censuses and surveys; his application of random noise, balanced noise, and rounding techniques has enabled the publication of more high-quality economic data while still protecting the confidentiality of respondents.
- ***Tucker McElroy*** – for contributions and published advances in the field of statistics and his recognition as a leader in research on time series analysis and signal extraction; his work in developing matrix formulas for signal extraction methods has led to improvements in diagnostics for model-based seasonal adjustment that have been implemented in Census Bureau software.

6.2 SIGNIFICANT SERVICE TO PROFESSION

Jennifer Beck
- Reviewed abstract submissions for American Association for Public Opinion Research (AAPOR).

Chris Blakely
- Refereed a paper for *The American Statistician.*

Pat Cantwell
- Associate Editor, *Journal of Official Statistics*.
- Associate Editor, *Survey Methodology*.
- Reviewed papers for the Joint Statistical Meetings (JSM).
- Member, selection subcommittee for Continuing Education courses at 2008 JSM.
- Member, The ASA's Committee on Committees.
- Member, The ASA's Committee on Meetings.

Anna Chan
- Refereed a paper for *Public Opinion Quarterly*.
- Reviewed abstract submissions for American Association for Public Opinion Research Conference.

Terry DeMaio
- Refereed papers for *Quality of Life* and *Public Opinion Quarterly*.
- Reviewed a draft NIST questionnaire concerning building emergency evacuation procedures.
- Reviewed abstract submissions for American Association for Public Opinion Research.

Jeremy Funk
- Member, Confidentiality and Data Access Committee (CDAC).

Patricia Goerman
- Refereed papers for *Journal of Survey Research Methodology* and *Ethnic and Racial Studies Journal*.
- Member, AAPOR Multilingual Interest Group.

Sam Hawala
- Member, Confidentiality and Data Access Committee (CDAC).
- Member, National Center for Education Statistics Disclosure Review Board.

Paul Massell
- Member, Confidentiality and Data Access Committee (CDAC).
- Member, Bureau of Transportation Statistics Disclosure Review Board.

Jerry Maples
- Refereed papers for *The American Statistician* and *Survey Methodology*.

Tucker McElroy
- Organizer, Topic Contributed Session, 2008 Joint Statistical Meetings.
- Refereed papers for *Journal of Multivariate Analysis, Journal of Time Series Analysis, Nonlinear Dynamics and Econometrics, Journal of Statistical Research, Journal of Computational and Graphical Statistics, Empirical Economics,* and *Journal of Nonparametric Statistics.*
- Developed and proposed an invited paper session for the 2009 Joint Statistical Meetings.
- Publications Officer, Business and Economic Statistics Section, American Statistical Association.

Brian Monsell
- Organizer, Topic Contributed Session, 2008 Joint Statistical Meetings.
- Webmaster and *AMSTAT Online* Assistant Editor, Business and Economic Statistics Section, American Statistical Association.
- Developed and proposed an invited paper session for the 2009 Joint Statistical Meetings.

Jeff Moore
- Refereed a paper for the *Journal of Official Statistics*.
- Reviewed a draft NIST questionnaire concerning building emergency evacuation procedures.

Mary H. Mulry
- Chair, Survey Research Methods Section, American Statistical Association.
- Associate Editor, *The American Statistician*.
- Associate Editor, *Journal of Official Statistics*.

Betty Murphy
- Reviewed three submissions for workshops proposed for the Usability Professional Association (UPA) 2008 Conference.

Yuling Pan
- Advisor, Editorial Advisory Board, *Handbook of Business Discourse*.
- Member, Coordinating Committee, Chinese Discourse Research Group.
- Member and Co-Organizer, AAPOR Multilingual Interest Group.

- Member, Advisory Board, *Journal of Politeness Research.*
- Reviewed a book for *Journal of Politeness Research*.
- Co-organized panels for the 11th International Pragmatics Conference (July 2009, Melbourne, Australia) and the International Symposium on Face and Politeness (July 2009, Griffith University, Brisbane, Australia)
- Reviewed twenty-five abstracts for the International Symposium on Face and Politeness and the 11th International Pragmatics Conference

Joanne Pascale
- Refereed papers for *Inquiry, Health Services Research Journal*, and *Journal of Official Statistics*.
- Reviewed a paper for the Federal Committee on Statistical Methodology

Eric Slud
- Associate Editor, *Journal of Royal Statistical Society, Series B.*
- Associate Editor, *Lifetime Data Analysis*.
- Co-organizer, "Bayesian Methods that Frequentists Should Know," a workshop at the University of Maryland, College Park.

Phil Steel
- Member, Confidentiality and Data Access Committee (CDAC).
- Member, Federal Committee on Statistical Methodology (FCSM) Privacy Committee.

Bill Winkler
- Member, Program Committee for Privacy in Statistical Databases 2008.
- Refereed papers for *Communications in Statistics: Simulation and Computation, Transactions on Data Privacy, Journal of Official Statistics, IEEE Transactions on Knowledge and Data Engineering*, and *PSD '09.*
- Associate Editor, *Journal of Privacy Technology.*
- Associate Editor, *Journal of Privacy and Confidentiality.*
- Associate Editor, *Transactions on Data Privacy.*
- Member, Committee on Voter Registration Databases, National Academies of Science.
- Reviewed a proposal for the National Science Foundation.

Tommy Wright
- Associate Editor, *The American Statistician.*
- Associate Editor, *The American Journal of Mathematical and Management Sciences*.
- Member, Department of Statistics Advisory Council, George Mason University.
- Member, Department of Mathematics Advisory Board for Masters Program, Georgetown University.
- Member, 2009 ISI Session Program Committee, International Association of Survey Statisticians.
- Member, Morris Hansen Lecture Committee, Washington Statistical Society.

Laura Zayatz
- Member, Confidentiality and Data Access Committee (CDAC).
- Member, Advisory Board, *Journal of Privacy Technology*.
- Member, Committee on Privacy and Confidentiality, American Statistical Association.
- Member, UK Census Design and Methodology Advisory Committee, refereed a report on proposed disclosure avoidance techniques to be used by the Office of National Statistics, United Kingdom, for Census 2011.
- Refereed a file for the *Journal of Official Statistics*.
- Reviewed a proposal for the National Science Foundation.
- Member, Disclosure Review Board (ad hoc), Patient Safety Organization Privacy Protection Center.

6.3 PERSONNEL NOTES

Irma Hindrayanto (Graduate student at Free University of Amsterdam) started and completed an internship with the Time Series Research Group.

Jun Shao (Statistics Faculty, University of Wisconsin) accepted a Schedule A appointment in our Missing Data Methods Research Group.

Allison Morgan (Ph.D. candidate in information sciences and technology at The Pennsylvania State University) joined our Human Factors & Usability Research Group as an intern.

Diana Simmons accepted a position with the Administrative and Management Systems Division.

Bor-Chung Chen accepted a position with the U.S. Department of Transportation's Railroad Administration.

Michelle Danaher (junior in statistics at U. of Maryland Baltimore County) joined our division as an intern.

George Carter completed his Postdoctoral appointment in our division and accepted a position in the Housing and Household Economic Statistics Division.

Sam Hawala accepted a position in the Data Integration Division.

Manuel de la Puente accepted a position with the Social Security Administration.

Eleanor Gerber retired from the Census Bureau after 14 years of federal service.

Matthew Clifton (B.A. candidate in Spanish/linguistics at Georgetown University) joined our division as an intern and eventually accepted a permanent position.

Elizabeth (Ellie) Ransom (graduate student in mathematics/statistics at Georgetown University) joined our division as an intern.

Phil Steel accepted a position in the Economic Directorate.

Alice Bell retired from the Census Bureau after 28 years of federal service.

Judi Norvell retired from the Census Bureau after 32 years of federal service.

Jeremy Funk accepted a position with Capital One.

Mohammed Chaudhry accepted a position in the Systems Support Division.

Anissa Sorokin (graduate student in linguistics at Georgetown University) joined our division as an intern.

Nathan Jurgenson (Ph.D. student in sociology at University of Maryland, College Park) joined our division as an intern.

Jennifer Romano (Ph.D. candidate in psychology at The Catholic University of America) joined our division as an intern.

Adam Persing (graduate student in mathematics/statistics at Georgetown University) joined our division as an intern.

Mikelyn Meyers (graduate student in sociolinguistics at Georgetown University) joined our division as an intern.

Virginia Wake accepted a Postdoctoral Research position in our division.

Leticia Fernandez transferred to our division from the Population Division.

Summer Visitors:
Patrick Joyce (Ph.D. candidate in statistics at University of Connecticut).
Marlow Lemons (Ph.D. student in research and measurement at Virginia Tech University).
Cynthia Tooley (graduate student in sociology at University of Missouri, Kansas City).
Kenneth Merritt (sophomore in finance at the University of Florida).
Christopher Roberts (graduate student in statistics at University of Missouri, Columbia).
Grace Haige Zhou (junior at Columbia University).
Stephanie Burres (doctoral student in sociology at University of Maryland, College Park).
Debra Miller (graduate student in survey research and methodology at University of Nebraska, Lincoln).
Brandon Tolson (sophomore in economics at Salisbury University).

Tucker McElroy participated in the Summer Program in Mathematical Cryptology at the Institute for Defense Analyses (IDA-CCR LaJolla), a federally funded research and development corporation, for 10 weeks this summer.

Natalya Titova accepted a position in our Time Series Research Group.

Jennifer Childs was accepted into the Department of Commerce Executive Leadership Development Program.

Stephanie Sheffield joined our division as Editor.

Malay Ghosh (Professor of Statistics at the University of Florida) joined the Census Bureau as an ASA/NSF/Census Research Fellow.

Getaneh Yismaw joined our division briefly before accepting a position with the Internal Revenue Service.

George Higbie joined our Language and Measurement Research Group.

Lisa Singh (Computer Science Faculty, Georgetown University) accepted a Schedule A appointment in our Disclosure Avoidance Research Group.

Asoka Ramanayake joined our Disclosure Avoidance Research Group.

Bimal Sinha (Statistics Faculty, University of Maryland – Baltimore County) accepted a Schedule A appointment in our Disclosure Avoidance Research Group.

Jon Krosnick (Communications Faculty, Stanford University) accepted a Schedule A appointment in our Language and Measurement Research Group.

APPENDIX A **Statistical Research Division's FY 2008 Program Sponsored Projects/Subprojects With Substantial Activity and Progress and Sponsor Feedback (Basis for PERFORMANCE MEASURES)**

Project #	Project/Subproject Sponsor(s)	SRD Contact	Sponsor Contact
	DECENNIAL		
5210801	Forms Development		
5210802	Content Planning and Development		
	1. Census Questionnaire Design Features	Jenny Childs	Sharon Boyer
	2. Short Form Questionnaire Content Other Than Race & Ethnicity	Terry DeMaio	Kathleen Styles
	3. Development of Race and Ethnicity Questions	Leticia Fernandez	Karen Humes
5210803	*4. Language Planning and Development*	Patti Goerman	Kathleen Styles
5310801	Data Collection Planning and Development		
	5. Usability Input to the Field Data Collection Automation (FDCA) Program	Larry Malakhoff	Rosemary Byrne
	6. Usability Review of the NRFU Paper Form	Erica Olmsted-Hawala	Sharon Boyer
	7. 2010 Census Internet Usability Testing	Betty Murphy	Kathleen Styles
5610802	Statistical Design and Estimation		
	8. Decennial Record Linkage	William Winkler	Maureen Lynch
	9 Decennial Disclosure Avoidance	Laura Zayatz	Marie Pees
	10. Census Unduplication Research	Michael Ikeda	Maureen Lynch
5610803	Coverage Measurement Planning and Development		
	11. Coverage Measurement Research	Don Malec	Tom Mule
	12. Accuracy of Coverage Measurement	Mary Mulry	Donna Kostanich
	13. Questionnaire Wording and Automation Team	Beth Nichols	Donna Kostanich
5610805	Coverage Improvement Planning and Development/		
5610806	Evaluation Planning Coordination		
	14. Decennial Privacy Research	Jeff Moore	Mary Frazier
	15. Development of Questionnaires for Decennial Coverage Improvement	Jenny Childs	Elizabeth Krejsa
	16. Evaluations, Experiments, and Assessments Operational Integration Team (EEA OIT)	Laura Schwede	Debbie Bolton
5385860	American Community Survey (ACS)		
	17. ACS Missing Data and Imputation	María García	Douglas Hillmer
	18. ACS Group Quarters Item Imputation and Micro Data Disclosure Avoidance Research	Yves Thibaudeau	Mark E. Asiala
	19. ACS Language Research	Yuling Pan	Todd Hughes
	20. ACS Applications for Time Series Methods	Tucker McElroy	Alfredo Navarro
	21. ACS Variances	Eric Slud	Mark E. Asiala
	22. ACS Data Projects - Display of Variability Measures	Lynn Weidman	Doug Hillmer
	23. ACS Additional Mail Test	Laurie Schwede	Jennifer Guarino Tancreto
	24. ACS Website: Card-sorting Study	Erica Olmsted-Hawala	Jennifer Holland
	25. AFF/ACS Low Fidelity Usability Study	Erica Olmsted-Hawala	Jan Ennis
	26. ACS Multiyear Estimates: User Guidelines for Choosing Between 1-, 3-, and 5-year Estimates	Lynn Weidman	Alfredo Navarro
	27. ACS 3-year Estimates: Methods for Analyst Review	Lynn Weidman	Doug Hillmer
	28. ACS: 2005 and 2006 Item Nonresponse Rates	Pam Ferrari	Debbie Griffin
	29. ACS Data Quality Indicator Project	Kathleen Ashenfelter	Jennifer Guarino Tancreto
	30. ACS Messaging Project	Laurie Schwede	Mary Davis

Project #	Project/Subproject Sponsor(s)	SRD Contact	Sponsor Contact
	DEMOGRAPHIC		
1443000	*31. Current Population Survey (CPS) Annual Social and Economic Supplement (ASEC) Tables*	Aref Dajani	Karen Humes
TBA	*32. Use of the Empirical Bayes Approach in the Housing Unit Method for Population Estimates*	Lynn Weidman	Charles Coleman
0906/7374	*33. Data Integration*	Ned Porter	Marie Pees
1440555	*34. Quick Turnaround Pretesting of Household Surveys (National Crime Victimization Survey-Identity Theft Supplement and Internet Predation Questions)*	Terry DeMaio	Marilyn Monahan
TBA	*35. Migration Supplement to the Current Population Survey*	Anna Chan	Elizabeth Grieco
1465001	Re-Engineered Survey of Income and Program Participation (RE-SIPP) Research		
	36. RE-SIPP Methodological Research	Jeff Moore	David S. Johnson
7558111	*37. SIPP Measurement of Wealth: Assets/Liabilities Imputation Research/Software Design*	Yves Thibaudeau	Thomas Palumbo
TBA	*38. 2010 NSCG Research to Model Field of Degree Information for College Graduates in the ACS*	Don Malec	John Finamore
4000801	*39. Sample Redesign*	Lynn Weidman	Patrick Flanagan
7165000	*40. Research for Small Area Income and Poverty Estimates (SAIPE)*	Elizabeth Huang	Lucinda Dalzell
TBA	*41. Small Area Health Insurance Estimates (SAHIE)*	Don Malec	Donald Luery
	ECONOMIC		
2370854	*42. Editing Methods Development (Investigation of Selective Editing Procedures for Foreign Trade Programs)*	María García	Ryan Fescina
2470851	*43. Disclosure Avoidance Methods*	Laura Zayatz	Rita Petroni
2370852	Time Series Research		
	44. Seasonal Adjustment Software Development and Evaluation	Brian Monsell	Kathleen McDonald-Johnson
	45. Research on Seasonal Time Series - Modeling and Adjustment Issues	Tucker McElroy	Kathleen McDonald-Johnson
7497000	*46. Survey of Research and Development in Industry, Imputation and Sampling Research and Software Design*	Yves Thibaudeau	Jeri Mulrow
	STRATEGIC PLANNING AND INNOVATION		
0359999	*47. Remote Access – Microdata Analysis System*	Laura Zayatz	Nancy Gordon
	STATISTICAL RESEARCH DIVISION		
8150000	*48. Postal Regulatory Commission/Statistical Consulting*	Leroy Bailey	John Waller
Other	*49. An Accessibility and Usability Evaluation of the Quality Information for Successful Printing II (QUISP2) Application*	Larry Malakhoff	Teresa Caldaro
	50. An Accessibility Evaluation of the Secure Message Center Application	Larry Malakhoff	Robert Brown
	51. An Accessibility Evaluation of the Classification Analytical Processing System Application	Larry Malakhoff	Danny Lee
	52. An Accessibility Evaluation of the Win X-12 Application	Larry Malakhoff .	Kathleen McDonald-Johnson
	53. An Accessibility and Usability Review of the Census in Schools Application	Larry Malakhoff	Victoria Glasier
	54. An Accessibility and Usability Evaluation of the 2008 Title 13 Awareness E-learning Application	Larry Malakhoff	Mary Catherine Potter
	55. Web Governance Video/Multimedia Working Group	Larry Malakhoff	Carollynn Hammersmith
	56. An Accessibility and Usability Evaluation of the StEPS E-Learning Application	Larry Malakhoff	Lisa Lawler
	57. Current Population Survey (CPS) Health Insurance Measurement Research	Joanne Pascale	Chuck Nelson

APPENDIX B

FY 2008 PROJECT PERFORMANCE MEASUREMENT QUESTIONNAIRE STATISTICAL RESEARCH DIVISION

Dear

In a continuing effort to obtain and document feedback from program area sponsors of our projects or subprojects, the Statistical Research Division will attempt for the tenth year to provide *seven measures of performance,* this time for the fiscal year 2008. For FY 2008, the *measures of performance* for our division are:

- *Measure 1. Overall, Work Met Expectations:* Percent of FY 2008 Program Sponsored Projects/Subprojects where sponsors reported that work met their expectations.
- *Measure 2. Established Major Deadlines Met:* Percent of FY 2008 Program Sponsored Projects/Subprojects where sponsors reported that all established major deadlines were met.
- *Measure 3a. At Least One Improved Method, Developed Technique, Solution, or New Insight:* Percent of FY 2008 Program Sponsored Projects/Subprojects reporting at least one improved method, developed technique, solution, or new insight.
- *Measure 3b. Plans for Implementation*: Of the FY 2008 Program Sponsored Projects/Subprojects reporting at least one improved method, developed technique, solution, or new insight, the percent with plans for implementation.
- *Measure 4. Predict Cost Efficiencies:* Number of FY 2008 Program Sponsored Projects/Subprojects reporting at least one "predicted cost efficiency."
- *Measure 5. Journal Articles, Publications:* Number of journal articles (peer review) and publications documenting research that appeared or were accepted in FY 2008.
- *Measure 6. Proceedings Publications:* Number of proceedings publications documenting research that appeared in FY 2008.

These measures will be based on response to the five questions on this form from our sponsors as well as from members of our division and will be used to help improve our efforts.

To construct these seven measures for our division, we will combine the information for all of our program area sponsored projects or subprojects obtained during October 1 thru October 26, 2008 using this questionnaire. Your feedback is requested for:

Project Number and Name: _____
Sponsoring Division(s): _____

After all information has been provided, the SRD Contact _____ will ensure that the signatures are obtained in the order indicated on the last page of this questionnaire.

We very much appreciate your assistance in this undertaking.

_____

Tommy Wright Date
Chief, Statistical Research Division

Brief Project Description ***(SRD Contact will provide from Division's Quarterly Report):***

Brief Description of Results/Products from FY 2008 ***(SRD Contact will provide)****:*

(over)

TIMELINESS:
Established Major Deadlines/Schedules Met

1(a). Were all established major deadlines associated with this project or subproject met? **(Sponsor Contact)**

□ Yes □ No □ No Established Major Deadlines

1(b). If the response to 1(a) is No, please suggest how future schedules can be better maintained for this project or subproject. **(Sponsor Contact)**

QUALITY & PRODUCTIVITY/RELEVANCY:
Improved Methods / Developed Techniques / Solutions / New Insights

2. Listed below are at most 2 of the top improved methods, developed techniques, solutions, or new insights offered or applied on this project or subproject in FY 2008 where an SRD staff member was a significant contributor. Review "a" and "b" below **(provided by SRD Contact)** and make any additions or deletions as necessary. For each, please indicate whether or not there are plans for implementation. If there are no plans for implementation, please comment.

□ No improved methods/techniques/solutions/new insights developed or applied.

□ Yes as listed below. (See a and b.)

Plans for Implementation?

a. _____ Yes □ No □

b. _____ Yes □ No □

Comments (Sponsor Contact):

COST:
Predict Cost Efficiencies

3. Listed **(provided by SRD Contact)** below are at most two research results or products produced for this project or subproject in FY 2008 that predict cost efficiencies. Review the list, and make any additions or deletions as necessary. Add any comments.

□ No cost efficiencies predicted.
□ Yes as listed below. (See a and b.)

a.

b.

Comments (Sponsor Contact):

OVERALL:
Expectations Met/Improving Future Communications

4. Overall, work on this project or subproject by SRD staff during FY 2008 met expectations. **(Sponsor Contact)**

□ Strongly Agree
□ Agree
□ Disagree
□ Strongly Disagree

5. Please provide suggestions for future improved communications or any area needing attention on this project or subproject. **(Sponsor Contact)**

(SRD Contact will coordinate first two signatures as noted and pass to SRD Chief.)

First_____
Sponsor Contact Signature Date

Second_____
SRD Contact Signature Date

(SRD Chief will coordinate last two signatures as noted.)

Third_____
Sponsor Division Chief Signature Date

Fourth_____
SRD Division Chief Signature Date

Since August 1, 1933—

". . . As the major figures from the American Statistical Association (ASA), Social Science Research Council, and new Roosevelt academic advisors discussed the statistical needs of the nation in the spring of 1933, it became clear that the new programs—in particular the National Recovery Administration—would require substantial amounts of data and coordination among statistical programs. Thus in June of 1933, the ASA and the Social Science Research Council officially created the Committee on Government Statistics and Information Services (COGSIS) to serve the statistical needs of the Agriculture, Commerce, Labor, and Interior departments . . . COGSIS set . . . goals in the field of federal statistics . . . (It) wanted new statistical programs—for example, to measure unemployment and address the needs of the unemployed . . . (It) wanted a coordinating agency to oversee all statistical programs, and (it) wanted to see statistical research and experimentation organized within the federal government . . . In August 1933 Stuart A. Rice, President of the ASA and acting chair of COGSIS, . . . (became) assistant director of the (Census) Bureau. Joseph Hill (who had been at the Census Bureau since 1900 and who provided the concepts and early theory for what is now the methodology for apportioning the seats in the U.S. House of Representatives) . . . became the head of the new Division of Statistical Research . . . Hill could use his considerable expertise to achieve (a) COGSIS goal: the creation of a research arm within the Bureau . . . "

Source: Anderson, M. (1988), *The American Census: A Social History*, New Haven: Yale University Press.

Among others and since August 1, 1933, the Statistical Research Division has been a key catalyst for improvements in census taking and sample survey methodology through research at the U.S. Census Bureau. The introduction of major themes for some of this methodological research and development where staff of the Statistical Research Division[1] played significant roles began roughly as noted—

- **Early Years (1933–1960s):** *sampling (measurement of unemployment and 1940 census); probability sampling theory; nonsampling error research; computing; data capture.*
- **1960s–1980s:** *self-enumeration; social and behavioral sciences (questionnaire design, measurement error, interviewer selection and training, nonresponse, etc.); undercount measurement, especially at small levels of geography; time series and seasonal adjustment.*
- **1980s–Early 1990s:** *undercount measurement and adjustment; ethnography; record linkage; confidentiality and disclosure avoidance.*
- **Mid–1990s–Present:** *small area estimation; missing data and imputation; usability (human-computer interaction); linguistics, languages, and translations.*

[1] The Research Center for Measurement Methods joined the Statistical Research Division in 1980. In addition to a strong interest in sampling and estimation methodology, research largely carried out by mathematical statisticians, the division also has a long tradition of nonsampling error research, largely led by behavioral and social scientists. Until the late 1970s, research in this domain (e.g., questionnaire design, measurement error, interviewer selection and training, nonresponse) was carried out in the division's Response Research Staff. Around 1979 this staff split off from the division and became the Center for Human Factors Research. The new center underwent two name changes—first, to the Center for Social Science Research, in 1980, and then, in 1983, to the Center for Survey Methods Research before rejoining the division in 1994.

U.S. Census Bureau
Statistical Research Division
Room 5K108
4600 Silver Hill Road
Washington, DC 20233
301-763-1702

Statistical Research Division

Assistant Division Chief
Robert Creecy
Chad Russell
VACANT

Machine Learning & Computational Statistics Research
Bill Winkler
William Yancey
VACANT

Computing Applications
Aref Dajani
Pam Ferrari
Tom Petkunas
Ned Porter
VACANT

Missing Data Methods Research
Yves Thibaudeau
Maria Garcia
Rolando Rodriguez
Jun Shao (U. of WI)
VACANT

Assistant Division Chief
Pat Cantwell
Gloria Prout

Sampling Research
Lynn Weidman
Mike Ikeda
Mary Mulry
Eric Slud (U. of MD)
Julie Tsay
VACANT
VACANT

Small Area Estimation Research
Don Malec
Malay Ghosh (F)
Elizabeth Huang
Jerry Maples

Disclosure Avoidance Research
Laura Zayatz
Marlow Lemons (S)
Jason Lucero
Paul Massell
Tapan Nayak (GWU)
Asoka Ramanayake
Elizabeth Ransom (S)
Lisa Singh (Georgetown U)
Bimal Sinha (UMBC)
VACANT
VACANT

Time Series Research
Brian Monsell
Chris Blakely (S/Postdoc)
Tucker McElroy
Natalya Titova
VACANT
VACANT

Assistant Division Chief
VACANT
Tina Arbogast

Questionnaire Design & Measurement Research
Jeff Moore
Stephanie Burres (S)
Anna Chan
Joanne Pascale
VACANT

Language & Measurement Research
Yuling Pan
Jenny Hunter Childs
Matt Clifton
Leticia Fernandez
Patti Goerman
George Higbie
Nathan Jurgenson (S)
Jon Krosnick (Stanford U)
Eliot Lee (S)
Mikelyn Meyers (S)
Laurie Schwede
Anissa Sorokin (S)
Rodney Terry (Postdoc)
Virginia Wake (Postdoc)
VACANT

Questionnaire Pretesting for Household Surveys
Terry DeMaio
Jen Beck
Dawn Norris (S)
Lorraine Randall
VACANT

Human Factors & Usability Research
Betty Murphy
Kathleen Ashenfelter
Jenna Beck (S)
Temika Holland (S)
Larry Malakhoff
Beth Nichols
Erica Olmsted-Hawala
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