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**2010 CENSUS PLANNING MEMORANDA SERIES**

**No. 203**

MEMORANDUM FOR      The Distribution List

From:                      Burton Reist *[signed]*  
                                 Acting Chief, Decennial Management Division

Subject:                    2010 Census Count Review Program Assessment Report

Attached is the 2010 Census Count Review Program Assessment Report. The Quality Process for the 2010 Census Test Evaluations, Experiments, and Assessments was applied to the methodology development and review process. The report is sound and appropriate for completeness and accuracy.

If you have any questions about this document, please contact Louisa Miller at (301) 763-2481.

Attachment

June 21, 2012

# **2010 Census Count Review Program Assessment Report**

U.S. Census Bureau standards and quality process procedures were applied throughout the creation of this report.

Edwin R. Byerly

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2010 Count Review Program  
Population Division



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## Executive Summary

The overall goal of the 2010 Census Count Review Program was to enhance the accuracy of results from the census. The first event of the program was a review of the 2008 Census Dress Rehearsal counts. The 2008 review was based on the model used in the Census 2000 Full Count Review. This traditional model compared counts of population and housing units to counts from the last census and to recent estimates. The 2008 experience demonstrated the inability of the traditional approach to provide the geographic precision necessary to affect corrections to the counts.

A new GIS-based approach also was tried for 2008 and proved very effective in identifying exact addresses of missing living quarters.<sup>1</sup> This new approach was adopted for the 2010 Census, with separate review events for housing unit addresses and for group quarters.

This assessment report asks and answers three overall questions:

1. Did the 2010 Census Count Review Program speak to the recommendations from the Government Accountability Office's report on Census 2000 entitled "Refinements to Full Count Review Program Could Improve Future Data Quality?"

The 2010 Count Review Program addressed all recommendations expressed in the Government Accountability Office's report. The program started earlier than the Census 2000 Full Count Review, was integrated with other census operations, was fully tested, included stakeholders, involved the Regional Census Centers, and all finalized count issues were corrected.

2. Was the 2010 Census Count Review Program effective in improving the accuracy of the 2010 Census counts of population, housing units, and group quarters?

The program did improve the accuracy of the census by identifying 73,716 missing housing units and having them counted in the census. It also identified 310 missing group quarters and had them counted in the census. Additionally, 173 group quarters misallocated to the wrong collection block were identified and updated.

3. What are recommendations for designing the 2020 Census Count Review Program?

This report discusses seven recommendations, with the two most important being:

- Begin planning the 2020 Census Count Review earlier in the census cycle in order to more seamlessly integrate the review operation with other decennial census operations.
- Design the review operation around address-level precision, utilizing GPS coordinates, GIS information, maps, and satellite imagery.

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<sup>1</sup> Living quarters refers to housing units and group quarters.



The 2010 Census Count Review Program developed and deployed a new review approach. The program met its goals and was well received by major stakeholders, including the members of the Federal-State Cooperative Program for Population Estimates.

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## **1. INTRODUCTION**

### **1.1 Scope**

The primary purpose of the 2010 Census Count Review Program (CRP) assessment is to evaluate the effectiveness of the 2010 Census CRP with regard to the overall goal stated in the “2010 Census Detailed Operational Plan for the Count Review Operation” dated August 10, 2009. This goal was, “to enhance the accuracy of the census.”

In addition, the assessment discusses how the 2010 Census CRP addressed the five issues cited in the Government Accountability Office’s (GAO) report on Census 2000 entitled “Refinements to Full Count Review Program Could Improve Future Data Quality,” dated July 2002.

Finally, the assessment recommends improvements for the planning and execution of the 2020 Census Count Review Program.

### **1.2 Intended Audience**

This report is intended for Census Bureau program managers involved in designing the architecture of the 2020 Census. It also will be relevant for those who manage decennial census operations such as address list development, data collection, decennial processing and Census partnerships. It will be of particular value to those in Population Division (POP) involved with the 2020 Census Count Review Program.

## **2. BACKGROUND**

### **2.1 Census 2000 Full Count Review**

POP has performed count review for many decades, but the Census 2000 Full Count Review Program was the first time members of the Federal-State Cooperative Program for Population Estimates (FSCPE) participated in count review. Several review events were offered to FSCPE members. In February 2000, the FSCPE members had the opportunity to review the census list of Group Quarters (GQs) for their state and suggest additions and changes. In late summer and fall 2000, FSCPE members had the opportunity to come to the Census Bureau to review the census counts of population and housing units for several iterations of the census results files. These summer and fall reviews resulted in thousands of count issues being formed, but in the end, only 5 issues out of 4,809 were corrected before the census counts were finalized for release in decennial census data products. Later, several hundred of the issues were forwarded to the Census 2000 Count Question Resolution (CQR) Program as internal cases. Much was learned from the Census 2000 Full Count Review experience and some of those experiences also were outlined in the GAO report. Page 13 of the report recommends consideration be given to the following:

1. Planning the Full Count Review program early in the census cycle and testing procedures under conditions as close to the actual census as possible;
2. Integrating the Full Count Review program with other census organizational units and operations to ensure the bureau has sufficient time and field support to investigate issues;
3. Developing clear guidelines on the minimum documentation needed for the bureau to investigate individual data issues;

4. Categorizing issues on the basis of the quality and precision of the documentation, and investigating first those issues that are best documented and thus more easily resolved, and
5. Exploring the feasibility of using staff from the bureau's regional offices to help investigate data issues in the field prior to the release of public law data.

## **2.2 Beginning of the 2010 Census Count Review Program**

Planning for the 2010 Census CRP began in POP in January 2007. This was earlier in the census cycle than the start of Census 2000 Full Count Review Program planning, though it was already late in terms of 2010 Census operations. By then, much of the 2010 Census architecture, schedule, and operations had already been planned, and POP was already being asked to attend to the Master Activity Schedule and provide other count review project management materials. There was no funding for count review and there was no one in POP who was assigned or funded to work on count review.

These deadlines led several members in POP to form a working group in January 2007 to provide basic support for count review until a CRP Manager position in POP could be funded and filled. That position was filled in July 2007. The CRP manager began work with borrowed POP staff until two CRP staff members could be hired.

Among the first tasks of the staff was to review the documentation from the Census 2000 Full Count Review Program and then decide how to structure the CRP for the 2008 Census Dress Rehearsal.

## **2.3 2008 Census Dress Rehearsal Design, Execution, and Findings**

The 2008 Census Dress Rehearsal CRP approach started with the Census 2000 Full Count Review model. This traditional model compares counts of population and housing units (HUs) to counts from the last census and to recent estimates. These comparisons are displayed in tables and thematic maps.

The goals of 2008 Census Dress Rehearsal Count Review were to:

- 1) Review 2008 housing unit and population counts for the 2008 Census Dress Rehearsal collection areas and identify the significant "missing" or "misallocation" errors. (Note: GQ data were not collected in the 2008 Census Dress Rehearsal.)
- 2) Evaluate strategies and procedures for performing count review in order to build a 2010 Count Review process to identify errors with the precision needed to make corrections possible.
- 3) Gather information to design the training protocol and materials the analysts would use to perform the review for the 2010 Census .

The 2008 Census Dress Rehearsal review was designed to accomplish the above stated goals, while also addressing a secondary purpose. The secondary purpose was to evaluate the advantages and limitations of incorporating a Geographic Information System (GIS)-address approach, proposed by several FSCPE members, into the count review. (See 2.5.2 for more details on the GIS-address approach.) Accordingly, the 2008 Census Dress Rehearsal Count Review was structured to incorporate an evaluation of the GIS-address approach as well as the

traditional comparison approach in terms of each method's ability to contribute to the effectiveness of the count review process.

The review of the 2008 Census Dress Rehearsal counts was conducted on October 9 and 10, 2008 by POP staff, with assistance from the Montana and New Mexico FSCPE members. Findings from the review are documented in the report, "2008 Count Review Dress Rehearsal Findings," dated January 6, 2009.

The traditional review method used the Count Review System (CRS) software<sup>2</sup>, developed by the Decennial Systems and Contract Management Office (DSCMO). During the review, the CRS functioned as intended, but it quickly became apparent that this approach could not identify missing living quarters with the geographic precision necessary to effect corrections in the counts.

The GIS-based approach provided the required geographic precision, but was tedious and manual, and needed to be implemented in a more efficient way. A combination of a GIS and a comparison approach appeared to be the best way to meet the goals of the 2010 CRP.

The 2008 Census Dress Rehearsal experience also demonstrated that the planned timing of the 2010 CRP (i.e., August 5-13, 2010) would be too late to make corrections to census counts for missing HUs given the already established 2010 Census deadlines. The Dress Rehearsal findings became the impetus for a significant revision to the 2010 Census CRP in terms of review approach and timing.

## **2.4 Revised Approach to 2010 Census Count Review Program**

The revised approach was centered on the analysis of living quarters addresses and their exact geographic location as determined by latitude and longitude on maps and on satellite imagery. This was a powerful approach that analysts could use to research missing or misallocated living quarters. This approach had never been attempted as part of count review and was not in practice by any other Census Bureau review program.

The Dress Rehearsal experience proved the GIS approach was capable of providing the required geographic precision; but the question remained whether this approach was feasible for the 2010 Census. Because this was a new approach, there were many questions, concerns, and assumptions that weighed on the decision to adopt the approach. Among these were:

1. Even though the original idea was from an FSCPE member, most of the FSCPE members were not familiar with this revised approach. Most had no experience in gathering living quarters addresses, especially HU addresses, with Global Positioning System (GPS) coordinates. There were concerns whether a sufficient number of FSCPE members could obtain and prepare the necessary coordinates and address data to make the review viable.
2. Most of the integrated 2010 Census schedule was set by the fall of 2008. Geography Division (GEO) had already planned their operations and deliverables as part of the integrated schedule. A proposed review of the HU inventory would impose new demands on their time and resources. The ability of the CRP staff to obtain the HU address data from the

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<sup>2</sup> System built by DSCMO to review census data via tables and thematic maps and create, add and update records for input into census files.

Enumeration Universe (EU), an extract of the Master Address File (MAF) from the MAF/TIGER database, in an acceptable time frame was a major issue to be resolved.

3. Prior to the 2008 Census Dress Rehearsal, the plan was for the GQ counts to be available through the CRS tool, programmed by DSCMO. This tool did not use GPS coordinates and thus was not suitable for the new approach. An extract of the early GQ counts would be needed for input to the new approach. This was an unplanned deliverable for the DSCMO staff.
4. The CRP staff had no experience in matching addresses. This capability would be important for turning the manual GIS- based approach used in the 2008 Census Dress Rehearsal into a more efficient and automated approach. Matching HU addresses would narrow the scope of a visual/manual review to examining unmatched addresses. The address matching software used in other Census Bureau divisions would have to be learned and then modified to meet the review procedures.
5. This approach would potentially involve processing several hundred million address records. At that time, POP did not have the hardware and storage capacity to process these data. POP had a limited ability to develop a database and a software application capable of processing that volume of HU addresses and the attending spatial data. POP's Information Technology (IT) area estimated it would take two years, under normal circumstances, to acquire and develop the hardware and software capabilities and there was only one year left to do the work. This would require a solid commitment of money and IT expertise.
6. The privacy of addresses is protected by Title 13. The necessary permission to research specific address resources via the Internet within the Census Bureau would be necessary.
7. Since this review approach had never been used before, a process and methodology to reliably identify and adequately document missing living quarters would need to be developed. This included designing the parameters and scope of the reviews. In the case of missing GQs, a process to obtain a population count would be needed.
8. In order to enhance the accuracy of the census, the revised approach had to fit within the flow and timing of existing census operations. The reviews would be of little value unless the review findings could be used to correct the census in real time. This would require integration with the operations of other Census Bureau divisions such as GEO, Field (FLD), and DSCMO.
9. The CRP Staff was small, with four regular staff members and one or two contractors at various times. Such a review approach would require the help of many more people, especially during review time. All would have to be trained in advance. Could adequate staff within POP and other Census Bureau divisions be dedicated to this kind of review?

In February 2009, after much discussion and consideration, it was decided that a GIS-address approach would be used. The HU address review and the GQ review would be performed as two separate review events at different times. The HU Address Review would occur the last week of February and first week of March 2010; the GQ Review would be performed the week of August 9-13, 2010 to fit in with the 2010 Census schedule.

## **2.5 Housing Unit Address Review**

The goal of the HU address review was to identify potentially missing HU addresses the Census Bureau did not have on their address list.

### **2.5.1 Preparation for the HU address review**

Members of FSCPE from all 50 states, the District of Columbia, and Puerto Rico were invited to participate in the HU address review. Thirty-two states signed on and began gathering their HU address data in summer 2009 (see Attachment A). The remaining states, the District of Columbia, and Puerto Rico most often cited data and/or staffing availability as their reason(s) for not participating in the HU review. The Census Bureau was not able to perform the review for states that did not participate, since the review required address data with GPS coordinates from an alternative source for comparison.

The FSCPE participants obtained address and coordinate data from various sources, with the most common sources being tax assessor records and Emergency Services (E911) data. State participants were required to provide their HU addresses and GPS coordinate data in a specified digital format so that these data could be used in the review software. Address data or GPS coordinates that were not in compliance could not be used in the review. States were required to submit test files of their address data between June 14-25, 2009. Their test data had to be accepted as suitable before their production HU address data could be sent. The FSCPE submitted their final production files by November 16, 2009. POP performed quality checks on the data, ensuring that all records had state and county codes, GPS coordinates, and were the correct length and type. The FSCPE address files were formatted and delivered to GEO for address standardization then transferred back to POP for the review.

The Census Bureau address information source was the EU extract of the MAF. The EU was the primary address file to be used to support the mailing of census questionnaires. POP received the EU from GEO on December 23, 2009. GEO planned to process address updates from several additional sources before Census Day, and the findings of HU address review would become one of these sources.

POP purchased hardware and software and developed an Oracle database and a review application called the Housing Unit Address Review System (HURS). The HURS application presented the FSCPE reviewers with tables showing the difference between tallies of the Census Bureau and FSCPE HUs in a given county, tract, or block. The prescribed review process focused the reviewers on the geographies where the FSCPE counts showed more HUs than the Census Bureau did.

### **2.5.2 During the HU address review**

Using the HURS, the FSCPE reviewers could navigate from the HU difference tables to maps that displayed the relative locations of the state and Census Bureau HU addresses. The map presentation showed Census Bureau HU addresses as blue squares and FSCPE-supplied addresses as red triangles. The area of interest for the review was map locations where there appeared to be FSCPE HU addresses that had no corresponding Census Bureau match, i.e., where there appeared to be a “cluster” of red triangles with no corresponding blue squares. The review protocol called for a reviewer to identify clusters of 30 or more missing HU addresses in order to form an issue. Originally, the minimum size was 50, but research conducted before the

review showed a minimum size of 30 was best to help ensure the largest groups of missed addresses received attention, and still provide a balance of productivity and efficiency.

When a reviewer encountered a cluster of 30 or more missed addresses, they could draw a boundary around the addresses using the HURS map interface and this created a “lasso.” The lasso function marked a boundary on the map and retrieved the underlying HU address information from the database for all the addresses within the boundary.

The retrieved address and coordinate data were displayed in a table listing all the FSCPE and Census Bureau addresses in street order. The reviewer had the ability to sort the table by various variables (i.e., street name, house number, ZIP code) to identify FSCPE and Census Bureau units that matched. The task then was to be sure the addresses in the lasso did not have a Census Bureau counterpart either inside or outside the lasso. The HURS matching function allowed FSCPE reviewers to associate additional matching records and eliminate them from the list. After checking for matches, if the remaining list of unmatched state HU addresses still contained 30 or more addresses, the list was eligible to submit as an issue for further review.

During the review, the FSCPE reviewers were paired with twelve employees from POP who served as “Census Liaisons.” The role of the Census Liaison was to provide guidance to the FSCPE reviewers as they developed their issues, help them use the HURS, and finally to review and approve or reject the issues that the FSCPE reviewers submitted. The Census Liaison followed prescribed procedures to review and determine the disposition of the issues submitted by FSCPE reviewers. Depending on their findings, Census Liaisons could set the issue status to “approved,” “rejected,” or “returned.” The “approved” status indicated that the addresses could not be found in the EU and the issue documentation met requirements. The “rejected” status was used in cases where it was found that the Census Bureau had matching addresses in the EU or there was no viable cluster of 30 HUs to substantiate an issue. Finally, the “returned” status was used to indicate that an issue was sent back to the FSCPE reviewer to correct their work and resubmit the issue.

As part of the research of each issue, the FSCPE reviewer was required to provide documentation to substantiate that there were habitable HUs at the address location. Acceptable documentation included satellite imagery clearly showing living quarters in the correct geography, street view images, and tax assessor records indicating it was an habitable unit. After an FSCPE reviewer submitted a missing HU issue, it was the responsibility of the Census Liaison to evaluate the issue to determine its disposition.

### **2.5.3 Results of the HU address review**

The HU address review had two products. The first product was produced several weeks before the actual review event, when POP sent FLD a list of census blocks (with predominately non-city style addresses) where there were appreciably more FSCPE-supplied HU addresses than Census Bureau HU addresses. This product was specified in a December 2, 2009 memorandum from POP to FLD. FLD used this information to notify the Update/Leave and Update/Enumerate enumerators in those operations to be aware that addresses were likely to be missing.<sup>3</sup>

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<sup>3</sup> This product was designed to accommodate FSCPE-supplied addresses in non-mailout/mailback areas, which were not in scope for the HU review.



The second product came from the HU address review conducted by FSCPE reviewers over two weeks beginning on February 22, 2010. Thirty-two states provided HU addresses (see Attachment A) and GPS coordinates and sent 40 FSCPE representatives to the onsite review event.<sup>4</sup> Each state came for one week; some states sent one reviewer and some sent two. The review resulted in 86,422 missing HU addresses being submitted to Vacant/Delete Check field operation.

## **2.6 Group Quarters Review**

### **2.6.1 Preparation for the GQ review**

The primary goal of the GQ review was to identify GQs missing from the 2010 Census. A secondary goal was to identify GQs in the 2010 Census that were misallocated to the wrong census block.

The onsite GQ Review was conducted during the week of August 9, 2010. FSCPE representatives from forty-two states and Puerto Rico participated in the onsite review (see Attachment A). The remaining states most often cited data and/or staffing availability as their reason(s) for not participating in the GQ review. During the review the FSCPE reviewers were paired with fifteen employees from POP who served as “Census Liaisons.”

States were allowed one reviewer. FSCPE representatives were asked to focus first on finding GQs missing in the 2010 Census. Census Bureau staff reviewed GQ data for states without FSCPE representation.

The Census Bureau’s GQ count data were from a file of the GQ records enumerated in the 2010 Census available at the time of the review. The 2010 Census count file was created on July 23, 2010, at a time when there were still GQ processing operations occurring. The timing of this file was selected as a balance between having as final of a file as possible, while still allowing time to make corrections.

The GQ types in-scope for the review were: nursing homes, college housing, military barracks, adult correctional facilities, and workers’ dormitories with populations of 50 or more. The primary reason these GQ types were selected for the review was because they represent more than 80 percent of the nation’s GQ population and are the majority of large GQs. Juvenile institutional facilities, medical institutional facilities, and all other non-institutional facilities were out of scope for the review.

The 2010 Census CRP Team built upon the HURS Oracle database and software application to create the GQ Review System (GQRS). DSCMO also developed software that was ultimately used to input all approved missing and misallocated GQs for inclusion in the Census Unedited File (CUF).

FSCPE members that chose to have their GQ records incorporated into the GQRS were required to submit their GQs to the Census Bureau approximately three weeks before the onsite review. Their GQ records were in a specified format, and included fields such as: the GQ name, its parent facility name (if any), address, and geographic coordinates. FSCPE members were not

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<sup>4</sup> For the HU review, POP was unable to do a proxy review without the state-provided address files.

required to perform the review with their GQ data in the GQRS, but having it included proved to be the most efficient way to perform the review.

### **2.6.2 During the GQ review**

Using the GQRS, reviewers could sort tables by county or by GQ type to look for where the FSCPE had more GQs than the 2010 Census did. The reviewer could then investigate the location of a GQ by selecting the coordinates, which were hyperlinked from the GQRS to Google Maps. Satellite imagery was used to confirm the existence of the GQ and locate it on the ground. There was one exception for the in-scope GQs; coordinates were not available for military installations (at the request of the military).

After a potentially missing GQ was identified, a second research step was conducted to determine if the GQ record was under another GQ type code that was ineligible for the review. Census Liaisons also searched for the potentially missing GQ using the MAF browser, along with staff from GEO, to validate missing units. If the GQ could not be found, then the reviewer created and submitted a missing GQ issue and included documentation that validated the existence and location of the GQ.

A Census Liaison reviewed the issues to ensure the documentation met requirements, and also did a final search to make sure the GQ could not be found in the GQRS or in the MAF as a housing unit. If the Census Liaison determined that the issue was valid, they forwarded it to FLD to complete a final research step and obtain the GQ's population.

The final check performed by FLD was to determine if the GQ enumeration had been processed after the July 23 file delivery used in the GQRS. If the issue did not fall in this category, the FLD Regional Census Center (RCC) representatives, working at Census Bureau Headquarters, called the GQ using a calling script designed for this purpose to obtain the facility's April 1, 2010 population (see Attachment B). Section 5.4.16 provides more details on RCC logistics.

The review for GQ misallocations was conducted when the 2010 Census counts were only available by collection blocks. The geocodes and boundaries of collection blocks may change when tabulation geography is assigned. Reviewers matched Census Bureau and FSCPE GQs to determine if the collection block of the Census GQ was correct. To make this determination the reviewer used the 2010 Census coordinates to locate the GQ on Google maps. If the coordinates plotted the GQ correctly on the map there was no need for further research. Again, military installations were excluded because the coordinates were not available.

If the coordinates were incorrect, the reviewer located the GQ on Google maps and obtained new coordinates. The reviewer input the correct coordinates into a utility in the GQRS that calculated the correct county, collection tract, and collection block. The reviewer proceeded to create a misallocation issue if the calculated block was different than the block on the current record. The documentation required for submission of a misallocation needed to illustrate where the 2010 Census GQ was enumerated compared with the collection block where it should have been enumerated. As with missing GQ issues, it was the responsibility of the Census Liaison to review the work of their assigned state reviewers and determine if the issue should be approved.

### **2.6.3 Results of the GQ review**

The GQ review resulted in just over 300 missing GQs, with a population count of nearly 48,000 people being identified. These missing units were delivered to DSCMO for inclusion in the 2010 Census counts. DSCMO delivered the same units to GEO for inclusion in the Final Collection

Universe. In addition, just over 170 GQs were found to be misallocated to the wrong 2010 Census collection block. These were delivered to GEO to be moved to the correct collection block.

### **3. METHODOLOGY**

#### **3.1 General Questions**

There are three overall questions, supported by the groups of specific questions below that this study will address:

- Did the 2010 CRP speak to the recommendations from the 2000 GAO report?
- Was the 2010 CRP effective in improving the accuracy of the 2010 Census counts of population, housing units, and GQs?
- What are recommendations for designing the 2020 Census Count Review Program?

#### **3.2 Methods**

A number of methods were used to perform the analysis to compile the information in the 2010 Census CRP assessment.

- Evaluation of issue history from the HURS in conjunction with MAF records for the selected HUs.
- Evaluation of issue history from the GQRS in conjunction with MAF post 2010 Census records for the selected GQs.
- Compilation of statistics from the preprocessing operations performed on the FSCPE and Census Bureau HU and GQ records.
- Feedback and/or interview responses from FSCPE members, Census Liaisons, 2010 Census CRP team members, FLD participants and GEO counterparts.
- Analysis of approved and rejected missing GQ issues to determine quality and correctness of the decisions to reject or approve.
- Comparison of the expected housing unit counts for selected geographies from the HU Review to counts tabulated in the CUF.

### **4. LIMITATIONS**

The results and recommendations discussed in this report are from a CRP perspective. Thus, these should be considered in the context of the needs and requirements of other Census Bureau divisions and programs.

## 5. RESULTS

### 5.1 Questions Relating to the Government Accountability Office's Report on the Census 2000 Full Count Review Program

#### 5.1.1 Did the planning of the 2010 Census CRP start early enough in the 2010 Census cycle?

Planning the 2010 Census CRP began in POP in January 2007, which was later than it should have been. This was earlier in the census cycle than the start of Census 2000 Full Count Review planning, but late in terms of 2010 Census operations. By January 2007, most of the 2010 Census architecture, schedule, and operations had already been planned. As a result, when the 2010 Census CRP was defined, the program had to impose on other divisions to accommodate CRP needs into their schedules and operations.

Even though the 2010 Census CRP was a success, it could have been more thorough, less stressful, and planned more efficiently had it started earlier. It was costly in terms of time spent for GEO, DSCMO, and FLD to adjust their programs late in the census cycle. It caused unnecessary pressure for POP staff and required long hours to compensate for the short amount of time left to develop the HU address and GQ review operations. It reduced the time FSCPE members had to develop their count review inputs and thus reduced the scope, thoroughness, and effectiveness of the review for some states. For example, many states could have submitted more HU addresses had they had time to prepare them, and more states may have participated in the reviews.

For the 2020 Census cycle, the CRP perspective needs to be represented as the census operations and schedules are being developed. A part-time staff presence in the early years of the decade should be adequate; then, a full-time staff from mid-2016 forward is needed.

#### 5.1.2 Was the 2010 Census CRP integrated well enough with other census organizational units and operations to ensure there was sufficient time to investigate individual data issues?

Yes, every count review issue that was generated was investigated and all approved issues flowed into census operations. The time period allotted to the reviews was a function of when the data necessary for the review were available and when the output from the reviews had to be incorporated in other scheduled processes. As a result, there was no flexibility in the schedule for the reviews.

Some reviewers would have liked additional review time to find more issues. During the HU address review several FSCPE reviewers with large numbers of HU addresses received help from fellow reviewers who had finished their own states. During the GQ review, some FSCPE reviewers only focused on selected GQ types or did not look for misallocations. If the 2020 Census schedule permits, more time for the review would be desirable, especially for GQs. An additional GQ reviewer from some states based on their anticipated workload would help as well.

#### 5.1.3 How closely did the conditions the review procedures were tested under approximate the actual reviews?

The HU address review procedures used in testing and training approximated the actual review event fairly closely. HU address data available for testing was limited to 2008

Census Dress Rehearsal areas. Some unanticipated situations were encountered during the review, such as wayward GPS coordinates in both the Census Bureau and FSCPE-supplied data.

The testing and training procedures for the GQ review proved effective and appropriate with respect to the GQ data received from the FSCPE. However, there were some unanticipated issues encountered in census data such as GQ type 999 (unclassified) and GQs with zero population that had to be addressed with new procedures formed at the last minute (see sections 5.4.12 and 5.4.13 for more information). This did cause some confusion for FSCPE reviewers and Census Bureau staff.

**5.1.4 Were the Census Bureau’s guidelines for investigating and documenting issues clear to the FSCPE participants?**

The majority of FSCPE responses to surveys issued by the CRP Team indicated that communications prior to and during the review were effective in setting their understanding and expectations. The essence of the documentation requirements for both reviews was to provide evidence that the HU or GQ in question was habitable and then establish its address and location on the ground using satellite or aerial imagery. Examples of acceptable documentation were presented in the respective review training sessions.

**5.1.5 Did the 2010 Census CRP allow issues to be categorized on the basis of the quality of the documentation so that the best-documented issues could be investigated and resolved first?**

Given the design of the review events, and the tools developed and used for research and documentation, it was not necessary to prioritize the work this way. The guidance provided in the training for the reviews, and the design of HURS and the GQRS, steered reviewers to identify where the biggest differences in counts and/or population occurred.

In the case of the HU address review, the effort to research and document a large compared with a small HU count difference did not vary greatly since the units were contiguous. For the GQ review, the training prescribed, and the GQRS allowed, reviewers to identify discrepancies in terms of both number of GQs and population. Research focused on first identifying and researching the missing GQs with larger populations, which were generally correctional facilities and student housing. Larger nursing homes followed those GQ types in terms of research priority. Given the size of these facilities and the presence of their information on the Internet, usually it was not difficult to establish their existence and locations.

**5.1.6 Did the 2010 Census CRP investigate the feasibility of using staff from the RCC’s to investigate issues prior to the release of public law data?**

Yes. Twelve representatives, one from each of the RCCs, participated in the GQ review at Census Bureau Headquarters.

The RCC representatives had the responsibility of researching the missing GQ issues that were referred to them by Census Liaisons. They contacted those GQs for which they could not find enumeration records. The RCC representatives used the “Calling Script for GQ Information” (Form D-941A) when contacting GQs to gather the GQ’s information and population (see Attachment B).

**5.1.7 How well did the Census Bureau communicate to the FSCPE regarding the objectives of the 2010 Census CRP and how the Census Bureau would use the results of the review?**

Surveys of the FSCPE participants indicated they were pleased with the communications from the 2010 Census CRP Team regarding the two review events.

Detailed guides were provided to FSCPE participants for both programs. The guides explained the objectives of the CRP; described how the program would work; and the preparation and data required for participating. In the case of the HU address review, the FSCPE Steering Committee was closely involved with the design of the program and facilitated advance communications with FSCPE members. Two members of the Steering Committee contributed to the HU Review program orientation and training that was offered to all FSCPE members in April 2009.

One criticism noted was the desire to have more advance notice in order to prepare their data for the review. Unfortunately, the timing of the communications was constrained by the timing of the decisions to finalize the design and requirements for participating in the 2010 Census CRP.

**5.1.8 Were all issues from the 2010 Census CRP resolved prior to the release of apportionment data?**

All the issues from the HU address review were resolved prior to release of apportionment data. The 2010 Census CRP Team confirmed the HU addresses submitted from the review were included in the enumeration processes leading to the development of the CUF. All the issues that were able to be resolved with the information available at the time of the GQ review were resolved in August 2010 for inclusion in the CUF. There were 38 GQ issues that were unable to be resolved at that time because the GQs in question could not be reached in order to verify their information and obtain their population counts as of April 1, 2010. It was expected that this situation could occur; these GQ cases remain in the GQRS with a status of “Unresolved.” The information for these GQs has been provided to the 2010 Census CQR Program staff, though without a population count they will not be in scope for CQR. One of the missing GQs provided a population count too late to use in CRP processing, but it will be processed in the CQR program.<sup>5</sup>

**5.2 General Questions Relating to the 2010 Census Count Review Program**

**5.2.1 How did the results of the 2010 program compare to 2000 in terms of number of corrections to the census counts before they were finalized for data products?**

The 2010 Census CRP was a vast improvement over 2000. In 2000, only five issues were able to be resolved before the census counts were finalized. In the 2010 Census CRP, the formation of count review issues was targeted toward ongoing census operations. All approved issues were processed from reviews before the counts were finalized.

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<sup>5</sup> The callback with population was received while the GQ review was still going on but the processing for the state had been closed out.

### **5.2.2 What was the value of direct participation of the FSCPE in the reviews?**

In the past, the primary value of FSCPE participation was the local knowledge they contributed to the identification of potential population count issues. The value of FSCPE participation in the 2010 Census CRP was more in their ability to gather and prepare high quality address data for both the HU address and the GQ reviews. FSCPE members varied in their ability to gather these data and also in their ability to use the tools provided to perform the review. In working with discrete address data and geographic coordinates, analytical skills were at least as important as direct local knowledge.

A benefit of the FSCPE participation for the 2010 Census CRP Team was the insight gained into the challenges various FSCPE members encountered in acquiring and preparing their data. The knowledge gained from the FSCPE experience will be incorporated in future plans.

### **5.2.3 Did the FSCPE participants consider the HU address and GQ reviews a success?**

The great majority of the participants considered the reviews a success. They could see they made a direct difference in the census counts for their state. There was some difference in perceived value noted between states whose addresses were predominantly “city style” as compared with states that had a high percentage of “non-city style” addresses.<sup>6</sup> The HURS was designed to work only with city style addresses. Thus the more city style addresses a state had, the more addresses were in scope for the review.

One of the benefits of participation that some FSCPE members cited was that the direct comparison of their address records with the Census Bureau records provided them with confidence in the accuracy of the MAF.

### **5.2.4 What criterion was most important to the FSCPE in making their determination of success?**

The criterion important to most participants was to develop confidence that their HUs and GQs were accounted for and would ultimately be included in the counts. For some, particularly those who had experience with the 2000 CRP, it was important to see that the issues they identified could be acted upon given the frustration with being unable to do that in 2000.

### **5.2.5 How did the POP “Liaison” role contribute to the Review events?**

The Census Liaison role was very well received by the FSCPE participants, and provided a great deal of value to both review events. FSCPE members provided overwhelmingly positive comments and appreciation for the help and guidance the Census Liaisons provided in working with them. They were viewed as partners in performing the review.

The Census Liaison role was designed for two purposes. The first purpose was to provide an adjunct to train and assist FSCPE reviewers as they transitioned from training to performing their review. The second purpose was a quality check role, to review and approve the issues and documentation that the reviewers submitted. Census Liaisons

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<sup>6</sup> A city-style address consists of a house number and street or road name. A noncity-style address includes rural routes and highway contract routes which may include a box number; post office boxes and drawers; and general delivery.

worked to ensure that truly missing HUs and GQs were properly documented and approved so they could be moved forward in the census process. They also rejected erroneous issues to keep them from going forward.

Each Census Liaison was assigned to work with two to four FSCPE reviewers. To facilitate the reviewers' transition from training in the HU Review, Census Liaisons had identified one possible missing address issue for each participating state prior to the review. Upon completion of the training session Census Liaisons presented these possible issues to their FSCPE counterparts for them to begin their research. This approach provided an immediate opportunity to work with an issue that would exercise the review procedures covered in training and utilize all the system functionality required to identify, research, document and submit an issue.

### **5.3 Questions Relating to the Housing Unit Address Review**

#### **5.3.1 How many HU addresses were in the EU and how many were presented in the HURS?**

The total number of HU address records in the EU was 130,483,740. The HURS presented 60,631,661 (46.5 percent) of those for use in the review. This represented the counties where the participating states submitted at least one HU address.

#### **5.3.2 How many HU addresses were submitted by the FSCPE participants and how many of those were presented in the HURS?**

The FSCPE participants delivered 36,211,694 address records. There were 292,217 duplicate addresses in their files, 77,507 records that could not be processed due to formatting errors, and 5,377 records were removed at the request of a state, leaving the number of addresses processed for use in the HURS at 35,836,593.

#### **5.3.3 How many FSCPE reviewers provided addresses for the entire state as opposed to selected geographies?**

Prior to the review, seventeen states anticipated they would submit data for the whole state. Ultimately, only four states submitted data for their entire state, while 28 states submitted data for part of their state.

#### **5.3.4 What were the reasons given by FSCPE members for not participating in the HU address review or not submitting all the HU addresses in their state?**

The most common reasons were that the necessary data did not exist, or if they did, the FSCPE member was unable to obtain them from sources within their state. Another reason was a lack of funding and/or staff to gather and prepare the data. In some cases, the FSCPE member cited their own lack of GIS experience as an obstacle. Other states found that the variance in address and file standards in their state made the preparation task too burdensome.

#### **5.3.5 What obstacles did the participating FSCPE members encounter in preparing their address data?**

In addition to the issues cited in response to the previous question, FSCPE members noted the following obstacles:



- Privacy issues (different counties/cities with different rules for sharing data)
- Lack of trust between state and local municipalities
- Data sources were sometimes incomplete and were not always up to date
- Data were harder to obtain and took longer to process than the time allotted
- Some localities needed money to buy the data
- Some localities did not have GPS coordinates

**5.3.6 What was the quality/usability of the HU address records submitted by the participating FSCPE members?**

The overall quality of the FSCPE-supplied data was very good; the CRP team was able to process 99 percent of the submitted address records. The rate of acceptable data by state ranged from 97.6 percent up to 100 percent. (See 2010 Count Review Detailed Guide for the Housing Unit Address Review, pages 6-13, for detailed data preparation instructions.)

It should be noted that two or three states had issues with duplicate addresses (and triplicate addresses in one case) because they used multiple sources to obtain their address data. The addresses met data processing requirements, but there was enough variation between the address records that they could not be automatically matched and eliminated with certainty as duplicates.

**5.3.7 What was the quality of the geographic address coordinates that the FSCPE members submitted in terms of datum, compliance, accuracy, formatting, etc.?**

Generally, the quality was very good; only 52,707 records could not be processed due to errors in their coordinates. A few states had a problem with many address records being attributed to a single set of coordinates. These records processed correctly because the coordinates were in the correct format and fell within the state's borders. It was in the process of performing the review that this issue was discovered. A couple of states had instances where their address coordinates placed the unit quite a distance (in some cases, miles) away from the actual location of the building.

**5.3.8 What percentage of EU HU records presented in the HURS had GPS coordinates?**

Of the EU HU address records presented in the HURS, 95.6 percent had GPS coordinates.

**5.3.9 What issues were encountered in preparing the EU and FSCPE address records for automated matching and visual comparison in the review?**

The 2010 Census CRP Team found the effort to prepare the address data for comparison and to load it into HURS was more difficult than first anticipated. In order to optimize the number of states that could participate in the review, the 2010 Census CRP Team had to define the minimum set of data that most states could obtain which would also allow an HU address to be clearly identified and located on the ground. Postal address standards were used to provide guidance to the FSCPE in preparing their data. Unfortunately, the data requirements that accommodated most states' needs did not correspond to the way Census address data are stored in the MAF. Software had to be developed for MAF records to execute conditional rules to concatenate and standardize the address information in order to compare it to the FSCPE address data.

**5.3.10 What percentage of EU and FSCPE addresses were automatically matched?**

The match rate varied by state; from a low of 46.0 percent to a high of 93.6 percent. The overall match rate between EU and FSCPE addresses was 81.2 percent.

**5.3.11 How could the automated matching process and results be improved?**

Adoption of address standards including the use of commonly used abbreviations in the address would yield a significant improvement.

**5.3.12 How many addresses did the HU address review submit as missing?**

The review produced 88,501 “missing” HU addresses. GEO performed a check on those addresses, and found 2,079 actually in the MAF, leaving 86,422 addresses to be included in the 2010 Census Vacant/Delete Check field operation.

**5.3.13 What was the final status of the 86,422 HU addresses sent forward for processing?**

The table below shows the number of addresses by the three possible outcomes.

**Table 1. Final Status of the 86,422 HU Addresses Sent to Vacant/Delete Check**

<b>Final Status</b>	<b>Number of HU Addresses</b>	<b>Percent of Addresses Sent for Processing (86,422)</b>
Occupied HUs counted in the census	62,735	72.6
Vacant HUs counted in the census	10,981	12.7
HU Addresses deleted from the census	12,706	14.7

Data Source: Final status counts obtained from 2010 Census Edited File (CEF) - January 2011.

**5.3.14 What was the most common reason for addresses missing from the EU?**

The most common reason was that addresses were flagged for deletion during the Address Canvassing operation.

**5.3.15 Were there any observable patterns in the locations of addresses missing from the EU?**

Some issues consisted of groups of co-located HUs that seemed to be isolated in an area that would not be easy to see from street level; in some of these cases it was apparent on HURS maps that Census Bureau geographic data did not have roads in these areas. Many of the issues that resulted from deletion during address canvassing consisted of groups of housing units in established neighborhoods. In some of those cases, the addresses on one side of the street were included in census records, while addresses on the other side of the street were missing.

**5.3.16 How many clusters of 30 or more HU addresses were approved by each state?**

There were 1,057 approved HU address clusters in the 32 participating states. The table below shows the number of approved clusters (issues) by state in descending order.

**Table 2. Approved Clusters of 30 or More HU Addresses, by State**

State	Approved Clusters	State	Approved Clusters
Texas	174	New York	20
Florida	151	Oregon	20
Nevada	148	Missouri	17
Washington	54	Georgia	14
Delaware	44	Utah	14
North Carolina	42	Colorado	11
Virginia	41	Kansas	10
Pennsylvania	36	New Hampshire	9
Tennessee	34	Minnesota	7
New Jersey	33	New Mexico	5
Maryland	32	Wyoming	5
Massachusetts	32	West Virginia	4
Indiana	29	North Dakota	3
Arkansas	23	Vermont	1
Michigan	23	Montana	0
Alaska	21	Wisconsin	0

Data source: HURS database.

**5.3.17 What implications does the size of a cluster of HUs have for GEO processing, field operations, or count review workload?**

The address data submitted from the HU Review were batched in with addresses from other sources and then unduplicated and processed as appropriate for use in the Vacant/Delete Check field operation. Cluster size had no effect on this processing or on enumerator workload.

As stated earlier, the minimum issue size of 30 HUs was chosen to ensure the largest concentrations of missed HU addresses received attention in the review. Some states would have benefited by having a smaller cluster size as they exhausted their clusters of 30 HUs.

**5.3.18 Should the size of address clusters be smaller or not restricted; i.e., allow single missing HUs to be submitted?**

Anecdotal evidence suggests the cluster size could be lowered to 20 or smaller and still result in a productive review.

The HURS shows that 36 tentative issues were formed with address counts between 20 and 29 addresses each, with a total of 957 addresses involved. Given the minimum size was 30 addresses, these were not pursued. These 36 tentative issues were originated by 16 of the 40 FSCPE reviewers that participated. A number of these reviewers were in states that had difficulty finding any larger clusters. Of course, many states spent their time with larger clusters and did not get to smaller size clusters in the week allotted for the review.

Some post-review feedback obtained from the FSCPE reviewers mentioned the desire to have a lower threshold than 30 HUs. There is not any solid information on how many additional addresses might have been submitted as missing if the minimum requirement for an issue was lowered to fewer than 30 addresses.

#### **5.3.19 How well did the design and functionality of the HURS support the HU review?**

The design and functionality of HURS supported the review very well. FSCPE feedback included responses such as: “worked perfectly”; “very impressive”; “easy to use”; and “incredible!! The team did a great job in putting this tool together.”

The HU address review parameters, process, and strategy were designed before the HURS software was designed. The review process was incorporated into the HURS in a logical way, allowing reviewers and Census Liaisons to become productive very quickly.

#### **5.3.20 Should resources be allocated to states according to the number of HU addresses they have to prepare and review?**

Allocating resources according to the amount of data would balance the workload more fairly and could increase the number of addresses covered in the review. Some states completed their reviews by the third day of the review, while others left at the end of the week having not reviewed some of their geography.

Allowing (and paying) for more data preparation time according to the number of addresses to review may make sense. During this review, states were allowed two reviewers and a week to complete the review. Another reviewer would be useful for states with a large number of addresses to review. Another week of review would be useful to some states. Of course, this would have to fit the overall schedule and budget of the census.

#### **5.3.21 Were there any HURS performance issues that affected the review?**

There were performance problems with the map viewing functionality of HURS. The problems were caused by memory shortages that occurred when a large number of system users were accessing maps at the closer zoom levels. The closer zoom levels meant users were retrieving more geographic data. The problem could be resolved by adding additional random access memory to the servers HURS runs on, but that was not an option during the review. Instead, the issue was addressed during the two weeks of review by making some performance adjustments to the software and clearing memory periodically during the day to free up capacity. While this remedy was somewhat inconvenient it did not prevent reviewers from being able to conduct their research.

### **5.3.22 What improvements could be made to the HURS review tool to improve the effectiveness of the review?**

The overall feedback from the FSCPE reviewers on HURS was very positive. Enhancements that were suggested include:

- Ability to click on a point representing an HU on the map to see its coordinates.
- Scale the size of the symbols used for HU points according to the number of units it represents.
- Ability to remove address records in batches rather than one at a time.
- Ability to see all the data for selected HU points without creating an issue record.
- Ability to label a lassoed area on the maps after it was researched to indicate it was commercial or vacant units.

### **5.3.23 Was the first product of the HU address review targeting blocks in Update/Leave and Update/Enumerate areas a productive strategy?**

There are no metrics available to answer this question though anecdotal evidence from FLD staff indicates it was beneficial and should be considered for the 2020 Census CRP.

### **5.3.24 What overall improvements could be made to the HU address review portion of the Count Review Program to improve its effectiveness?**

The most important improvement that could be made would be to increase the rate of FSCPE participation and the number of addresses covered in the review. This first HU address review revealed a number of barriers to FSCPE participation. Key reasons some states did not participate were the lack of time to prepare, lack of staff resources, lack of technical skills, and/or funding. For the FSCPE members that did participate, some members found it difficult to acquire address data for their entire state.

If the review were to be performed in a similar way for the 2020 Census, the lack of time to prepare could be addressed with advanced planning. Increasing the number of hours the FSCPE agencies could be compensated for preparation also would help. The growing use of GIS should address the skills issue and improve the availability of data for the review. And, the positive experience of participants in the 2010 review should encourage future participation.

## **5.4 Questions Relating to the Group Quarters Review**

### **5.4.1 How many eligible GQs were in the census universe?**

For the United States and Puerto Rico, there were 89,616 records of eligible GQ types from the census universe that were loaded into the GQRS. The number of eligible GQ records in the census universe available for the 43 states or state equivalents participating in the review was 78,832.

The GQ types eligible for the review were: nursing homes, college housing, military barracks, adult correctional facilities, and workers' dormitories with populations of 50 or more. The primary reason these GQ types were selected for the review was because they represent more than 80 percent of the nation's GQ population and are the majority of large GQs.

**5.4.2 What portion of total 2010 Census GQ population did the five in-scope GQ types contain?**

The five GQ types in-scope for the review were: nursing homes, college housing, military barracks, adult correctional facilities, and workers' dormitories with populations of 50 or more. The 89,616 eligible GQ records accounted for 83.9 percent of the total 2010 GQ population.

**5.4.3 How many missing GQs were approved in the review? What was their population?**

At the conclusion of the review, the Census Bureau had approved 313 missing GQ issues with a total population of 47,922 people.

Shortly after the review concluded, POP performed a quality check of the findings and determined that three of the 313 GQs were not missing. These three Count Review generated records and their 486 residents were removed from the census in order to prevent duplications. Thus the final number of missing GQs found in the review was 310 with a total population of 47,436.

**5.4.4 What were the reasons for the missing GQs that were approved in the review?**

The primary reason for missing GQs was because they were deleted in the 2010 Census Address Canvassing operation. Of the 310 approved missing GQs, 201 had been deleted in Address Canvassing. Within the set of 201 GQs deleted during Address Canvassing, many had been added in 2008 as part of the FSCPE Update and/or during the LUCA operation.

**5.4.5 What was the number of misallocated GQs and their associated population?**

The Census Bureau approved 173 issues of GQ misallocation to the wrong collection block; the total population associated with those GQs was 29,054.

**5.4.6 What was the total number of unresolved GQ issues and their reasons?**

The unresolved status applied only to missing GQ issues and not to misallocation issues. During the review all issues of missing GQs resulted in at least one telephone call to the GQ. After the review event was over, there were 38 issues classified as "Unresolved," which meant that the issue appeared to be a valid missing GQ case though FLD could not obtain a population. There were three primary reasons for being unable to resolve issues: 1) FLD could not make contact with 23 GQs; 2) FLD reached 9 GQs, but the GQ representative did not have time to research their data; and 3) policy prevented 5 GQ representatives from providing the data over the phone; additionally, 1 GQ representative called back with a population count after the GQ review was completed. (See Section 5.1.8.)

**5.4.7 What was the total number of missing GQ issues rejected and their reasons?**

During the review period, Census staff (Census Liaisons/FLD/Decennial Management Division) rejected 368 cases submitted by the FSCPE analysts as missing GQs. The reasons for rejection are shown in Table 3.

**Table 3. Reasons for GQ Issue Rejection**

Reason for Rejection	Number of Issues
<p><b>In GQRS</b> Cases where a secondary check found a census record for the GQ in the review system and thus the GQ was not missing from the census.</p>	65
<p><b>In GQRS with type code 999</b> Cases where the GQ thought to be missing was found in the MAF coded with type code 999 making it difficult to identify, but it was not missing. (Type code 999: Unclassified)</p>	10
<p><b>Type out-of-scope</b> Cases where the GQ submitted by the FSCPE was an ineligible type.</p>	47
<p><b>In MAF as HU</b> Cases where MAF research indicated the address associated with the GQ was classified as an HU.</p>	123
<p><b>In GQ Enumeration (GQE)</b> Cases where MAF or enumerations operations research indicated the GQ had gone through the GQE operation. The enumeration would have been after the GQ file was cut for use in count review.</p>	13
<p><b>In Paper-Based Operations Control System (PBOCS)</b> Cases where field operations research found evidence in PBOCS to indicate the GQ was still being processed.</p>	51
<p><b>Other</b> Reasons in this category include: GQ is vacant, population was captured under another GQ, or documentation submitted was inadequate.</p>	59

Data Source: GQRS database

**5.4.8 What GQ type was the most difficult to work with during GQ review due to definitions?**

Nursing homes were the most problematic GQ type to clearly identify during the review. FSCPE records often classified assisted living facilities as nursing homes. These discrepancies were fairly easy to resolve when the facility in question was dedicated to



assisted living services. However, in many cases nursing homes are part of senior living centers. The arrangements in these facilities can include independent living and assisted living, as well as skilled nursing care. A growing number of facilities also include Alzheimer care units. In most cases assisted living facilities were identified as HUs (typically apartments) in the Census MAF records; on occasion they were defined as adult group living facilities.

During the review, a useful means to distinguish the nursing home populations was to research state licensing or Medicare records for nursing homes. These sources indicated the number of licensed beds at the facility and could be used to check the reasonableness of the population count.

#### **5.4.9 In performing the review, how useful was the concept of parent institution to constituent GQs?**

The research of GQ issues was facilitated in cases where Census Bureau records included a facility name (e.g., John Q. Public University) that could be used to associate and organize the individual GQ records (e.g., Dorm A, Dorm B).

The Census Bureau maintains its records at the GQ unit level (in most cases). However, the FSCPE members often could not obtain GQ unit level information, but instead they would have a record for the whole facility, e.g., a college campus. Or, the FSCPE member would often have different names for the GQ units at a facility. Researching these “many to one” and mismatched GQ name situations proved very difficult and time-consuming, and impractical in some cases. The primary GQ types involved in these situations were prisons and student housing.

This kind of GQ review would benefit by having the facility name as part of the each GQ record on the MAF, and particularly if there was a true “parent-child” relationship between facility name and GQ name in the MAF database.

#### **5.4.10 What problems did the assignment of a GQ (or GQs) in the 2010 Census count records to a central place/office pose in the review?**

In cases where this occurred, research of a missing GQ or a misallocation was impractical. This did not occur often; when it did, it was usually student housing. It should be noted that some universities did not allow Census Enumerators access to student housing due to security policies and provided administrative lists that may have lacked address/location information. In such a scenario, if the FSCPE reviewer believed there was missing population it would be impossible to account for the specific GQs involved in the discrepancy.

#### **5.4.11 How often was the population of a GQ enumerated under another GQ at a parent facility?**

It cannot be known with certainty how often this occurred across all GQ enumerations. This situation manifested itself as a problem in the GQ Review only with regard to student housing. Of the 163 missing GQ issues submitted for student housing, 19 (11.7 percent) were rejected because FLD research discovered the population of the dormitory in question was included in the enumeration of another GQ.

#### **5.4.12 How did GQs found under type code 999 (unclassified) impact the review?**

Going into the review, POP understood that EU records coded with GQ type 999 (unclassified) would be HUs. Training of Census staff and FSCPE reviewers was based on this premise. However, this proved not to be the case. There were numerous situations where eligible GQ records submitted by the FSCPE were found as type 999. In many cases the GQ was identified on the basis of its street address, coordinates and/or population because very often these records lacked a facility name and had a GQ name of “Vacant.”

This had a significant impact during the course of the review. CRP staff had to introduce the additional step of reviewing all Census GQs in the county where the GQ was located as part of developing every missing GQ issue. This added to research time and introduced additional error, in that additional issues were submitted for review that should not have been.

#### **5.4.13 How did GQs with a zero population impact the review?**

In the few days immediately preceding the review event, the CRP Staff was made aware that some GQ records from the 2010 Census count file had population values of zero. It was decided that in cases where the FSCPE had a matching GQ record of an eligible type, the GQ would be treated as missing. Implementing this procedure required development of workarounds to the GQRS functionality and last minute training for Census Liaisons, RCCs and FSCPE reviewers. Again, this added to research time, added additional complexity to the review and introduced additional opportunity for human error.

#### **5.4.14 Did the lack of a precise GQ address hinder the review and cause problems?**

The lack of a precise GQ address caused problems in a small percentage of the cases researched. More often than not, it contributed to the inability to provide the necessary documentation to demonstrate the GQ was missing. This issue most often affected smaller GQs, particularly in rural areas, because they have less of an Internet presence in terms of independent websites or satellite imagery for use in validation.

In cases where larger GQs’ addresses were inadequate it was generally easier to find address and/or location data via web research. Often, the facility could be identified on street view, as well as satellite imagery. However, smaller nursing homes and county jails in rural communities proved to be particularly difficult to research. Even when an address could be corroborated for the GQ from different resources, it often proved impossible to positively identify the GQ’s location on the ground in order to place it in a 2010 Census collection block.

#### **5.4.15 What problems were encountered in the review with the placement of Census coordinates relative to the physical location of GQs?**

There were two common problems that were encountered during the review. The first situation was where many GQs were attributed to one set of geographic coordinates at a facility. The second situation occurred when FLD staff had to take the coordinates at the secured entry to a facility which was some distance from the GQ units in the facility.

Both these situations were encountered at colleges and correctional facilities. Colleges were typically easier to research in these cases because dormitory names were often

labeled on satellite imagery and campus maps identifying the buildings were available. However, on occasion the records for the Census GQs in the GQRS did not have specific, unique GQ names; the records only included the university name.

Correctional facilities were common to the second situation cited above. The points for the facility were often attributed to the main gate of the facility, which sometimes placed the GQ buildings in the incorrect block.

#### **5.4.16 Were there any issues with the workload during the GQ review?**

In general, review participants noted the need for more than one week to perform the review. Workload varied for the FSCPE reviewers based on the amount of GQ data in their review and how much research information they prepared in advance. Individual FSCPE reviewer's effectiveness varied significantly with their skills in using the computer and research tools provided to perform the review. In turn, Census Liaison workloads were influenced by the abilities of the FSCPE reviewers and the amount of support they required. Census Liaison workload assignments were based on the number of GQ records in their assigned states.

The workload for FLD to research missing GQ cases and obtain the population for the GQs determined to be missing required more time and effort than was anticipated. Staff from DMD, FLD, and POP worked the Saturday after review week and also the following Monday and Tuesday to resolve the cases generated by the FSCPE reviewers. Part of FLD's procedure was to research PBOCS data to determine if the GQ was in the process of enumeration. However, additional research steps were required because not all relevant information was available in PBOCS. To research the potential missing issues, FLD staff used the Automated Tracking and Control system at the National Processing Center for cases that may not have been entered into PBOCS in the LCOs. Supporting documentation resulting from research needed to be scanned to create files that could be attached to issue records in the GQRS. There also was an inherent time lag in the process to contact and obtain a response from GQs that required population information.

#### **5.4.17 What could be done to manage the workload more effectively?**

Census Liaison performance had a major influence on workload, in that failure of the Census Liaison to reject/return issues that were poorly prepared by the FSCPE caused additional and unnecessary research by FLD and others. There were a number of factors that influenced Census Liaison performance. Training prior to the GQ review was less comprehensive than desired, because there was a lack of data available to simulate all the scenarios that were encountered in the review. Last minute procedures had to be developed and incorporated into Census Liaison training to accommodate GQs with a population of zero, or those with a type code of 999. Regardless of those issues it was apparent that some Census Liaisons had absorbed the training more effectively and performed with a higher degree of accuracy than others.

The design of the GQRS could be improved to manage workload. The status functionality in the GQRS was designed to facilitate the workflow for all the various issue scenarios that might be encountered. However, the GQRS did not include true automated workflow functionality. Therefore, additional effort (using Excel outside the GQRS) was required to manage the workload and track the issues being referred to FLD.

Finally, additional resources were required to output data from the GQRS system in order to manually enter it in the CRS as required by the processing division, and reconcile the records in both systems. This was very cumbersome and time consuming.

**5.4.18 Should FSCPE resources be allocated according to the number of GQs they have to review?**

Allocating FSCPE reviewers proportionately to the amount of GQ data they have to review would be a fair way to administer the review. During the GQ review, some FSCPE reviewers limited their review to identifying only missing GQs and even then they were not able to research all GQ types or counties due to the amount of data. Only twenty-two states submitted misallocations that were approved. The number of approved misallocations ranged from twenty or more for three states to only one for six states. Additional reviewers for states with more GQs would improve the opportunities to identify and correct both missing and misallocated GQs.

It should be noted that additional reviewers would not compensate for variations in reviewer skills or the quality of the data provided by the states. In order to realize the benefits of a proportional approach, the FSCPE would need to provide complete and accurate information for incorporation in the review system ahead of time and be prepared to use the research tools effectively.

**5.4.19 How effective was the census proxy review of non-participating states?**

POP provided staff to perform a GQ review for the eight states and the District of Columbia that did not participate in the GQ Review. The proxy review was inherently limited because the information available for comparison was from Census 2000 GQ counts. The number of missing issues approved by a state is a rough indicator of effectiveness. On average the 42 participating states and Puerto Rico had slightly over 7 missing issues approved; the 8 proxy states and the District of Columbia had a total of 14 missing GQs identified, or about 1.5 per state.

**5.4.20 What can be done to improve the proxy review process?**

The key improvement would be to develop a current list of GQs for use in the review. A current GQ list would allow a more thorough and precise search for missing GQs. Data for the larger GQs such as correctional facilities and colleges can be derived from resources available on the Internet. Data for nursing homes can also be obtained via the Internet, but given the number of those facilities the data would need to be stratified by facility size in order to make the research practical.

**5.4.21 How well did the design and functionality of the GQRS support the GQ review?**

The feedback obtained from the FSCPE reviewers was very positive regarding the design and usability of the GQRS. Both FSCPE reviewers and Census Liaisons cited the desire to be able to match and/or include multiple GQs in a single issue; for example, multiple dormitories at a college to exclude them from research. However, this is less a GQRS functionality issue than constraints imposed by the need to precisely identify and match unique GQ records. The GQRS did provide functionality to allow reviewers to flag individual GQ records and remove them from being displayed so they could remove them from consideration in their research.

**5.4.22 Were there any problems with GQRS performance that affected the review?**

No. The system was available throughout the review and response time was fast.

**5.4.23 How could the MAF browser and PBOCS be better utilized in the GQ Review process?**

The MAF browser and PBOCS were used to research 2010 Census data to validate missing GQ issues. The MAF browser was used primarily by Census Liaisons and by a member from GEO to view GQ history to determine if the GQ record had been included in 2010 Census operations, or to see if the address in question was classified as an HU rather than a GQ. PBOCS was used by FLD to research cases where MAF research was inconclusive. PBOCS provided documentation indicating that the GQ in question had gone through GQ enumeration operations.

Post review evaluation indicates that additional training on using the MAF browser could benefit the accuracy of the review and eliminate rework.

The effectiveness of the MAF and PBOCS research could have been improved by training additional staff to use the system to improve the turnaround time on missing or duplicate GQ cases.

**5.4.24 Were there issues in the review process caused by the timing of the review?**

An issue that impacted the review was that some FLD and data processing operations were still ongoing at the time of the review. This was apparent in some of the incomplete GQ records that were received with a type code of 999 or a population of zero. The fact that not all GQ enumeration information was available in PBOCS further complicated GQ research. To research the potential missing issues, FLD staff used the Automated Tracking and Control system at the National Processing Center on cases that may not have been entered into PBOCS in the LCOs.

**5.4.25 Could the timing of the GQ review be modified to improve its effectiveness?**

Because the GQ review was based on actual 2010 Census count results, the timing was not very flexible but still fundamental to its success. The timing of the review was chosen as a balance between having actual GQ count results to review, and allowing enough time to process the review findings into the final census count. A review of the actual census count results could not be moved much earlier or later in the census cycle as the Master Activity Schedule required all findings to be submitted by August 18, 2010 to DSCMO.

The other option in timing is to follow the strategy used in HURS, which is to improve the address list as much as possible in time for the enumeration. Moving the GQ review up to February or March of the census year, could provide up-to-date corrections to the GQ list in time for GQ enumeration operations. This would have the advantage of avoiding the problems associated with reviewing census results that are almost, but not quite complete. The disadvantage would be there would be no review targeting and correcting the actual GQ census counts. This option was considered for the 2010 Census CRP, but a major issue was the timing did not coordinate with the planned architecture of the 2010 Census.

**5.4.26 How would other census operations be affected by changes in the timing of the review?**

Moving the timing of the GQ review to before Census Day could affect the timing and content of the GQ Advance Visit and the GQ enumeration operations. This would have to be planned early in the census cycle.

**5.4.27 How could the process of delivering the review findings to DSCMO and GEO be improved?**

As detailed in the background section of this report, the CRS software provided by DSCMO could not provide the address-level precision necessary for the GQ review. This led POP to develop the GQRS as the primary research tool and repository of all GQ issues information and supporting documentation. In addition to missing and misallocated GQ information, the GQRS also provided a place for reviewers to make comments on such GQ information as facility name, corrected GQ name, and corrected addresses.

However, POP was required by DSCMO to submit the missing and misallocation GQ issues through the CRS. This required the CRP staff to take the GQ issues in GQRS and input them into DSCMO's CRS. This proved to be an error prone and time-consuming process. Ultimately, the CRP staff compiled all the GQ issues information into a reconciliation spreadsheet that provided a cross-check between the issue IDs in the GQRS and the corresponding IDs in the CRS.

The CRP staff provided the GQ information updates to GEO electronically as an extra step. Using one system to generate, store, and transmit issues would improve the GQ review operation.

**5.4.28 How many GQ issues were referred to the 2010 Census CQR program?**

All issues in the GQRS will be available to the CQR program for use in researching CQR cases as needed. One limiting factor is that the GQs from CRP must have a population count. The scope and parameters of the 2010 Census CQR Program are very specific, and as of the writing of this report it is expected that only one CRP issue will be assimilated into the CQR program.

**6. RELATED EVALUATIONS, EXPERIMENTS, AND/OR ASSESSMENTS**

This section does not apply.

**7. LESSONS LEARNED, CONCLUSIONS, AND RECOMMENDATIONS**

The results section in this report spoke to the first two general questions; the 2010 Census CRP successfully addressed the concerns cited in the GAO report and improved the accuracy of the counts for the 2010 Census. This section will respond to the third general question on recommendations for the future.

## Lessons Learned and Recommendations

Below is a list of lessons learned that should be considered when planning the 2020 Census Count Review Program:

1. In regards to scheduling, planning for the Count Review Program needs to begin earlier in the decennial planning cycle in order to be more easily and fully integrated with other decennial census operations. The review(s) must be timed so that the findings flow seamlessly into subsequent census operations. A count review perspective should be represented as field, MAF, and data processing operations are being planned. Count review should be more fully integrated into the planned architecture of the census. To address budgeting and staffing, early planning would allow the CRP team and POP to put the proper resources in place and allow fuller testing of procedures. A part-time planning presence in the early years of this decade (2010- 2016), then a full-time staff from mid-2016 forward would meet this need.
2. Address-level precision is essential to an effective count review program. The new 2010 Census CRP approach utilizing addresses, GPS coordinates, GIS information, maps, and satellite imagery proved to be very effective in identifying HUs and GQs with the certainty needed to include them in the 2010 Census.
3. The E911 system and tax assessor records proved to be valuable sources of addresses and address information. The Census Bureau should consider working with these sources and with other federal agencies who keep address lists, to develop a common format and address updating protocol.
4. Participating FSCPE members realized the power and potential of a current GIS/GPS enabled address list. Only 12 states provided housing unit address records for their entire state in the 2010 Census CRP. FSCPE agencies could benefit by maintaining and expanding their address list capabilities. Such information could help with population and HU estimates and also position the agencies for optimal participation in a 2020 Census Count Review program.
5. The parent record-child record relationship should be considered in the MAF for colleges and prisons, in order to facilitate identification and validation of each individual GQ associated within the larger institution.
6. Have both GQ and HU address information available during the review, given the frequency that some presumed GQs, particularly dormitories and assisted living facilities, were classified as HUs.
7. The geographic misallocation of GQs would be better identified by submitting the correct GPS points along with the correct collection block code. Once tabulation blocks are formed, there is no guarantee the GQ in question will receive the correct tabulation block code. One such case is known as of the writing of this report. A process that allows GEO to intake the correct GPS points could prevent this situation.

## Conclusions

The 2010 Census CRP proved to be a valuable quality improvement program. It allowed errors that occurred in upstream processes to be corrected and it uncovered oversights that otherwise would have gone undetected. It demonstrated the feasibility and necessity of using both address and geographic coordinates to identify living quarters with satellite imagery. It also reinforced the concept that maintaining an accurate MAF would benefit the decennial census. Given the 2010 Census CRP experience, the need for an accurate MAF, and the evolution of geospatial technology and data, continual updates to the MAF would have a number of advantages:

- Smoothing the labor peak required for the Census Bureau and FSCPE to conduct the review
- Mitigating the loss of institutional knowledge that results from the time lapse between planning and executing the decennial censuses; CRP expertise would be maintained
- Bolstering the confidence of the FSCPE and states in the quality of the Census Bureau's records
- Improving the usability of the MAF data during the decade

The 2020 Census environment may be very different than that of the 2010 Census. The structure and operations of the 2020 Census may be different. Count review will need to fit into the 2020 Census environment so that it enhances and adds value to the census. Count review may need to occur at different times, lead to different operations, and involve a different role for FSCPE agencies. This assessment can help guide the planning for the 2020 Census.

## 8. ACKNOWLEDGEMENTS

The 2010 Census CRP staff was composed of Craig Cruse, Susan Keehan, and Nancy Schechtman. The Program Manager was Edwin Byerly. Many other employees in the Population Division and elsewhere in the Census Bureau, as well as several contractors, made significant contributions to the Count Review Program development and implementation.

## 9. REFERENCES

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U.S. Census Bureau, "Memorandum to Document Data Releases between Field and Population Divisions from Edwin Byerly, Count Review Program Manger, to Gail Leithauser, Assistant Division Chief, Geography and Data Collection, Field Division," December 2, 2009.



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April 21, 2010.

## ATTACHMENT A: STATE PARTICIPATION IN THE 2010 CENSUS COUNT REVIEW PROGRAM

State	HU Review	GQ Review	State	HU Review	GQ Review
Alabama		x	Montana	x	x
Alaska	x	x	Nebraska		x
Arizona		x	Nevada	x	x
Arkansas	x	x	New Hampshire	x	x
California		x	New Jersey	x	x
Colorado	x	x	New Mexico	x	x
Connecticut		x	New York	x	x
Delaware	x	x	North Carolina	x	x
District of Columbia			North Dakota	x	x
Florida	x	x	Ohio		
Georgia	x	x	Oklahoma		
Hawaii		x	Oregon	x	x
Idaho			Pennsylvania	x	x
Illinois		x	Rhode Island		
Indiana	x	x	South Carolina		
Iowa		x	South Dakota		
Kansas	x	x	Tennessee	x	x
Kentucky		x	Texas	x	x
Louisiana		x	Utah	x	x
Maine			Vermont	x	x
Maryland	x	x	Virginia	x	x
Massachusetts	x	x	Washington	x	x
Michigan	x	x	West Virginia	x	x
Minnesota	x	x	Wisconsin	x	x
Mississippi			Wyoming	x	x
Missouri	x	x	Puerto Rico		x

Data Sources: HURS and GQRS databases

### Contracting Information:

Contracts were in place for up to two FSCPE members to participate in the HU review. Participants were reimbursed up to 80 hours for data collection and preparation. Members were also reimbursed for travel expenses, Title 13 and Information Technology Security training, and up to 40 hours per reviewer for performing the actual review.

Contracts were in place for one FSCPE member to participate in the GQ review. Participants were reimbursed up to 40 hours for data collection and preparation. Members were also reimbursed for travel expenses, Title 13 and Information Technology Security training, and up to 40 hours per reviewer for performing the actual review.

## ATTACHMENT B: FORM D-941A CALLING SCRIPT FOR GQ INFORMATION

THIS LISTING CONTAINS CONFIDENTIAL INFORMATION, THE RELEASE OF WHICH IS PROHIBITED BY TITLE 13, U.S.C., OMB NO. 0607-0919-C APPROVAL EXPIRES 12/31/2011	
Form D-941A U.S. Department of Commerce (08/04/2010) U.S. Census Bureau <b>Calling Script for GQ Information Count Review Program Group Quarters Review 2010 Census</b>	GQ Name: Parent Facility: GQ Contact Name: GQ Contact Telephone:  CRP Staff Member: FSCPE Analyst: FLD/RCC Staff Member: LCO Code/Name:
<b>GQRS ISSUE ID:</b>	
<b>1. Interview Date: Month/Day/Year</b>	
<b>2. Read verbatim below - Note: Shaded areas are to be completed by the caller but not asked to the GQ contact</b>	
"Hello, my name is ( <i>your name</i> ). I work for the U.S. Census Bureau. As part of our quality control procedures, I would like to verify ( <i>your facility/a building on your facility</i> ) and its population. May I please speak with Mr./Ms. ( <i>GQ Contact Name</i> )?" ( <i>If the contact is unavailable</i> ) "May I speak with someone else who can answer my questions?" ( <i>Enter the provided name</i> ) _____. ( <i>If not, ask when the contact name would be available for a call back. Write call back time and date in the space below.</i> )	
<b>3. Is this facility or building a: (confirm GQ type)</b>	
<input type="checkbox"/> Nursing home? <input type="checkbox"/> Correctional Institution? <input type="checkbox"/> College Dormitory? <input type="checkbox"/> Military Barrack? <input type="checkbox"/> Workers Quarters or Job Corps Centers?	
<b>4. What is the official name of this facility/building? (GQ name e.g. Letts Hall, Cell Block D, Green Barracks 1)</b>	
<b>5. What is the name of the parent institution for this facility/building?</b>	
<b>6. Was this facility/building open on April 1, 2010?</b>	
<input type="checkbox"/> Yes <input type="checkbox"/> No ( <i>If no, skip to item 9</i> )	
<b>7. How many people were living in this facility/building on April 1, 2010? (If a military barrack, how many people were assigned to the barrack and were not deployed on April 1st?)</b>	
_____ <input type="checkbox"/> Don't know <input type="checkbox"/> This is the actual population on April 1. <input type="checkbox"/> This is the actual population as of _____. <input type="checkbox"/> This is a derived population based on actual population. ( <i>If derived, please explain below</i> )	
<b>8. What is the maximum number of people that this facility/building was meant to hold?</b>	
_____ <input type="checkbox"/> Don't know	
<b>9. THIS ENDS OUR INTERVIEW. THANK YOU VERY MUCH FOR YOUR TIME IN ANSWERING THESE QUESTIONS.</b>	
<b>10. This information was obtained by:</b>	
<input type="checkbox"/> A phone call from HQ <input type="checkbox"/> An LCO Manager/Supervisor	
<b>11. Final Outcome</b>	
<input type="checkbox"/> All necessary information obtained for a figure based on actual population <input type="checkbox"/> No figure based on actual population available <input type="checkbox"/> No information obtained/staff was non-cooperative or didn't know <input type="checkbox"/> Unable to reach a contact person <input type="checkbox"/> Out of scope	
<b>12. NOTES (Please use this section to provide any additional information)</b>	