

Census 2000 Dress Rehearsal Evaluation Summary

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**Economics and Statistics
Administration**

Robert J. Shapiro
Under Secretary
for Economic Affairs



Bureau of the Census

Dr. Kenneth Prewitt
Director

William G. Barron
Deputy Director

Paula J. Schneider
Principal Associate Director
for Programs

Cynthia Z. F. Clark
Associate Director for
Methodology and Standards

John H. Thompson
Associate Director for
Decennial Census

For questions regarding this report please contact the Planning, Research, and Evaluation Division, Bureau of the Census (301) 457-3525.

Census 2000 Dress Rehearsal

Evaluation Summary

Planning, Research, and
Evaluation Division
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Decennial Statistical Studies Division

Nicholas Alberti, Rosemary Byrne, Danny Childers, Jon Clark, C. Robert Dimitri, Courtney Ford, Deborah Griffin, Kevin Haley, John Hilton, Howard Hogan, Carrie Johanson, Charisse Jones, Susan Love, Christine Lynch, Maureen Lynch, Ann McGaughey, Tracey McNally, Miriam Rosenthal, Eric Schindler, Jimmie Scott, Martha Sutt, Michael Tenebaum, James Treat, David Whitford, and Erin Whitworth.

Decennial Systems and Contract Management Office

Florence Abramson, Dan Burkhead, Wendy Davis, Don Dwyer, Charles Kahn, Ellen Katzoff, Michael Longini, Derrell Matthews, George McLaughlin, Gerard Moore, Dan Philipp, Emmett Spiers, Dennis Stoudt, and Jess Thompson.

Field Division

Arlet Aanested, Miriam Balutis, Richard Blass, Angel Broadnax, Yorlunza Brown, Geraldine Burt, Caliber Associates, Moises Carrasco, Caren Drinkard, John Eggert (InfoWorks International Inc.), Lynda Foltyn, Kathleen Garcia, Susan Hardy, Harold Hayes, Christine Hough, Dayna Jacobs, Jan Jaworski, Nola Krasko, Richard Liquori, Brian Monaghan, Ruth Mangaroo, Geraldine Mekonnen, Alyssa Meerholz, Monique Miles, Charles Moore, Lois Moore, Stanley Moore, Sandra Lucas, Lori Putman, Cheryl Querry, Christine Real, Karen Seebold, Mark Taylor, Carol Van Horn, Sabrina Wells, Pamela White, and Rosalinda Yangas.

Financial and Administrative Systems Division

Janet Beck, Warren O. Davis, Nevins Frankel, Carole Messina, David Mushrush, Joseph Norvell, Novel Smith, and Thomas Smith.

Geography Division

Larry Bates, Brian Beck, Tony Costanzo, Bob Damario, Linda Franz, Dave Galdi, Kelly Gioffre, Ebony Hampton, Carl Hantman, Kenton Hoxie, John McKay, Robert Marx, Kali Mulchi, Linda Pike, Mark Porto, Danielle Ringstrom, Jeff Schneider, Brian Scott, Joel Sobel, Michelle Stathers, Thammarak Sukthavorn, and Dave Tarr.

Human Resources Division

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National Processing Center

Jean Banet, Sharon Basham, Reggie Bass, Julie Bibb, Sheila Bratcher, Sandra Burgin, Susan Curts, Suzanne Daniels, Catherine Evans, Wm. Proctor Eubank, Darrell Farabee, Sue Finnegan, Roberta Hargis, Pamela Jenkins, Sandy Johnson, Carol Joyce, Don Liebert, Billie Luca, Thomas Marks, Mark Matsko, Bernadette Mattingly, Linda McCauley, Marilyn Mink, Nancy Neveitt, Sandra Norton, Ruth Patterson, Judith Petty, Estell Power, Sharon Prow, Penelope Roseberry, Jenna Schmidt, Vicki Smith, Jennifer Snow, Stephanie Stark, Carol Stubblefield, Martha Sutt, Mary Vessels, Deborah Williams, and Pam Wilson.

Office of the Director

Margaret Applekamp, William Bell, Carolee Bush, Mary Ann Cochran, Robert Fay, Sue Kent, Elizabeth Martin, Shelly Wilkie Martinez, Sally Obenski, Jay Waite, Keisha Wilson, and Kathy Zveare.

Planning, Research and Evaluation Division

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Population Division

Arjun Adlakha, Claudette Bennett, Antonio Bruce, Tina Dosumnu, Allison Fields, Tecora Jimason, John Long, Louisa Miller, Gregg Robinson, Janice Valdisera, Kirsten West, and David Word.

Statistical Research Division

Carol Corby, Maria Garcia, Michael Hawkins, C. Easley Hoy, Michael Ikeda, Catherine Keely, John Linebarger, Margaret Poole, Cleo Redline, Richard Smiley, Laura Taylor, George Train, E. Ann Vacca, and Tommy Wright.

Systems Support Division

Martha Feemster and Robert Munsey.

Technology Management Office

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Quality Review Board Advisors to the Evaluation Program

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Chapter 1. Summary

The Census 2000 Dress Rehearsal was conducted by the U.S. Bureau of the Census in 1998. Census Day was April 18, 1998. It was the culmination of the testing program for Census 2000. This report provides the results and recommendations from more than 40 evaluation studies conducted during the dress rehearsal. Chapter 1 provides background on the dress rehearsal and general results from the evaluation studies. Chapters 2-7 discuss the evaluations of specific dress rehearsal operations in more detail.

In late 1997, the Administration and Congress reached a compromise on fiscal year 1998 funding for the Census Bureau in the Commerce Department. There were four major parts to this compromise. First, the Census Bureau was required to conduct the dress rehearsal in one site without using sampling. The Census Bureau was also instructed to produce numbers without sampling parallel to producing results that include sampling. Third, a Monitoring Board was established to oversee the operations of the decennial census. Finally, the agreement provided an opportunity for expedited judicial review of using sampling methods to determine apportionment counts. The compromise had a substantial impact on the operations of the dress rehearsal. We have noted when operations differ across sites due to this compromise.

The Sites

The Census Bureau selected three sites for the Census 2000 Dress Rehearsal. Columbia, SC, and eleven surrounding counties (Chester, Chesterfield, Darlington, Fairfield, Kershaw, Lancaster, Lee, Marlboro, Newberry, Richland, Union) represent an area that had a mix of house number/street name, rural route, and box number address types. With a relatively large proportion of African American population in the site, the Census Bureau had planned to apply sampling procedures to reduce the historic differentially large undercount for this group. However, this site represented the no sampling site in the dress rehearsal. The 1990 population was 655,066 and the housing count was 253,285.

Menominee County, WI, was selected because it contains the Menominee American Indian Reservation. This reservation was selected on recommendation of the Census Advisory Committee on the American Indian and Alaska Native Populations. The site allowed the Census Bureau to use sampling for reducing the differential undercount on American Indian Reservations, which had a 12 percent undercount in the 1990 Census. This site used the methods planned for Census 2000 at the onset of the dress rehearsal. The 1990 population was 3,890 and the housing count was 1,742.

The third site was Sacramento, CA, which was chosen for its population diversity. The site provided the opportunity to apply sampling designed to reduce the differential undercount and produce an accurate census for all components of the population. Another important reason for selecting this site was that Sacramento is a primary media market, which allowed analysis of the advertising campaign. This site used the methods planned for Census 2000 at the onset of the dress rehearsal. The 1990 population was 369,365 and the housing count was 153,362.

Methodology

The methods used in the dress rehearsal varied by site. Most operational components of the dress rehearsal were tested individually prior to the dress rehearsal. The dress rehearsal was the first opportunity to put all the operations together and observe the interactions. Some of the innovations were user-friendly forms, paid advertising, alternative pay rates for enumerators, digital capture of forms, and statistical sampling and estimation. The following methods were used and evaluated during the Census 2000 Dress Rehearsal.

Common Operations Across Sites

In each site, a Master Address File (MAF) was created. This file was the source of all addresses in the dress rehearsal sites at the time of questionnaire delivery. Each MAF was created using a series of operations, each building on the previous. The basis for the MAF was the 1990 Census list of addresses merged with the Delivery Sequence File (DSF) of the United States Postal Service (USPS). The DSF is the file of all addresses to which the USPS delivers. Local input and address listing operations added to this base. Prior to the dress rehearsal, the Census Bureau recognized the need to reengineer the MAF building process and made changes for developing the Census 2000 MAF. The new processes were not in place for the dress rehearsal, so the MAF evaluated here was not the MAF the Census Bureau expects to use in Census 2000.

Each site had response options in addition to the mailing back of census questionnaires. Be Counted forms (seven basic census questions) were available publicly for people to pick up and mail back, if they thought they were not counted in the dress rehearsal. People were also able to provide their responses over the telephone through the Telephone Questionnaire Assistance Program, which had a toll-free number.

A paid advertising campaign was used in the dress rehearsal sites. Historically, the Census Bureau has relied on *pro bono* advertising to encourage response, and the switch to a paid campaign is a major innovation for Census 2000. In addition, each site had an outreach program in which the Census Bureau and local groups formed partnerships to increase awareness about the importance of census data and to help boost response rates. No formal evaluation was conducted for the outreach program; a review of the effectiveness of paid advertising was carried out.

The data processing was similar for the three sites, starting with scanning, imaging and digital capture of data from the questionnaires. This data capture system was still in development at the time of the dress rehearsal, so the system evaluated here will be changed before being used for Census 2000. The sites had the same multiple response resolution operations applied to resolve instances of multiple returns for the same address. These multiple returns could occur due to the questionnaire delivery method or respondent use of more than one of the response options.

Form Delivery

Two questionnaire delivery methods were used in the dress rehearsal. In areas with house number/street name addresses, questionnaires were delivered by the USPS and respondents were

asked to return the form by mail. This is called the *mailout/mailback* strategy. It had four mail components, each sent by first class. First, a letter was sent to each address informing people to look for the census form. Next, a questionnaire was sent to each address, followed by a reminder/thank you post card. Finally, a second “replacement” questionnaire was mailed to all addresses, whether or not a response had been received. This method was applied in Sacramento and the house number/street name area of the South Carolina site.

In areas where addresses are typically rural route and/or box numbers, a method called *update/leave/mailback* was used. In these areas, Census Bureau enumerators delivered the questionnaires at the same time they updated maps and the list of addresses. The USPS delivered an advance letter and a reminder/thank you card to all “Postal Patrons” in the update/leave areas. Respondents were asked to return the form by mail. No second questionnaire was delivered in these areas. The Menominee site and the balance of the South Carolina site had this method applied.

The Census Bureau uses two types of forms. Short forms collect the information for the seven basic questions for Census 2000 (name, relationship, age, sex, race, Hispanic origin, and tenure—whether the housing unit is owned or rented). Long forms collect these items and additional socioeconomic data and have 53 questions. Both forms were used in all dress rehearsal sites. The sampling rate for the long form varies by size of governmental unit, so different rates were used throughout the three sites. The sampling plan for Census 2000 will yield about a 17 percent sample of long form cases.

Nonresponse Followup

In every census there are *nonrespondents* – households which do not return the form by mail. During the initial planning for the dress rehearsal, the Census Bureau expected to use sampling in two ways: sampling the nonrespondents, and conducting a coverage survey following the initial phase (through nonresponse followup) of the census then integrating the survey results in the dress rehearsal census numbers. Based on the compromise between the Administration and the Congress, in the South Carolina site every nonresponding household was visited. In Sacramento the Census Bureau’s plan to use sampling of the nonrespondents was implemented. In Menominee, the original plan for American Indian Reservations was used and every nonrespondent was visited to obtain census information.

The sampling method employed in Sacramento was instituted to save time and money. The sample was designated such that in every census tract dress rehearsal census information was obtained from at least 90 percent of the housing units. A *census tract* is a contiguous geographic area containing approximately 1,500 housing units, on average. The 90 percent includes both mail responses and nonresponse followup responses.

Note: In January 1999, the United States Supreme Court ruled, based on the Census Act (U.S. Title 13), sampling cannot be used to determine the population count for each state for apportionment purposes. Thus, all nonresponding households will be visited during Census 2000.

Integrated Coverage Measurement Survey and Post Enumeration Survey

The Integrated Coverage Measurement Survey (ICM) and the Post Enumeration Survey (PES) were conducted using the same procedures. The application of the results differed. These surveys are designed to determine the accuracy of the initial phase of dress rehearsal. The final survey estimates indicate the net undercount or net overcount. In Sacramento and Menominee, the ICM was used as an integrated part of the census estimate, measuring and adjusting for coverage in the final dress rehearsal census population number. In the South Carolina site, the PES was used to measure the coverage of the final census population number, but was not integrated into that number.

This difference in methodology was a result of the fiscal year 1998 budget compromise between the Administration and the Congress. The original plans were that all sites would use the ICM methodology.

During the months after Census Day, ICM/PES interviews were being conducted in a sample of housing units to assess coverage. First, a list of confirmed housing units within selected sample blocks was compiled. This list was constructed independent of the MAF, using a separate staff. ICM/PES interviewers used this list to collect information about current residents and those who moved out of the sample block between Census Day and the time of the ICM/PES interviews. Interviews were done by telephone or personal visit. Finally, people enumerated in the ICM/PES were matched with people enumerated in the initial phase of the dress rehearsal census. When there were uncertainties about a match, a followup interview was conducted in person. The results of this matching operation allowed estimation of the number of people who were not counted in the initial phase and also those who were counted multiple times.

Statistical methods were used to develop estimates of the number of people missed, duplicated, or counted in error during the initial phase of dress rehearsal operations. These estimates were then used according to the methods described above: integrated in Sacramento and Menominee, and as a measure of coverage in the South Carolina site.

Dress Rehearsal Results

The Census 2000 Dress Rehearsal was completed on time, with final numbers delivered nine months after Census Day. Table 1 provides selected results of the dress rehearsal.

Table 1. Selected Dress Rehearsal Results¹

	South Carolina Site	Sacramento	Menominee
1990 Population	655,066	369,365	3,890
Final Dress Rehearsal Population	662,140	403,313	4,738

¹Rajendra Singh.. "Some Results from the Census 2000 Dress Rehearsal." DSSD Census 2000 Dress Rehearsal Memorandum Series A-76, February 26, 1999.

Percent Final Population Due to ICM	--	6.3%	3.0%
Percent Net Undercoverage Measured by PES	9.0%	--	--
1990 Housing Units	253,285	153,362	1,742
Final Dress Rehearsal Housing Units	273,497	158,281	2,046
Dress Rehearsal Vacancy Rate	8.6%	7.4%	33.7%
Dress Rehearsal Mail Response Rate	53.4%	53.0%	39.4%

The mail response rates were very close to projections for the dress rehearsal in all three sites. All three dress rehearsal sites had lower than average (65 percent) mail response rates in 1990. Historically, intercensal tests or dress rehearsals have had lower mail response rates than the previous census in the chosen sites. For example, the mail return rates for dress rehearsal sites increased 6 to 7 percent between the 1988 Dress Rehearsal and the 1990 Census. After accounting for a change in the mail strategy for Census 2000, the Census Bureau's cautious optimism about achieving the projected mail response rates for Census 2000 is supported by these mail response rates.

Summary of Major Evaluation Findings

The Master Address File (Chapter 2)

The Master Address File (MAF) is the source of addresses to enumerate the population and is a critical component of conducting a successful census. In the dress rehearsal, the MAF building process involved a series of operations that built on each other and ultimately resulted in the address list used to conduct the dress rehearsal. One set of operations was used in areas with predominantly house number/street name, or city-style, addresses. A different set of operations was used in areas with predominantly noncity-style addresses (e.g., rural route, post office boxes). Although most components of the MAF building process were successful, there have been concerns about the coverage of housing units and about some weaknesses in the overall process.

In late 1997 the MAF process for Census 2000 was reengineered to address known problems. The changes were not made in time for use in the dress rehearsal. Fundamental changes included adding a 100 percent block canvassing operation for city-style address areas and doing an extensive quality assurance review in noncity-style areas. *Block canvassing* is a process where a lister goes to an assigned block and checks the addresses on the MAF with the addresses on the ground. Additions, deletions and changes are made by the lister. However, the reengineered changes were not made in time to affect the dress rehearsal MAF. Therefore, the MAF building

plan for Census 2000 is different than the operations used in the dress rehearsal. Inferences about the completeness of the MAF based on these evaluations do not provide information about the Census 2000 MAF.

The Master Address File Building Process

The Local Update of Census Addresses (LUCA) program had inadequate instructions and procedures in the Census 2000 Dress Rehearsal. These procedures resulted in large numbers of locally proposed adds, corrections, and deletes being rejected because they did not meet the requirements of the Census Bureau. The local submissions included problems like incomplete address information and out-of-jurisdiction changes.

One serious problem was the confusion experienced by local officials in noncity-style areas as they tried to review and verify the address descriptions provided by the Census Bureau. For example, "Rt 2, Box 19" is difficult to match with "white house with green shutters and picket fence". This led the Census Bureau to revise the materials it provides to local governments in noncity-style address areas. Another problem was that the Census Bureau provided local officials with addresses from surrounding jurisdictions in expectation this would help local officials ensure all their addresses were covered. Instead, this operation led to substantial confusion on the part of the local officials and they tried to delete the units outside their jurisdiction.

Several changes were applied to the LUCA process through a second round of updates from local and tribal governments. In this second round of updates, time constraints kept the field staff from doing a thorough review and the Census Bureau generally accepted everything submitted. This is problematic because it leads to erroneous addresses in the MAF, which are costly in dollars, staff resources, and census errors. Changes have been made to the LUCA program for Census 2000 to incorporate the information from the dress rehearsal. In particular, for noncity-style addresses, the Census Bureau will provide local governments with block counts to review rather than addresses.

We observed an inability to process new address information in the time available during the dress rehearsal. One of the processes used to do a final check on city-style addresses was a Postal Validation Check. The USPS returned information about addresses the MAF was missing, addresses that needed corrections, and addresses that did not exist. Only information about missing addresses was used. The timing of the Postal Validation Check meant block codes were not assigned to some new addresses in time to put the questionnaires in the mail stream. So, some addresses were included for the first time in the nonresponse followup operation. In the Be Counted program, some new addresses were not received and geocoded in time to include in the dress rehearsal at all. *Geocoding* is the process of assigning an address to a specific piece of geography—a census block. The Census 2000 schedule has four additional weeks available for processing these forms. We strongly recommended this issue be addressed, and changes are being made.

Several findings from the dress rehearsal point to enhancements needed in the control of the MAF building process. The most critical problem for evaluations was the lack of variables that would have identified how individual operations contributed to the overall address list. With the limited set of codes available, we could not obtain the universe of addresses that went into each operation.

This would have provided a base against which to measure the relative impact of each operation. The MAF extracts only retained the results from the most recent operation, making it impossible to determine which operation was the initial input source for each address. A set of variables has been defined and is being kept to account for the relative impact of each operation. This will allow more thorough evaluations in Census 2000.

Housing Unit Coverage of the Master Address File

The ultimate success of the development of the MAF is measured by its completeness and correctness. We intended to conduct a housing unit coverage study in the dress rehearsal. The study was dependent on the data that were to come from the final housing unit match, which uses the ICM/PES independent list of addresses to match to the final census address list. The operation was canceled due to concerns about diverting resources from Census 2000 planning at a crucial time and concern over the usefulness of evaluating a process that will be changed dramatically for Census 2000. Thus, we do not have a direct measure of housing unit coverage in the dress rehearsal. However, there are indications of varying success in MAF coverage from several sources.

The results of the initial housing unit match of the ICM/PES programs, along with the magnitude of added and deleted units following that initial match, provide one indication of coverage. The *initial match* occurred in the spring of 1998 and consisted of matching and reconciling the units on the MAF with the units that had been independently listed for ICM/PES. While specific estimates of coverage are not available, in Menominee we were able to conclude that the MAF coverage was at least as good as our goal of a net housing coverage of 96.8 percent or better. In Sacramento, we could not conclude whether we met our goal of a net housing coverage of at least 98.5 percent. Looking at the South Carolina site, we are able to conclude that the MAF coverage was not as good as our goal of a net housing coverage of at least 98.5 percent. These results confirm the importance of the Census Bureau decision to reengineer the MAF building process.

An examination of the consistency of housing unit totals with independent demographic benchmarks showed that results in both Menominee and Sacramento were broadly consistent with the benchmarks. However, the housing unit total in the South Carolina site fell 5.6 percent below the independent estimate. Additional analyses in the South Carolina site showed no systematic errors but demonstrated some potential weaknesses in the MAF for that site. In the mailout/mailback areas, no mechanism existed for retaining housing units with mailing addresses that were post office boxes. Similarly, no mechanism was available for obtaining new construction other than the postal validation check which was limited to Zip Codes entirely contained in mailout/mailback areas. Large numbers of deleted addresses, including units that had matched to the PES addresses prior to Census Day, were found. These deletes were disproportionately concentrated in update/leave areas. In Census 2000, housing units that are flagged for deletion in the update/leave operation will be verified in a later operation before being removed from the MAF. The MAF reengineering, especially the block canvass, will address the problems experienced with post office boxes in the dress rehearsal.

In dress rehearsal mailout/mailback areas, shortfalls in the MAF can be at least partially attributed to the lack of a 100 percent block canvassing operation. Although several targeted operations

appeared to be productive where they were conducted, they were done in very limited areas. In Census 2000, there will be a 100 percent block canvassing operation in all blocks in mailout/mailback areas.

Many of the concerns about the MAF can result in coverage and implementation problems. This was not the process designed for Census 2000, and the reengineering should make a positive difference. The addition of the 100 percent block canvass for city-style addresses, increased quality assurance for noncity-style address listing, and a redefinition of the delete rules should be positive for MAF coverage. Work is almost complete for documenting the MAF workflow and more clearly defining criteria that determine the eligibility of housing units for inclusion in the census.

Response Options and Data Quality (Chapter 3)

Households were provided several options to participate in the dress rehearsal census. They could complete and mail back a census questionnaire mailed to their address or dropped off by an enumerator in update/leave areas. In addition, they could complete a publicly available Be Counted form or call a toll-free number to reach the Telephone Questionnaire Assistance (TQA) center. A final response opportunity was the personal visit interview with a census enumerator during the nonresponse followup operation. Less than 1 percent of the people in the dress rehearsal were enumerated by a Be Counted form or a TQA interview. Given the intent that these options should be used as a last resort for respondents, the small number of such responses meets expectations.

To assess the different options, we examined quality indicators such as mail response rates, degree of utilization of various response options, and data quality measures such as item nonresponse rates and enumerator adherence to procedures. Questionnaire design changes since 1990 had both positive and negative impact on data quality.

The problems with geocoding mentioned under MAF operations carried over to the alternative response options. Cases coming in from TQA or Be Counted forms do not typically have an *identification number* which would link them to a specific MAF address. A number of processing and clerical operations are required to provide this link to the MAF. The first step for handling forms with no identifier was to geocode them and assign the identifier on the MAF and processing files. In some cases, the address can be geocoded to a block but the specific address was not on the MAF. These cases required verification in the field to establish the existence of the address. This process lagged seriously in the dress rehearsal, leading to the exclusion of some forms received from the alternative response options. For Census 2000, the time for processing these forms has been extended by four weeks.

Response by Mailout/Mailback

The overall mail response rate was 53.0 percent in Sacramento and 53.4 percent in South Carolina (55.0 percent in mailout/mailback areas and 47.8 percent in update/leave areas). In Menominee, which was all update/leave areas, the mail response rate was 39.4 percent. The replacement

questionnaire contributed positively to mail response rates. We estimate that this component of the mail implementation strategy increased mail response rates by about eight percentage points (at least a 7.5 percentage point increase in Sacramento and an 8.2 percentage point increase in South Carolina). This increase was slightly above the 6 percentage point increase expected. The replacement mailing added substantially to the processing flow for resolving multiple responses because 56 percent of the replacement forms were from housing units that had returned the initial mail form. The complications observed for this processing raised serious concerns about accuracy in Census 2000 if a large volume of duplicate replacement forms were received. Therefore, due to operational, timing and accuracy concerns, the Census Bureau has decided not to use a replacement questionnaire mailing in Census 2000.

Areas identified as containing a high concentration of Spanish or Chinese households were sent both an English form and a targeted language form. A Spanish form was returned by 4.9 percent of the households targeted to receive both an English and Spanish questionnaire. A slightly higher proportion, 7.1 percent, of the households in the Chinese language target areas chose to complete and return the Chinese language version. These relatively small portions of the target universe may imply the need for better methods of selecting the targeted areas. Alternatively, the small numbers can mean these special forms are not needed by many respondents.

The Census Bureau faced serious operational problems with matching two different language forms with the same identifier in a single envelope. This process was very labor-intensive, time consuming, and prone to error. The activity was possible for the dress rehearsal due to the small size of the task; Census 2000 would have much larger workloads. With these operational concerns, the Census Bureau has decided it will mail an English form to every housing unit and offer the option of receiving one of five additional language questionnaires by responding to the advance letter. The languages to be supported in this manner are Chinese, Korean, Spanish, Tagalog, and Vietnamese. Language guides to assist with form completion will be available in at least 49 languages.

The Be Counted Program

For the dress rehearsal, Be Counted forms (BCFs) were printed in English, Spanish, Cantonese, Vietnamese, Mien, and Russian. The forms were distributed at targeted locations, such as grocery stores and post offices. Few people were enumerated by the Be Counted form option, in part because many Be Counted forms were left unused, and in part because of the geocoding, processing and unduplication operations that removed responses for reasons such as “nonexistent housing unit” or “duplicates another response.” Because of the time required to process Be Counted forms, the addresses may have received a visit during nonresponse followup.

A number of recommendations are made for the Be Counted Program in Census 2000. The Census Bureau needs to improve the way it accounts for Be Counted form responses through all operational phases of the program, including check-in, geocoding, and field verification of addresses that do not match to the MAF. For Census 2000, the Census Bureau is working through an active partnership program to target Be Counted forms to areas where they will be of greatest value. Finally, the Census Bureau should conduct research into the effectiveness of BCFs in languages other than English for future censuses.

Telephone Questionnaire Assistance

Telephone Questionnaire Assistance (TQA) provided answers to questions from the public about what the census is, why it is conducted, and how to complete the form. Respondents could also request that a form be sent to them or, alternatively, they could provide their census data by completing an interview with a census operator.

Approximately 20 percent of all calls to TQA requested a form. Seventeen percent did so through the Interactive Voice Response and 3 percent after being transferred to an operator. Eighty-five percent of callers requesting a form ended up sending back the form originally mailed to their address and not the one sent through a TQA request. Few households were actually enumerated in the dress rehearsal by a phone interview with a TQA operator; in all three sites combined, just over 100 TQA interviews were included in the dress rehearsal census population. The Census Bureau will continue TQA options for Census 2000 because we have advice from stakeholders to make this service available. The Census Bureau is committed to offering multiple response options.

Questionnaire Design

Since 1990, there have been dramatic changes to the layout and format of the two primary data collection instruments—the mail questionnaire and the questionnaire used by enumerators during nonresponse followup, the Simplified Enumerator Questionnaire (SEQ). Changes in question wording were also made to the SEQ and mail questionnaires. Evaluations of four questions on the form—relationship, race, Hispanic origin, and tenure—yield several important findings. Both design and format changes can impact data quality.

Relationship for the mail form and SEQ. For the relationship to Person 1 question, response categories were added or split since 1990. For example, the son/daughter category was split into natural born and adopted. On the mail forms, there was no noticeable effect of the addition of new relationship categories on the level of missing data for the question, and the effect on the response distribution was as expected. Thus, no changes are recommended to the question. However, observations of field enumerators revealed that interviewers rarely read the entire list of relationship categories and did not probe for further specifics once given an answer. For example, when a respondent indicated ‘son’ as the relationship, enumerators should have probed to find out if this was an adopted son, natural born son, stepson or son-in-law. One suggestion is to create a relationship flashcard, although we know from many observations that most enumerators do not use flash cards provided for other questions. Once again, emphasis in enumerator training is needed.

Hispanic origin and Race for the mail form and SEQ. The Hispanic origin question was moved so that it immediately preceded the race question on the dress rehearsal forms. This is a reversal of the 1990 order. Also, the question wording and formatting for race were changed from 1990 to list more racial categories and to allow selection of more than one race category. Many of these changes were tested, but additional untested modifications to the design, formatting and wording of the race question were incorporated in the dress rehearsal forms. It is difficult to untangle causes among the combination of changes, but they appeared to affect data quality.

For the short form mail returns, item nonresponse to Hispanic origin decreased from 1990 in all sites, while nonresponse to race increased in the Sacramento site. This was due to the large population of Hispanics, and particularly recent immigrant Hispanics, in Sacramento. Hispanics were much more likely than non-Hispanics to leave the race item blank: 44 percent of Hispanics, compared to 1.3 percent of non-Hispanics, left race blank in short form mail returns in Sacramento. We believe that the large recent immigrant population of Hispanics in Sacramento contributed to the high race nonresponse rates. Research shows that many Hispanics do not make a distinction between race and Hispanic origin, and after reporting their Hispanic origin, many appear to have left the race item blank. The format, sequence, and wording changes also probably contributed to the high race nonresponse rate for Hispanics in ways that are not yet fully understood. Formatting differences probably also contributed to a difference between short form, 44 percent, versus long form, 37 percent, race nonresponse for Hispanics. These results are troubling and require further analysis. The Census Bureau plans to continue to learn about this issue through a panel in the Census 2000 experiments program to evaluate factors affecting the quality of race data and to provide guidance for its use and interpretation.

Based on a motion and time study and field observations, a majority of enumerators did not inform respondents that they could choose one or more races. This could potentially cause bias in race data collected during a personal visit. Data to assess the impact of allowing multi-race reporting were not available at the time of writing. For Census 2000, the race question on the SEQ has been rewritten to emphasize the option to choose more than one race.

Using the SEQ form. The dress rehearsal enumerator form (SEQ) was designed to be administered in a topic-based format rather than person-based. *Topic-based* refers to obtaining the response for one question (for example, age) for all household members, then moving to the next question. *Person-based* means all topics are covered for a person and repeated for succeeding people. Results from enumerator debriefings and an observation study suggest that many enumerators did not adhere to this new method of administration. We recommend that enumerator training stress the importance of this new format. While the format has changed since 1990, the wording of several questions on the dress rehearsal SEQ continued to promote a person-based approach. For Census 2000, the wording of the SEQ has been modified to emphasize the topic-based method of administration.

Format of the SEQ form. A change in the placement of the tenure question to the very end of the SEQ may have been responsible for a considerable increase in tenure item nonresponse on both the long and short form, compared to 1990. *Tenure* refers to whether the unit is owned or rented. The importance of this question should be stressed in training.

Advertising and Marketing Campaign (Chapter 4)

Components of the paid advertising campaign planned for Census 2000 were implemented in all three dress rehearsal sites. The campaign was designed to increase awareness of the dress rehearsal among both the general public and hard-to-reach subgroups. The marketing program in the dress rehearsal included advertisements delivered through television, radio, newspapers, magazines, a special school-based information campaign and out-of-home media (billboards, bus

shelters, posters, etc.). The evaluations of the paid advertising campaign were not conducted in the Menominee site due to the small number of housing units there and the large burden on those units. Two evaluations were carried out to assess the effectiveness of the campaign. The first examined changes in census awareness, attitudes, and knowledge before and after the advertising campaign. The second analyzed the relationship between exposure to the advertising campaign and likelihood of mailing back a census form. The first evaluation demonstrated that the campaign increased awareness, while the second showed that expecting a census questionnaire was positively associated with the likelihood of mailing the form back.

Findings from the first study suggest that advertising had an effect on increasing awareness about the census. In Sacramento, the percent of residents who had seen or heard anything recently about the census rose from 28 percent before the campaign to 80 percent after it. In South Carolina, the percentage increased from 29 percent before the campaign to 89 percent after. This increase in awareness surpassed the 30 percent increase set as a goal for the paid advertising campaign. We know that not all of this increase was due to the advertising campaign, since respondents would have received the census form, increasing awareness during this period.

While the reported awareness of the campaign was higher among non-Hispanic Whites and those with higher levels of education and income, large proportions of targeted low income and education groups and targeted race and ethnic groups were also found to have heard of the campaign.

Television was the most effective of the media, reaching 62 percent of respondents in Sacramento and 68 percent in the South Carolina site. Television also reached larger proportions of each of the targeted subgroups than any of the other media. Of the traditional media, magazines were the least effective, reaching 13 percent of the population in Sacramento and 16 percent in South Carolina.

The second study found a positive relationship between reported advertising exposure and level of census knowledge, even when controlling for other factors such as race/ethnicity, income and education. This relationship was particularly pronounced for the group containing Asians, and Native Hawaiians and Pacific Islanders in Sacramento. However, non-Hispanic Whites still had significantly higher levels of census knowledge after the campaign compared to the targeted race and ethnic groups.

Level of civic participation and expectation of the form before it arrived were both found to be strongly associated with the likelihood of mailing back the form. While the analysis failed to discover a direct relationship between advertising and mailback behavior, the analysis suggests that advertising may have had an indirect effect on behavior by making people expect the form in the mail which, in turn, was associated with a higher likelihood of returning the form.

Data Collection and Field Infrastructure (Chapter 5)

Performance of field operations and infrastructure are evaluated based on operational feasibility and quality of the resulting data. Overall, field activities, including infrastructure, were successfully implemented on schedule, although the Large Household Followup operation

encountered several data collection problems. The large household followup was used to recontact housing units that had more than five residents.

Success at achieving quality goals was mixed. Data quality was measured by the number of proxy responses, final attempt cases, and unclassified cases in nonresponse followup. A *proxy* comes from a knowledgeable respondent who does not live in the housing unit, like a neighbor or landlord. *Final attempt* cases occur at the end of field operations, with the intention of completing the remaining field workload quickly. Many final attempt cases end up as proxy responses because the nature of final attempt is to go out once and come back with the data. *Unclassified units* are housing units that enumerators were not able to determine whether they were vacant or occupied. The dress rehearsal contained more proxy, final attempt and unclassified data than expected.

Implementation difficulties in the large household followup resulted in a disproportionately large amount of missing data for large households, adversely affecting data completeness for some demographic subgroups. These problems are being addressed by the Census Bureau for Census 2000.

Nonresponse Followup

The nonresponse followup operation was conducted to obtain census data from households that did not complete a questionnaire by other means. Census enumerators are sent out to contact units and obtain data. The nonresponse followup universe was defined as all housing units in the mailout/mailback and update/leave universes for which a questionnaire had not been checked in by May 7, 1998. In South Carolina and Menominee, the Census Bureau conducted nonresponse followup for all housing units in the nonresponse universe. In Sacramento, nonresponse followup was conducted for a sample of housing units in the nonresponse universe.

The operation was successful in completing all of the nonresponse followup work on schedule, June 26 for Menominee and Sacramento and July 2 for the South Carolina site. The remaining results related to data quality were mixed.

The percent of the occupied nonresponse followup universe enumerated by proxy was 20.1 percent, 16.4 percent, and 11.5 percent for Sacramento, South Carolina, and Menominee, respectively. These proxy rates were much greater than the desired goal of 6 percent or less. This goal was set at the most optimistic level possible, based on 1990 data. Also, the Census 2000 Dress Rehearsal was the first time enumerators actually indicated that a response was obtained by proxy and thus the first time we have a direct measure of proxy use.

In Sacramento, 8.9 percent of the housing units were enumerated in final attempt procedures. The standard for final attempt cases was 5 percent. The operational rules about what must be completed before going to final attempt were not followed in Sacramento. The Menominee and South Carolina sites met the standard. Conducting interviews with household members under the tight deadlines of the dress rehearsal may have been more difficult than anticipated. A review of the procedures for trying to conduct nonresponse followup interviews with household members is recommended, given concerns over the quality of interview data collected by proxy and final attempt procedures. This is especially true for long form data. The Census Bureau has increased

the training and quality assurance for nonresponse followup which is expected to help this situation.

Unclassified units were 1.0 percent, 1.1 percent, and 0.8 percent of the nonresponse universe in Sacramento, South Carolina, and Menominee, respectively. The goal was 0.05 percent or less. These high rates were mainly driven by lost forms or problems in the data capture process rather than failure to contact housing units during nonresponse followup. We expect the rates to be better in Census 2000 because the Census Bureau is improving the processing control system and the data capture processing.

Coverage Edit Followup

The Coverage Edit Followup operation was a procedure to edit and correct information about household size on mail return questionnaires. Dress rehearsal census mail returns requiring followup were identified by a computer edit designed to recognize inconsistencies between the response on household size and the number of household members reported on a questionnaire. Households were telephoned and the correct household size determined.

The coverage edit followup had a substantial impact on the net population count for forms that failed the coverage edit. The edit-induced changes represent 0.3 percent, 0.6 percent, and 0.8 percent of the mail return populations of Sacramento, South Carolina, and Menominee, respectively. With these results, we recommend continuing and expanding the coverage edit followup as part of the Census 2000 operations. For Census 2000, the coverage edit rules will remain the same, but guidelines that were in place in the dress rehearsal to limit the number of forms sent to followup will be removed.

Large Household Followup

The Large Household Followup operation was a new mailout/mailback followup operation, tested the first time during the dress rehearsal. The dress rehearsal questionnaires had space for reporting information for up to five household members. Followup questionnaires were sent to collect the demographic data for "Person 6" and above in large households that responded by mail.

The large household followup was not successful. A large household followup questionnaire was received from fewer than one-third of the large households in all three dress rehearsal sites. This was caused by two main factors. Due to several operational problems, only about two-thirds of the large households were actually sent the followup questionnaire and less than one-half of the mailed forms were returned. These low collection rates meant that information for the additional household members was statistically imputed. Certain population groups, such as children and race/ethnic groups other than non-Hispanic Whites, tend to predominate in large households, leaving these groups with disproportionately high rates of imputed data.

These results support the Census Bureau decision to revise the design of the Census 2000 self-administered questionnaires to allow for reporting of information for up to six people. With the corresponding reduction in the number of households requiring large household followup, the operation can now be conducted by telephone in Census 2000 to increase collection rates. Also,

based on a separate review of conducting coverage edits on a sample of large households, the coverage edit followup for Census 2000 will now include large households. This series of decisions by the Census Bureau addresses the concerns raised by the evaluation of this operation.

Field Infrastructure

The dress rehearsal and Census 2000 require staffing and training a large number of field staff to conduct various operations for the development of address lists, nonresponse followup and other field activities. The evaluations of the hiring, retention, and administrative support of the staff indicate positive results.

New staffing and pay programs were implemented in the dress rehearsal. These programs contributed to the overall high quality of the workforce and their performance in the various field operations. Front loading, or hiring as many staff as will be needed for an entire operation in the beginning, was successful in assuring enumerators were available when needed. Recruiting, hiring, and retention of high quality employees was accomplished in part by setting higher pay rates. Target pay rates were set as a percentage of the estimated average wage rate of the specific area, using data from the Bureau of Labor Statistics. Historically, census pay rates were set near the minimum wage. In Sacramento, the target pay rates drew the desired number of applicants. In South Carolina, the pay rates had to be raised. The Census Bureau worked effectively with community-based organizations to help spread the word about job availability, thus improving the ability to hire the large number of staff needed.

We evaluated training for several key dress rehearsal operations, including nonresponse followup and the personal interview for ICM/PES. In general, trainees felt well prepared to do their jobs at the end of training, though there were some parts of training that needed strengthening. We recommend that trainers ensure enough time is spent on role playing and actual field work during the training period. Enumerators needed more instruction and practice with administering the long form, map reading, and basic census concepts such as proxy response. For Census 2000, the training has incorporated these recommendations as needed.

Data Processing (Chapter 6)

The overall data processing objectives were to:

- Capture and convert information from questionnaires returned by respondents or enumerators to computer readable format.
- Determine which responses of all those received for an address were to be used in subsequent processing.
- Edit the data and estimate the household size for cases not visited in nonresponse followup (Sacramento only) and unclassified housing units.
- Incorporate the ICM results in the dress rehearsal numbers in Sacramento and Menominee.
- Provide the results on schedule and at an acceptable level of quality.

In general, the dress rehearsal processing operations occurred on schedule, but at considerable effort. The quality results were mixed.

Data Capture System

For the first time, the Census Bureau is contracting out the data capture operation for the decennial census. The system used in the dress rehearsal was in the final planned stage of development and did not represent the full system designed for Census 2000.

The dress rehearsal results have been very useful to the system's designers as they have finalized the data capture system for use in Census 2000. The data capture operation for the dress rehearsal used digital imaging technology to capture responses from the census questionnaires. The image system scanned the census questionnaires to create image files. If the questionnaire could not be imaged, it was sent to a keyer who keyed from the original form. For images that were scanned, Optical Character Recognition (OCR) software was used to interpret the *write-in entries*, such as name. Optical Mark Recognition (OMR) software was used to interpret the *mark responses*, where respondents marked a box with an "X" or a "T". For the OCR system, tolerance levels were set and if the software could not recognize a response it was sent to a keyer. The keyer saw the image on a computer screen and entered the entire field (for example, first name) that had one or more characters which could not be read by the software. Of the many questionnaire types captured in the dress rehearsal, the evaluation study was able only to analyze data from the mailout/mailback short form mail returns.

For check box data fields, the overall short form mail return field error rate for mark responses was 0.8 percent. In this context, a field is in error if any part is in error. This was a substantial improvement since the 1995 Census Test when the error rate was estimated at 4.2 percent. Approximately 41 percent of the mark response errors may have been due to the way the respondent answered the form. Another 25 percent of the mark errors were from questionnaires that were received but had no data on the dress rehearsal file.

In cases where a respondent marked more than one race or Hispanic origin box, the error rates were much higher. If a respondent marked more than one race, 15.3 percent of the questionnaires had at least one mark omitted in capture. For more than one mark on the Hispanic origin question, 23.2 percent of the responses had at least one mark omitted in capture. The requirement to capture multiple responses to the race question did not come from the Office of Management and Budget (OMB) until October 30, 1997. This did not allow adequate time to develop and test for this capacity. This requirement has been added and included in development for Census 2000 processing.

While we do not have direct measures of dress rehearsal OCR quality, the overall system (after OCR and the keying of those fields for which OCR software was unable to interpret the response) yielded an error rate of 3.0 percent for write-in fields that were filled. Further, there was variability among fields. For example, the coverage question (how many people live at the address) had an error rate of 1.0 percent. This question benefits from an automated edit check during processing. On the other hand, the three race question write-in areas had error rates ranging from 9.8 percent to 12.3 percent, averaged across the sites.

Some of these errors are due to the difficulty of interpreting poor handwriting. Another issue is that respondents are asked to use a pen to complete the form. Any editing done by the respondent reduces the machine readability and greatly increases the potential for error. Approximately 24 percent of the write-in errors may have been due to the way the respondent filled the questionnaire.

Race write-in responses on the short form mail return were limited to 20 segmented boxes. Respondents sometimes resorted to irregular truncation and abbreviations of their entries, which in turn made it difficult for the system to interpret them completely or correctly. The level of clerical involvement in coding responses to the race question will be higher than originally anticipated for Census 2000.

The Census Bureau is working closely with the contractor to address the issues identified in the dress rehearsal. Changes have been made and additional testing is being conducted.

Multiple Response Resolution

The Primary Selection Algorithm (PSA) and the Within Block Search (WBS) were designed to resolve instances of multiple response from households and from those individuals who used one of the new response options such as a Be Counted form or an interview through TQA. The PSA is used to determine the person records and housing data that will represent each address in a census. The WBS is designed to match people across the whole census block, expanding on the PSA which works within the address. The WBS was tested for the first time in the dress rehearsal.

The expectation was that the WBS would lessen the possibility that the Be Counted Campaign and other respondent-initiated ways of responding to the dress rehearsal would result in people being counted more than once. In practice, it had minimal impact beyond the PSA. Since the WBS adds substantial processing time and complicates the PSA decision process, we conclude that the WBS adds little benefit to decennial response file processing and eliminating it could free up resources to improve the design and efficiency of the crucial PSA process. The WBS has been dropped for Census 2000.

Most of the resolution was done between mail returns from the two mailouts—initial and replacement—and between a mail return and an enumerator return from nonresponse followup for the same address. The replacement form will not be used in Census 2000 and there is more time between the delivery of the forms and the date when the nonresponse universe is defined.

Integrated Coverage Measurement/Post Enumeration Survey (Chapter 7)

The ICM program and the PES were designed to measure census coverage. Both involved an independent enumeration in a sample of census blocks. Using the results of that enumeration, combined with a careful matching with initial phase results, estimates were made of the missed (those who were not counted), of the duplicates, and of the erroneously enumerated population (those who were counted but should not have been). These were used to obtain coverage factors for a variety of population groups. Coverage factors were used to integrate ICM in the final dress rehearsal numbers in Sacramento and Menominee and served as a measure of dress rehearsal coverage for the PES in South Carolina.

We evaluated the data quality and also a number of operations of the ICM/PES program in the dress rehearsal. These evaluations indicate that operations can be strengthened by additional systems testing, reconsidering low pay-off steps, or changing problematic features. The review of characteristics of ICM/PES data indicates the quality of these data was good.

Operations

Overall Risk Assessment. An independent assessment of operations identified scheduling, staffing, and systems testing as potential risk factors. While the overall schedule was met and many tasks were completed on time, a majority of tasks were completed late, and a few ran very late. The single most important task, releasing the site level numbers on time, was accomplished. The evaluation concluded that additional technical employees are needed both in Suitland and the Regional Offices, and that integrated systems testing should be conducted. In response to this concern, end-to-end system testing is occurring for the Census 2000 processing systems.

Tracing Outmovers. People may have moved between Census Day and the ICM/PES interview day. The people who moved out of the ICM/PES housing unit after Census Day are called *outmovers*. Dress rehearsal data suggest that using proxy data for outmovers in place of data from tracing outmovers is adequate for the Census 2000 Accuracy and Coverage Evaluation.

We can collect information about the whole household outmover people from the in-movers or other knowledgeable proxies, or we can trace the outmovers to their new address. The evaluation found that proxy data seem to be giving appropriate data for matching purposes, since there were no significant differences in the estimates calculated using proxy people versus traced outmover people. This result held in both Sacramento and the South Carolina site.

Based on the results of this evaluation, the expensive and difficult operation of outmover tracing will not be conducted in the Census 2000 Accuracy and Coverage Evaluation.

Contamination. One of the key assumptions of the ICM/PES estimation methodology is that the two measures of the population, the initial count and the survey, are independent. We examined whether the fact a block was in ICM/PES affected (contaminated) the dress rehearsal initial phase results. We found no evidence of contamination.

Quality Assurance Procedures. *Falsification* occurs when an enumerator enters false information in the interview instrument. This can occur, for example, if an enumerator makes up responses rather than visiting the housing unit. A quality assurance reinterview was conducted to detect if field representatives falsified data during the person interview. For the dress rehearsal, both a 5 percent systematic sample of cases and a targeted sample based on the quality assurance falsification model were subjected to a quality assurance reinterview. Overall, we found targeting to be effective, but recommended some modifications to the model used for targeting. We also recommended some changes in the way suspected falsification is handled by field supervisors. These changes are occurring.

Characteristics of ICM/PES Data

A battery of independent demographic benchmarks were used to assess the dress rehearsal results. Assessments were made of the consistency of housing and population totals within independent benchmarks. We also assessed the consistency of key demographic characteristics, such as group quarters population, vacancy rates, persons per household, age/sex distributions, and race/Hispanic origin distributions.

The assessment found that dress rehearsal census results are generally demographically consistent with the independent measures. For all three sites, the characteristics examined agree with past census data and expected trends. For Sacramento and Menominee, the housing totals are within the range of independent estimates for 1998. Population totals and distributional results are generally on target when the ICM results are incorporated.

For the South Carolina site, in which the PES methodology was employed to measure coverage but not to integrate the measures into the population totals, the dress rehearsal census housing and population totals fell below expected levels. Population coverage in 1998 declined relative to 1990. This is attributable in large part to the incompleteness of the address list and the resulting shortfall of dress rehearsal housing units. The large undercoverage in the dress rehearsal results measured by the PES (9.0 percent) was validated by the independent estimates.

Overall Summary

All in all, the Census 2000 Dress Rehearsal was successful. The Census Bureau produced population numbers on time. The numbers, including ICM/PES data, compared favorably with independent benchmarks. Some problems were identified and methods to address the problems were developed.

Perhaps the most important finding of the dress rehearsal was the confirmation that counting alone did not provide an adequate representation of the population in any of the sites. In each case, the numbers developed using ICM or the PES came closer to independent estimates of the population.

Chapter 2. The Master Address File

Highlights

- In Menominee, a standard of at least 96.8 percent net coverage was met.
- In the South Carolina site, a standard of more than 98.5 percent net coverage was not met.
- In Sacramento, there was not enough information to determine if the standard of at least 98.5 percent net coverage was met.
- The Local Update of Census Addresses program had high participation rates, but many address submissions from local governments were rejected. The Census Bureau has made important improvements to this program based on the dress rehearsal program. The program for Census 2000 should be more efficient for the local governments and the Census Bureau.
- The relative impact of each operation on the building of the Master Address File (MAF) could not be adequately assessed in the dress rehearsal. This was largely due to the manner in which data were retained on the MAF extracts used in the dress rehearsal. In particular, the universe of addresses going into each operation could not be obtained. Additionally, the MAF extracts only retained the results of the most recent field operation. This information is now being maintained on files during Census 2000 MAF development.

The first component of the Census 2000 Dress Rehearsal was building the MAF. The MAF was the source of addresses used to deliver questionnaires in the dress rehearsal. Building the MAF involved a series of field and processing steps. The evaluations conducted during the dress rehearsal were designed to assess the completeness of the MAF by measuring how well the Census Bureau accounted for every housing unit in the dress rehearsal sites.

The MAF was reengineered before the dress rehearsal to address known problems with the process. Fundamental changes included adding a 100 percent block canvassing operation for city-style address areas and doing an extensive quality assurance review in noncity-style areas. *Block canvassing* is a process where a lister goes to an assigned block and checks the addresses on the MAF with the addresses on the ground. Additions, deletions and changes are made by the lister. The MAF building plan for Census 2000 is different than the operations used in the dress rehearsal. Therefore, inferences about the completeness of the MAF based on these evaluations do not provide information about the Census 2000 MAF.

Master Address File Building Process²

The MAF building process for the Census 2000 Dress Rehearsal involved a series of operations that ultimately resulted in the address list used to conduct the dress rehearsal. The process differed for areas with mail delivery to predominantly house number/street name (city-style) addresses and areas with predominantly noncity-style addresses. Overall, the master address building process had ten possible sources of data:

- 1990 Address Control File
- Delivery Sequence File from the U.S. Postal Service
- Targeting Multi-Unit Check
- Targeted Canvassing
- Local Update of Census Addresses
- Postal Validation Check
- Urban Update/Enumerate Process
- Address Listing
- Update/Leave
- Be Counted Forms/Telephone Questionnaire Assistance Operation

How was the initial MAF created?

The 1990 Address Control File and the Delivery Sequence File from the U.S. Postal Service were used to create the initial MAF for mailout/mailback areas of the South Carolina and Sacramento sites. For the update/leave areas of Menominee and South Carolina, the MAF was created through Address Listing.

What were the results of the Targeted Multi-Unit Check and Targeted Canvassing operations? Were any additional housing units added as a result of these operations?

The Targeted Multi-Unit Check operation compared the housing unit counts at multi-unit addresses between the 1990 Address Control File and the Delivery Sequence File. Where these counts differed, enumerators visited the basic street addresses to ensure that the census address list had the correct number of units. The operation found fewer than 300 new housing units in both Sacramento and the South Carolina site out of the 31,681 housing units that were canvassed.

In the Targeted Canvassing operation, local officials identified blocks where they expected hidden housing units to exist. Field staff canvassed these blocks, looking for missing or hidden housing units. The operation resulted in additions to the MAF in Sacramento and South Carolina. In Sacramento, 756 housing units were added as a result of canvassing 19,477 housing units, while 111 housing units were added from canvassing 5,803 housing units in South Carolina.

²All data reported in this subsection can be found in: Frank Vitrano and Lionel Howard. "An Evaluation of the Master Address File Building Process." Census 2000 Dress Rehearsal Evaluation Memorandum, B2. June 1999.

Although these operations contributed improvements to the MAF, they were limited in scope. The Census Bureau will conduct a 100 percent block canvass operation in Census 2000. The block canvassing operation is one where listers go to the field with the address list for city-style address areas. The listers do a dependent match between the list and what is on the ground. Additions, deletions, and corrections are made to the MAF. Since this operation will be completed for all city-style addresses, the targeting operations will no longer be necessary. The results of this operation indicate there may be substantial gains from the 100 percent block canvass in Census 2000.

How effective was the Local Update of Census Addresses (LUCA)?

The LUCA operation was used to improve the completeness of the MAF. In South Carolina, 51.6 percent of the 60 governmental entities participated. Those 31 governments represented the land area where 98 percent of the 1990 housing units were located. In the Sacramento site, the city of Sacramento provided initial feedback in the form of recommended additions and corrections to existing addresses. In Menominee, tribal government officials provided the initial feedback on the MAF as well.

The LUCA operation varied in the acceptance of initial submissions of new addresses, corrections to addresses, and addresses deleted from the MAF across the three sites. In Sacramento, the Census Bureau accepted 5.3 percent of the 2,918 additions and 86.5 percent of the 4,528 corrections submitted to the MAF. In Menominee, 100 percent of the additions submitted were accepted, whereas 97.6 percent of the 289 corrections submitted and 60.7 percent of the deletions submitted were accepted. In the South Carolina site, the LUCA operation accepted 43.2 percent of the 12,414 deletions submitted, 56.3 percent of the 26,983 corrections submitted, and 12.6 percent of the 30,942 additions submitted.

In Menominee and the update/leave area of the South Carolina site, a serious problem was the confusion experienced by local officials in noncity-style areas as they tried to review and verify the address descriptions provided by the Census Bureau. For example, "Rt 2, Box 19" is difficult to match with "white house with green shutters and picket fence". The LUCA operation has been modified for Census 2000 to minimize the number of rejected submissions. In particular, for noncity-style addresses, the Census Bureau will provide local governments with block counts to review rather than addresses.

Did the Postal Validation Check operation provide more addresses for the MAF?

The primary purpose of the Postal Validation Check operation was to capture new addresses that were the result of new construction in the Sacramento and South Carolina sites. USPS employees verified the completeness of the MAF by comparing MAF addresses with the addresses in their carrier routes. The operation provided a substantial number of addresses recommended for deletion. In Sacramento, 75.7 percent of the 12,551 addresses paid for were deletions, whereas in South Carolina, 67.3 percent of the 4,856 addresses paid for were deletions. The Census Bureau only processed the new addresses in this operation. There was a high match rate between "new" addresses provided by the USPS and addresses that were already on the MAF.

How many new addresses were added as a result of the Update/Leave operation?

The update/leave operation was conducted just before Census Day. Enumerators in Menominee and parts of the South Carolina site canvassed each block in their area, matching, updating, and deleting addresses from their address list. They also delivered a dress rehearsal questionnaire to each address. Of 66,704 addresses listed in the South Carolina site, the operation provided 4,331 new addresses, 7,543 corrections, and 4,225 deletions. In Menominee, out of 2,060 listings, the operation provided 96 new addresses, 566 corrections, and 87 deletions.

How were the Be Counted Program and Telephone Questionnaire Assistance operation used to compile the MAF?

The Be Counted program and Telephone Questionnaire Assistance operation were two ways that people could complete a census form. In both programs, if the address information that respondents provided could be geocoded and it was not already in the census address inventory, it was added to the MAF. Several addresses that met these criteria, however, were not geocoded in time for inclusion in the dress rehearsal census. In Sacramento, 84.3 percent of the 1,575 Be Counted cases were successfully geocoded, but only 68.3 percent were geocoded in time for inclusion in the dress rehearsal census. In South Carolina and Menominee, 91.7 and 76.9 percent of the 661 and 13 geocoded cases, respectively, were geocoded in time for inclusion in the dress rehearsal. For Census 2000, more time exists in the schedule to handle these cases.

What is the relative impact of each operation on the MAF?

The relative impact of each operation on the MAF could not be adequately assessed. This was largely due to the manner in which data were retained on the MAF extracts used in the dress rehearsal. In particular, the universe of addresses going into and out of each operation could not be obtained. Additionally, the MAF extracts only retained the results of the most recent field operation. For example, if an address came in through the Targeted Canvassing operation, and later through the Postal Validation Check, the MAF would flag the Postal Validation Check as the address's input source. By updating the file with the most recent field operation, it was not possible to determine which operation was the initial input source. This information is now being maintained on files during Census 2000 MAF development.

Housing Unit Coverage of the Master Address File³

An important part of assessing the completeness of the MAF for the Census 2000 Dress Rehearsal was an assessment of how well it covered existing housing units at the time of the census enumeration. The standards for measuring the completeness of the MAF were based on 1990 Census estimates of net undercount. The undercount was calculated from the gross omission rate,

³All data reported in this subsection can be found in: Frank Vitrano. "Executive Summary from the Draft Preliminary Evaluation of Housing Unit Coverage on the Master Address File." Census 2000 Dress Rehearsal Evaluation Memorandum, B1. April 1999.

which represented what was missed during the census, and the erroneous enumeration rate, which represented what was included in the census, but should not have been. The results are based on the initial housing unit match of PES in South Carolina and on the initial housing unit match of ICM in Sacramento and Menominee, as well as the magnitude of changes that occurred to the list of housing units in the census after the initial housing unit match. The housing unit match was an operation that matched the addresses on the dress rehearsal MAF to the independent list of addresses that was constructed for the ICM/PES.

What were the results from the preliminary evaluation of housing unit coverage?

Following the initial housing unit match, the census address list changed in all three sites. In Sacramento, the initial housing unit match yielded a net undercount of housing units of -0.5 percent (actually an overcount). The standard was at least 98.5 percent coverage. There was a weighted estimate of 3,560 added housing units and 12,794 deleted housing units after the initial housing unit match. As a result of the additions and deletions, the net undercount could have been changed enough to keep the standard from being met. We concluded there was not enough information to decide whether the standard was met or not.

In Menominee, the net undercount after the initial housing unit match was 0.0 percent, and there was a weighted estimate of 90 added housing units and 93 deleted housing units. The number of additions and deletions after the initial housing unit match did not indicate that the net undercount was changed greatly by the operations that followed the initial match. The standard of at least 96.8 percent coverage was met.

In South Carolina, the net undercount of housing units from the initial housing unit match was 10.5 percent. After this match, a weighted estimate of 13,760 housing units were added to the list and a weighted estimate of 24,213 housing units were deleted from the list. The number of additions and deletions after the initial housing unit match did not give an indication that the net undercount was improved by the operations that followed the initial match. We concluded that the standard of at least 98.5 percent coverage for the entire site was not met.

Are the housing counts consistent with independent demographic benchmarks?⁴

The objective of this evaluation was to examine the consistency of housing totals with independent benchmarks for each dress rehearsal site.

For Sacramento and Menominee, the housing totals were broadly consistent with independent estimates for 1998. In Sacramento, the census housing unit total was below both the Census Bureau and the California Agency estimate (by 0.5 and 1.9 percent)—but the margin of error in the independent estimates could have been this large. In Menominee, the housing unit count was higher

⁴The data reported in this subsection can be found in: J. Gregory Robinson, Kirsten West, and Arjun Adlakha. "Assessment of Consistency of Census Estimates with Demographic Benchmarks." Census 2000 Dress Rehearsal Evaluation Memorandum, C7. August 1999.

than expected (6.9%), but this may have been due to the imprecision in the independent estimate for such a small site.

The South Carolina site results differ somewhat; the 1998 housing totals fell considerably below the independent estimates. The shortage of housing units was reflected in a population shortfall for the site. For the total site, the census housing total was 5.6 percent below the Census Bureau-generated independent estimate.

Additional analyses in the South Carolina site showed no systematic errors, but demonstrated some potential weaknesses in the MAF for that site. In the mailout/mailback areas, no mechanism existed for retaining housing units with mailing addresses that were post office boxes. Similarly, no mechanism was available for obtaining new construction other than the postal validation check which was limited to zip codes entirely contained in mailout/mailback areas. Large numbers of deleted addresses, including units that had matched to the Post Enumeration Survey addresses prior to Census Day, were found. These deletes were disproportionately concentrated in update/leave areas. In Census 2000, housing units that are flagged for deletion in the update/leave operation will be verified in a later operation.

Chapter 3. Response Options and Data Quality

Highlights

- The overall mail response rate was:
53.0% in Sacramento, which was all mailout/mailback,
53.4% in the South Carolina site; 55% in mailout/mailback and 47.8% in update/leave,
39.4% in Menominee, which was all update/leave.
- Respondents were more likely to return the initial questionnaire than use any other response option.
- The replacement questionnaire mailing had a positive effect on mail response rates. However, about 56 percent of the returns from the replacement form were housing units that also returned the initial form. This led to a substantial increase in the processing workload and raised serious concerns regarding accuracy for Census 2000.
- The folding of the short form questionnaire does not appear to present a problem to respondents. They did not miss any person spaces at a high rate.
- Compared with previous census data, including the 1990 Census, very few households left the coverage-related question blank.
- The race question and its sequencing with the Hispanic origin question have changed. For the first time, respondents are allowed to report more than one race and the Hispanic origin precedes the race question. The question format, sequence and wording changes probably contributed to the high race item nonresponse rate for Hispanics in ways that are not yet fully understood.
- In all three sites, there was an improvement over 1990 in response rates to the Hispanic origin question.
- In Sacramento, there was a higher rate of missing data for the race question than was the case in 1990. The increase was due to many Hispanic respondents leaving the race item blank.
- Since 1990, there was a decrease in item nonresponse to race in the South Carolina site and in Menominee.

Highlights (continued)

- In nonresponse followup, observers noted that enumerators did not consistently indicate to respondents that they could choose one or more races.
- Some Be Counted forms were not geocoded in time to be included in the dress rehearsal.
- The most frequently selected TQA option was to speak to a census operator. The second most frequent selection was to get an explanation of the replacement mail form.
- Of the people that called TQA requesting a form, 69 percent returned a form by mail. Eighty-five percent of these returned the original mailed form, while the remainder returned the TQA-initiated form.
- The percentage of households that were incorrectly enumerated by short forms rather than by the intended long forms was minimal. The overall long form sample loss was 0.9 percent in South Carolina, 1.2 percent in Menominee and 1.4 percent in Sacramento.

The Census 2000 Dress Rehearsal used several new methods targeted at increasing response rates. These evaluations were designed to assess the degree to which alternative methods were employed by respondents and their impact on creating multiple responses for housing units. In addition to the questionnaire delivery methods of response, the Census Bureau used two alternate data collection forms. The Be Counted form (BCF) obtained census information from people who thought they were not included on any other dress rehearsal census form. The Telephone Questionnaire Assistance (TQA) collected census information via telephone primarily from those asking to give their information by phone.

Copies of the mail short and long forms are presented in Appendices A and B, respectively. Appendix C displays the Simplified Enumerator Questionnaire (SEQ) short form, and Appendix D the SEQ long form.

Mail Return Procedure

Sacramento used the mailout/mailback and Menominee the update/leave methodology. The mailout/mailback methodology was used in urban parts of the South Carolina site, with 79 percent of the addresses, while update/leave was used in the remainder of the South Carolina site. In mailout/mailback areas, a questionnaire was mailed to the address, requesting the respondent to complete and return the form by mail, using the accompanying first-class, postage-paid return envelope. In update/leave areas, census enumerators delivered questionnaires to housing units while updating the address lists. The enumerators left a form to be completed and returned to the Census Bureau by mail.

Mail Implementation Strategy⁵

What were the response rates?

In the South Carolina site, the overall mail response rate was 53.4 percent. The mailout/mailback response rate was 55.0 percent (56.8 percent for short forms and 45.6 percent for long forms) and the update/leave response rate was 47.8 percent (50.1 percent for short forms and 37.1 percent for long forms). In Sacramento, the overall mailout/mailback response rate was 53.0 percent (55.4 percent for short forms and 40.7 percent for long forms). In Menominee, the overall update/leave response rate was 39.4 percent (40.6 percent for short forms and 32.4 percent for long forms).

The majority of respondents in all sites and enumeration areas did not hold questionnaires until April 18, Census Day. The majority of mail returned forms were checked in prior to April 18: 74.9 percent in Sacramento; 74.6 percent in South Carolina; and 78.8 percent in Menominee. In the mailout/mailback areas respondents more often returned the initial questionnaire than the replacement questionnaire, since the replacement questionnaire was not delivered until around Census Day. Once the replacement questionnaire was delivered, though, many respondents in the short form universe used the replacement questionnaire. In the long form universe, nonrespondents up to the point of the replacement mailing more often returned the initial questionnaire than the replacement. This may indicate that people started but did not finish the long form when first received, with the replacement acting as a reminder.

What was the effect of the replacement questionnaire mailing?

Through May 7, 1998 in Sacramento, approximately 5.9 percent of the housing units (about 11.2 percent of the respondents) in the mailout/mailback universe returned both an initial and a replacement questionnaire. In the South Carolina mailout/mailback universe about 6.4 percent of the housing units (approximately 11.6 percent of the respondents) returned both an initial and replacement questionnaire. After May 7, 1998, additional replacement forms were received for housing units that had already responded. After processing, about 56 percent of the replacement forms were from housing units that had returned the initial mail form. Of those housing units that returned both an initial and a replacement questionnaire, about 86.8 percent in Sacramento and 88.3 percent in South Carolina were instances in which the responses on the two forms were identical. These results demonstrate that the replacement questionnaire added to the workload for resolving multiple responses at an address, which contributed to delays in processing and raised serious accuracy concerns.

Approximately one-third of the TQA workload was attributed to the mailout of the replacement questionnaire. Of the calls that were questions or complaints about the mailing, 83 percent were

⁵The data reported in this subsection can be found in: C. Robert Dimitri. "Mail Implementation Strategy." Census 2000 Dress Rehearsal Evaluation Memorandum, A1a. June 1999.

handled by the automated Interactive Voice Response (IVR) system, rather than being transferred to an operator.

It was difficult to measure exactly the effect of the replacement questionnaire mailing on mail response rates. In the South Carolina mailout/mailback areas, the improvement was approximately eight percentage points. In Sacramento, the improvement in the response rate was about 7.5 percentage points. These data represent the percentage of households that mailed back the replacement questionnaire only throughout the response period. Sacramento and the South Carolina site had roughly the same percentage of households that mailed back the initial questionnaire, the replacement questionnaire, or both in the time frame between April 17, two days after the mailout of the replacement questionnaire, and May 7, 1998, the cutoff date for defining the nonresponse followup universe. If we account for housing units that returned only the replacement form, the nonresponse followup workload decreased by 15.4 percent in South Carolina and 13.7 percent in Sacramento.

What was the effect of mailing targeted language forms?

Areas identified as containing a high concentration of Spanish or Chinese households were sent both an English form and a targeted language form. A Spanish form was returned by 4.9 percent of the households targeted to receive both an English and a Spanish questionnaire. A slightly higher proportion, 7.1 percent, of the households in the Chinese language target areas chose to complete and return the Chinese language version. These relatively small portions of the target universe may imply the need for more current data to select the targeted areas. Alternatively, the small numbers can mean these special language forms are not needed by many respondents.

The Census Bureau faced serious operational problems with matching two different language forms with the same identifier in an envelope. This process is very labor-intensive, time consuming, and prone to error. The activity was possible for the dress rehearsal due to the small size of the task; Census 2000 would have much larger workloads. With these operational concerns, the Census Bureau has decided it will mail an English form to every housing unit and offer the option of receiving one of five additional language questionnaires by responding to the advance letter. The languages to be supported in this manner are Chinese, Korean, Spanish, Tagalog, and Vietnamese. Language guides to assist with form completion will be available in at least 49 languages.

Did including housing units in the dress rehearsal that were also in the American Community Survey (ACS) in South Carolina have an effect on response rates?

Yes, inclusion in the ACS had a deleterious effect on dress rehearsal mail response rates. The Census Bureau is piloting a program called the ACS which will ultimately replace the census long form. This survey is primarily a mailout/mailback operation, with telephone and personal visit followups for nonresponse. Several counties in the South Carolina site were in the ACS during the period of the dress rehearsal. All cases in the ACS were sent a short form in the dress rehearsal. In mailout/mailback areas of Kershaw and Richland counties, households that were a part of the ACS were less likely than non-ACS households to respond by mail in the dress rehearsal. However,

those who responded to the ACS were more likely to respond to the dress rehearsal by mail than the housing units that did not respond to the ACS. In general, the farther away from Census Day a household was in the ACS survey, the more likely they were to respond to the dress rehearsal.

Mail Return Questionnaire⁶

One objective of the Census 2000 Dress Rehearsal was to evaluate the quality of the data reported on the mail returns to determine whether question modifications or design changes were needed. The evaluation assessed both mailout/mailback and update/leave/mailback questionnaires. Specifically, it focused on whether the structure of the short form negatively affected the way people navigated through the form, whether respondents completed the coverage related questions, and whether the changes made to content items since 1990 affected data quality.

What effect did the placement of questions on the short form, in relation to folds in the document, have on data quality?

The folds on the short form may have contributed to the omission of some data in the dress rehearsal. For the dress rehearsal, the short form was a single sheet of paper with three folds. Even though the form was not intended to be completed in a booklet format, the design of the folds allowed the respondent to turn pages from right to left. If a respondent turned pages instead of unfolding the form, it appeared that there were no spaces for listing the fourth and fifth household members. So respondents in households with four or more people could potentially proceed by completing the continuation roster instead of the appropriate person spaces. Improperly unfolding the short form questionnaire also could lead respondents to begin entering names at the third space, which would then give them three spaces (spaces three through five) for recording household members' names.

Fewer than one percent of all respondents started entering a name in a space other than person 1. Across the sites, between 3 percent and 5 percent of households with more than four members missed one of the person spaces on the form. The folds may have contributed to this problem. This is not a potentially large enough problem to demand attention before Census 2000, but the Census Bureau needs to keep abreast of research in the area of questionnaire navigation as it continues to design respondent-filled forms.

What were the coverage related items? Did respondents complete them?

Overall, very few households in the dress rehearsal left the coverage-related questions blank. Coverage questions asked respondents to list household members to help respondents remain consistent in their later answers and to help avoid mistakenly omitting household members as they completed the person spaces. For the short form, there were two coverage questions. One asked respondents to report the number of people living in the household; the other question was a roster

⁶All data reported in this subsection can be found in: Wendy Davis. "Evaluation of the Mail Return Questionnaires." Census 2000 Dress Rehearsal Evaluation Memorandum, A2. April 1999, Revised.

used when there were more than five people in the household. For the long form, respondents were requested to complete a roster listing names of all household members before providing the census information for each member.

The percent missing data for the three questions was compared to that from the 1990 Census, the Alternative Questionnaire Experiment (AQE) in the 1990 Census, and the 1996 National Census Test (NCT).

- The percent missing data for the person count box (the count of household members) on the short form was relatively high—about 6 percent for Sacramento and South Carolina and a little over 3 percent in Menominee. In all cases this was less than what was observed in the 1996 NCT. For Census 2000, the question format was modified to make the person count box more visible.
- The percent missing data was low for the continuation roster on the short form—less than 2 percent in all three sites.
- The percent missing data for the long form roster was 3 percent in Sacramento and South Carolina. In Menominee, none of the long form roster pages were left blank. Given the low percentage of missing data, no changes were recommended for Census 2000.

What changes were made to questions since 1990?

The most significant changes for the short form were allowing respondents to select more than one race and switching the order of the race and Hispanic origin questions. There were several wording changes to questions, as well as changes to the format of response categories and the placement of question instructions. Since 1990, changes have been made to questions on relationship to Person 1, race, and Hispanic origin. New response categories have been added for all three questions. While many of these changes were tested, additional untested modifications to the design, formatting, and wording of the race question were incorporated in the dress rehearsal forms. In terms of formatting, the short and long form questionnaires differed in how the race and Hispanic origin response categories were presented. There was concern that the layout or presentation of the response categories would affect the way in which respondents complete the form.

Did the changes affect data quality?

For the relationship item, the changes had no noticeable effect on the percentage of missing data. An effect of changes in response category formats and item placement was observed in the relationship question on the long form. The data suggest that the format of the write-in fields might have decreased the number of respondents who chose responses from the non-relative categories, which were located below the write-in field. Apparently respondents interpreted the placement of the write-in field as a stopping point in the question. The South Carolina site had 3.3 percent nonrelatives on the short form, compared with 2.2 percent on the long form. Sacramento and Menominee had, respectively, 6.2 percent and 6.3 percent nonrelatives on the short form, and 4.4 percent and 4.7 percent on the long form. The design of the questionnaire, however, does not permit alternative placement of the response categories and write-in fields.

Although it is difficult to disentangle causes among the combination of content, format, and sequence, changes to the race and Hispanic origin questions appear to have affected data quality. For the short form mail returns, item nonresponse to Hispanic origin decreased from 1990 in all sites, while nonresponse to race increased in the Sacramento site. The latter result is due to the large population of Hispanics, and particularly recent immigrant Hispanics, in Sacramento. Hispanics were much more likely than non-Hispanics to leave the race item blank: 44 percent of Hispanics, compared to 1.3 percent of non-Hispanics, left race blank in short form mail returns in Sacramento. Research shows that many Hispanics do not make a distinction between race and Hispanic origin, and after reporting their Hispanic origin, many appear to have left the race item blank. The format, sequence, and wording changes probably contributed to the high race nonresponse rate for Hispanics in ways that are not yet fully understood. The Census Bureau needs to continue to learn about this issue and there will be research conducted in the Census 2000 experiments program to evaluate factors affecting the quality of race data and to provide guidance for its use and interpretation.

Differences between the short and long form in formatting of the race question probably contributed as well to a difference between short form (44 percent) and long form (37 percent) mail returns for race nonresponse for Hispanics.

Consistent with prior research, the change in order for race and Hispanic origin improved data quality for the Hispanic origin question. The percentage of missing data on the Hispanic origin question on the short form was noticeably lower in the dress rehearsal than it was in the 1990 Census. The nonresponse rate for the Hispanic origin question was 7.3 percent for the South Carolina site, 6.1 percent for Sacramento, and 8.9 percent for Menominee. The percentage of missing data on the Hispanic origin question on the short form from the 1990 Census was 19.8 percent for the South Carolina site, 10.2 percent for Sacramento, and 21.2 percent for Menominee.

Simplified Enumerator Questionnaire

The Simplified Enumerator Questionnaire (SEQ) is an enumerator-administered paper questionnaire used to collect information from housing units that did not respond to the census by mail. Questionnaires used previously by enumerators for nonresponse followup were cumbersome and awkward for both enumerators and respondents. To improve the nonresponse followup questionnaire, the Census Bureau has dramatically changed the format of the SEQ since 1990. The largest change for the Census 2000 Dress Rehearsal was the administration of the SEQ form in a topic-based format, rather than a person-based format. In the topic-based format, the enumerator asked a given question about every household member before moving to the next question. For example, the enumerator asked the relationship question for all household members before asking the age/date of birth question for anyone. Additionally, major changes were made to the race and Hispanic origin questions, and the long form SEQ contained a new question about grandparents as care givers, along with a substantially revised series of disability questions.

Results from a motion and time study, observation reports, and enumerator debriefings, as well as item nonresponse rates, provided insight regarding questions and methods that have changed since 1990.

Observation Report Study and Debriefing Study⁷

Through an observation study, the Census Bureau assessed both the questions and methods that were changed on the SEQ. Debriefing focus groups were held in Sacramento and South Carolina, and a self-administered debriefing questionnaire was given to field enumerators. The results were used as an evaluation of the SEQ and of nonresponse followup questionnaire administration procedures. While the methods did not yield direct measures of SEQ data quality, they were useful indicators of potential problem areas with both the questionnaire and interview training.

Were there problems facing enumerators using the SEQ?

Enumerators generally reported no problems with the short form SEQ continuation sheets, or with the coverage, disability, or grandparents questions. Many of the observed enumerators either administered the form in a person-based format or a combination of person- and topic-based formats. This may have contributed to under reporting of persons in large households. Observers noted that interviewers rarely read the response categories to respondents and rarely probed for further specifics once given an answer to the relationship questions.

Were the race and Hispanic origin questions administered correctly?

Although the mail questionnaire included a note to respondents to answer both the race and Hispanic origin questions, there was no similar instruction to enumerators on the SEQ. Race and Hispanic origin questions were not administered as outlined in training and in the Enumerator Job Aid. Both interviewers and respondents had trouble differentiating between race and Hispanic origin. A majority of enumerators had to explain to respondents why they had to answer both the race and Hispanic origin questions, indicating a need for augmenting enumerator training to include the reasons for asking these questions.

The race questions seemed even more troublesome for the enumerators to administer. Enumerators generally did not use the flashcards, and a majority of enumerators failed to instruct respondents that they could choose more than one race category.

⁷The data reported in this subsection can be found in: Courtney N. Stapleton. "Evaluation of the Simplified Enumerator Questionnaire —Observation Report Study." Census 2000 Dress Rehearsal Evaluation Memorandum, A3a. April 1999, and the "Evaluation of the Simplified Enumerator Questionnaire—Enumerator Debriefing Study." Census 2000 Dress Rehearsal Evaluation Memorandum, A3b. April 1999.

What were the results for the Whole Household Usual Home Elsewhere Question?

Apparently there was difficulty with the question, “Is this house or apartment a vacation or seasonal home or a temporary residence for your household?” Many enumerators either reworded the question or skipped it entirely. This question continues to be a difficult concept for respondents. The purpose of the question is to determine if the occupants have another home where they should be counted. The length of time spent in each place determines where they should be counted. Observers felt that rewording of the question would greatly contribute to clarifying it for respondents. A common misunderstanding among respondents who were renters was interpretation of the phrase “temporary residence” to include their living arrangements. As a result, these respondents incorrectly answered “yes” to the question. The wording of the question has changed for Census 2000. Research should continue to determine a better way to ask this complex question.

SEQ Motion and Time Study⁸

A motion and time study was used to estimate the average time enumerators spent completing both short and long form cases, and to answer specific questions about enumerators’ adherence to procedures and questionnaire wording. Observers recorded the number of living quarters visited, interviews completed, addresses deleted, and number of visits, as well as information on flashcard usage, asking coverage questions, continuation form use, and following skip instructions. They briefly interviewed each enumerator observed and completed diary forms recording events and factors affecting each enumerator’s performance and productivity.

How well did the enumerators follow the procedures for completing the SEQ questionnaire, especially for large households?

Enumerators generally followed the procedures, but many encountered difficulty completing the geocodes on the continuation forms. Those forms were used in cases where households had more than five members. Enumerators recorded the data on additional forms, as the dress rehearsal forms were designed to accommodate five or fewer people.

Were the SEQ questionnaires administered correctly?

The long form SEQ included a number of instructions indicating that enumerators should ask a certain question if a respondent was of a particular age. Enumerators successfully administered those questions with skip patterns. The observers recommended that additional screening questions be added to prevent respondents from answering unnecessary questions.

For the Hispanic origin question, few enumerators showed the flashcard, and almost none read the second sentence of the question which listed examples of Hispanic origins. Many respondents said

⁸The data reported in this subsection can be found in: Warren O. Davis. “Management Study Of Nonresponse Followup—Use of the Simplified Enumerator Questionnaire in the Census 2000 Dress Rehearsal (Motion and Time Study).” Census 2000 Dress Rehearsal Evaluation Memorandum, A3c. April 1999.

they thought that the enumerator—by asking the Hispanic origin question—was assuming they were of Hispanic origin. Enumerators asked the race question for each person in the household; they often showed the questionnaire in place of the flashcard to the respondent. Enumerators indicated that among the reasons they did not use the flashcards was because the cards were awkward or the display of the card broke the flow of the interview and consumed too much time. Observers believed, however, that the responses were generally correct; respondents understood the questions and provided accurate answers. Observed enumerators asked the first sentence of each question as worded, but seldom read the second sentence of the race question: “You may choose more than one race.” Enumerators seldom led respondents or assumed answers.

What was the average interview length for the short and long forms respectively?

Motion and time data collected to estimate the completion time for each questionnaire were analyzed. The pre-census estimate of the time to complete the short form was 7.0 minutes, and 30.0 minutes for the long form. The motion and time study indicated that the average interview times during the dress rehearsal SEQ were 5.2 minutes for the short form and 26.4 minutes for the long form.

SEQ Item Nonresponse Rates⁹

We assessed item nonresponse as another measure of the quality of data collected through the SEQ. Changes in question wording, format, and response categories were factors reviewed for their impact on item nonresponse. Rates were calculated for the seven short form items, which were questions asked of every household. Those items included questions on name, age, gender, race, Hispanic origin, relationships within the household, and whether the unit was owned or rented. In addition, item nonresponse rates were calculated for two long form question sequences covering grandparents as care givers and disability. The item nonresponse rates for the items asked of all respondents were compared to similar measures collected from previous census enumerator-administered forms from the same geographical area.

Were there changes to the item nonresponse rates as a result of the changes made to the questionnaire since 1990?

There were several changes in item nonresponse that can be attributed to modifications made to the race and Hispanic origin questions. As on the mail form, the order of the questions was reversed, with the Hispanic origin question before the race question in an effort to reduce item nonresponse to the Hispanic origin question. Results from a 1995 study (Bates, et. al.) indicated that the ordering of the Hispanic origin and race questions had a positive effect on item response for Hispanic origin. In 1990, when race was asked before the Hispanic origin question, there was a high nonresponse to the Hispanic origin question by non-Hispanics who did not understand it, or

⁹The data reported in this subsection can be found in: Courtney N. Stapleton. “Evaluation of the Simplified Enumerator Questionnaire—Item Nonresponse Analysis.” Census 2000 Dress Rehearsal Evaluation Memorandum, A3d. April 1999.

thought the question did not apply to them. Another change to the race question allowed respondents to identify themselves by more than one race.

Results from the evaluation indicate that in South Carolina there was a decrease in item nonresponse to questions on Hispanic origin and race. On the long form questionnaire, item nonresponse dropped from 7.1 percent in 1990 to 2.8 percent for the Hispanic origin question, and from 4.5 percent to 2.1 percent for the race question. On the short form questionnaire, item nonresponse fell from 8.7 percent to 1.9 percent for the Hispanic origin question, and from 4.8 percent to 1.2 percent for the race question. The differences might be attributable to the ordering effects of those questions. The findings indicated, however, that Hispanics had a higher nonresponse rate to the race question than did non-Hispanics in the South Carolina site (Table 2). Studies related to this evaluation suggested that respondents (especially those of Hispanic origin) generally did not understand the difference between race and Hispanic origin. After responding to the Hispanic origin question, they might have felt that the race question did not apply to them and declined to answer.

In Sacramento, item nonresponse for the race question increased on the long form from 3.2 percent in 1990 to 6.2 percent, and on the short form from 3.8 percent to 4.5 percent in the dress rehearsal. This increase in item nonresponse to the race question was a result of the large population of Hispanics in Sacramento. There was a higher rate of race nonresponse for Hispanics than for non-Hispanics (Table 2).

In Menominee, item nonresponse for the Hispanic origin question showed a sizable decrease on both the long and short forms (from 8 percent in 1990 to less than 1 percent for the long forms, and from 10 percent to less than 1 percent for the short forms). Nonresponse to the race question was reduced to 0.7 percent on the short form, although Hispanics did exhibit a higher nonresponse rate than non-Hispanics: 8.2 percent versus 0.4 percent (Table 2).

Table 2. SEQ Nonresponse Rates for the Race Question by Hispanic Origin*

Form Type	Item Nonresponse for Hispanics		Item Nonresponse for Non-Hispanics	
	Number	Percent	Number	Percent
South Carolina Site				
Long form	878	19.8	36,149	0.3
Short form	3,892	16.1	177,590	0.2
Sacramento				
Long form	4,330	12.6	12,722	1.4
Short form	24,107	11.9	68,664	1.0
Menominee				
Short form	61	8.2	1,691	0.4

*There were not enough long form respondents (n=2) to report for Menominee.

There was an increase in item nonresponse for the tenure (owner/renter) question on both the long and short SEQ forms. When compared to data collected in 1990, long form nonresponse to tenure quadrupled (from 6.7 percent to 28.6 percent) while short form nonresponse to tenure nearly doubled (from 5.5 percent to 9.2 percent) in the South Carolina site.

We suspect that much of the increase in long form tenure item nonresponse was due to the placement on the SEQ at the very end of the person data. The placement of the tenure question has changed on both the long and short SEQ forms since 1990.

In the Sacramento site, nonresponse rates for the tenure question increased substantially on the long form from 2.8 percent to 37.2 percent and more than doubled on the short form from 3.0 percent to 8.2 percent. Item nonresponse rates from other housing unit questions also showed comparable high nonresponse rates. Trends in nonresponse to the tenure item were repeated in Menominee where nonresponse more than doubled on both the short and long forms. We suspect that much of the increase in long form tenure item nonresponse was due to the placement of the SEQ at the very end of the person data. The placement of the tenure question has changed on both the long and short SEQ forms since 1990.

What was the item nonresponse rate for the new disability questions?

The sequence of six disability questions appeared on the SEQ long form. Item nonresponse to the disability items in all three sites was high—in South Carolina it was 15 percent; in Sacramento, 22 percent; and in Menominee, 7 percent. Those results, however, might reflect a large proportion of item nonresponse for the long form questionnaire overall, rather than inability to answer the disability questions.

It should be noted that the disability questions were among a list of questions enumerators reported having trouble getting respondents to answer. Despite the reported difficulty, item nonresponse to disability did not appear to increase relative to other long form questions.

What were the item nonresponse rates for the series of questions on grandparents as care givers?

The sequence of questions about grandparents as care givers were asked of all long form respondents aged 15 or older. For the purpose of this analysis, item missing data rates were calculated for those respondents aged 30 and over. Item nonresponse to this sequence of questions varied between approximately 3 percent to 15 percent in South Carolina, while in Sacramento it was between 4 percent and 25 percent, and in Menominee between 0 and 13 percent. As noted in the analysis of the disability questions, nonresponse rates for the grandparent questions were similar to rates for other long form questions.

Simplified Enumerator Questionnaire and Large Households¹⁰

The Census Bureau evaluated whether the enumeration of large households (those with more than five persons) was under reported on the SEQ short and long forms because of difficulties interviewers experienced due to the structure of enumeration continuation forms. Although enumerators were instructed to complete the entire household roster before asking the 100 percent questions, related evaluations suggest that they might have collected all of the data on the first five household members before taking the names of any other persons in the household. For households with more than five members, interviewers needed to continue the enumeration on a separate form. Once respondents knew that there were a number of questions to answer for each person listed on the roster, they might have been reluctant to provide the names of additional household members.

How were data collected for this operation?

In all three sites, data collected during nonresponse followup through the SEQ process were compared to ICM/PES population counts. That survey was an independent re-enumeration conducted with a large sample of households after the initial phase of census data collection using a Computer Assisted Personal Interview (CAPI) instrument. ICM/PES households with six or more persons were linked to corresponding households who responded via the SEQ and reported five household members in the Census 2000 Dress Rehearsal. Based on discrepancies between ICM/PES data and SEQ data on the number of household members, the level of potential under reporting for large households in the nonresponse followup universe was estimated. As a check, the Census Bureau also analyzed data from households listed in the SEQ as having one, two, three, four or six persons, and for which ICM/PES noted a larger number of residents than did the SEQ.

¹⁰The data reported in this subsection can be found in: Courtney N. Stapleton. "Evaluation of the Simplified Enumerator Questionnaire—ICM Comparison." Census 2000 Dress Rehearsal Evaluation Memorandum, A3e. April 1999.

To what extent did the SEQ continuation forms contribute to under reporting in large households?

In the South Carolina site, for about 12 percent of the cases where the SEQ enumerated a household with five members, ICM/PES enumerated the same household with six or more residents. In Menominee and Sacramento, results were similar: 17 percent of the cases enumerated six or more residents using ICM/PES in Menominee, while this occurred in 18 percent of the cases in Sacramento.

Households for which SEQ enumerators had listed four or six persons tended to have fewer occurrences of ICM/PES population count discrepancies compared to five-person households (Table 3). In Sacramento, five-person households had a higher level of discrepancy with ICM/PES person count than six person households. Both Sacramento and the South Carolina site showed higher levels of discrepancy for four-person households. The number of cases in Menominee is so small that no conclusions can be drawn. It seems possible that the increased percentages of positively discrepant households were in fact due to the structure of the SEQ form and its administration.

Table 3. Cases Where ICM/PES Enumerated More Household Members than the SEQ

SEQ Roster Count	Number of Households in Nonresponse Followup	Positively Discrepant ICM/PES Population Counts	
		Number	Percent
South Carolina Site			
4	420	16	4 (1.0)
5	169	20	12 (2.5)
6	57	5	9 (3.8)
Sacramento			
4	369	39	11 (1.6)
5	280	50	18 (2.3)
6	118	11	9 (2.6)
Menominee			
4	21	2	10 (6.5)
5	18	3	17 (8.9)
6	3	1	33 (27.1)

Numbers in parentheses are standard errors.

Alternative Response Options

The Be Counted Program¹¹

The Be Counted Program provided a means for people to be included in the Census 2000 Dress Rehearsal who may not have received a census questionnaire or believed they were not included on one. The Be Counted questionnaire also allowed people who had no usual residence on Census Day to be counted in the census. For the Census 2000 Dress Rehearsal, the Be Counted forms (BCFs) were made available to the public in a large number of targeted locations identified through consultation with local government officials, community groups, and local census officials. The forms were available in many locations, such as local businesses, community organizations, libraries, and churches. Posters were hung outside of the targeted sites to advertise the existence of the BCFs. In addition to the BCFs in the field, persons who called TQA without an identification number and requested a telephone interview were enumerated on a Be Counted equivalent instrument.

The BCFs were made available shortly after Census Day and removed from the targeted locations before the start of nonresponse followup. When responses were received, the addresses were geocoded and verified, and persons searched for among other returns for the address and the block to guard against the possibility of multiple enumerations. The BCFs received without an address and for which the person indicated that they had no usual address on Census Day were included in the Service Based Enumeration process. The focus of this evaluation was to measure the effectiveness of the campaign through such things as assessing the success in distribution of the BCFs, as well as determining the demographic characteristics of those who returned forms.

How many BCF distribution sites were there? Were the forms picked up by the public?

There were a total of 218 Be Counted distribution sites for Sacramento, 183 for the South Carolina site, and 16 for Menominee. In Sacramento, BCFs were available in English, Spanish, Cantonese, Mien, Vietnamese and Russian, while in South Carolina they were available in English and Spanish. In Menominee, the forms were available in English only. Approximately 3 percent of the available BCFs were picked up by the public in Menominee, 18 percent in South Carolina, and 39 percent in Sacramento.

How many responses were generated from the BCFs?

Completed BCFs and Be Counted telephone responses with address information were received from all three sites, resulting in a total of 1,707 persons who were not otherwise enumerated in the census. In the Sacramento site, 1,575 responses were generated. From these, 907 had geocodable addresses and arrived in time for census processing. A total of 343 had information for 870 people who were not otherwise enumerated in the census. In South Carolina, 783

¹¹The data discussed in this subsection can be found in: Karen L. Owens and Michael Tenebaum. "The Be Counted Program." Census 2000 Dress Rehearsal Evaluation Memorandum D2. May 1999

responses were generated; 606 of these had geocodable addressees that arrived in time for census processing, and data for 821 people that were not enumerated through other means were collected from 337 forms. The Menominee site had a total of 21 responses; of these, ten had geocodable addresses and arrived in time for processing. From these responses, five had information for 16 people that were not otherwise enumerated in the census. In addition, a total of 85 persons who returned a BCF which indicated they had no usual residence were processed in the SBE operation.

Were there any major problems in the processing of these forms?

A significant problem encountered with the BCFs was that many forms did not arrive in time to be included in dress rehearsal processing. In these cases, the BCFs were discarded. Three forms from Menominee, 55 forms from South Carolina, and 421 forms from Sacramento had addresses that were geocodable, but they arrived too late for processing. It is important to note that the people at these addresses were not necessarily missed in the census, since they may have been enumerated during nonresponse followup or on another form.

What were the demographic characteristics of people enumerated on BCFs? How did they compare to other mail returns?

The demographic distributions for persons enumerated by the Be Counted program varied across sites. Some demographic highlights are:

- The distribution by sex was relatively even in all three sites.
- The majority of people enumerated on BCFs in Sacramento were White or Asian. Overall, the BCFs had a higher percentage of racial and ethnic groups other than White than did other mail return forms. The BCFs also had a higher percentage of persons under 24 years of age than other mail returns.
- The majority of people enumerated on BCFs in South Carolina were Black/African-American or White. Comparisons to other mail returns showed that BCFs had a higher percentage of people from racial and ethnic groups other than White than did mail returns. The BCFs had a higher percentage of people under age 14 than other mail returns.
- The people enumerated on BCFs in Menominee were all American Indian and most of them were between 5 and 14 years of age.

Were there differences in data quality between BCFs and other mail returns?

Yes, in some situations, with BCFs having higher item nonresponse rates in each case. Part of the success of the Be Counted Program is determined by the quality of data collected on the BCFs. In order to assess this, data quality was measured in terms of item nonresponse rates, which were then compared with the rates for other mail returns. Due to the small number of BCFs in Menominee, the site was not included in this analysis. The item nonresponse rates in Sacramento were all significantly higher than comparable rates on other mail returns. In South Carolina, all item nonresponse rates were similar to rates for other mail returns in the site except for the Hispanic origin item, which was significantly higher on the BCFs.

Telephone Questionnaire Assistance¹²

Telephone Questionnaire Assistance (TQA) was an operation designed to perform several functions:

- Answer questions from the public on what the census is and how to complete specific questions on the forms;
- Mail replacement forms to callers;
- Collect census information over the telephone (also referred to as reverse Computer Assisted Telephone Interview).

TQA began at the time the update/leave operation started and remained open through the end of the nonresponse followup field period. There were three components to the operation:

- An Interactive Voice Response (IVR) system provided initial assistance to the caller including collecting an address so a form could be sent. In addition, the IVR system could forward the call to a live agent.
- Direct assistance was provided by a Census Bureau interviewer after being re-routed from the IVR to an interviewer at one of the telephone centers. The interviewer then evaluated the reason for the call and coded that reason into the first screen of the instrument. The service provided to the caller was determined by this information.
- Census information was collected over the phone. Interviews were taken when callers specifically requested to give their information over the phone, the residency status was complicated, or they called to request a form so close to the cut off date for nonresponse that if TQA mailed a form rather than taking the interview, the caller would still have been visited by a nonresponse enumerator.

TQA was conducted from a central location and served callers from all sites in the same manner. The evaluation of TQA was not designed to differentiate between callers from the three dress rehearsal sites.

How long were TQA calls? Did the TQA system handle calls in an efficient manner?

The system exceeded expectations in terms of the average length of call. Compared to the average times from the 1995 census test, the Census 2000 Dress Rehearsal times were shorter. In the 1995 test, the average call time excluding interviews was about 3 minutes and 42 seconds. Calls that completed a short form interview in 1995 lasted on average about 6 minutes and 6 seconds. In 1995 a long form interview took on average 32 minutes 36 seconds. For the dress rehearsal, the average call time excluding interviews was 3 minutes and 19 seconds. The short and long form interview portion of the calls lasted 4 minutes and 31 seconds and 27 minutes and 8 seconds, respectively.

¹²The data discussed in this subsection can be found in: Wendy Davis and David Phelps. "Evaluation of Telephone Questionnaire Assistance." Census 2000 Dress Rehearsal Evaluation Memorandum, A4. April 1999.

For the dress rehearsal, was the menu of choices in the system well designed? Did the system properly route callers?

Statistics on the TQA system indicated that the system was less effective than intended. The percentage of callers who had to repeat the menu in IVR, the percentage of callers who were forced out of IVR because of too many invalid selections, and the percentage of times a path in the TQA instrument was not completed correctly indicated some problems. Within the IVR, almost all of the callers had to listen to the top menu more than once to make a selection, a phenomenon suggesting that the menus were not clear or were too lengthy to process without hearing more than once. In 29 percent of the calls, the operator did not navigate the system correctly to solve callers' problems.

What reasons did callers give for contacting TQA?

The most commonly selected option among those calling TQA was to be routed to an operator. The next most frequent selection was to get an explanation of the replacement form—25.3 percent of the calls received at the IVR and 11 percent of the calls handled by an interviewer were for this reason.

The coding of calls by interviewers revealed that the most frequently selected category was the miscellaneous "other" category. In developing the TQA instrument, the Census Bureau intended the "other" category to be one of the least selected categories. The fact that about 25 percent of the calls were categorized as "other" suggested that different categories should have been directly accessible to the interviewers. Responses specified for "other" were coded to reveal what direct links would most benefit callers for Census 2000. Results revealed that 12.6 percent of the callers had a question about the meaning of Census Day, April 18. They were unsure whether that was a due date, whether they were supposed to wait to fill the form out until that day, or why they received the form before that day. Another 11.3 percent of the callers in the "other" category were people who had received forms at a business, church, or institution and 10.4 percent had a question about employment or a request for particular government phone number. Based on this analysis, a category about what to do if the form was received at a business or other non-housing unit, a category that lists other government numbers and addresses that callers would like to access, and a category addressing questions about the date for Census Day should be added. These suggestions were considered and incorporated as appropriate in the TQA program for Census 2000.

Were any of the TQA methods used to collect census address information more effective at producing information for matching to the MAF?

All three methods worked well. Another portion of the evaluation assessed whether any one of the three methods used to collect census addresses from callers was more effective at producing information that could be matched correctly to the MAF. The first method used by the TQA system used the caller's telephone number to match to a database of residential addresses. Callers only had to verify their house number and street name. The second method prompted the caller to

provide a complete mailing address via the IVR, while the third method used operator probes to collect a complete mailing address in the city-style format. All methods yielded high quality addresses about 89 percent of the time (91.3 percent by telephone number match, 89.3 percent by voice capture, and 82.2 percent by an operator). However, since the first two methods were limited to callers with city-style addresses, these two methods resulted in the highest percentage of callers whose addresses could be matched to the MAF (the automated match to the MAF required a city-style address).

Did TQA callers requesting a form actually return one?

Of the people that called TQA requesting a form and who had city-style addresses, 69 percent returned a form, though most responded with their original form. That is much higher than the overall response rate for the dress rehearsal sites. This part of the analysis measured the degree to which callers who requested forms actually returned those forms. The assessment measured the efficiency of address collection and whether the quality of responses on the TQA returns was comparable to that of the general census returns.

Approximately 20 percent of all calls to TQA requested a form. Seventeen percent did so through the IVR and 3 percent after being transferred to an operator. The vast majority of the forms returned by these callers were not the forms mailed by TQA. Eight-five percent returned their original census form. Given this finding, the effectiveness of the TQA mailout operation seemed questionable. Census 2000 will still include this option based on input from stakeholders and the commitment to offer multiple response options.

How many responses were received from TQA interviews?

In all three sites combined, just over 100 TQA interviews were included in the dress rehearsal census population. Few households were actually enumerated in the dress rehearsal by a phone interview with a TQA operator.

What were the item missing data rates?

The item nonresponse rates for forms mailed back by TQA callers requesting a form were comparable to those on the other mail returns for any item. The TQA callers have a slightly higher rate (about 2 percent) of nonresponse for three items (tenure, the person count box on the short form, and the long form roster). For all other items, the difference is close to or less than 1 percent.

Effect of Alternative Response Options on Long Form Data¹³

¹³The findings discussed in this subsection can be found in: Zakiya T. Sackor. "Evaluation of the Effect of Alternate Data Collection Forms on Long Form Data." Census 2000 Dress Rehearsal Evaluation Memorandum, A5. May 1999.

The Census Bureau used alternative data collection forms in an attempt to allow people a means to respond. Friendly forms and increased accessibility of the forms were important. Both the BCF and TQA interviews were developed to reach population groups expected to have language difficulties in completing forms. The intent of these options was to be a last resort for people who thought they weren't counted.

Prior to the mailout, the Census Bureau assigned all households a form type, either a short form or a long form. As a result of the use of the alternative forms, the *a priori* form type assignment for a household might not have matched what was actually collected for that household or a person within that household. The BCF was a short form questionnaire; for TQA, respondents who were unable to provide the correct identification number were assigned a form type on the basis of a sampling method to allocate long and short forms. As a result, TQA collected both long and short form data. We determined the percentage of households and people who were enumerated by short forms rather than long forms as intended, and whether there were statistical differences in demographics between people who were enumerated as assigned and people who were enumerated by another means. The analysis was restricted to occupied housing units and excluded households that were not contacted during nonresponse followup due to sampling (Sacramento only).

What were the effects of the alternative collection methods on the prevalence of short forms being used in place of long forms?

The overall loss of sample data from alternative data collection methods and other reasons was minimal. In South Carolina it was 0.9 percent, in Menominee 1.2 percent, and in Sacramento 1.4 percent. The majority of long form sample loss was due to form assignment problems with added units in update/leave areas or an enumerator administering the incorrect form in nonresponse followup. The findings suggested that, overall, alternative data collection methods had virtually no effect on the amount of sample data available (0.0 percent in South Carolina and Menominee; 0.4 percent in Sacramento).

Were there any demographic differences between those who were enumerated as assigned and those who were not?

Statistical differences between those who were enumerated on the form type assigned and those who were not were found by race and ethnicity but not by sex. For the most part, the distribution of *a priori* long form persons enumerated not-as-assigned was greater for all race and ethnic groups except White. Race and ethnic groups other than Whites and Hispanics appear less likely to be enumerated as assigned.

Younger people were more likely not to be enumerated as assigned. Those in younger age groups might be more likely to have mobile living conditions and therefore be enumerated by an alternative data collection methodology.

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Chapter 4. Advertising and Marketing Campaign

Highlights

- The paid advertising campaign in South Carolina and Sacramento, together with partnerships and the mail strategy, were very effective at increasing awareness about the Census 2000 Dress Rehearsal.
- The campaign had a modest effect on individuals' attitudes and knowledge of the census.
- Civic participation was positively related to returning a form.
- If a person expected a form in the mail, the rate of response was higher.
- The advertising campaign did not appear to have a direct effect on the likelihood of individuals returning a census form.

The Census 2000 Dress Rehearsal tested several new methods targeted at promoting census awareness. A paid advertising campaign was conducted to increase awareness of the Census 2000 Dress Rehearsal. Before and after the campaign, telephone surveys were conducted with randomly selected households to evaluate the campaign's effectiveness.

Paid Advertising Campaign

A paid advertising campaign was conducted to increase awareness of the Census 2000 Dress Rehearsal among both the general public and hard-to-reach minority subgroups. Historically, the Census Bureau has relied on *pro bono* advertising to encourage response, and the switch to a paid campaign is a major innovation for Census 2000. The marketing strategy included advertising messages delivered through print media, radio, television, out-of-home media (billboards, bus shelters, posters, mobile billboards, and advertisements on shopping carts and in beauty salons, convenience stores, and check cashing establishments), as well as a special school-based public information campaign.

Although the evaluation concentrated specifically on the efforts of paid advertising for the dress rehearsal, there were outreach and promotion activities independent of the advertising campaign (e.g., local partnership activities) and receipt of census materials (pre-notice letter, census forms, reminder postcard) that undoubtedly influenced awareness and were reflected to some degree in evaluation results. In addition, both before and during the campaign, there was national media coverage of the debate over sampling for Census 2000. That coverage may have increased

awareness of the census as well. There was no reason to believe, however, that the coverage had a greater impact on post-campaign respondents than on pre-campaign respondents.

Effectiveness of Paid Advertising¹⁴

Two telephone surveys were conducted with randomly selected households—one before the advertising campaign and one after—to identify the differences between the pre-campaign and post-campaign respondents in their awareness, attitudes, and knowledge about the census. Within each sampled household, an interview was conducted with a household member who opens the mail for that household. There were 817 respondents to the pre-survey (a 28 percent response rate) and 1,506 respondents to the post-survey (a 64 percent response rate) in South Carolina. In Sacramento, there were 565 respondents to the pre-survey (a 25 percent response rate) and 1,504 respondents to the post-survey (a 54 percent response rate).

Were there any limitations that may have impacted the results?

The need to complete the pre-campaign survey before the advertising campaign began made for a much shorter field period than what was needed to obtain a high response rate to the survey. Interviewing began on February 10, 1998, which allowed 19 days to complete the interviews before the March 1 initiation of campaign activities. Survey methods usually used to maximize response rates, such as recontacting respondents who declined to participate the first time they were called, were dramatically limited by the short field period. The reduced amount of time, combined with the need to complete the largest number of baseline interviews possible before March 1, resulted in a very low response rate for the pre-survey.

How successful was the campaign in reaching the targeted audience?

In both test sites, most respondents known to reside in the targeted area reported having seen or heard information about the program in their community encouraging dress rehearsal census participation. In Sacramento, 8 of 10 respondents reported having seen or heard something about the program in their community that encouraged everyone's participation in the census, while in the South Carolina site, 84 percent of respondents known to reside within the targeted area reported having seen or heard information about the program in their community encouraging census participation. While the reported awareness of the program was higher among non-Hispanic Whites and those with higher levels of education and income, large proportions of targeted low education groups, low income groups, and non-Hispanic Blacks also had heard of the program (in South Carolina, 65 percent of those who did not finish high school, 77 percent of those with household incomes less than \$20,000, and 81 percent of non-Hispanic Blacks; in Sacramento, 81 percent of Hispanics, 74 percent of non-Hispanic Blacks, 69 percent of Asian/Native Hawaiian/Pacific Islanders, 63 percent of households in which English was not the primary

¹⁴The discussion presented in this subsection can be found in: Roper Starch Worldwide. "Effectiveness of Paid Advertising." Census 2000 Dress Rehearsal Evaluation Memorandum, E1a. April 1999.

language, 60 percent of those born outside the United States, 54 percent of those who did not finish high school, and 70 percent of people with household incomes less than \$20,000).

The number of residents in the South Carolina site who recently had heard or seen information about the census rose dramatically from 29 percent before the campaign to 89 percent after it. Similar increases were seen in the Sacramento site: the number of Sacramento residents who had recently heard or seen anything about the census rose from 28 percent before the campaign to 80 percent after it. That increase was seen across all educational, income, race, and Hispanic origin groups that were analyzed.

The number of people in both South Carolina and Sacramento who had heard of the census increased much more modestly, primarily because most people had heard of the census before the campaign. In South Carolina it was 93 percent before the campaign compared to 98 percent after the campaign, while in Sacramento it was 86 percent before the campaign compared with 94 percent after the campaign. The increase in awareness was greatest for groups that had lower levels of awareness before the campaign, and those with lower levels of education, lower levels of income, and non-Hispanic Blacks.

Familiarity with the Census Bureau was also increased modestly, again because of the relatively large numbers who reported familiarity with the Census Bureau before the campaign—94 percent of pre-campaign respondents compared with 97 percent of post-campaign respondents in the South Carolina site, and 89 percent of pre-campaign respondents compared with 93 percent of post-campaign respondents in Sacramento. The greatest increase with familiarity of the Census Bureau in both cases was among groups who were the least familiar with the Census Bureau before the campaign—people with lower levels of education, lower levels of income, and non-Hispanic Blacks.

Did the advertising campaign affect people’s attitudes and knowledge about the census?

There was modest change in responses to survey questions about attitudes toward and knowledge of the census. Modest improvements were seen on questions dealing with feelings and beliefs about confidentiality. Even after the campaign, 56 percent of the South Carolina respondents who had heard of the Census Bureau agreed that “*The Census Bureau would never let another government agency see my answers to the census.*” Fifty-nine percent knew that police and FBI do not use census data to keep track of people who break the law, and 64 percent knew data are not used to check on whether people are paying their taxes. In Sacramento, half of the residents who had heard of the Census Bureau agreed that “*the Census Bureau would never let another government agency see my answers to the census.*” Sixty-eight percent knew that police and FBI do not use census data to keep track of people who break the law, and 71 percent knew the data are not used to check on whether people are paying their taxes.

Both sites witnessed improvement in perceptions about the direct value of the census to respondents themselves and to their community after the campaign. The proportion agreeing that answering the census is an opportunity to do something that can improve circumstances for their families and future generations rose from 79 percent to 89 percent in the South Carolina site and

from 78 to 85 percent in Sacramento. The number of respondents believing that the census is used to decide where resources like schools and health care facilities are needed and to decide how much money communities will get from federal and state governments rose significantly for South Carolina and moderately for Sacramento.

The greatest increase in knowledge about the census concerned the mandatory status of census participation, although even after the campaign the majority of residents still did not realize that they were required by law to complete and return their census forms. Among respondents who had heard of the census in the South Carolina site, the number who correctly answered this question rose from 20 percent before the campaign to 46 percent after it. In Sacramento, this change was from 18 percent to 40 percent, respectively. We note, however, that a statement indicating participation is required by law was printed on the envelopes in which census forms were mailed to respondents, and it is likely that this, rather than paid advertising, was responsible for the change.

How did people hear about the census?

Eight out of 10 respondents reported having heard about the program through one of the media used by the paid advertising campaign in South Carolina, while 75 percent reported having heard about the census through these sources in Sacramento. The targeted groups were less likely to have heard about the census in both sites, though even among those groups the paid advertising campaign appears to have reached significant numbers of households. In South Carolina, 73 percent of those with household incomes less than \$20,000, 61 percent of respondents who did not finish high school, and 79 percent of non-Hispanic Blacks reported having heard about the program through the media employed by the paid advertising campaign. In Sacramento, 76 percent of Hispanics, 70 percent of non-Hispanic Blacks, 64 percent of Asian/Native Hawaiian/Pacific Islanders, 60 percent of respondents in whose households a language other than English was spoken, 61 percent of immigrants, 66 percent of those with household incomes less than \$20,000, and 50 percent of those who did not finish high school reported having heard about the program through the media employed by the paid-advertising campaign.

Television was the most effective of the media in both sites, reaching 68 percent of those in the South Carolina area, 62 percent in Sacramento, and larger proportions of each of the targeted subgroups than any of the other media. Newspaper advertising reached about half of all South Carolina residents. While it was less successful in reaching those with lower levels of education and income and Blacks, newspapers were still the second most important media for those groups as well. The success of radio advertising, through which 42 percent of all residents heard about the program, was also greater among the better educated and those with higher household incomes. Of the traditional media used in the advertising campaign, magazines were the least effective, reaching 16 percent of the population. Blacks and Whites were not significantly different from other racial and ethnic groups in their likelihood of being exposed to magazine advertising, but both education and income levels were related to its success. Two out-of-home media used in the paid-advertising campaign—billboards and posters, signs or handbills—also were relatively successful by reaching 35 and 36 percent, respectively, of all respondents in South Carolina.

Those media were found to be as successful in reaching Blacks as well as Whites, although their success declined among lower income and education levels.

The success of media sources in reaching targeted populations was similar in Sacramento. Newspaper advertising reached four-out-of- ten Sacramento residents, but was less successful in reaching many of the targeted groups. While about half of non-Hispanic Whites reported having heard about the program through the newspapers, this was true of 37 percent of Hispanics, 28 percent of non-Hispanic Blacks, and 34 percent of Asian/Native Hawaiian/Pacific Islanders. One-third of immigrants and 28 percent of those in households where English was not the primary language reported having heard about the program through the newspapers. The biggest barrier to the success of newspapers reaching these groups was education, with 14 percent of those with less than a high school degree saying that they had heard about the program through the newspapers.

The success of radio advertising, through which one-third of all residents heard about the program, was not significantly different among the racial/ethnic groups studied, between those born in the United States and those born elsewhere, or between English speaking households and non-English speaking households.

Of the traditional media used, magazines were the least effective, reaching 13 percent of the population. The out-of-home media used in the awareness campaign, billboards and posters, and signs or handbills, were successful in reaching about 33 and 25 percent, respectively, of all respondents. Posters, signs, and handbills were seen by equal numbers of immigrants and U.S.-born respondents (26 percent). Overall, these media were not found to be less successful in reaching the targeted racial/ethnic groups and non-English speaking households than others.

Advertising Exposure and Likelihood of Returning a Census Form¹⁵

By using data from the post-campaign survey described above and from Census Bureau records, the relationship between reported exposure to dress rehearsal paid advertising and the likelihood of returning a census form was assessed.

Did the paid advertising affect census knowledge?

In general, there was a positive relationship between reported advertising exposure and level of census knowledge. Even when controlling for other factors such as race, income level, and education, as exposure to advertising increased, census knowledge increased significantly as well. However, in both sites, African Americans, Hispanics, and Asian/Native Hawaiian/Pacific Islanders had significantly lower levels of census knowledge compared to Whites.

¹⁵The data presented in this subsection can be found in: Nancy Bates and Sara K. Buckley. "Effectiveness of Paid Advertising Campaign: Reported Exposure to Advertising and Likelihood of Returning a Census Form." Census 2000 Dress Rehearsal Evaluation Memorandum, E1b. April 1999.

There also was evidence that the paid advertising successfully penetrated some targeted subgroups. For example, Hispanics in the Sacramento site reported higher levels of census exposure than Whites did — an average of 2.44 media sources versus an average of 2.28 media sources for Whites. Likewise, in the South Carolina site, Whites reported lower levels of exposure (an average of 2.64 sources) than all other races did (an average of 2.94 sources).

What factors affected the likelihood of households returning a census form?

There did not appear to be a direct relationship between reported advertising exposure and likelihood of returning a census form. It appeared, though, that advertising had an *indirect* effect on likelihood of returning a form. Households that were expecting the census form before it arrived were significantly more likely to return it than those who were not. Therefore, because exposure to the advertising made people expect the census form in the mail, they were more likely to return the form. This was true even when other things like education, race, civic participation, and income were held constant.

The level of civic participation was strongly associated with the likelihood of returning a census form. The higher the degree of civic participation, the higher the predicted odds of mailing back a form, even when controlling for demographic characteristics such as race and education.

Chapter 5. Data Collection and Field Infrastructure

Highlights

- Nonresponse followup was completed early in South Carolina and on time in Sacramento and Menominee.
- The Large Household Followup operation was not successful. A large household followup questionnaire was received for fewer than one-third of the large households in each of the dress rehearsal sites. This led to extensive imputation of characteristics for people in large households.
- Census mailings including recruitment postcards and the advance letter were more effective in reaching job applicants than newspaper and radio advertisements in all three sites, though most applicants reported hearing about dress rehearsal census jobs from friends or relatives.
- In all three sites, transportation difficulties presented an obstacle to the hiring of welfare-to-work recipients.
- The dress rehearsal results from the investigation of nonresponse followup and ICM/PES recruiting indicated that a lower recruiting goal could be used. A recommendation was made that this new goal be eight times the number of authorized enumerator production positions. Based on further analysis by field managers, the goal will remain ten times the number of authorized positions.
- Training effectively prepared enumerators to do their jobs during the dress rehearsal, though some improvements are needed in composition and delivery in both the Nonresponse Followup and ICM/PES training programs.

The data collection operations for the Census 2000 Dress Rehearsal included nonresponse operations for enumerating those who did not initially reply by mail, as well as special operations for enumerating people without housing. In the large household followup, the Census Bureau collected demographic data for people in households that responded by mail to the census, but had more than five household members. These households were mailed a followup questionnaire. The coverage edit followup was a procedure to edit and correct enumeration data indicating household size on short form and long form data.

Field activities encompassed the actual processes of staffing and conducting census data collection operations. The processes included defining job requirements, identifying and testing potential census enumerators, establishing payroll procedures, furnishing necessary supplies and tracking

dress rehearsal inventories, collecting data from hard-to-reach populations, and collecting data from large households.

Each of the three dress rehearsal sites used slightly different strategies and methods to recruit applicants for Census Bureau jobs. Welfare recipients were actively recruited at all sites.

Automated systems were employed to track and handle EEO complaints, recruit applicants, and process payroll information. Local Census Offices (LCOs) sent orders for supplies to their Regional Census Center (RCC) using the automated system.

Data Collection Operations

Nonresponse Followup¹⁶

Nonresponse followup was a field operation that was conducted to obtain census data for households that did not complete a questionnaire, whether through the mail, by completing a Be Counted form, or by providing data over the telephone to a TQA operator. The operation tracked the receipt of questionnaires by check-in date at the LCO for each site. A profile identified the percent of final attempt cases, the percent enumerated with proxy respondents, and the percent which had unknown occupancy status after nonresponse followup. For housing units which did not have a checked-in questionnaire by May 7, 1998, full nonresponse followup was conducted in South Carolina and Menominee, while sampling was used in Sacramento.

Was nonresponse followup completed on time?

In all three sites, nonresponse followup was completed on time or ahead of schedule. In South Carolina, nonresponse followup ran from May 14 through July 2, 1998, ending six workdays ahead of schedule. Approximately 81.9 percent of all nonresponse followup questionnaires were checked in by June 12, 1998, about halfway through the South Carolina nonresponse followup operation. In Sacramento, the operation ran from May 14 through June 26, 1998 and approximately 54.9 percent of all nonresponse followup questionnaires were checked in by June 5 (about halfway through the Sacramento nonresponse followup). In Menominee, nonresponse followup ran from May 14 to June 26, 1998. The check-in of nonresponse followup questionnaires in Menominee seemed to peak toward the middle of the operation. Approximately 58.4 percent of all nonresponse followup questionnaires were checked in by June 5 (about halfway through the Menominee nonresponse followup). In all three sites, long form SEQs exhibited a slower rate of return than the short forms.

¹⁶All of the data presented in this subsection can be found in: C. Robert Dimitri. "Nonresponse Followup Operation." Census 2000 Dress Rehearsal Evaluation Memorandum, A1b. April 1999.

What portion of the nonresponse followup universe was enumerated by proxy at each site?

The results indicate that interviews with actual household members were not nearly as easy to obtain as expected, and the quality of the data—especially for the long form questionnaires—was a concern. In Sacramento, 20.1 percent of the occupied nonresponse followup universe were enumerated via proxy, while in South Carolina 16.4 percent of the occupied nonresponse followup universe were enumerated via proxy. In Menominee, 11.5 percent of the occupied nonresponse followup were enumerated via proxy.

What is the distribution of proxy returns?

Interviews by proxy in occupied housing units tended to increase in frequency toward the end of the nonresponse followup operation. This is expected due to the rules for taking an interview from someone who is not a household member (proxy). At the beginning of nonresponse followup, a proxy was taken after six attempts to contact the unit, three by phone and three in person. Once final attempt procedures were invoked at the end of nonresponse followup, proxies were taken right away.

The South Carolina proxy questionnaires were similar to the nonresponse followup questionnaire pattern of receipt. Most of the proxy questionnaires were checked-in during the early and middle parts of the operation, with 72.9 percent of them checked in by June 12. Relative to all nonresponse followup interviews, an occupied housing unit proxy interview was more likely to have occurred late in the nonresponse followup operation.

The receipt of Sacramento nonresponse followup proxies for occupied housing units was different than the nonresponse followup universe as a whole. Questionnaires completed via proxy were checked in at a slower overall pace; 37.6 percent were checked in through June 5.

The Menominee proxy questionnaires from occupied housing units were not consistent in check-in distribution with the entire nonresponse followup questionnaire universe. The majority of these questionnaires were checked in during the later stages of the operation; 33.9 percent had been checked in by June 5.

What was the extent of final attempt?

An intense effort was made to get a completed questionnaire for each remaining unit in nonresponse followup. Final attempt procedures for nonresponse followup began when the completion rate for an area reached 95 percent, as determined by the nonresponse followup progress report. Final attempt procedures were used for 3.2 percent of housing unit interviews in South Carolina site. In Menominee, it seemed that either the final attempt procedures were not utilized, unnecessary, or the enumerators did not properly complete the item on the questionnaire. Final attempt procedures in Sacramento apparently were not followed properly. More than 5 percent (8.9 percent) of the nonresponse followup universe was enumerated during final attempt procedures, contrary to the guidelines for the final attempt operation.

Overall, long form housing units were more difficult to enumerate, leaving a substantially larger proportion of these cases to be enumerated via final attempt procedures than short form cases. This translated to 20.4 percent long compared to 6.9 percent short in Sacramento, and 5.6 percent long as compared to 2.7 percent short in the South Carolina site.

Service Based Enumeration¹⁷

The Service Based Enumeration (SBE) focused on enumerating people without housing who might have been missed by the traditional procedures applied to housing units and group quarters. For the Census 2000 Dress Rehearsal, enumeration sites included emergency shelters, soup kitchens, and targeted non-shelter outdoor locations, such as outdoor encampments. Individuals who indicated that they had no address on the Be Counted form (by marking the “no address on April 18, 1998” box on the form) were also included in the SBE universe.

Table 4. Number of Service Locations by Service Type and Site

Type of Service Location	South Carolina Site	Sacramento	Menominee
Shelters	13	11	0
Soup Kitchens	4	1	0
Targeted Non-Shelter Outdoor Locations (TNSOL)	2	--*	2
Total Enumeration Sites	19	12	2

*There were some TNSOL locations in Sacramento, but they were miscoded as a T-night location.

What was the outcome of the SBE?

The SBE appeared to be a successful method of including people without housing in the census. The SBE operation netted a total of 1,615 people across all three sites. The South Carolina site enumerated 19 designated sites, while the Sacramento and Menominee sites enumerated 11 shelters and a soup kitchen, and two non-shelter outdoor locations, respectively (Table 4).

How many cases were unclassified at the end of nonresponse follow?

Unclassified units were 1.0 percent, 1.1 percent, and 0.8 percent of the nonresponse universe in Sacramento, South Carolina, and Menominee, respectively. The goal was 0.05 percent or less. These high rates were mainly driven by lost forms or problems in the data capture process rather than failure to contact housing units during nonresponse followup. We expect the rates to be better in Census 2000 because the Census Bureau is improving the processing control system and the data capture processing.

¹⁷The data discussed in this subsection can be found in: Tracey McNally. “Service Based Enumeration Coverage Yield Results.” Census 2000 Dress Rehearsal Evaluation Memorandum, D1. April 1999.

What procedures were used to gather data at the service sites?

An enumeration of emergency shelters was conducted on April 20, 1998. At least one team of two enumerators was assigned to each shelter; more than one team was assigned if large numbers of clients were expected. Upon arriving at the shelter, the enumerators introduced themselves to the contact person, explained how the enumeration was to be conducted, and asked the contact person to make an announcement encouraging participation in the enumeration. Each participant received a privacy act notice in his or her enumeration packet containing a form, privacy act notice, pencil and envelope, and every sixth person was given a long form to complete. Respondents were asked to return the completed questionnaire in the envelope provided.

During the day and evening of April 21, 1998, enumeration of soup kitchens was conducted. A soup kitchen enumerator team consisted of seven enumerators; multiple teams were assigned to soup kitchens where large numbers of clients were expected. Upon arriving at the soup kitchen, the enumerators introduced themselves to the contact person, explained how the enumeration would be conducted, and asked the contact person to make an announcement encouraging participation in the enumeration. On each team of seven enumerators, two members completed long-form interviews.

Enumeration at targeted non-shelter outdoor locations took place on April 22, 1998. Through the use of partnerships, each targeted outdoor shelter had a contact person who accompanied enumerators while at the location. There was no long form enumeration at those sites, and enumerators were instructed to note ages and sex if they were unable to complete interviews.

How were duplicate responses eliminated from the SBE universe?

Specifications were developed to guide the process of unduplicating people in the SBE universe. If an individual completed a questionnaire at a shelter and at one or more soup kitchens or a targeted outdoor location, the shelter questionnaire became the primary data source. If a respondent was not interviewed at a shelter, but did complete questionnaires at more than one soup kitchen or targeted outdoor location, the questionnaire with the most complete data became the primary source. People enumerated on BCFs who were designated as part of the SBE universe were randomly allocated to shelters, soup kitchens and targeted outdoor locations for tabulation purposes. All enumerated people were counted in the Census 2000 Dress Rehearsal, regardless of whether their records contained sufficient information for unduplication.

What was the outcome of the unduplication process? How did the SBE affect the number of additions, corrections, or deletions for dress rehearsal sites?

The South Carolina SBE counted 525 people. In this site, 80.4 percent (422) had records with sufficient data for matching or detecting duplicate records. Seventy-three records (13.9 percent) were matched with others and not included in the final count. The SBE netted a total of 452 people in this site. In Sacramento, of the total 1,193 people who were enumerated during SBE, 63.9 percent (762) had records with sufficient data for matching. Thirty-seven records (3.1 percent) were matched with others and not included in the final count. All seven of the

records (100.0 percent) from the Menominee site contained sufficient data to be matched (Table 5).

Table 5. Results of the SBE Unduplication

Site	South Carolina Site		Sacramento		Menominee	
	Number	Percent	Number	Percent	Number	Percent
Total person records collected	525	100.0	1,193	100.0	7	100.0
Person records with sufficient data	422	80.4	762	63.9	7	100.0
Person records with insufficient data	103	19.6	431	36.2	--	--
Person records matched and not counted	73	13.9	37	3.1	--	--
Total unduplicated number of people included in dress rehearsal counts	452	86.1	1,156	96.9	7	100.0

Coverage Edit Followup¹⁸

The Census 2000 Dress Rehearsal Coverage Edit Followup operation was a procedure to edit and correct enumeration data indicating household size on short form and long form mail return questionnaires. Errors in the data on household size resulted either from data capture errors, caused by scanning or imaging problems, or from respondent errors. Data Capture Audit Resolution, a computer edit and computer-assisted review process, was expected to resolve many, if not most, of the data capture errors affecting household size. The coverage edit followup was designed to correct respondent errors resulting from the inadvertent omission or duplicate listing of household members, the misunderstanding about whom should be included on a census form, or from a general failure to completely and accurately fill out the census form.

How were the households needing coverage edit followup identified?

The coverage edit for short form questionnaires compared the count of household members at the beginning of the questionnaire (short form person count box) with the number of person panels filled plus the number of names entered on the short form roster (for persons 6-12). On long form questionnaires, the coverage edit compared the number of names on the household roster with the number of person panels filled. If these measures of household size did not agree and the data showed that there were less than six people in the household, the questionnaires failed the coverage edit and required followup. Mail return questionnaires with six or more people were included in the large household followup and were ineligible for the coverage edit followup.

What happened to cases that failed the coverage edit?

¹⁸The data provided in this subsection can be found in: Nicholas Alberti. "Coverage Edit Followup." Census 2000 Dress Rehearsal Memorandum, D3. August 1999

For each coverage edit failure, a telephone interview with a household member was attempted to review the information about the count of household members and the names of the people listed on the form. When the followup interview was not possible, the household size was imputed by choosing the maximum count of people, not to exceed a total of five, based on all available data. A comparison between the household sizes determined through the followup interviews and the household sizes that would have been imputed had followup interviews not been completed demonstrated that the coverage edit followup had a substantial downward impact on the net population count for forms that failed the coverage edit. Had the coverage edit followup not been conducted, the mail return population would have been 0.3 percent higher in Sacramento, 0.6 percent higher in the South Carolina site and 0.8 percent higher in Menominee.

How should mail returns be handled when they were missing one or two of the counts required to conduct the automated coverage edit?

When respondents neglected to fill in the household size on short forms or the roster on long forms, or when they did not complete any of the person panels, the automated coverage edit was unable to check on the consistency of household size information. Census returns with these types of missing information did not fail the coverage edit in the dress rehearsal; however, an experimental coverage edit followup was conducted for a sample of these types of cases by using seven experimental coverage edit criteria. Results from this study—indicating the frequency of coverage errors among mail returns with these types of missing data—indicated that if any of these experimental criteria had been included in the dress rehearsal production coverage edit followup, they would have substantially increased the workload while providing only a very small improvement to the quality of the population coverage.

Should large households be included in the coverage edit followup?

Yes. Although large households were excluded from the dress rehearsal coverage edit followup, a separate coverage edit followup was conducted on a sample of large household mail returns that had inconsistent information on household size. The data from this sample indicated that applying a coverage edit followup to the mail returns in the large household followup would have corrected the household size on an estimated 2.2 percent (se 0.2 percent) of the large household short forms and an estimated 3.7 percent (se 0.3 percent) of the large household long forms. Therefore, the coverage edit followup process would have corrected for a higher proportion of the household size data of the large households than of the non-large households. Including large households in the dress rehearsal production coverage edit followup would have increased the workload by about 13 percent.

Based on these results, how did the Census Bureau design coverage edit criteria for Census 2000?

The Census Bureau designed coverage edit criteria for Census 2000 similar to those used in the dress rehearsal. The number of cases receiving a call will not be capped as it was in the dress rehearsal and all large households will be included in the followup operation. For Census 2000,

the coverage edit followup and the content followup for large households have been integrated into one operation.

Large Household Followup¹⁹

The large household followup was a new mailout/mailback operation, tested for the first time during the dress rehearsal. Its purpose was to collect demographic data for people in households that responded by mail to the census, but for whom there was not enough space on the census questionnaire to collect demographic data for all household members. During the dress rehearsal, the census questionnaires used for both mailout and update/leave contained spaces to report the names of up to twelve household members, but only enough spaces for respondents to provide detailed demographic data for five household members. Households that reported by mail questionnaire that their household size was six or greater were mailed a large household followup questionnaire to provide information on those household members for whom only names were provided. The Census Bureau assessed the completeness and quality of data for households and people requiring followup.

How successful was this operation?

The large household followup was not successful. A large household followup questionnaire was received for fewer than one-third of the large households in each of the dress rehearsal sites. Because of several operational restrictions, one-third of the large households were not sent a large household followup questionnaire. For example, in the South Carolina site, more than 33 percent of the mail return households did not receive large household followup questionnaires.

What was the response rate for large household? Did it differ by race and Hispanic origin?

The response to large household followup was low. In all three sites, the large household followup response rates were below 32 percent. Those low rates were due both to the low mail check-in rates and the fact that a large number of eligible cases were excluded from large household followup. In South Carolina, 28.3 percent of large households responded. In Sacramento, 31.1 percent of large households responded, and in Menominee 32.7 percent of large households responded.

The proportion of households for which a large household followup questionnaire was returned varied by race and Hispanic origin of the household. In South Carolina, the percentage of Black, non-Hispanic, large households that returned the followup questionnaire was more than 10 percentage points lower than the percentage of White, non-Hispanic households that returned a followup questionnaire (Table 6).

¹⁹The data discussed in this subsection can be found in: Nicholas Alberti. "Large Household Followup." Evaluation Census 2000 Dress Rehearsal Evaluation Memorandum, D4. May 1999.

Table 6. Percent of Large Households that Responded by Race and Hispanic Origin

Dress Rehearsal Site	Total	Black non-Hispanic	White non-Hispanic	American Indian/Alaska Native	Other non-Hispanic	Hispanic
South Carolina site	28.3	24.4	36.2	**	18.0	17.3
Sacramento	31.1	23.2	33.4	**	37.5	23.8
Menominee	32.7	**	**	32.6	33.3	

**Estimates were not made in these cells.

How did the low response rate for the large household followup affect the completeness of census data?

The low proportion of large households for which large household followup data were collected had a profound effect on the number of people with statistically imputed characteristics in the census. Because the data were collected from so few large households, most of the people allocated into mail return households were in large households. For example, in South Carolina, 1.9 percent of the mail return population were imputed people and more than 70 percent of those people were imputed in large households. There were also important differences across age, race, and Hispanic origin. Young children (10 and under) who were imputed into mail return households comprised a high percentage of all young children in mail return households. For mail return households in South Carolina, 4.8 percent of all young children versus 32.2 percent of those in the large household population were imputed into large households. For the mail return population in South Carolina, 2.8 percent of the Black, non-Hispanic population and 2.2 percent of the Hispanic population versus 20.6 percent of the large household population for both Black and non-Hispanics were imputed in large households. For White non-Hispanics, however, 0.6 percent of the population versus 15.4 percent of the large household population were imputed in large households.

What was the quality of data collected from the large household followup operation?

In assessing the completeness of data in the large household followup, the forms seemed to provide comparable quality to other questionnaires returned in the Census 2000 Dress Rehearsal. The item nonresponse rates were comparable for both 100 percent data items and for those sample data items that appear for all other persons in mail return households.

Field Infrastructure

Recruitment Activities²⁰

Recruiting and retaining a competent, motivated, and representative staff of local census-takers, who are available to work flexible hours, including evenings and weekends when residents are at home, and who are geographically distributed across all areas of a site, may be the most important condition which affects the quality, length of time required, and overall cost of the field data collection phase of the census. Each of the three dress rehearsal sites used slightly different strategies and methods to recruit applicants for Census 2000 Dress Rehearsal jobs; each was able to recruit enough applicants to fully staff each operation and complete operations on time.

How did applicants learn about dress rehearsal census jobs?

The majority of applicants reported hearing of the job from a friend or relative or census mailing (including recruiting postcards and advance notices to the questionnaire). Census mailings proved very effective, although recruiting postcards were costly when an entire area was blanketed. Newspaper and radio advertisements were not used much and proved to be marginally effective at bringing in applicants. In the South Carolina site, the census mailings ranked number one in providing information about census positions, accounting for one-third of all applicants. In the Sacramento site, “friend or relative” topped the sources cited by applicants as most important for providing information about census positions (27 percent). Local partnerships with community centers and other organizations were considered effective tools in spreading the word about Census Bureau employment opportunities in Sacramento. “Friend or relative” also was cited most frequently by applicants in Menominee, with “federal, state, or tribal employment office” ranking a close second.

When should recruiting and testing activities take place?

Recruiting activities were timed appropriately, although in the future recruiting materials and supplies need to be available in larger quantities and reorders should arrive sooner. On average, applicants were selected 50 to 65 days after taking the test, but this lag between testing, selection and training varied quite a bit between rural and urban areas. The average number of days from testing to training in rural South Carolina was 81 days, while in the city of Columbia, it was 61 days. In contrast, the average length of time between testing and training was 52 days in Sacramento.

Welfare-to-Work Applicants²¹

²⁰The data presented in this subsection can be found in: Cheryl Querry. “Field Infrastructure: Recruiting Activities.” Census 2000 Dress Rehearsal Evaluation Memorandum, G8. April 1999.

²¹The data discussed in this subsection can be found in: Geraldine Mekonnen and Sonya G. Reid. “Field Infrastructure: Welfare-To-Work.” Census 2000 Dress Rehearsal Evaluation Memorandum, G9. May 1999.

In March 1997, President William J. Clinton asked federal agencies to support welfare reform by setting hiring goals through the year 2000. The Secretary of Commerce, William Daley, set a goal of 4,000 to be hired by the Census Bureau. While the Census Bureau has historically made great efforts to hire individuals on public assistance, the goal of 4,000 heightened the necessity to target recruiting efforts among that population. The Census Bureau's welfare-to-work recruiting strategy centered primarily on partnerships. Recruiters in all three dress rehearsal sites successfully partnered with state and local social service offices, non-profit agencies, and other organizations to recruit welfare recipients. The primary agencies and organizations used among the three sites included: the Department of Social Services, the Supplemental Food Program for Women, Infants and Children, local churches, community action leagues, vocational rehabilitation centers, and the Department of Veterans Affairs.

How many welfare-to-work applicants were hired?

In South Carolina, 71 welfare-to-work applicants were hired as enumerators for the Census 2000 Dress Rehearsal. That number was short of the goal of hiring 121 enumerators for the dress rehearsal. In Sacramento, 200 welfare-to-work applicants were hired, well surpassing the hiring goal of 49 enumerators, while in Menominee the goal of hiring two welfare-to-work applicants for enumerator positions was met (Table 7).

Table 7. Welfare-to-Work Hiring for the Census 2000 Dress Rehearsal

Sites	Welfare-to-Work	
	Hiring Goal	Hires
South Carolina Site	121	71
Sacramento	49	2000
Menominee	2	2
Total	172	273

What obstacles were encountered in hiring welfare-to-work applicants?

Transportation for field jobs was an obstacle experienced by all three sites. Dress rehearsal recruiters were able to overcome those obstacles with some creative ideas. In South Carolina (as well as in Sacramento), the transportation problem was minimized by placing many of the welfare applicants in office positions in the Local Census Office, resulting in the formation of car pools for some and greater use of public transportation for others.

The fear of benefits reduction was a key obstacle in hiring welfare recipients in the South Carolina site. Because of the short-term nature of census employment for the dress rehearsal, recipients chose not to accept positions. Investigation by Census Bureau staff into the benefit reduction guideline of South Carolina's Temporary Assistance to Needy Families program revealed that

although recipients would experience a reduction of benefits upon becoming census employees, they may not experience a complete loss of benefits. The local partners, however, were more interested in moving recipients into longer term employment.

In the Sacramento site, another major obstacle encountered was the lag time between recruiting, testing, and hiring, which resulted in applicant referral sources losing interest in promoting Census 2000 Dress Rehearsal jobs. To minimize the lag time, partner agencies were provided with updated hiring schedules. Sacramento also secured a memorandum of agreement with California's Employment Service to provide automated hiring reports. According to Sacramento staff, the test preparation manuals helped prepare the applicants for the test, so Sacramento had great success in recruiting, testing, and hiring welfare-to-work applicants. Having to report to HQ and to referral agencies on the number of actual applicants tested and hired in addition to completing earnings reports required by the state of California, as well as limited testing space, were obstacles faced as well.

In Menominee, additional obstacles included lack of child care, driver's license requirements, competitive labor markets, and the lack of a telephone. As Menominee is primarily an American Indian reservation, the Census Bureau later learned that driver's licenses are not required to operate a vehicle. The competitive labor market also made it difficult to hire potential employees. Those people without telephones were contacted in person by current Census Bureau staff who passed information on to them. This was feasible due to the small size of the Menominee site.

How was the hiring of welfare-to-work applicants tracked and documented?

Analysis of welfare-to-work hiring practices was limited by the structure of the system for reporting such hires. Generally, across all three sites, identification of welfare-to-work hires was provided by statistics reported via the Office of Personnel Management (OPM) form 1635. As the OPM-1635 form is a voluntary reporting form, nine applicants chose not to identify their welfare-to-work status. Therefore, the numbers reported were less than the actual number of hires. In the South Carolina site, a testing sign-in sheet given by the South Carolina Department of Social Services provided additional sources of hiring information, while in Sacramento and Menominee, some of the partner agencies sent the lists of applicants that their offices had referred for testing.

Staffing Selected Census Operations²²

The Census Bureau had to hire a large staff of temporary employees to conduct field activities including update/leave, group quarters enumeration, the ICM/PES operations, and the largest, nonresponse followup. To ensure adequate staffing to meet operational deadlines, the Census Bureau employed over-recruiting and over-hiring strategies for selected field operations. The objective was to select enough staff to meet or beat the established deadlines for field operations, compensating for employee attrition and a large number of part-time enumerators. An applicant

²²The data discussed in this subsection can be found in: Karen G. Pennie and Christine L. Hough. "Ability to Fully Staff Selected Census Operations." Census 2000 Dress Rehearsal Evaluation Memorandum, G1. May 1999.

was considered selected when he or she accepted a job offer. To assess the success of the recruitment, selection, hiring, and maintenance of staff, we analyzed data reported from the dress rehearsal sites and data from the Preappointment Management System/Automated Decennial Administration Management System, which tracked employee payroll and hiring records.

What were the recruiting and hiring goals for the Nonresponse Followup (NRFU) operation, and the ICM/PES?

The recruiting goal for nonresponse followup was approximately 10 times the number of authorized enumerator positions. The hiring goal was approximately twice the number of authorized enumerator positions to account for attrition and other factors that lead to lower productivity. In contrast, ICM/PES did not implement an over hiring strategy, so the selection goal for initial training was equal to the number of existing positions, with replacement enumerators selected as needed. Dress rehearsal results indicated that a lower recruiting goal could be used for nonresponse followup. A new goal of eight times the number of authorized enumerator production positions was suggested. The Census Bureau has decided to maintain the dress rehearsal goal of ten times the number of authorized positions.

How difficult was it to find eligible applicants for the dress rehearsal?

When recruiting ended, most recruits were considered eligible applicants (83 percent in the South Carolina site; 70 percent in Sacramento, and 66 percent in Menominee). From the pool of applicants who were offered positions, 13 percent refused positions in Menominee, while 2 percent refused in the South Carolina site, and 5 percent refused the employment offer in Sacramento. All three sites exceeded the selection goals for both nonresponse followup and ICM/PES.

How many hires completed the training and stayed to receive an assignment?

For nonresponse followup in the South Carolina site and Sacramento, 74 percent of enumerators who began training completed it, while 79 percent finished training in Menominee. All of the PES enumerators who arrived for training in South Carolina (100 percent) remained to receive assignments. In Menominee and Sacramento, 86 and 88 percent, respectively, of those who attended training stayed on to receive an assignment.

Were the sites fully staffed for nonresponse followup?

For nonresponse followup, the evaluation produced a comparison of the total number of necessary enumerator workdays to the actual number of enumerator workdays in order to assess how long it took to reach the required staffing levels. The comparison revealed that the South Carolina site exceeded the projected staffing levels throughout the operation. Near the operation's midpoint, 82 percent of the workload had been completed. Over the course of nonresponse followup, enumerators worked an average of 3.0 hours per day, 4.3 days per week. At that site, nonresponse followup was completed ahead of schedule. The Menominee site reached the required staffing levels during the third week of operation, completing 59 percent of the workload near the

midpoint. Enumerators at this site averaged 3.8 hours per day, 4 days per week. Sacramento exceeded the required staffing levels during the first week of operations, with the enumerators at this site working an average of 3.2 hours a day, 4.8 days per week. By the midpoint of the operation, 56 percent of the workload had been completed.

Were the sites fully staffed for the ICM/PES operations?

In the South Carolina site, where PES was conducted, the staffing requirements were met after the first week of the operation. Over the course of the survey, enumerators worked an average of 2.9 hours per day, 4.0 days per week. They had completed 76 percent of the workload by the midpoint. The PES personal interviews were finished ahead of schedule at this site. Work was completed either on or ahead of schedule at the other two sites as well. At the midpoint of the operation in Menominee, 77 percent of the ICM workload had been completed, with enumerators working an average of 2.4 hours a day, 2.9 days a week. In Sacramento, enumerators worked an average of 2.0 hours a day, 5.8 days a week, completing 36 percent of the workload by the midpoint, and an additional 30 percent over the next two weeks.

Evaluation of Enumerator Training²³

An evaluation of enumerator training was conducted to determine the key factors in creating and delivering high quality training. Enumerator training was a critical factor in the performance of interviewers collecting data through door-to-door interviews for either nonresponding households or households identified for the ICM/PES operation. A headquarters-based evaluation team consisting of employees other than the designers of training was convened to assess the training provided to enumerators for the Census 2000 Dress Rehearsal. Assessment also was provided by an outside expert.

What were the objectives of the training evaluation?

This training evaluation project was designed to follow the Kirkpatrick model which assesses the quality and effectiveness of training according to four levels. These levels include trainee and trainer attitudes (Level I), trainee comprehension and skill development (Level II), post-training performance (Level III), and overall organizational performance (Level IV). In this evaluation, only Levels I-III were to be measured. The evaluation methodology also included a review of the individual training materials from an instructional design perspective.

Were there any significant limitations on the data collection and analysis for this evaluation?

While the initial design of the evaluation study was to include measurements of the first three Kirkpatrick levels, most of the data collected was Level I attitudinal data from surveys of trainers

²³The data discussed in this subsection can be found in: Angel W. Broadnax, et. al. "Evaluation Study of Nonresponse Followup and Quality Check Personal Interview Enumerator Training Programs." Census 2000 Dress Rehearsal Evaluation Memorandum, G10. July 1999.

and trainees. The surveys were designed by the evaluation team. Insufficient record keeping and reporting of the measurements of trainee comprehension during training made Level II analysis nearly impossible to determine. Level III analysis was not conducted because a large number of enumerators failed to provide identifying information that would have allowed evaluation survey data to be matched to performance measurements. The data collected in the survey was supplemented by observation reports and crew leader performance reviews. A separate study of enumerators who resigned, conducted by an external evaluator, was based on 25 key characteristics and the clarity and completeness of the training program. This study provided a comprehensive look at how enumerators assessed their readiness to interview.

Did enumerator training differ by field operation? If there were differences, were they a part of the assessment?

Enumerators received training specific to the operation to which they were assigned, either nonresponse followup or the ICM/PES. Both the nonresponse followup and the ICM/PES training packages followed a basic Census Bureau interviewer training format. All enumerator training materials were developed to be generic in nature and to be delivered in all geographic areas. There were two distinct differences between the training programs. The NRFU enumerator training provided an opportunity for trainees to actually work in the field and gain feedback while the ICM/PES training did not. Since ICM/PES enumerators capture data responses on laptop computers while nonresponse followup enumerators used paper questionnaires, the ICM/PES training incorporated computer-based training modules, while the NRFU training did not. Both types of training were evaluated in the assessment.

What were the findings from the evaluation?

Overall, there were no differences between the three dress rehearsal sites in the attitudes of enumerators with regard to the training they received in either nonresponse followup or ICM/PES training. Both groups liked the training materials in general. The ICM/PES enumerators expressed the need for more interaction with the trainers. Both groups were satisfied with the skill development provided, but both sets of trainees felt under-prepared to deal with reluctant respondents. The nonresponse followup enumerators appreciated the field work component of their training, the pace of the course, and their training video. They highlighted the need for more training working with maps, more time for role playing and field work, and more guidance completing the long form and following proxy procedures. Observation reports indicated the need to emphasize data quality since the enumerators claimed to be well prepared to read questions as worded but did not always do so during the interview process. Enumerators reported being trained well on how to work with a laptop computer. Finally, neither the nonresponse followup or the ICM/PES enumerators were satisfied with the explanation of how the supplemental pay system worked.

Pay Rates²⁴

The evaluation of wages for the Census 2000 Dress Rehearsal focused specifically on whether the Census Bureau was able to hire and retain an adequate staff of enumerators, how production and turnover were affected by the new pay rates, how the hourly pay affected recruitment, and what role the supplemental pay played.

Was the Census Bureau able to hire and retain an adequate staff to execute nonresponse followup?

At the wage rate of \$10.50 per hour in South Carolina and \$12.50 per hour in Sacramento, the Census Bureau was able to hire and retain an adequate staff of enumerators. The South Carolina pay rates were raised from their initial level, which was based on a percentage of the prevailing wage structure in the site. In both sites, nonresponse followup was completed on time and within budget.

What was the effect of hourly pay on recruitment and how did potential recruits view various elements of the pay package?

To determine how various elements of the pay package affected recruitment, a series of focus groups with residents, enumerators, recruiters, and senior managers was conducted. Virtually everyone had very favorable views of high hourly pay, paying transportation costs, and paying for time in training. Regression analysis showed that enumerators who were unemployed and looking for work completed 15 fewer cases on average than other enumerators, making them less desirable hires. In contrast, enumerators who were employed part-time or not in the labor force (such as retirees) completed 20 more cases on average than other enumerators, making them highly desirable hires. Levels of unemployment were not a factor because even in high unemployment areas the unemployed comprise a small fraction of the labor pool, unemployed workers are quick to leave census jobs to take other work, and high census wages can attract sufficient numbers of individuals employed part-time or not in the labor force to fill census jobs.

It was concluded that part-time employees and individuals who are out of the labor force should be the primary targets for recruiting, and that high census wages are crucial to getting these individuals to become enumerators.

How did supplemental pay affect performance and what were enumerators' perceptions of supplemental and other types of pay?

It was not possible to statistically relate supplemental pay entitlements to performance because there was no variation in the way supplemental pay was computed across areas, and it proved difficult to make supplemental payments in a timely fashion. A post-nonresponse followup

²⁴The data reported in this subsection can be found in: Westat. "Field Infrastructure: Pay Rates." Census 2000 Dress Rehearsal Evaluation Memorandum, G4. August 1999.

telephone survey with roughly half of all enumerators revealed that about 70 percent of all enumerators were very satisfied with the hourly pay, but only 32 percent were very satisfied with supplemental pay tied to cases completed each week, and less than 20 percent were very satisfied with completion bonuses. The supplemental pay system was so complex that enumerators could not figure out their entitlement and the Census Bureau could not make payments promptly. Thirty-six percent of the enumerators reported being able to compute completion bonus entitlement even though 79 percent could easily meet the supervisor's production goals.

How were production and turnover affected by the new pay rates?

Based upon variation between the census wage and the prevailing wage rates, the model predicted that a one dollar decrease in census wages would have increased the number of enumerators who quit by 25 percent in the dress rehearsal. Enumerators whose previous earnings were between \$4.51 and \$7.25 per hour were about eight percentage points more likely to quit or be fired than higher wage workers. This finding strongly reinforces the view that low census wages can make it impossible to complete nonresponse followup on time and within budget.

What are the recommendations for Census 2000?

The two key factors crucial in getting individuals to become enumerators in Census 2000 are recruiting part-time employees and individuals who are out of the labor force, and paying census wages that are at least 75 percent of the prevailing wage rates. Although the results of the dress rehearsal cannot technically be generalized to the whole country, the analyses strongly suggest that while the Census Bureau was able to hire and retain an adequate staff to execute the nonresponse followup in South Carolina and Sacramento, the nonresponse followup in Census 2000 could be improved by selecting enumerators willing to work at least 24 hours a week for about seven weeks, and hiring all enumerators needed prior to the start of the operation. Finally, the Census Bureau should not implement a supplemental pay system for Census 2000. Strong incentives to work hard and effectively on nonresponse followup were created by assigning the most work to high performers and inducing low performers to quit. These recommendations have been accepted.

Equal Employment Opportunity Process²⁵

Equal Employment Opportunity (EEO) laws and regulations require that the Census Bureau process all employee and job applicant allegations of discrimination based on race, color, religion, sex, national origin, disability, age, and reprisal for participation in EEO protected activity. The Census Bureau's EEO office developed an automated system to handle the workload and followup on these complaints. All initial complaints or contacts were logged into the tracking system while EEO specialists at the Census Bureau attempted to resolve complaints and notify complainants of their right to file a formal complaint.

²⁵The data discussed in this subsection can be found in: Joseph Norvell and Warren Davis. "Field Infrastructure: EEO Process." Census 2000 Dress Rehearsal Evaluation Memorandum, G7. April 1999.

The EEO process during the dress rehearsal was reviewed to determine how many contacts were made, what reasons were given for complaints, and whether there were a sufficient number of staff to handle the workload, as well as the overall performance of the new tracking system. The EEO tracking system summarized the few initial contacts at the level of RCCs.

Overall, how well did the EEO process work?

Because of the limited number of initial contacts during the dress rehearsal, the Census Bureau was unable to evaluate the capacity of the process. A total of 14 initial contacts were entered into the EEO Office Tracking System for the period January 1 through June 30, 1998. Eight were related to the dress rehearsal. Consequently, no verifiable predictions can be made regarding the ability of the EEO process to handle the projected Census 2000 caseload of 3,000 to 6,000 initial contacts. The EEO staff did report that the tracking system worked well.

Supply Ordering Process²⁶

The Census Bureau evaluated its ability to provide the necessary office equipment and furniture, census operational and administrative forms, and supplies needed by office and field staff to complete their census-taking activities during the dress rehearsal. The assessment focused on the opening of dress rehearsal offices, the timeliness of receipt of supplies, and the adequacy of the quantities of supplies. Data were collected via surveys and from supply reporting systems. Each of the three dress rehearsal offices devised its own individualized system for recording the dates and quantities of supplies that were received, as well as their own system for tracking the reordering of supplies rather than Census Bureau standardized procedures for the maintenance of detailed records of supply orders and the receipt of ordered supplies.

Were supplies received in a timely manner?

In most cases, the supplies required to open and set up the offices were provided in a timely manner and in the necessary quantities. In the South Carolina LCO the initial supply shipment needed for opening was scheduled to arrive on December 1, 1997. It arrived on time and with the precise quantities of the identified items that were originally ordered. Office equipment was obtained locally, and the operational kits for the update/leave operation were received as scheduled and in slightly greater quantities than originally anticipated.

The Sacramento LCO received their initial shipment in mid-December 1997. The nonresponse followup operation required additional supplies beyond the quantities originally anticipated. In some cases, the originally expected quantity was not received which, in turn, necessitated the ordering of additional quantities.

²⁶The data discussed in this subsection can be found in: Christine L. Hough. "Field Infrastructure: Supply Ordering Process." Census 2000 Dress Rehearsal Evaluation Memorandum, G6. May 1999.

For Menominee, details on the specifics of the items provided to the census field office, as well as the timing of the receipt of such equipment, are not available. The kits for the update/leave field operation sent to the Menominee Census Field Office were received by the office, but based on the responses provided on the survey sheet, it is unclear whether or not the kits were received by the office in a timely manner.

What percent of items were reordered? What types of items were reordered?

Fifty-eight percent of the supply items included in the South Carolina site initial shipment had to be reordered during the course of the census-taking operations. Most of the items that required reordering were small office supplies such as paper clips and binder clips, telephone message pads, copying paper, ink pens, and so forth. The South Carolina site office lacked adequate space for storing unused supplies, supplies for upcoming operations, and incoming supply orders. Staff also noted that the physical dimensions of the supply area were insufficient for the tasks of kit assembly and map copying.

Sixty-three percent of the supply items included in the Sacramento initial shipment had to be reordered during the course of operations. Most of the items that required reordering also were small office supplies. All of the initial kit supplies also were sent to the Seattle Regional Office, where they were assembled and then shipped to the Sacramento office due to a lack of adequate lead time required for on-site kit preparation.

How was the reordering of supplies handled? How long did the process take?

The resupply/reordering aspect of the supply process functioned in a minimally adequate fashion in the two dress rehearsal sites for which information was provided. In the South Carolina site all of the “reorders” of initial shipment office supplies were transmitted via facsimile to the Charlotte RCC. The Charlotte RCC personnel placed the orders with the Government Services Administration (GSA). An average of 16.3 calendar days elapsed before the South Carolina office received the reordered items. Despite the placement of orders up to four weeks in advance, there were several occasions when Charlotte RCC staff did not forward the orders to GSA. In at least two cases, the South Carolina site staff had to purchase supplies locally because of the delays. Information on the number of calendar days it took to reorder and receive supplies was not noted in detail for either Sacramento or Menominee, but there was some indication that delays occurred in Sacramento. Local staff reported that supplies ordered often did not arrive until the following month.

Was there an inventory control system? Did it work effectively?

Each site had an inventory control system that was effective. For all three sites, inventory was checked and supply counts updated on a weekly basis.

Chapter 6. Data Processing

Highlights

- The data capture system used in the Census 2000 Dress Rehearsal was in the final stage of development, so evaluation data have fed into improvements to the final system.
- The check box data fields were captured at the error rate of 0.8 percent.
- Fields that required respondents to write a response were captured at an error rate of 3.0 percent.
- Error rates differed for questions, leading to differential quality of capture.
- Changes in the race question, changes in race coding procedures since 1990, and the use of segmented boxes increased the volume of cases that required expert race coding.
- When processing multiple returns for the same census address, the within block search had a noticeable effect in update/leave areas of the South Carolina site and a minimal to nonexistent effect elsewhere. This is likely caused by the difficulty of matching addresses in noncity-style address areas. Changes to MAF development should mitigate this problem for Census 2000.
- The rate of census addresses with more than one return in the South Carolina site update/leave areas was about 6 percent. The remaining areas in the dress rehearsal had more than one return for about 12.5 percent of the census addresses. The replacement questionnaire mailing was the major reason for multiple returns in mailout/mailback areas of the South Carolina site and in Sacramento.

Data processing for the dress rehearsal included: scanning to capturing images; creating data files by reading the images; editing and imputation; the Within Block Search which searches for people to match across the block; the Primary Selection Algorithm (PSA) that determines the data to be used for each housing unit in the census; and the Invalid Return Detection operation. Due to problems with the data capture system in the dress rehearsal, the quality assurance was turned off, limiting the information available for the evaluations of the system. Because the public could respond in a variety of ways, the Census Bureau developed a program to control coverage errors introduced by the receipt of multiple forms from an address. The examination of the effect of multiple forms included a system to detect invalid census returns; some invalid returns were intentionally submitted by a contractor as part of the assessment.

Data Capture²⁷

The data capture operation for the Census 2000 Dress Rehearsal utilized digital imaging technology to capture responses from the census questionnaires. The image system consisted of scanning the questionnaires to create image files. Optical Character Recognition (OCR) software was used to interpret the handwritten responses, and Optical Mark Recognition (OMR) software was used to interpret the mark responses. The system was designed with a key from image component to display responses on a computer screen to a keyer when the OCR software was uncertain of the correct answers. If a questionnaire could not be scanned it was sent to be keyed from paper. As a source of nonsampling error in the census, it is important to measure the error and provide information on overall system performance. With this information, we can then decide how and to what extent to improve the data capture system for Census 2000 (DCS2000).

How many responses were captured correctly?

The various questions from the dress rehearsal questionnaire can be broken down to write-in and mark fields. A field is the space provided for the respondent to provide an answer, or response. For write-in responses the field is a set of segmented boxes, while for mark responses the field is a set of check boxes. For write-in fields 3.0 percent of the responses were captured incorrectly, while for mark fields 0.8 percent of the responses were captured incorrectly.

Did the system capture all fields at an equal level of quality?

There was variation in how well DCS2000 was able to capture different fields. For example, the Other Race write-in field had an error rate around 12 percent, while the Last Name write-in field had approximately a 4.5 percent error rate. The same variation was true for the mark fields. The Sex mark field had an error rate of 0.4 percent, while the Race mark field had an error rate of 1.1 percent.

Did the quality of the captured responses differ by dress rehearsal site?

There was no difference between the Sacramento and South Carolina dress rehearsal sites in the overall write-in field error rate. There were four individual write-in fields for which there was a difference: Last Name, American Indian Tribe, Other Race, and Area Code. For the mark fields, there did appear to be an overall difference between the two sites. This difference was driven by the large difference in race distributions between the sites.

What types of write-in response errors were committed, and what were the possible reasons?

Of the errors found for the write-in responses, 63.7 percent had wrong characters or numbers, 13.8 percent were omitted responses that should have been on the dress rehearsal response file,

²⁷The data presented in this subsection can be found in: Kevin Haley. "Quality of the Data Capture System." Census 2000 Dress Rehearsal Evaluation Memorandum, H3. August 1999.

10.9 percent had characters or numbers omitted, 5.5 percent had characters or numbers added, 1.7 percent were added responses that should not have been on the dress rehearsal response file, and 4.5 percent were characters in numeric fields or numbers in character fields.

Most of the write-in errors, 40.4 percent, could have been caused by poor handwriting. Approximately 24 percent of the write-in response errors may have been due to the way the respondent filled out the questionnaire. Some examples include situations where the respondent crossed out a response and wrote something else, or when a respondent wrote a response that extended outside the set of segmented boxes. Approximately 29 percent of the errors had no apparent cause and should have been captured correctly. Another 6.6 percent of the write-in response errors were from questionnaires that were checked into the DCS2000 but had no data on the dress rehearsal response file.

What types of mark response errors were committed, and what were the possible reasons?

Of the errors found for the mark responses, 21.9 percent were added responses that should not have been on the dress rehearsal response file, 52.8 percent were omitted responses that should have been on the response file, and 25.4 percent had the wrong response captured.

Approximately 41 percent of the mark response errors may have been due to the way the respondent filled out the questionnaire. These were mostly cases where a respondent made a mark that was close to or touched another check box, or when a respondent crossed out a box that was marked by mistake. Approximately 25 percent of the mark errors came from questionnaires that were checked into the DCS2000, but had no data on the dress rehearsal response file. The remaining errors, approximately 34 percent, had no apparent cause and should have been captured correctly.

How well were multiple mark responses to the race and Hispanic origin questions captured?

A special type of omission occurred with the race and Hispanic origin response groupings. A respondent was allowed to mark more than one box for these questions. For the cases where a respondent marked more than one race box, 15.3 percent of the responses had at least one mark omitted. For the cases where a respondent marked more than one Hispanic origin box, 23.2 percent of the responses had at least one mark omitted. Together, these multiple mark response errors represented approximately 29 percent of the mark omission errors. The requirement to capture multiple responses to the race question did not come from OMB until October 30, 1997. This did not allow adequate time to develop and test for this capacity.

Evaluation of Segmented Race Write-Ins²⁸

²⁸The data discussed in this subsection can be found in: Claudette Bennett and Alison Fields. "Evaluation of Segmented Race Write-ins." Census 2000 Dress Rehearsal Evaluation Memorandum, H1. August 1999.

This evaluation focused on what effects segmented write-in areas on the Census 2000 Dress Rehearsal forms had on both the quality of the data retrieved from the three race write-in areas and the ability to accurately code the responses during the general and expert race coding operations. General coding referred to the processing of the write-in data through an automated coding program. The expert coding process was applied to write-in entries that could not be assigned codes through the automated coding program. The assignment of these codes was done on an individual write-in basis by a member of headquarters staff.

How has the structure of the race question changed since the 1990 Census?

Changes to the census questionnaire design included five important developments in the question on race.

- The race categories were changed to conform to the OMB decision of October 30, 1997, allowing respondents to identify more than one race. The number of OMB tabulation race categories was increased to six, and there were 15 check boxes displayed.
- The relative position of the race question among 100 percent items was changed to the last item, immediately following the Hispanic origin question.
- Four race categories required write-in areas; two of these categories (“Other Asian” and “Other Pacific Islander”) shared a write-in area.
- Segmented boxes were used in the write-in areas to assist respondents in filling the response in a machine readable manner.
- There were design differences between the long and short form, including column positions and length of the segmented write-in areas.

How did the race coding in the Census 2000 Dress Rehearsal compare with that in the 1990 Census?

More than 80 percent of the write-ins from the first extraction of race write-in responses were able to be coded by the automated coding program. This was substantially less than the 97 percent that was automatically coded in the 1990 Census race coding process.

What accounted for the lower rate at which codes were assigned by the automated coding program during the Census 2000 Dress Rehearsal?

The automated coding program assigned codes at a lower rate because of changes in the race question, changes in race coding procedures, and the use of segmented boxes necessitated an increase in expert race coding. In the dress rehearsal, all long write-ins required expert race coding. Long write-ins are those with a length more than 20 characters. All five major race groups, White, Black, American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, and the Some Other Race category were represented in the distribution of long write-ins, and almost 60 percent of the long write-ins required the use of more than one race code. Primary race codes also included 0.3 percent who claimed to be “American” and 4.6 percent who were uncodable.

The lower rate at which codes were assigned by the automated coding program is probably attributable to several factors: changes in the race question, including the option to select more than one race, changes in race coding procedures which necessitated an increase in expert race coding, and the length of segmented boxes.

How are changes to the race question and to the data capture process likely to impact Census 2000 activities?

From these results we concluded that the changes in the race question and the use of the new data capture system may have had an effect on the quality of the data on race and the initial coding burden for the expert race coders during the Census 2000 Dress Rehearsal. The automated coding program contains many of the most common misspelling occurrences from past censuses and census tests, so it is unlikely that errors stemming from misinterpretation of alphabet characters will significantly impact the expert coding procedures in terms of single coded write-in entries. Our judgement is that the most likely increase in expert race coding burden during Census 2000 will occur in the case of long write-ins that require multiple codes. We noted that all 461 of the long write-ins in the Census 2000 Dress Rehearsal required expert race coding.

Within Block Search Operation and Primary Selection Algorithm²⁹

One of the new aspects of the Census 2000 Dress Rehearsal was the testing of additional alternative methods for census data collection. The methods were designed to allow the public to respond in a variety of ways. For example, the Be Counted Forms allowed people to pick up census questionnaires at community centers, while the Telephone Questionnaire Assistance allowed people to respond to the questionnaire by the telephone. A replacement questionnaire mailed to all addresses in the mailout/mailback areas also provided another opportunity to respond to the census. One consequence of the alternative methods was the potential for multiple returns for a census address. Subject matter and computer specialists designed and implemented a computer program to control the introduction of errors by resolving situations where more than one form was received from an address. The program consisted of two major steps: the Within Block Search (WBS) and the Primary Selection Algorithm (PSA).

How did the process function? How was each activity different?

Once data collection activities were completed, the WBS and the PSA were run. During these operations, data capture records were reviewed to identify census addresses with more than one eligible return. The operations compared person records on each return. People found to have been included on two or more separate returns were flagged as such and their record was ignored in subsequent data processing on all but one of the returns. Other rules were used to make determinations of final household composition. The WBS, which occurred first, was a person-

²⁹The data discussed in this subsection can be found in: Miriam D. Rosenthal. "The Within Block Search and Primary Selection Algorithm Operational Evaluation." Census 2000 Dress Rehearsal Evaluation Memorandum, F1c-F2b. April 1999.

based search operation designed to screen out certain person records on respondent-initiated returns before the PSA was applied. The records that were flagged during WBS were not included in the PSA operation. The PSA was used to determine the person records and housing data that represented each census address.

What effect did the WBS have on the detection of multiple census returns?

The WBS had an effect in update/leave areas of the South Carolina site and a minimal to nonexistent effect elsewhere. About 9 percent of the people in the multiple return workload for update/leave areas of the South Carolina site were matched to people in the expanded search area. Additional analysis is needed to determine if address matching complexities for rural-style addresses led to the inclusion of duplicate addresses in the South Carolina site and could have caused the higher rates. The reengineered MAF will substantially reduce this type of problem for Census 2000.

How often were multiple forms returned for a single census identification number?

Update/leave areas in the South Carolina site had more than one return for about 6 percent of census addresses. All other sites received more than one return for about 12.5 percent of the census addresses. At all sites, fewer than one-half of 1 percent of the addresses had more than two returns.

A review of addresses with two returns identified which response options generated the returns. The replacement mailing was the major reason for multiple returns in mailout/mailback areas of the South Carolina site and in Sacramento. The receipt of late mail returns, Be Counted forms, and TQA interviews overlapped with nonresponse followup. Dress rehearsal results indicated that between 3 and 4 percent of all housing units were enumerated on both a mail return and a nonresponse followup return. Responses on Be Counted forms and from TQA required address geocoding and matching to obtain a census address. The geocoding and matching processes were not completed before the identification of the workload for nonresponse followup. This means many of these households were enumerated again during nonresponse followup. Finally, there was evidence that specific nonresponse followup cases were assigned to more than one enumerator, resulting in two nonresponse followup returns being generated for the same address.

Were there any significant differences in the content of multiple returns?

Data indicated that most returns at two-return addresses were similar or identical in content. This finding is of value when assessing the potential of multiple returns to introduce coverage error. The number of addresses with more than one return that contain different individuals was still very large and poses a daunting task for the PSA in Census 2000.

Contractor-Submitted Invalid Returns³⁰

A contractor submitted invalid cases to help us assess whether the fraudulent forms could be removed from the dress rehearsal. The evaluation also looked at the characteristics of the contractor-submitted fraudulent forms that were not removed from the dress rehearsal. There were two situations that caused the fraudulent forms to be removed from the dress rehearsal: the fraudulent forms did not meet census inclusion criteria during a processing step, or the form was detected during the Invalid Return Detection Operation. The contractor-submitted forms went through normal census processing until the application of WBS and PSA. At that point, the submitted invalid returns were removed from the dress rehearsal processing flow and a parallel evaluation file was created and processed.

What was the total number of invalid returns for each site?

Of the 772 contractor-submitted fraudulent cases captured during the dress rehearsal, 401 cases were in South Carolina. Of these forms, 259 (65 percent) were removed from the dress rehearsal enumeration. The remaining forms were included in the evaluation file. In Sacramento, of the 371 invalid returns submitted, a total of 251 returns (67 percent) were removed from the dress rehearsal evaluation file. The Census Bureau is examining the characteristics of the contractor-submitted cases that were not detected to design a process to ensure that fraudulent forms are screened out in Census 2000.

³⁰The data discussed in this subsection can be found in: David A. Phelps. "Contractor-Submitted Intentional Fraud in the Census 2000 Dress Rehearsal." Census 2000 Dress Rehearsal Evaluation Memorandum, F3. April 1999.

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Chapter 7. Integrated Coverage Measurement/ Post Enumeration Survey Program

Highlights

- The operations for ICM/PES were completed and the Census Bureau released the population counts on schedule.
- In the dress rehearsal there were two names for the coverage measurement survey: Integrated Coverage Measurement (ICM) in Sacramento and Menominee and the Post Enumeration Survey (PES) in the South Carolina site. The similar survey planned for Census 2000 is the Accuracy and Coverage Evaluation (A.C.E.)
- The ICM/PES risk assessment revealed that the overall schedule was met and many activities were completed on time, but a majority were completed late and a few ran very late.
- The need for strong ICM/PES managers and technical staff for Census 2000 operations is critical.
- The evaluation of mover tracing suggested that the Census Bureau does not need to trace outmovers for Census 2000 A.C.E.
- Contamination of the initial phase by ICM/PES was not a problem in the dress rehearsal. That is, early ICM/PES activities like address listing in a block did not affect initial phase results.
- Problems with skip instructions and formatting caused interviewers to miss questions or resort to paraphrasing during the Person Followup Interview which was conducted to resolve differences in residence status between the initial phase and ICM/PES operations.

This chapter looks at many aspects of potential errors in the ICM/PES, assesses processing and field operational risks, examines the use of administrative records, and discusses some estimation decisions made based on the evaluations.

The ICM/PES process is the method used by the Census Bureau to determine the level of coverage in a census. The process is:

- Create an independent list of housing units in the sample of ICM/PES blocks.
- Match the housing unit list to the MAF.
- Resolve the status of any nonmatches by doing a field check.
- At the end of the NRFU, conduct an interview at every housing unit on the independent list.

- Match the people named in this interview to the people named in the census in the same housing unit.
- Resolve any mismatches by conducting a followup interview.
- Impute for missing information.
- Poststratify the ICM/PES data by age, sex, race, tenure and/or other appropriate variables.
- Calculate the coverage factor in each poststratum using dual system estimation.
- Apply the coverage factors to the appropriate poststratum of census people.
- Create the population estimates.

Risk Assessment of the ICM/PES Field Data Collection³¹

The Integrated Coverage Measurement (ICM) program and the PES were designed to measure census coverage. Both involved an independent enumeration in a sample of census blocks. Using the results of that enumeration, combined with a careful matching with initial phase results, estimates were made of the missed (those who were not counted), of the duplicates, and of the erroneously enumerated population (those who were counted but should not have been). These were used to obtain coverage factors for a variety of populations. Coverage factors were used to integrate ICM in the final dress rehearsal numbers in Sacramento and Menominee and served as a measure of dress rehearsal coverage for the PES in South Carolina.

How was this risk assessment structured? What factors were important in the analysis?

The Census Bureau produced a Master Activity Schedule (MAS) for ICM/PES activities that was updated weekly. The overall standard used to determine whether tasks were completed on time was whether or not the dress rehearsal population numbers were completed nine months after Census Day, to parallel the criterion for Census 2000. Several areas of risk were recognized in the evaluation of the schedule. Even though the overall schedule was met and many tasks were completed on time, a majority of tasks were completed late. Overall, four factors were used to determine risk with meeting deadlines.

- Was the task completed by the end of calendar year 1998?
- Was the task completed when the MAS said it would be?
- How many times did the schedule change between April 28 and December 22, 1998?
Frequent changes might signal a change in plans, unanticipated delays, or delays in earlier operations.
- Was the original duration for a task a good estimate of the amount of time it would take to do the task? Any deviation within two days was accepted as no change.

³¹The data presented in this subsection can be found in: Barbara Bailar. "Risk Assessment of the Integrated Coverage Measurement Field Data Collection and Processing Schedule." Census 2000 Dress Rehearsal Evaluation Memorandum, C1. April 1999.

Was the ICM/PES schedule followed? Were the scheduled tasks completed on time?

Every group of major tasks took longer than planned. Several tasks took at least twice as long as planned. A large effort was expended in the dress rehearsal to ensure final data would be available on schedule.

Were other areas of the ICM/PES process cause for concern?

To answer this question, the Census Bureau reviewed field observation reports and other contractor reports concerning field management, telecommunications, and Computer Assisted Personal Interview (CAPI) components of the ICM/PES person interview operations. The issues that were addressed were divided into two major categories: field concerns and systems concerns.

The field concerns covered a wide range of areas, including staffing needs, space, maps, training of listers and interviewers, use of CAPI, case management, and scheduling.

- The need for strong managers for Census 2000 A.C.E. operations is critical.
- A.C.E. managers need to receive as much experience with CAPI operations as possible before the start of Census 2000.
- There is a need for additional space for crew leaders to meet with ICM interviewers.
- Space separate from the LCO is needed as a central location for staging equipment and to serve as a hub.

Some important systems concerns were the staffing of technical employees, the ICM questionnaire, and systems testing. Additional staff will be needed in headquarters to build a system to manage the large number of housing units that will be included in Census 2000.

- Staff are needed to support key functions, such as CAPI instrument testing, and sampling and estimation programs.
- Help desk staff are needed to support field interviewers.
- Field technicians are necessary for regional offices.
- There is widespread concern that not enough computer engineers and software specialists will be available due to shortages in qualified people.
- At the time this evaluation report was written, there were still many suggestions that needed to be evaluated in regards to improvement in the CAPI questionnaire. The improvements were accomplished later.
- Full systems tests are recommended.

Comparison of Alternative Estimators for Movers³²

This evaluation examined two different methods for using in-mover and out-mover data. For Method A, data for persons who move away from the ICM/PES blocks after Census Day were collected either by proxy or by tracing. These data are used to estimate both the number of out-movers and their match rate to Census Day residents. The difficulty with this method was that out-mover tracing is difficult and typically does not result in the best estimate of the total number of out-movers. Method A used proxy data for this evaluation. Method C used the demographic characteristics of the people who had moved into ICM/PES blocks to estimate the number of movers and the matching characteristics of those who had moved out. Method A and Method C were compared to determine whether one estimator could be identified as preferable to the other.

How do the site level and poststrata estimates compare for the alternative estimators?

The site level results shown in Table 8 indicate that the differences were small in all three dress rehearsal sites and that they were statistically significant only in Sacramento, where the difference, 822 people, was about 2.4 times the standard error (344). As expected, the estimates for Method A were smaller than those for Method C. Similarly, the poststratum level estimates indicated that the differences between Method A and Method C were statistically significant only in Sacramento.

Table 8. Site Level Summary Statistics for Housing Unit Population*

	South Carolina Site	Sacramento	Menominee
Initial Phase Count	628,616	369,434	4,550
Method C	693,724	395,005	4,694
Standard Error	11,976	4,648	103
Method A	693,525	394,183	4,647
Standard Error	11,995	4,562	88
Difference	199	822	47
Standard Error	260	344	54

*Table 8 contains only the population in housing units. It excludes people who live in institutions and special places, such as college dorms or boarding houses.

How do the estimates compare for race groups?

In Sacramento, after combining to obtain cells with adequate data, there were four race/origin groups: non-Hispanic White, non-Hispanic Black, non-Hispanic Asians and Others, and mostly

³²The data discussed in this subsection can be found in: Eric Schindler. "Comparison of Method C and Method A." Census Dress Rehearsal Evaluation Memorandum, C8a. July 1999.

Hispanics. In Menominee, there were three groups, non-Hispanic Whites, Hispanics and all others, and mostly American Indians. In the South Carolina site there were two groups, non-Hispanic Whites and all others that consisted mostly of non-Hispanic Blacks. Although no testing has been done, it is possible that there are differences among race groups.

What are the implications for Census 2000 A.C.E.?

Based on these results, the Method C estimator will be used in Census 2000. The next evaluation addresses whether proxy data are sufficient, or if outmovers have to be traced.

Outmover Tracing and Interviewing³³

An important part of the Census 2000 Dress Rehearsal was the ability to account for people who completed census questionnaires at one address and then moved to another before they could be enumerated through the ICM/PES process. Census Day was April 18, 1998, while the ICM/PES data were collected from May to September 1998 in Sacramento, South Carolina, and Menominee.

The ability to account for people who have moved out of enumerated households as well as those who have moved in after Census Day is important for calculating population estimates. The people who had moved out of the housing unit after Census Day, outmovers, were used to estimate the proportion of movers that match to the initial phase. Inmovers, people who had moved into the housing unit since Census Day, were used to estimate the number of movers. One option for collecting information about the outmovers involved relying on either the inmovers or other proxies, such as landlords or neighbors. Another option was tracing the outmovers to their new addresses using the information provided by proxies. This tracing procedure was time consuming and costly. This evaluation was designed to determine if such tracing was needed to produce sound estimates. It compared the proxy data, which were used in the official dress rehearsal estimates, and traced data, which were collected especially for this evaluation.

How many cases were traced in each site? What were the results?

The results demonstrate the difficulty of tracing movers and the amount of data that will have to be collected by proxy even if movers are traced. Overall, about 5 percent of households in Sacramento and South Carolina were considered to be outmovers. Because of the small number of outmovers in Menominee, this site did not produce enough data for analysis and comparison. In Sacramento, the household was traced and data were obtained 33.8 percent of the time. Another 7.6 percent of the time, the household was traced, but data were not obtained because everyone in it had died or moved permanently out of the United States, or the housing unit did not exist or was vacant on Census Day. In South Carolina, the household was traced successfully 41.0 percent of the time, while another 11.1 percent of the time the household was traced and no data were obtained.

³³The data discussed in this subsection can be found in: David A. Raglin and Susanne L. Bean. "Outmover Tracing and Interviewing." Census 2000 Dress Rehearsal Evaluation Memorandum, C3. May 1999.

For households where a traced interview was obtained, how do the proxy and traced data compare?

In Sacramento and South Carolina, if the person was mentioned in the proxy interview, they were almost always found in the traced interview: 93.3 percent in Sacramento and 92.0 percent in South Carolina. As expected, the traced interview found additional people that the proxy interview had missed. In Sacramento, 462 people were obtained from the proxy interview and 664 from the traced, or 43.7 percent more in the traced interviews. Similarly, there were 45.3 percent more traced than proxy in South Carolina.

What are the demographic characteristics of people found in the proxy and traced interviews?

In Sacramento, there was a nominally larger percentage of children, non-Hispanic Asians, and non-Hispanic Asian children found in the successfully traced households than were found in households with both proxy and traced interviews. No differences in age, race or ethnicity were found in the South Carolina site.

How do the match rates for the proxy data compare to those for the traced data?

For successfully traced households, the nonmatch rates were almost the same for the proxy people as for the traced people. The traced interview found more people, but their match rate, which is the factor used in estimation, is very similar to the match rate for the proxy people. The proxy derived match rate was used for the official dress rehearsal population numbers.

How do the dual system estimates using proxy data compare to those using traced data?

No significant differences were found in the dual system estimates calculated using proxy versus traced outmover people. Dual system estimation is the method used to calculate the coverage factors used to integrate (ICM) or estimate coverage (PES). The dual system estimates are calculated in various poststrata, which represent certain groups, such as non-Hispanic Asian females aged 65+ who rent their home. No differences were found in either Sacramento or the South Carolina site for any poststrata variables. Therefore, we recommended that outmover tracing not be conducted as part of the Census 2000 A.C.E.

Contamination of Initial Phase Data Collected in ICM/PES Blocks³⁴

The Census 2000 Dress Rehearsal used the dual system estimation method in producing official population numbers for Sacramento, Menominee, and for coverage measurement in South Carolina. This method required the development of two independent lists of the population. The first list was the MAF, and the second was a list of those covered by the sampling frame for the sample of the

³⁴The data discussed in this subsection can be found in: Sam Hawala. "Contamination of Initial Phase Data Collected in ICM Block Clusters." Census 2000 Dress Rehearsal Evaluation Memorandum, C2. July 1999.

ICM in Sacramento and Menominee, and the PES in South Carolina. These two lists were used to test for differences between ICM/PES blocks and non-ICM/PES blocks in the census data. The independence assumption, however, could fail if there was contamination between the two lists. Contamination occurs when the event of an individual's inclusion or exclusion from one list affects the probability of their inclusion in the other list. For example, being contacted to develop the ICM/PES list may affect a respondent's likelihood of responding to the census. This evaluation determined whether assuming that there was no contamination of the census list was valid. We did this by testing whether census data collected in ICM/PES blocks differed from areas where no survey was done.

What were the overall results of the evaluation?

Very few significant differences were found in population coverage and no significant differences were found in housing unit status and respondent reaction indicators. Overall, when comparing blocks in which the survey was conducted and matched blocks not included in the survey, no differences attributable to the survey were found. There is no evidence that contamination of the census data was present. To prevent contamination from occurring in Census 2000, overlap between census field operations and the A.C.E. survey should continue to be minimized.

Quality Assurance Falsification Model for ICM/PES Personal Interviews³⁵

As part of the ICM/PES operation, quality assurance (QA) reinterviews were conducted to ensure the validity of data collected during the original ICM/PES person interview. The reinterviews were conducted in person and used to determine if original interview data had been falsified by the field representative. Two methods were used to choose cases for quality assurance reinterviews: random selection based on a 5 percent systematic sample, and targeting based on specific selected criteria. For the reinterview, a QA interviewer returned to the household and determined if the respondent or someone else in the household had been interviewed. If the respondent had not been interviewed during the ICM/PES person interview, then the QA interviewer conducted the interview. We evaluated whether the targeting procedure identified significantly more suspected falsified cases than the systematic sample, and whether or not the current targeting model and procedures should be changed to detect more falsified cases. This study indicates targeting methods should be used along with systematic QA sampling in Census 2000.

How were potential QA reinterview cases identified using the targeting method?

Targeting referred to the procedure developed to identify cases that were possibly falsified or of poor quality. For the Census 2000 Dress Rehearsal, three targeting reports were developed: *Field Representative Outlier*, *Respondent Name*, and *Not Enough Quality Assurance Cases*. Each of

³⁵The data discussed in this subsection can be found in: Elizabeth A. Krejsa. "Evaluation of the Quality Assurance Falsification Model of the Integrated Coverage Measurement Person Interview." Census 2000 Dress Rehearsal Evaluation Memorandum, C5. July 1999.

the reports contained criteria that were used to select cases for the quality assurance reinterview. The first report identified outliers, such as cases where interviews were too short (less than four minutes), cases completed outside regular hours (10 p.m. to 8 a.m.), and cases for a field representative with a large number of proxy cases. The second report looked for indications of falsification, such as the names of famous people or fictitious characters, and the third report identified field representatives that had completed at least 10 interviews but had no cases in quality assurance.

How many QA reinterviews were conducted by site? How many were selected using either the targeting model (all three targeting reports) or the systematic sample?

In South Carolina, field representatives conducted 18,302 person interviews and 1,634 QA reinterviews. Of the total 1,634 QA reinterviews, 853 were randomly selected, and 781 were targeted. In Menominee, field representatives conducted 801 person interviews and 113 QA reinterviews. Of the 113 QA reinterviews, 32 were randomly selected and 81 were targeted. In Sacramento, 17,060 person interviews were conducted and 1,696 QA reinterviews. Of the 1,696 QA reinterviews, 821 were randomly selected and 875 were targeted. Across all three sites, three interviewers were confirmed to have falsified cases.

How many falsified cases were detected by each method?

In all three dress rehearsal sites, targeting identified a nominally higher percentage of potentially falsified cases than did systematic sampling. The difference, however, was statistically significant only in South Carolina. In South Carolina, out of the total 853 systematically sampled cases, 1 case was confirmed to be falsified. From the 781 targeted cases, 10 were confirmed to be falsified. In Sacramento, for both the total 821 systematically sampled cases and the 875 targeted cases, 0.0 percent were confirmed to be falsified. In Menominee, no cases were found to be falsified for either the 32 systematically sampled cases or the 81 targeted cases.

What categories within the three targeting reports produced the most cases sent to QA reinterview?

In all three sites, the “not enough QA cases” criterion in the *Not Enough Quality Assurance Cases* targeting report was the most frequent reason for sending cases to QA. In South Carolina, the “length of interview” criterion in the *Field Representative Outlier* report was also heavily used.

Should any of the variables in the targeting reports be omitted? Should any variables be added?

Analysis suggested that the “missing outmover data” and “number of days with more than 13 completed interviews” were not effective criteria in targeting cases for QA reinterview and should be removed from the model. The “missing phone number” criterion should be reevaluated and modified to identify invalid phone numbers such as “1” or those numbers with area codes that begin with “1” or “0”. Add a “missing respondent name” variable to the outlier report or instruct supervisors to check for missing (blank) respondent names on the *Respondent Name* report.

Evaluation of the ICM/PES Person Followup Questionnaire³⁶

This evaluation used behavior coding to identify potential problems with question wording and ordering and other questionnaire design issues in the ICM/PES Person Followup questionnaire, which was designed to gather information to resolve matching and residence status discrepancies. Behavior coding, the assessment of the interactions between an interviewer and a respondent, is commonly used to assess whether interviewers have problems administering questions and whether respondents have difficulty comprehending questions, vocabulary, terms, and concepts. The evaluation used data provided by a systematic review of a sample of 49 tape-recorded Person Followup interviews conducted in Sacramento, CA. The behavior coding data revealed some potential problems with the wording and format of the Person Followup Questionnaire and resulted in 24 specific recommendations for changes, which were accepted when possible.

Error Profile for the Census 2000 Dress Rehearsal³⁷

Survey measurement and processing errors in the ICM/PES were evaluated through the Matching Error Study, the Evaluation Followup Interview, and the Data Collection Mode Study. Production and evaluation operational problems made it impossible to conduct any of these studies as originally intended, but the evaluations yielded some interesting findings.

What was the Matching Error Study? What did it reveal?

The Matching Error Study (MES) was designed to measure the error in the clerical matching process of the ICM/PES. People enumerated by the ICM/PES were matched to people found by the initial phase. This matching process was done first by computer and then, for the more difficult cases, by clerical matchers or by expert matchers. To determine the level of clerical error, expert matchers rematched people within each block in a subsample of ICM/PES blocks known as the evaluation sample. The results from the rematching operation were compared to the production results to find differences in match status. The discrepancy rates between the production and MES matching operations were less than one percent in each of the three dress rehearsal sites. The discrepancy rates were lower than expected, presumably because the matching experts performed a 100 percent quality assurance during the production matching operation. The relatively small matching error suggested that the matching expert coding was highly reliable.

The plans for Census 2000 A.C.E. will not have 100 percent quality assurance by matching experts due to the volume of work anticipated. The quality assurance will be conducted by reviewing 100 percent of a matcher's work until he/she passes the matching criteria. Once the matcher's work is

³⁶The data presented in this subsection can be found in: Catherine Keeley. "Evaluation of the Integrated Coverage Measurement/Post Enumeration Survey Person Followup Questionnaire." Census 2000 Dress Rehearsal Evaluation Memorandum, C6. July 1999.

³⁷The data discussed in this subsection can be found in: Susanne L. Bean, et. al. "Error Profile for the Census 2000 Rehearsal." Census 2000 Dress Rehearsal Evaluation Memorandum, C4. August 1999.

in statistical control, a 10 percent random sample of the matcher's work will be reviewed to ensure the work stays in control.

What was the purpose of the ICM/PES Evaluation Followup Interview? What were its findings?

The Evaluation Followup Interview measured two types of survey error. The first type was measurement error introduced into the survey process by the interviewer, respondent, or instrument. Measurement error was identified by redoing the Person Followup Interview in a subset of the blocks in the evaluation sample. Clerical matchers were given a second set of Person Followup Interview data from the Evaluation Followup Interview, along with the production Person Followup Interview data, to determine the final residence status and match status of each person. The comparison of these results with the production data provided a measure of the error in the production data.

The second type of error the Evaluation Followup Interview attempted to measure was production error due to the decision to not conduct a Person Followup Interview for certain people who did not match between the initial phase and the ICM/PES. The Evaluation Followup Interview form was used to collect information about all people in the evaluation sample blocks who did not match initial phase people but were excluded from the Person Followup Interview. The results were compared to the production results to determine if any production error from the decision to exclude these people from the Person Followup Interview operation had significant effects on the final data. No significant differences in the dual system estimates were found for Sacramento or South Carolina at the site level nor for any of the poststratification variables (age, sex, tenure, race, and Hispanic origin). Estimates for Menominee were not calculated.

What level of error occurred because data were collected by telephone for the ICM/PES?

Due to operational problems in the dress rehearsal, the sample for this evaluation was too small to draw any conclusions. The data collection mode study attempted to measure error due to collecting ICM/PES Person Interview data over the telephone from the interviewer's home using the CAPI instrument, as opposed to collecting the data using the same instrument during a personal visit. Eligible cases included cases which responded early by mail and provided a telephone number. Noncity-style addresses, multi-unit structures with fewer than 20 units, and large household followup and coverage edit cases were all excluded from the telephone universe. The study was conducted by not allowing data to be collected by telephone for half of the eligible cases in the evaluation sample blocks, while attempting to collect the data by telephone for the other half. The phone and personal visit cases were paired as the sample was selected, and the percentage of matches to initial phase people and item nonresponse rates were compared to measure if there were significant differences by the mode of data collection.

Acquisition of Administrative Records³⁸

The Census Bureau was required to develop two approaches for conducting Census 2000 prior to the final decision made in February 1999. The first approach involved the use of sampling and estimation, while the second census design was geared to a nonsampling census that included the possible use of administrative records. Administrative records are program-specific files maintained by various agencies at the federal, state and local levels. As part of ongoing research to determine the feasibility of using these files, we mounted an extensive effort to acquire targeted state and local files. The Census Bureau decided not to use Administrative Records in Census 2000.

What state or local administrative record source files were targeted for collection?

The Census Bureau tried to gather state and local record files for drivers' licenses, parolee/probationers, school enrollment, voter registration, and Medicaid.

What federal administrative record source files were targeted for collection?

There were four federal files targeted:

- Department of Housing and Urban Development, 1997 Tenant Rental Assistance Certification System (TRACS)
- Internal Revenue Service, Tax Year 1996 Individual Master Return File
- Department of Health and Human Services, Public Health Service, 1997 Indian Health Service Patient Registration File
- Selective Service System, 1997 Registration File.

What were the state and local file acquisition results by dress rehearsal sites?

In Sacramento, five files were targeted but only the voter registration and two probation files (youth and adult authorities) were received. Acquisition time ranged from one week to three months and the total cost of two files was \$785. The file from the youth authority was free.

In the South Carolina site, five files were targeted and received. The school enrollment file contained two files from school districts in the South Carolina site and five files from the surrounding eleven counties. Acquisition time ranged from two weeks to two months. The total cost of the driver's license and voter registration files was \$6,975, and the others were free.

³⁸The data discussed in this subsection can be found in: Francina Kerr. "Uses of Administrative Records for Coverage Improvement in a Traditional Census." Census 2000 Dress Rehearsal Evaluation Memorandum, D5. August 1999.

In Menominee, five files were targeted but only the school enrollment and driver's license files were received. Acquisition time ranged from two weeks to two months. The driver's license file cost \$27 for computer time; the school enrollment file was free.

What recommendations resulted from this study?

The acquisition of these files was generally a labor-intensive and time-consuming process with no guarantee of success in gaining all files sought. When administrative records are used, the Census Bureau should identify select state or local files that offer the greatest return.

Assessment of Consistency of Census Results with Independent Demographic Benchmarks³⁹

The objective of this evaluation was to examine the consistency of housing and population totals for the Census 2000 Dress Rehearsal with independent benchmarks. We examined the consistency of housing and population totals with independent benchmarks for each site. We assessed the consistency of key demographic characteristics, such as persons per household, age/sex distributions, race/Hispanic origin distributions, vacancy rates, and group quarters population.

How were data collected for this evaluation?

For each of the three sites, the consistency of the census housing totals with independent housing benchmarks was examined. Independent population estimates were used to make inferences about the magnitude of population undercoverage. The adjusted population estimates had two evaluative purposes: they provided an early assessment of the magnitude of undercoverage in the initial census results, and they broadly validated the ICM/PES results. For Sacramento and Menominee, the consistency of the final census population results was assessed against the independent adjusted benchmarks. For South Carolina, the consistency of the PES-adjusted population total with independent benchmarks was assessed. Finally, the consistency of key demographic characteristics, such as the group quarters population, vacancy rates, persons per household, age/sex and race/Hispanic origin distributions was assessed for all three sites.

What are the results for the housing and population counts by site?

In general, the dress rehearsal census results passed most tests of demographic consistency. For all three sites, the demographic characteristics examined agreed with past census data and expected trends.

For Sacramento, the released census population total of 403,313 is confirmed by independent demographic estimates adjusted for net undercount. The underlying ICM estimate of net undercount

³⁹The data reported in this subsection can be found in: J. Gregory Robinson, Kirsten West, and Arjun Adlakha. "Assessment of Consistency of Census Estimates with Demographic Benchmarks." Census 2000 Dress Rehearsal Evaluation Memorandum, C7. August 1999.

(6.3 percent) is validated by the independent benchmarks. Without the ICM adjustment, the result for Sacramento would be too low. The dress rehearsal housing unit total of 158,281 is below both the Census Bureau demographic and the California agency estimates (by 0.5 and 1.9 percent)--the error in the independent estimates could be this large.

In Menominee the released census population total of 4,738 is confirmed by independent demographic estimates adjusted for net undercount. The underlying ICM estimate of net undercount (3.0 percent) is broadly validated by the independent benchmarks. The dress rehearsal housing unit count of 2,046 is higher than expected (6.9 percent), but we cannot make any reliability statements given the imprecision in the independent estimate for such a small site.

For the South Carolina site, the census housing total (273,497) and population total (662,140) fall below expected levels. Population coverage in 1998 declined relative to 1990--attributable in large part to the incompleteness of the address list and the resulting shortfall of dress rehearsal housing units. The large undercoverage in the dress rehearsal results for the site was measured by the PES (9.0 percent) and validated by the demographic benchmarks.

How were inferences for the magnitude of undercoverage generated?

The adjusted population estimates were used to provide an early assessment of the magnitude of undercoverage in the initial census results.

In Sacramento, a population undercoverage of 3 to 7 percent in the dress rehearsal results was implied by the alternative adjusted population estimates (-3.5 percent for the Census Bureau demographic estimate, -6.8 percent for the California agency estimate). The independent figures were generated by using the 3.0 percent PES undercount adjustment in 1990 and estimated population change for 1990-98 (births, deaths, migration).

A population undercoverage of 3 to 11 percent in 1998 was implied by the alternative adjusted population estimates for Menominee (-11.5 percent for the Census Bureau demographic estimate, -3.1 percent for the Wisconsin agency estimate). These figures were generated by using a 10.0 percent undercount adjustment in 1990 and estimated change for 1990-98. The wide range in the implied undercoverage reflects the wide range in the independent estimates for small areas like Menominee.

For the South Carolina site, a population undercoverage of about 7 percent in the dress rehearsal result was implied by the adjusted population estimate (-7.0 percent for Census Bureau demographic estimate; separate estimates are not available from South Carolina).

What are the possible implications of these differences between the independent estimates and the actual dress rehearsal results in the South Carolina site?

The housing deficiency was somewhat surprising given that the MAF total was higher than the independent estimate. Analysis of housing data shows that high levels of deleted units may be in part responsible for this drop. Additionally, the differences in the housing results are large enough

to lead to different paths of housing growth since 1990—the 1998 census results imply housing loss in Marlboro and Union counties, while the independent estimates indicate expected housing growth. As a result, the adequacy of rules to delete and add addresses should be assessed. The Census Bureau has nearly completed this assessment.

Were there other steps taken to determine the sources of differences in the initial population estimates and the assessment of undercoverage in South Carolina?

To better understand and verify the decline in coverage indicated for the South Carolina site, other demographic data, including sex ratios, were examined. The sex ratios were used because they provided inferences about the coverage of specific groups. In the site, the sex ratios for African Americans were low relative to Whites, with the gap between the two groups' ratios increasing from 1990 to 1998. Of particular interest were indications that the low sex ratio for African Americans was in part due to a high undercount of African American men. Other data sources, such as Medicare data, school enrollment data, and birth and migration statistics were also used to assess the relative coverage of smaller age groupings of the population. The comparisons for each age group were consistent in indicating a decline in coverage from 1990 to 1998 in the South Carolina site. The findings of a coverage shortfall would be expected if the undercount is attributable in large part to missed housing units.

How consistent were key demographic characteristics, such as the group quarters population, vacancy rates, persons per household, age/sex and race/Hispanic origin distributions ?

For all the sites, the statistics for the percent of the population in group quarters, vacancy rates, persons per household, age distributions, race distributions and Hispanic origin distributions exhibit consistency with previous census data and expected trends.

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