



U.S. DEPARTMENT OF COMMERCE
Office of Inspector General



U.S. CENSUS BUREAU

*Improving Our Measure of America:
What the 2004 Census Test Can
Teach Us in Planning for the
2010 Decennial Census*

Final Report No. OIG-16949/September 2004

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MEMORANDUM FOR: Charles Louis Kincannon
Director, Bureau of the Census

FROM: 
Johnnie E. Frazier

SUBJECT: Final Report No. OIG-16949
*Improving Our Measure of America:
What the 2004 Census Test Can Teach
Us in Planning for the 2010 Decennial Census*

Attached is the final report on our review of selected aspects of the recent 2004 Census Test, the first of two scheduled site tests of concepts, proposed systems, and procedures being explored for a reengineered 2010 decennial census. Leading up to the 2010 census, the bureau plans to conduct the second site test in 2006 and a full dress rehearsal in 2008. An executive summary of our report begins on page i.

We conducted our review from March 2004 through July 2004 at bureau headquarters in Suitland, Maryland; regional offices in Atlanta and New York; and at the two local census offices established by the bureau to carry out the test in Queens and south central Georgia. As we completed our work, we made a concerted effort to discuss the details of our findings with the managers and staff of the Technologies Management Office, the Field Division, the Decennial Management Division, and the involved regional offices. Moreover, we held a formal exit conference with senior Census officials on August 12, 2004.

We found that the handheld computers and related automation are promising replacements for paper-based nonresponse followup. The enumerator workforce—recruited and hired using the bureau's traditional practices—was trained and able to use the handhelds. The handheld assignment and questionnaire functions generally appeared to work well, as did the control system used for assigning cases to enumerators, receiving questionnaire data, and providing other critical management functions.

However, the test exposed problems with data transmissions, technical support in the field, and the bureau's system and software engineering practices in developing the field data collection systems that will have to be addressed for future tests and the 2010 census.



We also identified other issues that warrant management's attention including improvements needed in (1) enumerator training, (2) group quarters definitions, (3) quality assurance functions, and (4) management and administrative activities.

Cognizant that the 2004 Test was a "test," and that it is still in progress, our findings and conclusions are presented here without specific recommendations for corrective action. We are providing this report to Census officials so, as appropriate, they will take the necessary actions to address our observations as they plan future tests and prepare for the 2010 decennial census.

In responding to our draft report, the Director stated that the bureau plans to consider the suggestions in the report as it looks to ways to improve the 2006 Census Test, 2008 Dress Rehearsal, and the 2010 Census. The response also included clarification of some items contained in the draft report that we have incorporated in the final report. The bureau's response is included as an appendix to the report.

We appreciate the cooperation and courtesies extended to us during our review by Census Bureau headquarters and regional office personnel.

Attachment

cc: Kathleen B. Cooper, Under Secretary for Economic Affairs
Preston J. Waite, Associate Director for Decennial Census
Marvin D. Raines, Associate Director for Field Operations
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EXECUTIVE SUMMARY

The decennial census is a constitutionally mandated population count that provides the basis for reapportioning seats in the U.S. House of Representatives. It is also used for redrawing state legislative district boundaries and allocating federal funds to state and local governments. The decennial censuses provide official, uniform information gathered over decades on the social, demographic, and economic characteristics of the nation's people. Because of its importance, the decennial census must be as accurate and complete as possible.

The 2000 Decennial Census yielded many successes, such as a higher than expected mail response rate and a reduction of the differential undercount. Contributing factors to the successful implementation of the decennial were: a greatly expanded and aggressive commercial advertising campaign, use of improved technology for capturing questionnaire data, and increased emphasis on recruitment, partnership, and outreach activities. However, the 2000 decennial also highlighted areas of weakness. Delays in finalizing the operational design left insufficient time for planning and testing. Moreover, incomplete and duplicate address list and map information and an often *ad hoc* approach to software development led to complications and some disruptive errors that had to be corrected during the course of the 2000 decennial operations.

In addition, the cost of conducting the decennial census has increased dramatically over the years. According to GAO, in constant 2000 dollars, the 1990 Census cost \$3.3 billion, the 2000 Census cost \$6.6 billion, and the cost of the 2010 Census is estimated to be \$9.3 billion.

To address the challenges of the 2010 decennial, the bureau has adopted a reengineering strategy intended to improve the relevance of census long-form data,¹ reduce operational risk, improve the accuracy of census coverage, and contain costs. The three integrated components of the bureau's strategy are to: (1) collect and tabulate long-form data every year throughout the decade through a large household survey, (2) enhance and improve the existing address list and geographic database, and (3) conduct a program of early planning, development, and testing.

The 2004 test is the first of two scheduled site tests of concepts, systems, and procedures being explored for the reengineered census. The most costly operation in the decennial is nonresponse followup (NRFU) in which temporary Census employees (enumerators) visit addresses for which the bureau has not received a mailed back questionnaire. Automating NRFU's paper-based processes is a key feature of the bureau's redesign for Census 2010, and if successful, should enhance operational efficiency, data quality, enumerator productivity, and help contain costs. The transformation is built around a handheld computer (HHC) designed to allow enumerators to manage their housing assignments, locate housing units using electronic maps and global positioning system (GPS) technology,² interview household occupants using an automated questionnaire with English and Spanish text, and exchange data daily with Census headquarters.

¹ The long form asked more personal and housing questions than the short form and was sent to about 17 percent of the population in the 2000 Census.

² GPS is a space-based radio-navigation system consisting of a constellation of satellites that provides users with accurate information on position, velocity, and time. GPS coordinates are a unique numeric or alphanumeric description of the position.

A major objective of the test was to determine whether HHCs could effectively support NRFU activities and whether the enumerators were able to use them to perform their work.

In addition to an automated NRFU, the bureau tested new methods for improving census coverage (including minimizing address duplication) and gauging respondent reaction to new race and origin questions. It also tested revised definitions and methods for distinguishing between group quarters and housing units. The bureau plans to conduct detailed evaluations of these activities, most to be completed in 2005. Leading up to the 2010 census, the bureau plans a second site test in 2006, and a dress rehearsal in 2008.



The palm-sized handheld computer used for the 2004 NRFU operation.

For the 2004 test, the bureau established two local census offices (LCOs)—one located at an urban site—a portion of the New York City Borough of Queens, the other at a rural site—three counties (Colquitt, Tift, and Thomas) located in south central Georgia. Combined, the two offices visited more than 120,000 non-responding households. In comparison, the 2000 decennial had 520 LCOs and visited 42 million non-responding households.

Each LCO was equipped with the necessary infrastructure—the mix of space, staff, forms and supplies, operating procedures, training manuals, computer hardware and software, and telecommunications networks—to facilitate the flow, processing, and reporting of information needed to manage the collection of questionnaire data and transmit the data to Census headquarters.

A multidisciplinary team from OIG's Office of Audits, Office of Inspections and Program Evaluations, and Office of Systems Evaluation reviewed selected aspects of the 2004 census test to evaluate the effectiveness of (1) HHCs and associated systems in automating NRFU; (2) enumerator hiring, training, and quality control processes; (3) revised definitions and methods for distinguishing between group quarters and housing units; and (4) management, administrative, and logistical support for the 2004 test.

We conducted our review from March 2004 through July 2004 at bureau headquarters in Suitland, Maryland; regional offices in Atlanta and New York; and at both the Georgia and Queens LCOs. We attended crew leader training and portions of 15 enumerator training classes, and observed 31 enumerators during the first 3 weeks of NRFU. Although the training classes and enumerators observed are not statistically representative samples, such observations are helpful in identifying areas that went well, as well as areas in need of improvement.

Our review disclosed the following.

- **Automated nonresponse followup appears feasible, but technical issues need to be resolved.** The test demonstrated that HHCs and related automation are promising replacements for paper-based NRFU. The enumerator workforce—recruited, hired, and trained using the bureau's traditional practices—was able to use the HHCs. HHC assignment and questionnaire functions generally appeared to work well, as did the Operations Control System used for assigning cases to enumerators' HHCs, processing their questionnaire data, and providing other critical management functions. Enumerators were generally also able to follow procedures and collect housing unit GPS coordinates, although the bureau must still determine GPS accuracy.

However, the test exposed weaknesses with data transmissions, technical support to the field and the bureau's system and software engineering practices in developing the field data collection systems. Specifically, transmission problems and inadequate help desk support led to serious disruptions of enumerator training and NRFU operations. The delivery of inadequately tested HHC software to the field and the consequent need to transmit improved software during enumerator training stressed the telecommunication system, and was a major contributor to the transmission problems and their attendant disruptions. Operations were further disrupted by HHC crashes and loss of interview data. Moreover, the slow performance of the electronic maps on the HHCs has prevented the bureau from adequately assessing the maps and the other navigation aids. To mitigate these problems for future tests and the 2010 Census, the bureau will need alternative approaches for transmissions and technical support, and improved system and software engineering, including requirements specification, design, integration, and testing. (See page 7.)

- **NRFU training improvements are needed.** Effectively training over a half million temporary workers is a major challenge in conducting a decennial census, which the bureau has traditionally addressed using rigidly scripted “verbatim” training. Some problems we observed during NRFU operations appeared to be systemic and long-term, from enumerators answering questions for respondents to inadequately handling reluctant respondents, and may be linked to weaknesses in training. Introduction of the HHC has made training even more difficult, particularly because of the need to train enumerators having little or no familiarity with computers. To improve training and mitigate some of the problems we observed, the bureau should consider preparing alternative scripts or explanations for asking awkward questions. It should also consider whether alternative training methods to supplement the verbatim technique, such as multi-media and computer-based training, would be cost effective.

Because of the increased requirements for training, the space that accommodates it must have an adequate infrastructure to support the training. Since the bureau tries to use free or low-cost space, some of the training sites will inevitably lack desirable features. Consequently, the process for obtaining the training sites must ensure that the facilities accommodate technology requirements. In the event that the space lacks some of the necessary features, management must ensure that adequate training can still take place. (See page 17.)

- **The test of revised group quarters definitions was hampered by insufficient planning.** The late delivery of new group quarters definitions and the ambiguity in the definitions undermined the staffs' ability to accurately categorize residences. We found that the process for redefining group homes was not in step with the 2004 test schedule. Consequently, the interim definition that identified group homes as housing units during address canvassing was delivered late, and the resulting instructions were inadequate. For the 2006 test, the bureau needs to solidify new definitions and deliver the requirements early so that they can be adequately incorporated into the test operations. In addition, we observed that neither test site contained university-leased off-campus housing, the second key new definition being tested. For future census tests, the bureau needs to better correlate its objectives with the choice of test site. For the 2006 test, the sites have already been chosen. However, the bureau should determine whether the sites would adequately test the new definition. If not, the boundaries may need to be expanded or an alternative approach used for testing its group quarters objective. The bureau should also determine whether the optimal approach to accurately locating and enumerating group quarters is being tested. (See page 22.)
- **Recruiting and partnership efforts went well and quality assurance method was improved over 2000 census.** Certain operations ran well, such as the recruitment and partnership efforts, which successfully promoted awareness of the census operation and enabled the LCOs to meet staffing goals. In addition, the new quality assurance operation successfully isolated the reinterview process from field operations. However, to better ensure data integrity during the nonresponse followup operation, the training manuals could better describe the independence and authority of the assistant manager for quality assurance. (See page 28.)
- **Some management and administrative activities need attention.** A census test must adequately document problems encountered during the operations under review so that those operations can be carefully evaluated and improved as needed. We found that of the 2 sites, one seemed to have a clearer understanding of the purpose of the test. Specifically, the Queens LCO staff appeared to systematically and strategically "test" and document what did and did not work. For a census test to work, it is important that all parties involved understand the procedures to be followed and the need for problems to be reported and documented.

We also found that selection criteria and uniform processes for selecting crew leaders were lacking, and that the Georgia LCO was not consistently following Census hiring policies until headquarters personnel visiting Georgia pointed out problems. Likewise, we found that no formal mechanism was in place at either LCO to monitor and ensure the prompt return of the HHC equipment from separated employees. (See page 30.)

We recognize that the purpose of the 2004 test was to assess concepts, systems, and procedures for a reengineered 2010 Census, and that some of the problems encountered may not be issues for future tests or the 2010 decennial (for example, systems tested were not prototypes of the final technical design). Nevertheless, the problems that surfaced during the test underscore the challenges faced by Census in achieving a thoroughly tested and smoothly running 2010 decennial census operation.

In an effort to provide the bureau and other stakeholders with timely feedback regarding the test, we decided to issue this report without formal recommendations. Rather, we are providing the bureau with our observations and conclusions and ask that Census develop and implement plans to address these areas for the 2006 test, 2008 dress rehearsal, and 2010 decennial census. Below is a summary of issues to be addressed (1) for the next site test planned in 2006, (2) to successfully automate NRFU, and (3) to better ensure administrative and programmatic success.

BEYOND THE 2004 TEST: PREPARING FOR THE 2010 DECENNIAL CENSUS

To meet performance and cost goals for the 2010 decennial, the Census Bureau should develop and implement plans that accomplish the following:

2006 Test

- Balance the dual objectives of managing a test and conducting a census, including complete documentation of test problems and operations.
- Confirm that test sites support test objectives (e.g., select representative group quarters housing to test university-leased, off-campus definition) or find an alternative for testing the objective.
- Explore and test alternative methodologies to train enumerators.

Automated Operations

- Reevaluate and improve data transmissions.
- Reevaluate and improve field operations technical support.
- Define complete and verifiable specifications that address functional, performance, and human factor requirements for further system development and acquisition.
- Improve system and software engineering practices to ensure the deployment of thoroughly tested automated capabilities before training and operations begin.
- Plan contingencies for essential NRFU components whose failure would jeopardize field operations.
- Improve performance of and further test map functions.
- Upgrade selection criteria for crew leaders to reflect higher level skill requirements.
- Ensure HHC training can be effective in facilities lacking functional and accessible electrical outlets and telephone lines.
- Establish better inventory controls for reclaiming HHCs from departing employees.

Other Considerations

- Gain consensus for new definitions (e.g., group quarters) prior to applying them in an operation.
- Reinforce Census hiring policies to LCO staff.
- Continue to emphasize partnership efforts to recruit staff and publicize the census (i.e., increase participation).
- Verify that the quality assurance operation supports data integrity.

Our observations and conclusions begin on page 7.



In its response to our draft report, the Census Bureau stated that it had no substantial disagreements with our observations, asserting they were similar to their own findings. In addition, the bureau said that the suggestions contained in the report would be considered as the bureau plans for the 2006 Census Test, 2008 Dress Rehearsal, and the 2010 Census. The response also clarified some areas in the draft report, which we have incorporated into the final report. The bureau's response is included as an appendix to the report.

INTRODUCTION

The decennial census is a constitutionally mandated population count that provides the basis for reapportioning seats in the U.S. House of Representatives. It is also used for redrawing state legislative district boundaries and allocating federal funds to state and local governments. The decennial censuses provide official, uniform information gathered over decades on the social, demographic, and economic characteristics of the nation's people. Because of its importance, the decennial census must be as accurate and complete as possible.

The 2000 Decennial Census yielded many successes, such as a higher than expected mail response rate and a reduction of the differential undercount. Contributing factors to the successful implementation of the 2000 Census were: a greatly expanded and aggressive commercial advertising campaign, use of improved technology for capturing questionnaire data, and increased emphasis on recruitment, partnership, and outreach activities. However, the 2000 decennial also highlighted areas of weakness. Delays in finalizing the operational design left insufficient time for planning and testing. In addition, incomplete and duplicate address list and map information and an often *ad hoc* approach to software development led to complications and some disruptive errors that had to be corrected during the course of the 2000 decennial operations.

The Office of Inspector General has documented many of these challenges in its more than 30 reports and special memorandums issued on the 2000 decennial. This report is the third in a series on the bureau's preparations for the 2010 Decennial and details our review of the 2004 census test. Our first report,³ issued in 2002, addressed the lessons learned from the 2000 census that need to be considered by the bureau in its 2010 preparations. It pointed out that more needs to be done to improve data accuracy, implement more cost-effective operations, and reduce the risk associated with the decennial—all to be accomplished in an environment characterized by increasing demographic diversity and rapid technological change. In our second report,⁴ issued last year on the MAF/TIGER redesign, Census's project to modernize the map and address databases, we noted that the bureau had yet to implement a comprehensive project management process and needed to accelerate software process improvement on the project.

The overall cost of conducting the decennial census has increased dramatically over the years. According to GAO, in constant 2000 dollars, the 1990 Census cost \$3.3 billion, the 2000 Census cost \$6.6 billion, and the cost of the 2010 Census is estimated to be \$9.3 billion.

The most costly operation in the decennial is nonresponse followup (NRFU). NRFU is a labor-intensive operation in which temporary Census employees (enumerators) visit addresses from which the bureau has not received a mailed back questionnaire. NRFU accounted for \$1.4 billion, or 26 percent of the total cost of the 2000 decennial. Contributing to this cost was the fact that of the 42 million nonresponding households, nearly 4.2 million were enumerated multiple times—once in other operations, and again during NRFU.

³ Office of Inspector General, U.S. Department of Commerce, *Improving our Measure of America: What Census 2000 Can Teach Us in Planning for 2010*, Report No. OIG-14431, Spring 2002.

⁴ Office of Inspector General, U.S. Department of Commerce, *MAF/TIGER Redesign Project Needs Management Improvements to Meet Its Decennial Goals and Cost Objectives*, Report No. OSE-15725, September 2003.

Decennial time line requires disciplined testing and evaluation

To address the challenges of the 2010 decennial, the bureau has adopted a reengineering strategy intended to improve the relevance of census long-form data,⁵ reduce operational risk, improve the accuracy of census coverage, and contain costs. The three integrated components of the bureau's strategy are to: (1) collect and tabulate long-form data every year throughout the decade through a large household survey, (2) enhance and improve the existing address list and geographic database, and (3) conduct a program of early planning, development, and testing.

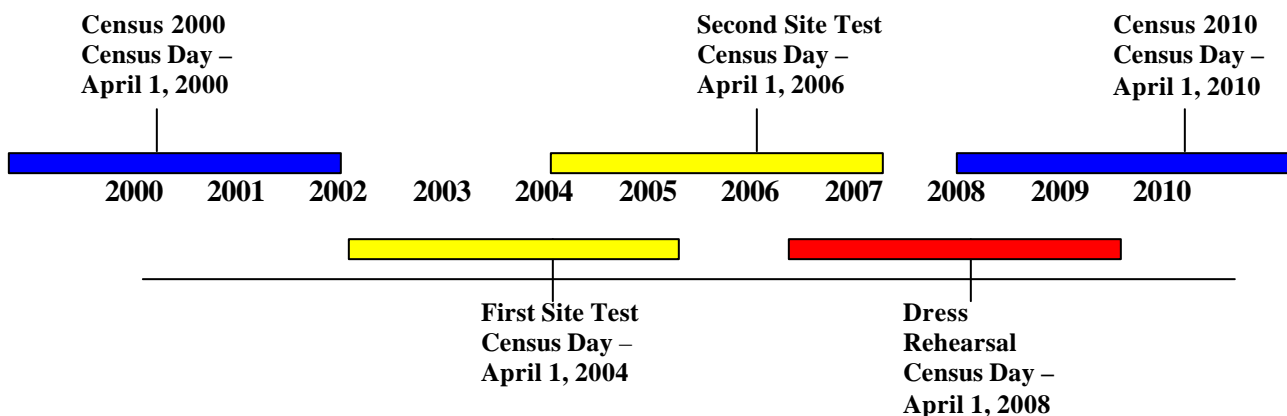
Leading up to the 2010 census, the bureau plans to conduct a number of large-scale field tests: another site test in 2006; several national tests that will examine, for example, revised wording, layout, and replacement questionnaire delivery methods; two tests to determine the feasibility of enumerating U.S. citizens overseas; and a full dress rehearsal in 2008.

Decennial Census Tests Planned for 2010	
Site Tests	2004 Census Test 2006 Census Test
National Tests	2003 National Census Test 2005 National Census Test
Overseas Tests	2004 Overseas Census Test 2006 Overseas Census Test
Dress Rehearsal	2008

Source: U.S. Census Bureau

Figure 1 illustrates decennial planning. The 2004 and 2006 tests, the dress rehearsal in 2008, and the 2010 decennial are scheduled at 2-year intervals but each has a 3-year time line, and thus overlaps with many prior or subsequent operations. Building on experiences and incorporating feedback from events and evaluations that may still be in process as the next operation begins is crucial to the bureau's ability to stay on course and implement reengineered processes.

Figure 1: Decadal Test/Implementation Schedule for Census 2010



⁵ A form sent to about 17 percent of the population that asks additional personal and housing questions.

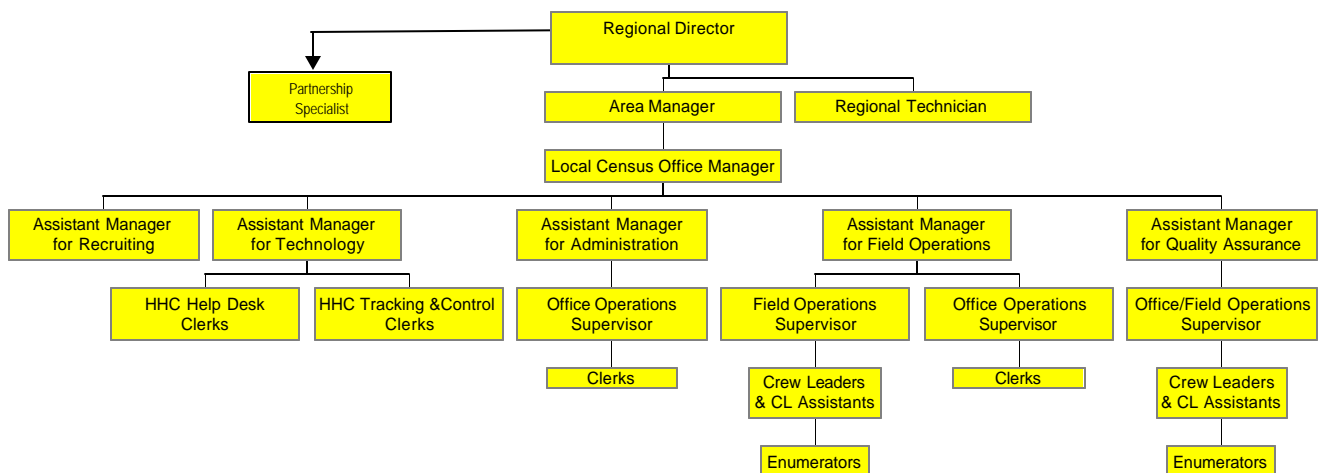
The 2004 test provides an opportunity to assess the bureau’s progress in planning for the 2010 decennial. It is also a good measure of the bureau’s efforts in areas of importance we raised in our MAF/TIGER report and in our summary evaluation of Census 2000, including improving software and systems engineering practices, producing accurate address lists and maps, and improving management of its temporary staffs. The bureau plans to conduct detailed evaluations of the test, most to be completed in 2005.

2004 field test conducted in Queens, New York and Colquitt, Thomas, and Tift counties, Georgia

The 2004 test is the first of two scheduled site tests of concepts, systems, and procedures being explored in the reengineered census. The test was conducted at two locations—one rural (Colquitt, Thomas, and Tift counties in south central Georgia) and one urban (encompassing a portion of Queens, New York). Each was managed by a local census office (LCO) and equipped with the necessary infrastructure—the mix of office space, staff, forms and supplies, operating procedures, training manuals, computer hardware and software programs, and telecommunications networks to facilitate the flow, processing, and reporting of information needed to manage the collection of questionnaire data and transmit the data to Census headquarters.

For the 2000 decennial, 520 local census offices conducted census operations and visited 42 million non-responding households during NRFU. Figure 2 depicts the regional and LCO organizational structure for NRFU at the two sites.

Figure 2: Organization Chart for Nonresponse Followup



Field operations supervisors are responsible for daily field operations.

Crew leaders train and supervise enumerators in their assigned crew leader districts, and ensure that enumerators' work is completed correctly, efficiently, and on schedule.

Crew leader assistants help crew leaders train enumerators and perform other duties as assigned.

Enumerators use the Census HHC to find each housing unit and complete a census interview.

Automating NRFU's paper-based processes is a key feature of the bureau's decennial redesign for Census 2010, and if successful, should enhance operational efficiency, data quality, enumerator productivity, and help contain costs. For example, late mail returns from approximately 780,000 households could not be removed from NRFU during the 2000 decennial, necessitating a visit to these households. The Census 2000 estimated cost per housing unit for NRFU was \$26.96.⁶ Consequently, the potential for savings exists if personal visits to these households could be prevented through automation.

NRFU automation for the 2004 test is built around a handheld computer system designed to allow enumerators to manage their housing assignments, locate housing units using electronic maps and global positioning system (GPS) technology,⁷ interview household occupants using an automated questionnaire with English and Spanish text, and exchange data daily with Census headquarters.

In addition to evaluating automated NRFU during the 2004 test, the bureau intends to assess new methods for improving census coverage (including minimizing address duplication), gauge respondent reaction to new race and origin questions, and evaluate revised definitions and methods for distinguishing between group quarters and housing units. Traditionally, when conducting field tests, the bureau also obtains an official count of the population. However, to ensure that the test objectives were not overshadowed by the need for a complete and accurate count, Census did not conduct a full official enumeration of the test areas.

⁶ *Nonresponse Followup for Census 2000*, Census 2000 Evaluation H.5, p. vii., U.S. Census Bureau, July 25, 2002.

⁷ GPS is a space-based radio-navigation system consisting of a constellation of satellites that provides users with accurate information on position, velocity, and time. GPS coordinates are a unique numeric or alphanumeric description of the position.

OBJECTIVE, SCOPE, AND METHODOLOGY

A multidisciplinary team from OIG's Office of Audits, Office of Inspections and Program Evaluations, and Office of Systems Evaluation reviewed selected aspects of the 2004 census test to evaluate the effectiveness of (1) handheld computers and associated systems in automating NRFU; (2) enumerator hiring, training, and quality control processes; (3) revised definitions and methods for distinguishing between group quarters and housing units; and (4) management, administrative, and logistical support for the 2004 test.

We conducted our review from March 2004 through July 2004 at bureau headquarters in Suitland, Maryland; regional offices in Atlanta and New York; and the Queens, New York, and the three-county Georgia LCOs—the sites of the 2004 testing.

As part of our review, we conducted:

(1) Reviews of -

- 2004 census test planning and evaluation documentation to determine the bureau's goals and objectives for the test, as well as Census regulations, policies, and procedures.
- Test operations documentation to determine Census regulations, policies, and procedures, including manuals describing the roles and responsibilities of managers and staff.
- Training manuals and materials for crew leaders and enumerators
- Technical documentation describing the handheld computer and Operations Control System, and overall system architecture and workflow.
- 2004 census test group quarters data from the Queens address canvass operation and Census 2000 group quarters data and group quarters validation data from both 2004 test sites.
- Administrative files to determine compliance with administrative requirements.

(2) Interviews with -

- LCO staff involved in the group quarters address canvassing and update/leave operations (we did not observe these earlier operations).
- Bureau headquarters officials in the Office of the Associate Director for Decennial Census and the Office of the Associate Director for Field Operations, Suitland, Maryland.
- Regional management officials in Atlanta, Georgia, and New York City.
- LCO managers and supervisors at both test locations, help desk clerks, and a total of 58 enumerators, crew leaders, and crew leader assistants.

(3) Observations of -

- Crew leader training in March 2004 and portions of 15 enumerator-training classes held in April 2004 at both locations.
- Nonresponse followup operations at both test locations during the first three weeks. We observed enumerators conducting interviews and attended crew leader and crew

leader assistant meetings. We also observed LCO staff and field operations supervisors managing workloads, and where applicable, staff.

(4) Testing of -

- Selected handheld computer functionality and performance.

We recognize that the purpose of the 2004 test was to assess concepts, systems, and procedures for a reengineered 2010 Census, and that some of the problems encountered may not be issues for future tests or the 2010 decennial (for example, systems tested were not prototypes of the final technical design). Nevertheless, the problems that surfaced during the test underscore the challenges faced by Census in achieving a thoroughly tested and smoothly running 2010 decennial census operation.

OBSERVATIONS AND CONCLUSIONS

I. AUTOMATED NONRESPONSE FOLLOWUP APPEARS FEASIBLE, BUT TECHNICAL ISSUES NEED TO BE RESOLVED

For Census 2010, the bureau wants to equip enumerators with relatively inexpensive handheld computers (HHCs) with GPS capabilities to locate households and collect questionnaire data during nonresponse followup (NRFU). Handheld computers would replace the laborious decennial process of managing paper questionnaires and address assignment lists, improve data quality and operational efficiency, and reduce costs. A major purpose of the 2004 test was to determine the feasibility of using HHCs to automate NRFU operations.

To evaluate the feasibility of automating NRFU, we assessed whether enumerators were able to use the HHCs, as well as whether HHCs and related systems appeared to work as intended and seemed capable of supporting NRFU operations. We focused our work on the following:

- *HHC functions*—assignment management, automated questionnaire, electronic maps, and GPS coordinate collection;
- *Operations Control System (OCS) workflow functions*—allocating assignments to HHCs, processing completed assignments, eliminating unneeded assignments from HHCs, supporting supervisory reviews, and reporting on production;
- *Transmissions*—transfer of data between enumerator's HHC and Census telecommunication system at headquarters; and
- *Technical support for HHCs*—assistance to enumerators and crew leaders in solving problems encountered in using the handheld computers.

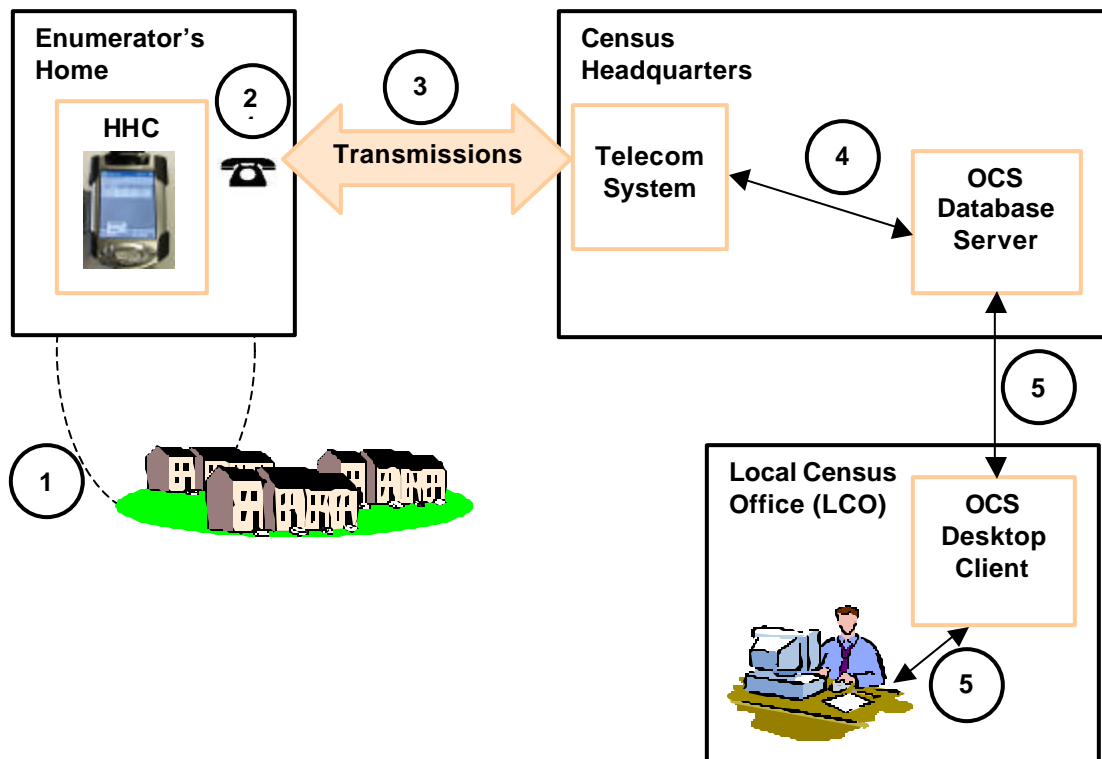


The palm-sized handheld computer used for the 2004 NRFU operation.

Figure 3 provides a schematic of the field data collection systems (HHC, OCS, and telecommunication system) and daily workflow for the 2004 test of NRFU automation.

Our observation of the 2004 test suggests that HHCs and related automation show promise for replacing paper-based NRFU. However, the test exposed weaknesses with the approach used for transmissions and technical support and with the bureau's system and software engineering practices in developing the field data collection systems.

Figure 3: NRFU Field Data Collection Systems and Daily Workflow



Basic Daily Workflow

1. Each day the enumerator selects assignments from his or her HHC assignment list, goes into the field, and uses the HHC to locate addresses and conduct interviews.
2. Each evening the enumerator initiates a transmission to exchange data with Census headquarters. The enumerator connects the HHC to the home telephone jack and sets up the HHC to connect to the Census telecommunication (Telecom) system.
3. During the transmission, the enumerator's HHC uploads collected questionnaire data to the telecommunication system at headquarters and headquarters downloads new assignments to the HHC.
4. During the transmission, the OCS Database Server at headquarters receives questionnaires from the telecommunication system and sends new assignments to the telecommunication system. The OCS Database Server automatically accepts completed questionnaires or flags partially completed ones for supervisory review.
5. Throughout the day, supervisors and crew leaders review reports generated by the OCS (Database Server and desktop Client) about the status of assignments. Then they allocate new or partially completed assignments to enumerators. These assignments are entered into the OCS Client and stored in the OCS Database Server.

A. Many HHC Functions Appeared to Work Well, but System Reliability and Map Response Time Must Be Improved

The enumerators we observed could generally use the HHCs to manage their assignments and conduct interviews. While most aspects of these HHC functions seemed to work as intended, HHC crashes—serious failures in which a program stopped processing or the HHC completely froze or shut down—sometimes caused interview data to be lost. The map functions on the HHC were underutilized, in part, because the map program was slow to start. The slow performance of the maps hampered the bureau’s ability to assess their usability.⁸

HHC assignment management and automated questionnaire capabilities appeared to work well

The bureau used its traditional recruiting, hiring, and training practices to build an enumerator workforce that appeared competent in using the HHCs. The enumerators we observed were generally able to manage their assignments and collect questionnaire data (see figure 4). Using the HHC’s assignment management functionality, they navigated through a series of computer screens to obtain the addresses of the housing units they were assigned to enumerate. The enumerators then followed the automated questionnaire in English or Spanish, which allowed them to proceed through the programmed sequences of interview questions and data entry screens, and select options for handling exceptional cases, such as terminating an interview early. Also, enumerators were able to use many other HHC functions—for example, reviewing their work assignments and writing contact notes—that supported assignment management and collecting questionnaire data.⁹

HHC crashes caused interview data to be lost

HHC reliability needs to be improved. Crashes disrupted enumerators’ activities and reduced their productivity. Enumerators lost time with each crash because they had to restart their work, and even more seriously, sometimes lost questionnaire data. To obtain the lost data, enumerators would have to reinterview the household, providing the occupants were willing.

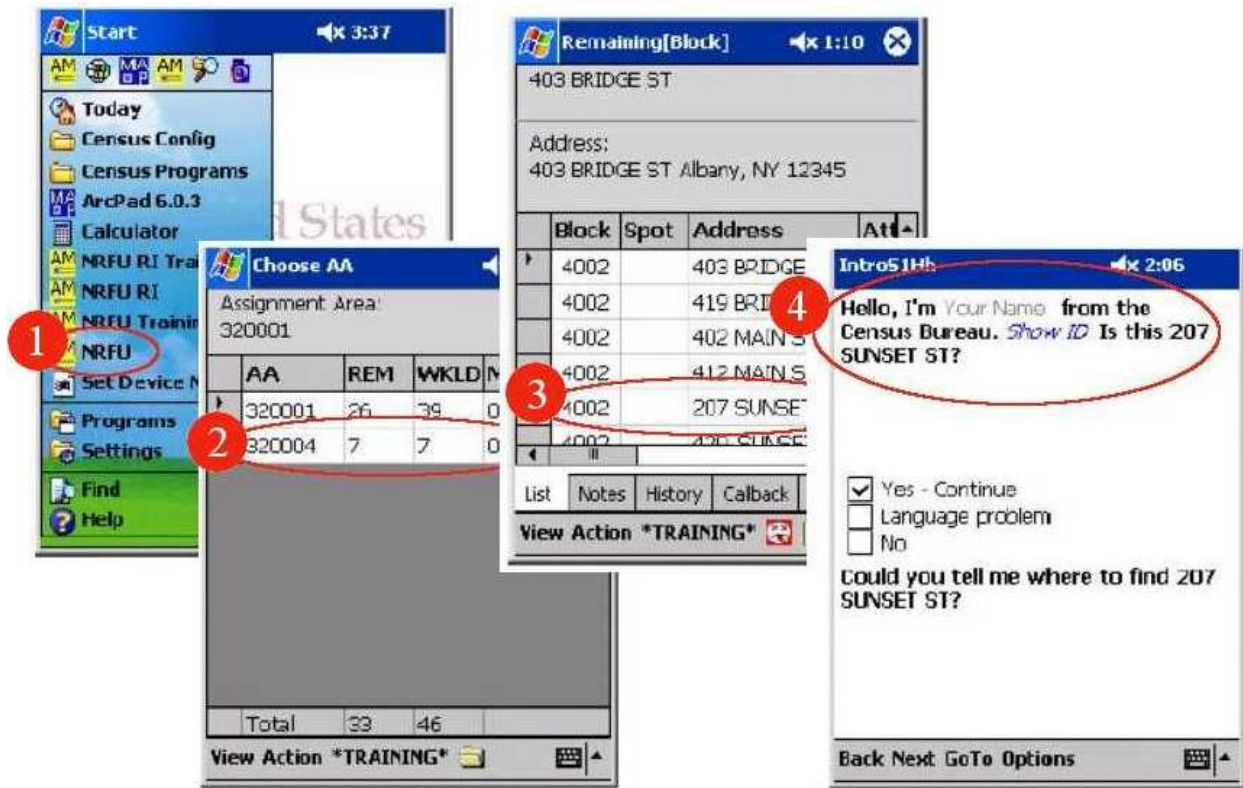
To minimize the potential for data loss, Census had designed the HHC to save a backup copy of the questionnaire data on its removable memory card. However, if the memory card was not inserted properly or had other technical problems, collected data would be lost. Census therefore programmed the HHCs to display a warning message notifying enumerators when data backup was not occurring. From our observations, most enumerators who received this message continued using the HHC rather than re-inserting the removable memory card properly or turning in the HHC to the Local Census Office (LCO) to fix the backup problem, as instructed. One enumerator told us that he lost 24 interviews by continuing to work after receiving a message that the memory card was not working. The experience of this enumerator illustrates the

⁸ International Standards Organization (ISO) 9241-11, “Guidance on Usability,” defines usability as the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.

⁹ We did not comprehensively evaluate all HHC assignment management or automated questionnaire functions.

importance of having an HHC whose system components are well integrated and resistant to human error.

Figure 4: HHC Navigation to Assignments and Questionnaire



1. Select NRFU from the start menu to get a list of assignment areas. Enumerator's work is divided into geographic sections called assignment areas, each one containing about 40 addresses.
2. Select an assignment area (AA) to get the address list.
3. Select an address to start the automated questionnaire.
4. Follow the script in the automated questionnaire and obtain answers.

Although not all computer crashes were recorded, and it could be difficult to determine the cause of each crash, Census was able to correct at least one serious problem. Software design flaws that were not identified in development or testing caused OCS to sometimes attempt to download more data to the HHC's removable memory card than the card could hold. Once Census understood that this integration problem was causing the HHC to crash, a software change was made to OCS to work around the problem.

Electronic map and "you-are-here" GPS functions were underutilized

HHCs are equipped with a customized commercial off-the-shelf electronic map program that uses Census's map database and GPS technology to display real-time maps and a "you-are-here" position indicator. These functions are designed to assist enumerators in navigating to their assignments by pinpointing their exact location and showing their movements. By replacing

paper maps with electronic maps and navigational aids, Census officials expect to eliminate costly printing, storage, and handling of paper maps and improve enumerator productivity by reducing the time needed to complete assignments. However, during the 2004 test, enumerators seldom used the electronic map and location functions. Consequently, these functions were not adequately assessed, and their value will remain unclear until further testing is conducted.

In Queens, most enumerators we observed did not use the electronic maps to locate their assignments because they either knew the area or could easily navigate the streets to find housing units. Enumerators in Georgia were more likely to consult the electronic maps because finding housing units in rural areas was more difficult. But even in Georgia, use of the maps was too sporadic to assess their usability and the “you-are-here” function was seldom used at all.

The principal reason that the Georgia enumerators did not use the maps was because the process of starting the map program and opening map files was very slow, taking minutes rather than seconds. In fact, some enumerators in Georgia purchased paper maps rather than use the electronic functions, at least in part because of their slow performance. Our own testing of the HHC confirmed that the maps were slow to start, but we found that once the files opened, other map functions—including the “you-are-here,” zoom, pan, and find address capabilities—responded at reasonable speeds. We also found that the “you-are-here” feature accurately pinpointed our position and showed our movements. However, since the HHCs had a tendency to crash, enumerators who wished to use the maps and other navigation functions had to endure the program’s slow startup every time they rebooted the system after a crash.

Enumerators were able to adequately follow procedures for collecting GPS coordinates

As part of 2004 NRFU operations, enumerators collected GPS coordinates near the main entrance of a housing unit or building before starting an interview. The purpose of collecting GPS coordinates was to help correctly locate every required residential and non-residential structure with its address in the Census map database. In both Queens and Georgia, enumerators initially had difficulty collecting coordinates during training, and two steps in the collection procedure seemed particularly troublesome—(1) properly inserting the GPS receiver into the HHC, and (2) positioning the HHC with an unobstructed view of the sky while standing near the front door of a structure.

Once enumerators became familiar with the procedures, they generally appeared to follow them and were able to obtain GPS coordinates. Still, some enumerators in Queens reported having problems, such as when tall structures like apartment buildings surrounded their location, obstructing a clear view of the sky. And in Georgia, enumerators we observed occasionally did not follow collection procedures: for example, one consistently took GPS readings 15 or 20 yards from the front door of structures.

Census is conducting a separate GPS field evaluation to be completed by the end of September 2004 to determine the extent to which such deviations from procedures may have impacted data accuracy. The bureau plans to use the results from this followup evaluation to refine GPS collection procedures for the Census 2006 test.

B. The Operations Control System Appeared to Support Automating NRFU

OCS is used for managing census field operations. The effective functioning of OCS is therefore critical to the success of NRFU automation. OCS appeared capable of supporting NRFU operations during the 2004 test including assigning cases to enumerators' HHCs and processing their questionnaire data, providing LCO managers with adequate information to control NRFU operations, and promptly removing NRFU assignments from the HHCs for households that were late in returning their census forms by mail. This last capability can potentially reduce costs by eliminating a significant number of enumerator visits to households that mailed completed census forms late.

We observed that crew leaders were able to assign work to enumerators' HHCs: on a daily basis, crew leaders, working from a list of all assignments in their district, could give the enumerators new assignments by having a clerk at the LCO enter them into OCS. The new assignments would then be downloaded to the enumerators' HHCs during their daily transmission. OCS was able to accept, or "check in," the questionnaire data transmitted from the enumerators' HHCs. However, the bureau reported several failures in which data from about 1,200 assignments (1 percent of the total processed) was not properly checked in, causing confusion about which assignments were completed. According to Census officials, this problem occurred if an enumerator entered too many characters in the questionnaire's note field or when OCS did not recognize the characters entered. It also occurred if the transmission account code in the HHC and OCS did not match. Census officials told us they were able to fix this problem as the test progressed.

From the checked-in questionnaires, OCS generated productivity reports on individual staff—from field operations supervisors down to individual enumerators. We observed LCO managers, field operations supervisors, and crew leaders using these reports to address production problems. The system also flagged partially completed questionnaires for review by LCO managers, who would decide whether to accept them, return them to the original enumerators with instructions on how to complete them, or reassign the questionnaires to different enumerators better suited to handle exceptional cases (for example, reassign a bilingual enumerator to a household that did not speak English).

OCS was successful in removing assignments from enumerators' HHCs for many households that returned census forms after the start of NRFU. This reduced the number of unnecessary enumerator visits and cut Census's costs: the bureau reported that over 75 percent of the late mail returns (LMRs) resulted in assignments being removed from enumerators' HHCs in time to avoid conducting an interview. While we did not confirm these numbers, we did observe that numerous LMRs were downloaded to the HHCs.

C. Transmission Problems Disrupted Training and Enumeration

Transfer of data between enumerators' HHCs and the Census telecommunication system is indispensable to the automation of NRFU. Enumerators were instructed to transmit daily to ensure that Census headquarters had received all completed cases and enumerators had up-to-

date assignment lists. In the 2004 test, however, transmissions often failed, disrupting training and enumerators' activities, particularly during the first weeks of NRFU.

According to Census data, 84 percent of the reported transmission problems were due to user errors. Many of these errors were precipitated by the lengthy transmission setup procedure. Enumerators had to follow a multi-step process to transmit, which included properly setting home telephone services (such as voice mail) to accommodate the transmission, connecting four adapters and peripheral devices,¹⁰ entering two passwords at different points in the process, and checking to make sure the transmission was successful. Complicating matters were the expansion battery pack and modem, which could be difficult to properly connect to the HHC. Initially enumerators were not adept at checking whether these peripheral devices were properly connected. After it became apparent that enumerators were having difficulty with the set-up procedure, both LCOs developed clearer guidance, and in Queens, conducted additional transmission training.

Even when enumerators followed the setup procedure correctly, transmissions could still fail because of malfunctions in the Census telecommunication system or problems with telephone lines. The bureau reported that the rate of interrupted transmissions dropped from 20 percent during the first 2 weeks of enumeration to 5 percent thereafter.¹¹

According to bureau officials, the initially high failure rate (20 percent) can be attributed to the long time (about 30 minutes) needed to transmit new HHC software. The HHCs were shipped to the two LCOs in January 2004—before the software programs were fully tested and finalized. Because testing continued into April, the corrected version of the software was not available for training field operations supervisors (beginning March 15) and crew leaders (March 29), or initially for training enumerators (April 19). Consequently, the corrected software had to be transmitted with the first work assignments during enumerator training, extending the length of the transmission. Although Census was concerned about the impact of long transmission times when planning for the test, it did not have a contingency plan to deal with failures when they actually occurred.

Transmission problems prevented more than half of the enumerators in Georgia and two-thirds of the enumerators in Queens whom we observed from receiving the corrected software or their work assignments in time for the last 2 days of the 5-day training course. Even after the new software had been successfully transmitted, transmission problems continued into the actual NRFU operation, and were the main reason why enumerators had difficulty completing their assignments during the first 2 weeks of NRFU.

During NRFU, the software on some HHCs was replaced again when technical support personnel could not find any other way to correct malfunctions. The process of reinstalling the software on the HHC was referred to as "reimaging." The same long transmission times were

¹⁰ Enumerators had to connect (1) the expansion battery pack to the HHC, (2) the modem to the expansion battery pack, (3) the modem cable to modem and the telephone jack, and (4) the A/C adapter to the HHC and the home electrical outlet.

¹¹ These rates represent failures detected after users successfully connected with the Census telecommunication system. Failed setup attempts are not included.

again experienced while reimaging the HHCs. This problem was later resolved by providing a copy of the software to the LCOs, allowing reimaging to be done without a transmission.

D. Field Personnel Need Improved Technical Support

Due to technical flaws and user errors, enumerators will inevitably experience problems in using their HHCs. Proficient technical support personnel must be available to help the enumerators solve problems quickly so they can resume work promptly. The technical support in the 2004 test, however, did not provide enumerators with efficient and effective solutions to problems.

Enumerators and crew leaders were expected to troubleshoot simple HHC hardware, software, and transmission problems by themselves. However, as discussed in finding II (page 20), they were not trained in basic troubleshooting techniques that would have helped them diagnose and correct simple problems. When unable to resolve a problem, enumerators and crew leaders were to contact the LCO help desk for technical support: help desk staff would elevate problems they could not resolve to the Decennial Regional Office computer specialist (DROCS), and—if still more assistance was needed—the DROCS referred the problem to the Technical Assistance Center at Census headquarters. This tiered approach was intended to resolve simple problems quickly, reduce overall downtime, and reserve higher-level expertise for complex issues.

Help desk staff did not have the experience or receive adequate training to support operations. Help desk personnel were screened and hired using the same test that was administered to candidates for enumeration and general office positions. This test did not assess technical skills or experience such as familiarity with software or computers—desirable attributes for technical support personnel. Also, the help desk staff received only limited technical training—3 days of enumerator training (including the use of HHCs) and 1 day of training on LCO systems: OCS, Census Applicant Personnel and Payroll System (CAPPS), Property Management System, and the commercial help desk support system used throughout the Census Bureau. However, of these, only the HHCs and the help desk support system were relevant to the daily duties of the help desk personnel.

Help desk staff did not have a way of gathering and distributing solutions to recurring technical problems. The help desk support system has a knowledge-base capability, which could have been used to collect and disseminate the best solutions for common problems, but Census did not implement this capability. Instead, after NRFU operations had started, help desk staff at the Queens LCO developed a guide describing solutions that had worked for frequently occurring problems.

Finally, help desk procedures were not designed for operational efficiency. When large-scale HHC transmission or other difficulties occurred, help desk personnel frequently could not resolve them over the phone. As a result, enumerators had to bring their HHCs to the LCO for repair, where they often waited several hours for their handheld computers to be fixed. Help desk staff often could not identify specific solutions to problems, so as a last resort, they would reimage the HHC software. As noted previously, reimaging was time consuming at first, requiring up to a 30-minute transmission. Another time-consuming repair procedure was needed when enumerators were denied access to their HHCs because of password problems. In such

instances, the handheld computers had to be completely reimaged, rather than simply restored to functionality via a master password.

CONCLUSION

Census officials are learning a great deal about the HHCs and associated systems from the 2004 test. The test demonstrated that HHCs and related automation are promising replacements for paper-based NRFU. The enumerator workforce—hired, recruited, and trained using the bureau's traditional practices—was able to use the HHCs. HHC assignment and questionnaire functions generally appeared to work well, as did the OCS workflow functions that we observed. Enumerators were generally also able to follow procedures and collect housing unit GPS coordinates, although the bureau must still determine their accuracy.

Transmission problems and inadequate help desk support were the main reasons for the serious disruption of the NRFU operation and will require the design of alternative approaches for future tests and the 2010 Census. The delivery of inadequately tested HHC software to the field and the consequent need to transmit corrected software during enumerator training stressed the telecommunication system, and was a major contributor to the transmission problems and their attendant disruptions. HHC crashes and loss of data were also disruptive. Indeed, technical problems lowered enumerator productivity, and managers at the Queens LCO believed that technical problems led to a higher than expected enumerator attrition rate. Moreover, the slow performance of the electronic maps has prevented the bureau from assessing them and the other navigation aids in the 2004 test.

Census officials have stated that they are aware of the risks and complexities of transmissions and that they do not intend to use the same approach in 2010 as was used for the 2004 test. They acknowledged that even transmitting at the 95 percent success rate ultimately achieved in the test would not be acceptable—with more than 500,000 enumerators transmitting in 2010, this level of reliability would result in more than 25,000 transmission failures daily. Census needs to plan contingencies for essential NRFU components, like transmissions, whose failure would jeopardize field operations.

In improving technical support, the bureau should use screening methods for technical support personnel that identify the needed aptitudes for operating the help desk function. Help desk staff should be provided with training that focuses on anticipated problem areas and entails hands-on work with HHCs so they are familiar with the hardware, software, and significant operations of the device; and they must be given the tools needed to resolve problems efficiently. Although the tiered approach to technical support—successively elevating unresolved problems to personnel with more expertise—was intended to promote efficient use of resources, our observation of the 2004 test suggest that alternative models need to be considered to minimize enumerator downtime—for example, having a limited troubleshooting capacity in the LCOs, supplemented by a call center capability staffed by more highly-skilled personnel that enumerators could call directly when assistance is needed.

Many of the reliability and usability problems we observed—frequent HHC crashes, loss of questionnaire data, slow response times, and problems connecting peripheral devices (memory

cards, modems, expansion battery packs)—can be avoided or mitigated by improved system and software engineering practices: better requirements specification, design, integration, and testing. Most fundamentally, the bureau must prepare specifications that not only identify functional requirements but also stipulate performance and human factor needs such as the necessary degree of reliability, acceptable response times, easy-to-connect peripherals, and straightforward user procedures. The HHC must be designed to limit the possibility of both human and system errors and to handle unanticipated errors in the least disruptive manner possible.

The bureau plans to contract for development of the field data collection systems for the 2008 Dress Rehearsal and the 2010 Census. Although contracting can help bring the necessary system and software development expertise and management discipline, Census still faces tremendous challenges in capturing lessons learned from the 2004 and subsequent tests; defining complete and verifiable system requirements; preparing the solicitation; selecting a competent contractor; and overseeing the contract so that systems are fully developed, tested, and finalized before operations begin.

II. NRFU TRAINING IMPROVEMENTS ARE NEEDED

Key to the success of the 2004 test was how well the bureau prepared the 1,100 enumerators to conduct automated nonresponse followup. We evaluated how well the training appeared to prepare the enumerators to conduct NRFU—attending 10 of 36 classes held throughout the Queens area and 5 of 8 classes conducted in Georgia, and then observing 31 enumerators at work in the field during the first 3 weeks of NRFU. The bureau’s training approach generally appeared to teach enumerators how to perform their duties using handheld computers, but enhancing certain aspects of the training and adding a component on HHC troubleshooting could improve their overall performance. In addition, some of the 15 training facilities we visited lacked adequate infrastructure—sufficient electrical outlets and functioning telephone lines—to support training on the handheld computers. Because of the increased requirements for training, the space that accommodates it must have an adequate infrastructure to support the training, or in the event that the space lacks some of the necessary features, management must ensure that adequate training can take place.

A. *Enumerator Problems Observed During NRFU May Be Linked to Weaknesses in Training*

For the 2004 test, the bureau used its traditional recruiting, hiring, and training practices to build an enumerator workforce that appeared to be competent in using the HHCs. For this test, as in the past four decennial censuses, the bureau used a “verbatim” training methodology, whereby recently trained crew leaders read word for word from a training manual to teach a class of 15 to 20 students how to conduct NRFU operations, including locating households, completing questionnaires, and tracking work hours. In shifting from paper and pen to an automated process, the bureau expanded the 3 days of training to 5 days.

“The best indicator of the effectiveness of employee training programs is the degree to which the skills taught in training are demonstrated on the job.”

Excerpted from *Nonresponse Follow-up (NRFU) Enumerator Training, Census 2000 Evaluation H.7*, March 28, 2003.

We found that most enumerators were generally able to use the HHCs to conduct interviews and perform other required functions, and were generally knowledgeable about the nonresponse followup process. However, we observed that a number of them improperly executed various NRFU procedures. Although we do not have any quantifiable measure of how widespread the problems were, we observed enumerators who did the following:

- Obtained questionnaire information via proxy interviews before making the requisite number of visits to the assigned household.
- Omitted the age question.
- Reworded the survey questions concerning race and ethnicity.
- Made and recorded race and ethnicity determinations without asking the respondent.
- Disregarded the “respondent flashcard booklet,” which was designed to assist the respondent with answering census questions.
- Failed to leave a “notice of visit” form at households where no one answered.

- Recorded respondent data on paper and then entered it into the HHC.
- Failed to document problems with their handheld computer.
- Failed to transmit data daily.

Some of the problems appear to be systemic and may be linked to weaknesses in training, as the bureau also identified them in its internal evaluation of Census 2000 training.

Methods to supplement verbatim training for HHCs and other NRFU procedures should be considered

More than a half million temporary workers were hired and trained to conduct NRFU in 2000. As in the previous three censuses, the bureau used verbatim training in 2000 in order to help minimize costs and ensure uniform instruction across the hundreds of LCOs and thousands of training classes. Verbatim training was used for NRFU in the 2004 test as well, although training requirements have become more challenging: enumerators with various levels of expertise, including no computer experience at all, must learn how to operate the HHC and perform automated procedures, in addition to mastering the other requirements of the NRFU operation.

Figure 5: Enumerator Training Class



Some trainees had difficulty keeping up because they could not see the instructor's actions on the HHC. (Instructor is in center of photograph.)

Although all enumerators had their own HHC during training, they were unable to see the crew leader's handheld computer, as shown in figure 5, causing some to have difficulty following the procedures being taught. Some of the field operations supervisors and enumerators we spoke with said their understanding would be facilitated if the class could observe an HHC proceeding through the various NRFU steps as they were being explained. Some enumerators commented that a trainee's confusion about HHC terminology (for example, one trainee told us she did not understand the term "icon") or a trainee's inability to keep up with the sequence of screens being presented caused classes to lag behind schedule.

In addition to the difficulties in using verbatim training for HHCs, this training method may also have resulted in some of the enumerator problems we observed that were not related to the handheld devices. Some enumerators appeared disinterested or bored in class, obviously not paying attention, and in one class we observed, actually falling asleep. Enumerators we spoke with told us that they found classroom training to be slow and uninteresting, and that lapses in their concentration occurred. Consequently, some enumerators may have failed to learn how to conduct important NRFU procedures.

We discussed the possibility of using alternative methods for training enumerators with bureau officials, who emphasized that the cost-benefit ratio of changing the training format must be considered. The bureau has recognized the need to improve its training, however. Its own evaluation of Census 2000 NRFU enumerator training recommended that additional media such

as audiotapes, videos, flip charts, posters, and slides be included. Moreover, to help address its future training needs, the bureau has hired a contractor to evaluate the training for the 2004 test and provide recommendations for improving it. Over the past 10 years, enumerators have used laptop computers in field enumeration for some of the bureau's non-decennial survey operations. Verbatim training is used in conjunction with interactive (multi-media and computer-based) methods for these enumerators, and the bureau believes this combination of methods has enhanced their proficiency with the technology.

Given the issues identified with verbatim training in the 2000 Census and the 2004 test, as well as the bureau's success with interactive training methods in its survey operations, it is advisable for the bureau to explore whether cost-effective methods to supplement verbatim training can be developed and tested for use in the 2010 Census.

Better preparation for handling reluctant respondents is needed

Enumerators' most frequent complaint about NRFU training was that it failed to prepare them for how they should deal with people unwilling to cooperate. Reluctant respondents were a concern in the 2000 decennial, and a bureau evaluation recommended incorporating more role-playing as practice for handling difficult respondents.

The *NRFU Enumerator Manual* for the 2004 test provided enumerators with only a few statements regarding respondent refusals, generally advising them to be prepared to explain why the follow-up operation is necessary and how the data will be used, and offering the answers to these questions. And while the manual stressed that enumerators should encourage respondents to answer as many questions as possible, it offered no special guidance for convincing reluctant respondents to fully cooperate. Bureau officials stated that earlier versions of the training manual had incorporated reluctant respondent role-playing. However, that section was eliminated after initial testing because those exercises were found to be confusing.

During our observations, we witnessed that some enumerators were self-assured and persistent, while others appeared to be easily intimidated when faced with reluctant respondents. Watching persistent enumerators showed us how even the most reluctant person could be convinced to cooperate. The bureau should consider revising its role-playing exercises based on 2004 and prior experiences. In addition, this area may be well suited for using multi-media training methods. Bureau officials agreed that given the number of homes with a VCR or DVD player, perhaps viewing alternative approaches for handling reluctant respondents as an enumerator homework assignment could help address this on-going problem.

Prepared scripts for explaining awkward questions should be considered

Sound survey methodology requires that questions be asked in a consistent manner in order to minimize the potential for biased responses. The original survey questionnaire mailed to households in the 2004 test was a paper document that respondents read on their own and answered. To ensure consistency, enumerators conducting in-person interviews must pose the same questions exactly as they appear on the paper questionnaire that was sent through the mail. Enumerators are instructed not to deviate from the script that appears on their HHC. However,

some written questions become awkward when spoken. During the 2004 test, questions whose answers seemed obvious appeared to make some enumerators and interviewees uncomfortable and may have affected how or whether enumerators posed them. For example, we observed some enumerators skipping the Hispanic origin question as shown in Figure 6, supplying the yes or no answer depending on the neighborhood and respondent appearance, and in some cases, filling in the race category without asking. Frequent changes in verbiage or failure to ask a question could impact the integrity of the entire body of collected data. Enumerators should be given additional training and some explanatory script to prepare respondents for such questions and the need for asking them during the interview process.

Figure 6: Hispanic Origin and Race Questions

I am going to ask you two questions, one on Hispanic origin and one on race. Please answer both questions.

Are you of Spanish, Hispanic or Latino origin? (*Respondent answers No*)

Using this list, please choose one or more races that you consider yourself to be.

- White
- Black or African American or Negro
- American Indian or Alaska Native
- Asian Indian
- Chinese

-
-

Crew leaders and enumerators should be trained in basic HHC troubleshooting techniques

Although enumerators and crew leaders were expected to troubleshoot simple HHC hardware, software, and transmission problems by themselves and the HHC handbook contained a section on troubleshooting and problem solving, the verbatim training guide used by instructors did not cover the troubleshooting techniques. The hands-on portion of the HHC training was disrupted for many enumerators because of technical problems, as noted in finding I. Some of these problems were simple enough for crew leaders and enumerators to have diagnosed and corrected themselves had basic troubleshooting techniques been covered in class. For example, more of the limited hands-on training time would have been available for gaining practical experience if crew leaders and trainees had been aware of techniques to properly connect the peripheral devices (e.g., modem, GPS) to the HHCs. We suggest that the bureau add an HHC troubleshooting component to the training for the 2006 test, the 2008 dress rehearsal, and 2010 decennial training.

CONCLUSION

Effectively training over a half million temporary workers is a major challenge in conducting a decennial census, which the bureau has traditionally addressed using rigidly scripted training. Some problems we observed during NRFU operations are systemic and long-term, from enumerators answering respondent questions to inadequately handling reluctant respondents. Introduction of the HHC has made training even more difficult, particularly because of the need to train enumerators having little or no familiarity with computers. To improve training and mitigate some the problems we observed, the bureau could consider employing cost-effective alternative training methods, such as multi-media and computer-based training, to supplement the verbatim technique, and preparing alternative scripts or explanations for asking awkward questions.

B. New Training Requirements Increase Challenges in Obtaining Adequate Space

In order to contain costs, the bureau traditionally looks for donated or inexpensive space at churches, schools, and community centers to conduct enumerator training. In addition to increasing the training time from 3 to 5 days to include HHC training in the 2004 test, the bureau sought space with enough electrical outlets to plug in power strips for maintaining the charge on enumerators' HHCs during classroom training and with one or more telephone lines for making transmissions during class. Bureau officials told us that finding training sites with adequate space, lighting, ventilation, and accessibility has always been difficult and has become even harder because of increased training requirements for HHCs.

The Queens LCO struggled to find 36 free training sites that were available for 5 consecutive days and adequately equipped with telephone lines and electrical outlets. Some sites in Queens lacked telephone lines capable of handling HHC transmissions, and others had no phone lines at all. In Georgia telephone lines in 2 of its 8 locations could not handle HHC transmissions.

In addition to some space not being well-suited to HHC training, a number of enumerators stated in their evaluations of the training that the sites had poor lighting, cramped seating, uncomfortable and uncontrollable room temperatures, and distractions from nearby classes, groups, or activities. Consequently, some enumerators had difficulty hearing or seeing the instructor and experienced general discomfort.

The bureau used teams of field and office operations supervisors and clerks from the LCOs to identify and select the 44 training sites. In the 5 months before the 2004 test, teams looked for suitable training sites using the bureau's "Testing/Training Space Worksheet" as a guide. However, team members pointed out that some sites were selected without a visit, relying solely on a description of the facility obtained through phone conversations. The contractor evaluating the training also confirmed that site selection team members chose at least two of the Queens sites without advance visits.

CONCLUSION

Because of the increased requirements for training, the space that accommodates it must have an adequate infrastructure to support the training. Since the bureau attempts to use free or low-cost space, some of the training sites will inevitably lack desirable features. Consequently, the process for obtaining the training sites must ensure that the facilities accommodate technology requirements. In the event that the space lacks some of the necessary features, management must ensure that adequate training can take place.

III. TEST OF REVISED GROUP QUARTERS DEFINITIONS WAS HAMPERED BY INSUFFICIENT PLANNING

For purposes of enumeration, the Census Bureau divides the U.S. population into two distinct groups: (1) those that occupy housing units and (2) those that reside in group quarters. Census 2000 counted 7.8 million people, or 2.8 percent of the population, living in group quarters.

Enumerating group quarters is a complex and meticulous undertaking accomplished by operations different from those that enumerate housing units. After identifying all facilities that qualify as group quarters, the bureau attempts to classify each facility by category to determine the best approach for enumerating its residents. For example, college students must be enumerated before they leave campus; and, enumeration of nursing homes, homes for battered women or the mentally handicapped, prisons, and others must be coordinated with administrators and caregivers. Accurate group quarters enumeration is important because results affect official census counts and provide data helpful to communities.

As presented in its Census 2000 evaluation¹² and reported elsewhere, group quarters enumeration posed significant problems for the bureau during the last decennial. For example, communities reported that residents of prisons containing several thousand inmates were not included in their population but were included erroneously in another location. As a result, populations were overcounted in the misidentified community and undercounted in the correct community, which then may have qualified for less federal funding.

Living quarters (LQ) are places where people live or stay or could live or stay and include two categories – housing units and group quarters.

Housing units (HU) are living quarters including a house, apartment, mobile home, or group of rooms, or a single room that is occupied as separate living quarters, or if vacant, intended for occupancy as separate living quarters.

Group quarters (GQ) are living quarters that are not housing units and include organized communal living situations such as college dormitories, residential treatment centers, half-way houses, hospices, hospitals, nursing homes, military barracks, prisons, juvenile institutions, migrant worker dormitories, and facilities for people experiencing homelessness.

Other living quarters (OLQ) is a term used in the field operations that canvass all addresses to qualify structures that are not obviously housing units but likely to be group quarters. Operational instructions define OLQs as places where people live or stay that are normally owned or managed by an entity or organization providing services and care for the residents. These services may include custodial or medical care, as well as other types of assistance, and residency is commonly restricted to those receiving services. The instructions further explain that OLQs are usually not family oriented; that is, the people living in them are not considered to be members of a household. Examples of OLQs include:

- Correctional institutions
- Juvenile institutions
- Nursing homes
- College and university housing
- Dormitories for migrant workers
- Assisted living housing
- Religious living quarters

However, in the 2004 test, OLQs were not to include one type of group quarters—group homes.

Group homes or halfway houses are group quarters that include community-based homes providing care and supportive services for the mentally ill, mentally or physically handicapped, drug/alcohol halfway houses not linked to prisons, and other social services, and communes. In the 2004 address canvassing operation, group homes were to be designated as housing units rather than as OLQ because, although group quarters, they often resemble housing units.

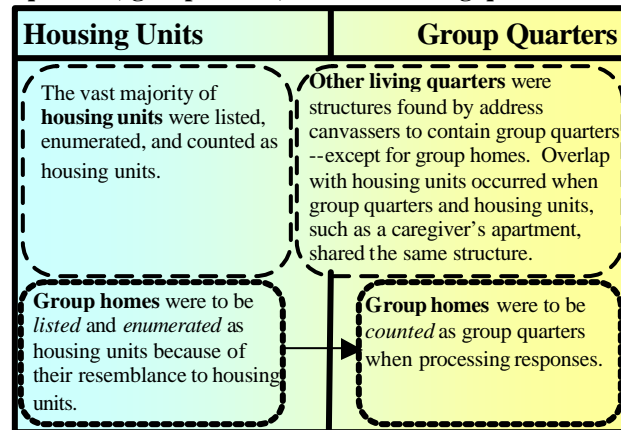
The bureau acknowledges that a sizable number of group quarters were associated with the wrong location in the bureau's map database. In addition, group quarters were being duplicated as both group quarters and housing units because different operations maintained their respective inventories. In particular, the bureau found that off-campus college housing and group homes

¹² *Special Place/Group Quarters Enumeration*, Census 2000 Topic Report No. 5, Census 2000 Testing, Experimentation, and Evaluation Program, U.S. Census Bureau, February 2004.

were often difficult to distinguish from housing units, so they would sometimes be inventoried as both. The evaluation recommended modifications to resolve these and other issues and enhance the accuracy of group quarters counts. To work toward fulfilling these recommendations, the bureau revised the address canvassing that took place at the Queens site in late summer 2003, group quarters operations, and the definitions of some group quarters. Aspects of the new approach incorporated into the 2004 test included:

- Listers in the address canvassing operation worked off a single list that contained both housing unit and group quarters addresses (rather than separate lists of each, as in the past) and interviewed a resident at every address (rather than every third address as in Census 2000) to verify the address itself and its assigned census block¹³ in the bureau’s address database.

Figure 7: Relationship among housing units, group quarters, group homes, and other living quarters



- Listers were supposed to classify each address as either a housing unit or “other living quarters” (OLQ). A structure was to be classified as an OLQ if it obviously contained group quarters. The test approach, summarized in figure 7, also included classifying group homes as housing units rather than as OLQs because they are not obviously group quarters but, instead, often look like housing units. Address listers were instructed that OLQs are not always easily identified by their physical structure and were provided with a list of OLQ types (e.g., correctional institutions, juvenile institutions, nursing homes). They were also instructed that an OLQ might be obvious if the name of the facility identifying the OLQ is posted on a sign outside the structure.
- In an operation called “group quarters validation” (GQV), which took place in early 2004 at both the Queens and Georgia test sites, listers visited each OLQ address in Queens and each group quarters found in Census 2000 in Queens and Georgia to verify that the structure belonged in the group quarters universe, as well as find any other associated group quarters, such as additional prison pods, migrant worker dormitories, or hospital wards, not already on the bureau’s list. If the structure did not belong in the group quarters universe, it was reclassified as either a housing unit or not a living quarter; if a housing unit was found in part of the structure, such as a caregiver’s apartment, it would be added as a housing unit if not on the list already.

¹³ A census block generally is a small area bounded by a series of streets, roads, railroads, streams, bodies of water, or other visible physical and cultural features, and some legal boundaries. Census blocks are the smallest geographic area for which the bureau collects and tabulates decennial census data.

- The bureau broadened the group quarters off-campus student housing definition, which previously included only university-owned facilities, by adding those leased by the university as well. The definition continued to exclude housing leased by students from private owners.

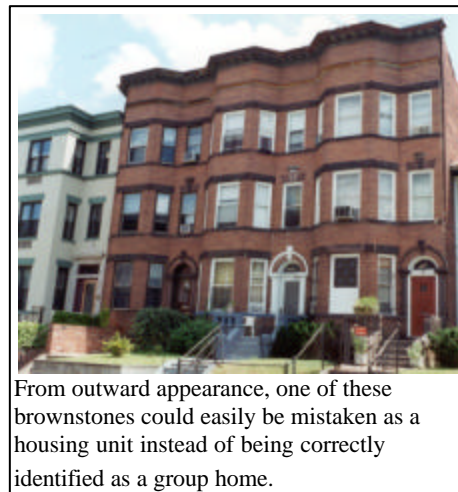
We found that the 2004 test did not adequately further the bureau's goal of distinguishing group homes from housing units, nor did it test university-leased, off-campus student housing.

A. Late Delivery of and Ambiguity in Group Quarters Definitions Undermined Listers' Ability to Accurately Categorize Residences

We found that address canvass listers were not properly prepared to make the distinction between housing units and other living quarters, as the bureau had not fully incorporated those distinctions into the listers' instructions and training materials.

New group quarters requirements were not documented in training materials

In order to correctly determine whether a residence qualifies as a housing unit or should be designated as an OLQ, listers must understand the bureau's instructions for making that determination when they begin their address canvassing. However, we learned that Census had not finalized the requirements for the new definitions before listers' canvassing instructions and training manuals had been prepared. As a result, the training manual did not provide adequate instruction on determining whether a structure is a group home that should be categorized as a housing unit, not as an OLQ. Adequate instruction was also not provided on how to contact the administrator of an unmarked group home where it would be inappropriate or disruptive to interview the residents, such as a home for mentally handicapped adults or battered women and their children. However, even if the instructions had been clear, as discussed below, bureau analysts decided that this approach would not be workable.



2004 test approach for handling group homes is unworkable

The bureau's approach to handling group homes has been evolving since Census 2000, as summarized in table 1, and a workable approach was not developed in time for the 2004 test. In Census 2000, the bureau found it difficult to distinguish between unmarked group homes that provide formal care for people with special needs (e.g., physical, mental, or emotional disabilities, halfway houses) and housing units in a residential area. For the 2004 test, Census had intended to evaluate definitions that allowed this particularly problematic type of group quarters to be better identified and counted. However, the bureau working group developing the requirements for the new definitions was unable to fully vet them before the deadline for

receiving and incorporating them into test procedures and training materials. Census therefore decided to implement an interim definition in the test: address canvass listers were to designate group homes as housing units rather than as other living quarters unless a facility was clearly identified as the latter by, for example, posting its name on an outdoor sign. The plan was to determine from the questionnaire completed by the residents whether residents in the group home were receiving formal care and thus whether the residence should be reclassified as a group home and counted with group quarters, not with housing units.

Table 1: Summary of Evolution of Bureau's Handling of Small Group Homes

Activity	Description
<p>Census 2000 Address Canvass Operation</p> <p>Group Quarters Working Group Design of 2004 Test</p> <p>2004 Test Address Canvass Operation</p>	<p>Canvass operations used separate housing unit and group quarters address lists; however, this led to duplication.</p> <p>Using a single address list:</p> <ul style="list-style-type: none"> • listers were to designate living quarters that were not housing units —i.e., group quarters—as other living quarters, except • group homes that resembled housing units were to be designated as housing units. <p>Subsequently:</p> <ul style="list-style-type: none"> • the bureau would recognize from the questionnaire responses that many unrelated people residing in the group home were receiving formal care, and • the structure would be reclassified as a group home and counted with group quarters, not with housing units. <p>Listers actually designated all group homes as other living quarters.</p>
<p>Group Quarters Working Group Conclusion:</p>	<ul style="list-style-type: none"> • Designing one questionnaire that would elicit accurate responses from both housing units and group homes and allow the different types of group homes to be identified was not feasible. • For 2006 Test, <i>all</i> group quarters are to be designated as other living quarters.

While the 2004 test was in progress, the working group continued its discussions and decided that this approach would not work because it would be too confusing for the residents of both housing units and the unmarked group homes now in the housing unit universe to decipher a questionnaire designed to accommodate both. In addition, according to a bureau official, interviewing group home residents instead of following appropriate procedures for contacting the administrator would be intrusive and could negatively impact data accuracy. Finally, Census concluded that it would be difficult to devise a method for determining whether a housing unit was really a group home after the data had been collected and even more difficult to accurately classify what type of group home it was (i.e., for the mentally ill, physically handicapped, halfway house, etc.). Its final decision was to list and enumerate unmarked group homes as group quarters. But since the 2004 test was already under way, it was too late to implement the decision.

As it turned out, the instruction to designate only clearly marked group homes as other living quarters and all other group homes as housing units proved confusing to listers. As a result,

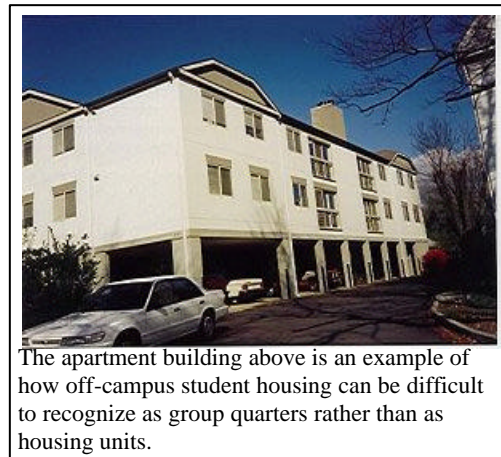
listers categorized group homes as OLQs, an approach the bureau now plans to implement in the 2006 test. In future tests, instructions for address canvassers to categorize structures, including unmarked group homes, as OLQs must be fully developed in a timely fashion and consistent with the final definition of group homes. In addition, these instructions need to include methods such as using local knowledge to enable the listers to identify group homes and contact the administrator with minimal disturbance to the residents.

CONCLUSION

The evolution of the definition for group homes was not synchronized with the milestone for delivering requirements to develop instructions for address canvassing. Requirements for an interim definition that identified group homes as housing units during address canvassing were delivered late and not adequately implemented in the instructions to the address listers. Furthermore, the definitions evolved after delivering the requirements for the test so what was tested did not reflect a stable definition. For the 2006 test, the bureau needs to solidify the definition and deliver the requirements early in the development of the operational instructions so address canvassing can correctly implement the definition to identify group homes.

B. Test Sites Contained No University-Leased Off-Campus Housing

To improve on its efforts to enumerate students living in off-campus housing, the bureau intended to test a revised definition that added off-campus, university-leased buildings to the category that in the past had counted only off-campus buildings owned by a college or university. However, neither test site offered the variety of off-campus student housing situations needed to clarify the range of issues the bureau must consider in enumerating this population (e.g., temporarily leased space such as a hotel to handle short-term overflow or an option to live in a university-leased, apartment-like setting). The Queens site contained no colleges or universities, nor did the bureau find any university-leased off-campus student housing at that site. The Georgia site did contain two colleges, but neither provided the conditions for testing the revised definition: one was a 2-year residential college that maintained only on-campus housing; the other was a 4-year commuter college that owned and operated only one off-campus residence hall on 2 acres nearby. While the bureau had intended to test this new definition in the 2004 test as a key part of its group quarters objective, the choice of test sites prevented it.



In Census 2000, cities also raised the question of whether off-campus, privately-owned housing leased to students should have been classified as group quarters, which would require the bureau to broaden its definition of college housing beyond its 2004 test rendition. Moreover, to ensure that students residing in these privately-owned residences are enumerated before the end of spring semester, it would be advantageous for them to get similar attention as students in housing

provided by the university in order to enumerate them before they leave campus. However, bureau officials stated that privately-owned housing intended for students should not be included in group quarters because it could also be leased to families and then would be considered housing units. While not agreeing that this type of housing should be included in group quarters, they did agree that for success in enumerating students residing in such housing, the bureau should consider handling the enumeration similarly to the group quarters' categories.

CONCLUSION

For future census tests, the bureau needs to better correlate its objectives with the choice of test sites. For the 2006 test, the sites have already been chosen. However, while we recognize it will not change their location at this point, the bureau can assess whether these sites need to be expanded in order to meet its group quarters objective or whether it should find an alternative for testing these objectives. The bureau should also determine whether the optimal approach to accurately locating and enumerating students is being tested.

IV. RECRUITING AND PARTNERSHIP EFFORTS WENT WELL AND QUALITY ASSURANCE METHOD WAS IMPROVED OVER CENSUS 2000

The success of the decennial census in counting the entire U.S. population is tied to the efficiency and effectiveness of all its component operations. During our review we noted that certain operations ran well. The recruitment and partnership efforts promoted overall awareness of the census operation in the test locations, which helped both sites meet their recruitment goals. Queens met its mailed-in questionnaire response rate goal, while Georgia fell slightly below the targeted response rate. The new quality assurance operation successfully isolated the reinterview process from field operations, which should contribute to the accuracy and completeness of collected data.

A. *Recruiting and Partnership Operations Achieved an Adequate Pool of Candidates and Garnered Local Support*

The assistant manager for recruitment and the partnership specialist at each test site were jointly responsible for establishing local partnerships with governments, organizations, businesses, and the media to promote awareness of the census test, attract enumerators, encourage return of census questionnaires, and foster residents' cooperation with nonresponse followup.

Mail Response Rate*	
Georgia	
Goal	Actual
50%	46%
Queens	
Goal	Actual
40%	42%
*As of July 16, 2004	

The bureau established specific recruitment and mail response goals for the two test sites. Within the LCOs, the partnership specialist and recruitment manager contacted organizations and handed out brochures and posters publicizing the test and related employment opportunities. The materials were carefully targeted for the two locations. For example, in the Queens test site, an estimated 61 percent of the population is foreign born. Thus, materials were printed in 15 languages to ensure that information reached all segments of this multicultural community. Queens exceeded its questionnaire mail-back rate, while Georgia was 4 percentage points shy of its goal.

To ensure an adequate number of qualified candidates,¹⁴ more applicants must be recruited and tested than needed. Both Queens and Georgia met their recruitment goals.

	Total No. Applicants	Enumerator Recruitment		
		Goal	Actual	No. Hired
Georgia	1,545	1,215	1,242	232
Queens	5,006	3,865	3,886	925

The recruitment staff and partnership specialist played an important role in the success of the 2004 test.

¹⁴ For example, applicants must take a written test, meet local and state employment age requirements, possess a valid Social Security number, and provide U.S. citizenship documentation (although in locations where bilingual ability is needed, noncitizens with documentation of employment eligibility are considered when qualified citizens are not available).

B. New Quality Assurance Operation Supports Data Integrity

To ensure the accuracy of data collected during NRFU, each LCO conducts “reinterviews”: quality assurance enumerators contact a sample of previously enumerated households. This quality control operation is designed to detect and deter data falsification and identify enumerators who are not following procedures. The reinterview process was under the management of the assistant manager for field operations in Census 2000. However, problems with data falsification during the census¹⁵ prompted the bureau to separate the reinterview process from NRFU field operations. Beginning with the 2004 test, this quality control operation has its own assistant manager for quality assurance (AMQA), who reports directly to the LCO manager. The AMQA’s staff includes a reinterview crew leader, reinterview crew leader assistants, reinterview enumerators, clerks, and office operation supervisors.

To ensure the integrity of the process, the quality assurance training manual needs to clarify the authority of the assistant manager for quality assurance. The “AMFO/AMQA Responsibilities” manual accords the AMQA authority for investigating possible falsification or poor-quality enumeration, but the procedures for fulfilling this role often require the AMQA to seek answers regarding irregularities from field operations management rather than from crew leaders and enumerators. These procedures are repeated in the “2004 NRFU Reinterview MaRCS LCO” manual as well.

We observed, however, that the Queens and Georgia LCO management interpreted the AMQA’s authority differently. Georgia managers initially instructed the AMQA not to contact crew leaders or enumerators directly, but instead to route quality assurance requests for information through the assistant manager for field operations. In addition to being time-consuming, this process makes it possible for field operations managers to minimize problems, thereby avoiding any additional work for field operations. We were told in our final interview with Georgia’s AMQA that LCO management changed its position on this issue four or five weeks into the NRFU operation and allowed the AMQA to contact crew leaders and enumerators directly when there was a question. In Queens, the AMQA was always allowed to contact crew leaders and enumerators as long as the AMFO was kept informed. The ambiguities in the training manuals that permit these different interpretations of AMQA authorities should be eliminated to ensure the consistency, integrity and independence of the quality assurance process.

CONCLUSION

While the assistant managers should work cooperatively to achieve the LCO’s goals, the training manuals should clearly describe the role of the AMQAs and their authority to independently conduct quality assurance operations to ensure data integrity during the Census.

¹⁵ *Re-enumeration at Three Local Census Offices in Florida: Hialeah, Broward, and Homestead*, Department of Commerce Office of Inspector General, ESD-13215-0-0001, September 2000.

V. SOME MANAGEMENT AND ADMINISTRATIVE ACTIVITIES NEED ATTENTION

We reviewed various aspects of the management, administrative, and logistical support for NRFU. During the course of our review, we observed some management differences between the two LCO sites. While both sites appeared to adequately implement the NRFU operation, Census managers in Queens appeared to have a better understanding of the purpose of the test. We also identified some weaknesses with the crew leader selection criteria and selection process, and found that Georgia had not, during the initial phases of the NRFU operation, followed Census hiring procedures. Finally, some aspects of HHC inventory controls need strengthening.

A. *Test Implementation Differed Between the Two LCOs*

A basic enumeration of population, housing units, and group quarters is usually conducted during census site tests, resulting in a certified official population count. However, the bureau's primary objectives for the 2004 test were to evaluate automated NRFU processes and supporting operations (e.g., revised group housing definitions, staff training, etc.). To ensure that these objectives were not overshadowed by the need for a complete and accurate count, Census eliminated the requirement to obtain an official population count for the test. Consequently, the 2004 test is fairly unique in that it sought to capture and document objective information about functional operations (e.g., HHC processes) and performance (e.g., enumerator production rates) rather than to conduct a full enumeration.

"We are to carry out our mission according to the instruction/directives given to us so that they can be evaluated for their effectiveness. That is what this test is all about!"

New York Regional Director
(Memo to LCO staff, March 31, 2004)

Operations at the two test sites intentionally differed in some respects. For example, Queens conducted 100 percent address canvassing and Georgia conducted the update/leave operation.¹⁶ However, we found unintentional differences in the way the two test sites documented problems.

A census test must adequately document problems encountered during the operations under review so that those operations can be carefully evaluated and improved as needed. To capture information to support evaluations, enumerators and other field staff are to document refusals and other unusual situations, record HHC problems, and ask questions about procedures and other work-related matters on a form referred to as an "Information Communication" (INFO COMM) form. In addition, for this test, LCO office staff is responsible for documenting the impact of the HHCs on LCO space, equipment, and staffing requirements in the "Office Staff Daily Checklist and Diary." Help desk personnel were to record all HHC technical or procedural problems on the "LCO Help Desk Remedy Ticket" form, whether they came in by telephone or personal visit, or were otherwise communicated by enumerators, crew leaders and crew leader

¹⁶ Address canvassing is an operation where assignment areas are systematically traveled, block by block, to find where people could live for the purpose of updating addresses and correcting maps. Update/Leave is a method used primarily in areas where homes do not receive mail at a city-style address. Enumerators canvass assignment areas to deliver a census questionnaire to be returned by mail and at the same time, update addresses and maps.

assistants. As illustrated in table 2, we found that enumerators in Queens proportionally documented more HHC problems than their counterparts in Georgia.

Table 2: Remedy Tickets Per Test Site

Test Site	Remedy Tickets	Estimated Average No. of Enumerators	Remedy Ticket per Enumerator
Georgia	247	164	1.50
Queens	1,930	711	2.71

The differences in the number of tickets generated may be accounted for by various factors, including differences in the size of the workforce, ability of the workforce, and volume of work. However, it was apparent that the Queens LCO staff was aware of the dual objectives—implementing a census test and documenting what did and did not work. All of the staff we spoke with, from the LCO manager down to the enumerators, emphasized the importance of documenting the problems encountered during the test. The assistant managers said they were keeping a diary and preparing information for the debriefing that is to occur after the test.

Conversely, Georgia LCO staff admitted that during an earlier 2004 test operation, they purposely did not report some of the less favorable details for fear that it would reflect poorly on them. Also, one assistant manager admitted to not keeping a daily diary. Finally, there was a perception by some of the LCO staff that some of the more outspoken personnel (i.e., staff more likely to report problems) were intentionally excluded from the debriefings held with Census headquarters.

In addition, correspondence from the New York Regional Office to the Queens LCO emphasized the importance of documenting problems and other information. In a March 31, 2004, memorandum to the area manager, LCO manager, all assistant managers, and regional technicians, the NY Regional Director wrote, “An extremely critical component of the 2004 census test in NW Queens is the ability to conduct evaluations and debriefings from staff participating in the test. ... The census test is not the forum for you to deviate from established procedures to ‘make it work smoothly or more efficiently.’” In a May 7, 2004, memorandum, upon approving some procedural changes, the regional director again emphasized that LCO staff should “maintain constant and consistent documentation.” We did not find similar input from the Atlanta Regional Office.

CONCLUSION

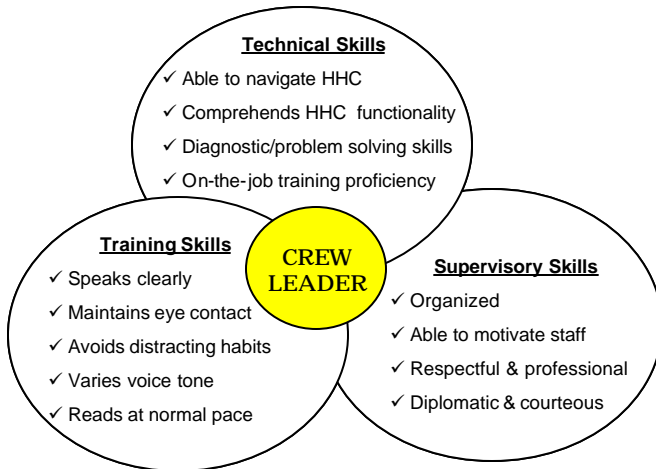
A census test must adequately document problems encountered during the operations under review so that those operations can be carefully evaluated and improved as needed. We found that of the two sites, one seemed to have a clearer understanding of the purpose of the test. For a census test to work, it is important that all parties involved understand the procedures to be followed and the need for problems to be reported and documented.

B. Crew Leader Selection Criteria Need to Reflect Higher-Level Skill Requirements

Crew leaders perform a critical role in nonresponse followup: they train enumerators, coordinate and oversee their activities, and review and certify their daily payroll forms. Crew leaders meet regularly with their staff of enumerators to discuss work assignments, monitor progress, and review completed work for accuracy and completeness.

The use of handheld computers in NRFU has added another technical skill requirement to the

Crew Leader Skill Set



crew leader position, one that we believe is not adequately identified in the current selection process. To be an effective crew leader, a candidate should have at least some training and supervisory skills, along with technical or computer capabilities. However, eligibility requirements for crew leaders differ little from those for other LCO positions—crew leaders take the same test used to fill clerical and help desk clerk positions and enumerator positions. Applicants with the highest score are supposed to be selected as the crew leaders. No separate criteria are used to select crew leaders versus

enumerators or to take into account past management or technical capabilities and experience. Rather, the basis for identifying potential crew leader candidates is only a high nonsupervisory test score in conjunction with veterans’ preference points. This test consists of 28 multiple-choice questions designed to measure skills and abilities needed to perform nonsupervisory census jobs. (See Finding I, page 14, for a discussion of help desk training.) Figure 8 illustrates the positions you can be considered for depending on the type of test you take.

Once a list of eligible candidates is generated based on the highest test scores, temporary office clerks conduct a telephone interview, using the “Selection Guide for Crew Leader” form. Only two questions differ from the guide used to select enumerators—one asks candidates if they are familiar with the area in which they live and the second asks if they are able and willing to handle leadership responsibilities. No face-to-face interview is conducted.

Figure 8: Test to Take for Various LCO Positions

<i>If you take the...</i>	<i>Then you can be considered for...</i>
Nonsupervisory test (DB-267)	Enumerator Crew Leader Crew Leader Assistant Recruiting Assistant Office Clerk Administrative Clerk
Supervisory test (DB-270)	Office Operations Supervisor Field Operations Supervisor

Source: *Pre-Appointment and Selection Handbook* (DB-1110)

Census officials agreed that the multiple-choice test does not capture the technical or supervisory skills needed by crew leaders. And several field operations supervisors commented that some

enumerators in training were more managerially and technically competent to be crew leaders than the crew leaders who were training them.

CONCLUSION

Although crew leaders train, supervise, and are the first point-of-contact for enumerator technical problems, census hiring procedures fail to address management and technical capabilities. Rather, eligibility requirements for crew leaders differ little from those of enumerators and clerical and help desk clerks. The criteria and process for selecting crew leaders need to be examined.

C. Georgia Failed to Comply with Census Hiring Policies

Census has very specific written policies to ensure that fair hiring practices are followed. We found that the Georgia LCO ignored a number of these practices when hiring staff for the first two field operations of the 2004 test. It did not adequately document the hiring process; sometimes passed over candidates with high test scores in favor of lower-scoring applicants; and—when supervisory positions were filled—placed applicants for the supervisory positions in enumerator slots without requiring these applicants to compete with other enumerator applicants in the pool. LCO management discontinued these practices after Census headquarters personnel visiting Georgia pointed out the problems. However, many applicants had already been hired under these practices, and most retained their positions through nonresponse followup.

The workflow for hiring personnel is shared between the assistant manager for field operations and the assistant manager for administration: field operations prepares the “job certification” form, which lists the criteria for each field position and specifies, among other things, the total number to be hired for each position and type of test required (supervisory or nonsupervisory). The assistant manager for administration then runs a “selection record” from the Census Applicant Personnel & Payroll Processing System (CAPPS) that lists applicants who meet the criteria, in descending order of veterans’ preference and high-test scores. Clerks from the administration office contact eligible applicants from the selection record to offer them jobs according to Census Selection Guidelines.

In Georgia, the assistant manager for administration ran the selection record as required, but the assistant manager for field operations and his clerks called to extend offers. It appears that applicants with lower test scores were sometimes offered jobs over higher scoring candidates. For example, two crew leader assistants ranked 22nd and 42nd on a selection record of 50 applicants were hired over the other, higher-ranked applicants on this list. The documentation retained in the files does not show that all higher-ranked candidates refused the jobs before the positions were offered to the lower-ranking candidates.

In addition, applicants were hired as enumerators without having to adequately compete for the positions. Field operations prepared a job certification for an enumerator position for an applicant who had taken the supervisory test (see figure 8 for the position and test requirements). Since applicants for the enumerator position are directed to take the nonsupervisory test, the resulting selection record was limited to only a select few applicants. The assistant manager for

field operations explained that the applicants in question actually wanted supervisory positions but since all supervisory positions had been filled, they were offered enumerator positions instead.

CONCLUSION

Census officials should ensure that LCO personnel follow hiring policies contained in Census's administrative manuals.

D. HHC Inventory Controls Need Improvement

The LCO assistant manager for technology is tasked with tracking and controlling accountable property that is brought into, used by, or deployed from the LCOs. "The Hand-Held Computer Tracking and Control" manual provides procedural guidance for assigning HHCs to staff, and instructions for using the automated property management system. While the guidance for assigning HHCs to employees appears thorough, our review determined that more internal controls are needed to monitor the return of HHCs from separated employees.

During nonresponse followup, the Queens office had an HHC inventory of 897 units, while Georgia had 218. All employees are responsible for maintaining complete computer kits and then turning them in when their employment ends.¹⁷ Departing enumerators are instructed to give their computer kits to their crew leader, who returns the kits, along with the proper paperwork, to the LCO.

The assistant manager for technology has no way of knowing when enumerators leave LCO employment and thus is unable to monitor whether separated employees have returned their HHCs. To overcome this, the Georgia LCO developed a spreadsheet to track separated employee HHC returns. Comparing a list of separated employees to the inventory was discussed but not implemented in Queens during NRFU, in part because the volume of employees, 52 percent turnover rate, and the high number of HHC problems overwhelmed the field office staff. In addition, there was no automated process in place to compare separated employees with the HHC inventory.

Currently, separated employee information is not communicated to the staff responsible for maintaining the inventory. Once a resignation or termination action is initiated, the assistant manager for field operations signs the paperwork and gives it to the assistant manager for administration, who processes the separation. However, no formal checkout procedures exist to ensure that all equipment has been returned before the employee receives a final paycheck.

CONCLUSION

While the assignment of handheld computers to staff appears sufficient, there should be a formal mechanism in place to monitor and ensure the prompt return of the handheld computer equipment from separated employees.

¹⁷ Computer kits consist of the handheld computers, cables, and other peripherals.

APPENDIX: CENSUS BUREAU RESPONSE



UNITED STATES DEPARTMENT OF COMMERCE
Economics and Statistics Administration
U.S. Census Bureau
Washington, DC 20233-0001
OFFICE OF THE DIRECTOR

SEP 29 2004

MEMORANDUM FOR Judith J. Gordon
Assistant Inspector General
for Systems Evaluation

Through: Kathleen B. Cooper *KB Cooper*
Under Secretary for Economic Affairs

From: Charles Louis Kincannon *CK*
Director

Subject: Response to Draft Report No. OIG-16949
*Improving Our Measure of America: What the
2004 Census Test Can Teach Us in Planning for the
2010 Decennial Census*

Thank you for the opportunity to review the above-mentioned draft report. We read the report with great interest and appreciate the efforts your staff made in visiting both the Queens, New York, and south central Georgia Local Census Offices; observing the 2004 Census Test operations; and reviewing our procedural and training manuals and other test-related materials.

One of our goals for the 2010 census included beginning the test cycle earlier than in the past. Thus, we implemented the 2004 Census Test to begin focusing on new methods and obtaining information to inform decisions about adopting, refining, or rejecting potential new methods for the 2010 census. We have no substantial disagreement with your observations; in fact, they are very similar to our findings. We plan to consider the suggestions in your report as we look for ways to improve the 2006 Census Test, 2008 Dress Rehearsal, and the 2010 census itself.

Comments on the Text of the Report

Executive Summary, page i, paragraph 3—The report stated, “In 1990, the government spent \$2.6 billion. In 2000 it cost \$6.5 billion and the estimated cost for 2010 is expected to exceed \$11 billion.” These figures are also included on page 1, paragraph 4. In constant 2010 dollars, the 1990 census cost \$3.8 billion, the 2000 census cost \$7.6 billion, and we estimate that the 2010 census will cost \$11.5 billion.

2

Page 2, Inset—Decennial Census Tests Planned for 2010” include the “2005 National Census Test and 2005 National Content Survey.” The Census Bureau combined the research objectives for the content and modal tests into a single test—the 2005 National Census Test.

Page 16, paragraph 2—“The bureau plans to contract for support to develop field data collection systems for the 2006 test, as well as use a contractor to develop these systems for 2010.” The Census Bureau is not planning to contract for support to develop field data collection systems for the 2006 test. We plan to contract out the development of these systems for the 2008 Dress Rehearsal.

Legislative Authority

The Office of Inspector General conducted this program evaluation in accordance with the *Quality Standards for Inspections* issued by the President's Council on Integrity and Efficiency, and under authority of the Inspector General Act of 1978, as amended, and Department Organization Order 10-13, dated May 22, 1980, as amended.

Program evaluations are reviews the OIG undertakes to achieve one or more of the following purposes:

- Provide agency managers with timely information about operations. A primary goal of a program evaluation is to encourage effective, economical, and efficient operations.
- Identify or prevent fraud, waste, and abuse in federal programs. By asking questions, identifying problems, and suggesting solutions, the OIG helps managers determine how best to quickly address issues identified during the review.
- Highlight effective programs or operations, particularly if their success may be useful or adaptable for agency managers or program operations elsewhere.



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