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2010 CENSUS PLANNING MEMORANDA SERIES

No. 162 (Reissue)

MEMORANDUM FOR The Distribution List

From: Arnold Jackson *[signed]*
Acting Chief, Decennial Management Division

Subject: 2010 Census Field Verification (FV) Assessment Report

Attached is the revised 2010 Census Field Verification (FV) 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. The revised document contains two changes to the analysis that follows Table 5.8:

- *Removal of a statement that incorrectly compares the Field Verification workload derived from Coverage Followup in the 2006 Census Test and the 2010 Census. The method for determining the respective workloads was not the same, so a direct comparison cannot be made between the two.*
- *Removal of a statement regarding all small (2-19 housing unit) multi-unit structures and replacing it with text that focuses specifically on structures containing 2-4 housing units, consistent with the sentence that precedes it.*

If you have questions about this report, please contact Frank McPhillips at (301) 763-8781.

Attachment

2010 Census Field Verification Operational Assessment

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

Address List Development Operations Integration Team

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

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Executive Summary

This assessment provides results, statistics, and analyses from the 2010 Field Verification operation. The qualitative information presented, such as recommendations, is based on team member involvement in the development and implementation of the operation. Quantitative information comes from the Decennial Statistical Studies Division, which collected and summarized assessment data from various sources after the operation was completed in September 2010.

Assessment Methodology

The 2010 Field Verification operation was assessed by:

- Using Cost and Progress System data
- Evaluating assessment data files provided by the Decennial Statistical Studies Division, the Geography Division, and the Technologies Management Office
- Using budget models to compare budget estimates to actual spending
- Using staffing models/authorizations from Field Division and Decennial Applicant, Personnel, and Payroll System data to determine projected, authorized, and actual staffing
- Consulting reports from debriefings, observations, and lessons learned exercises to contribute qualitative information

Operation Overview

Field Verification was the field operation for the 2010 Census that served as the final check on the existence of specific addresses in specific census blocks. The operation was managed out of all 494 Local Census Offices located across the 50 states, the District of Columbia, and Puerto Rico. The objective of the 2010 Field Verification operation was to verify the existence of respondent-provided addresses absent from census address files and to make a final determination about potentially duplicated housing units identified during person matching conducted for the Coverage Followup operation. Respondent-provided addresses came via the Non-ID Processing¹ operation from the following sources:

- Be Counted Program
- Telephone Questionnaire Assistance Fulfillment
- Telephone Questionnaire Assistance Interview
- “Usual Home Elsewhere” responses from:
 - Group Quarters Enumeration
 - Nonresponse Followup
 - Remote Alaska
 - Remote Update Enumerate
 - Update Enumerate

¹ The Non-ID Processing operation is the subject of a separate 2010 Assessment Report, which provides further detail regarding the Non-ID inputs.

The scheduled start for Field Verification production operation was August 6, 2010, using the same basic control system intended for use in all of the enumeration activities in 2010. However, given some of the challenges that earlier operations faced in using the Paper-based Operations Control System, Census Managers decided to implement a contingency plan that led to the development of a different operational control system for Field Verification. Specifically, the Field Verification operational planning staff worked with the Technologies Management Office, who adapted a control system they had developed for Census Coverage Measurement operations. Moving to the contingency allowed the expansion of resources devoted to the development and support of the Paper Based Operations Control System for use in the Non-Response Followup and Vacant Delete Check operations.

In order to test the control system on a smaller scale before full implementation, field training began earlier in a small number of Local Census Offices; they began Field Verification production training on July 21, 2010 and began quality control training on July 26, 2010. The system performed well during the testing period and did not require any changes before the operation began in all other Local Census Offices in August 2010.

The initial workload for the operation was 421,759 cases, and a small supplemental workload of about 35,000 cases was delivered in mid-August. The supplemental workload consisted of cases from Non-ID Processing that did not make the cut-off date for the original Field Verification workload delivery; there were no additional cases from Coverage Followup. All offices completed production on August 30, 2010. Rework and quality control fieldwork were completed on September 7, 2010.

Listers used address listing pages and maps to locate and determine the status of each address identified for 2010 Field Verification. They attempted to conduct interviews with occupants of the designated addresses to confirm address information. Through these activities, Listers verified, deleted, or designated an address as a duplicate. A separate staff of Quality Control Listers verified every Field Verification address to ensure that the original Listers had accurately worked the addresses.

Staffing and Workloads

Notable results from the 2010 Field Verification operation include:

- Local Census Offices hired, trained, and managed the work of 1,375 Crew Leaders and 8,106 Listers and Crew Leader Assistants for production. Listers completed 455,913 Field Verification cases in 267,183 Assignment Areas.
- Local Census Offices hired, trained, and managed the work of 921 Crew Leaders and 7,811 Listers and Crew Leader Assistants for Quality Control. Listers and Quality Control Listers completed 455,913 Field Verification cases in 267,183 Assignment Areas.

Budget and Cost

Overall, the Field Verification operation cost \$21,013,625, or 62.2 percent of the direct field cost budget of \$33,769,964. However, it should be noted that the actual workload of 455,913 was only about 57 percent of the estimated workload of 801,249 cases. Actual cost per case was \$46.89, which was also 62.2 percent of the \$74.07 per case planned for the combined Production and 100% QC work.

Operational Challenges

Due to performance issues and high project risks associated with the Paper-Based Operations Control System, about three weeks prior to the start of the operation, Headquarters staff implemented a contingency plan for a new system to manage and control the Field Verification assignments and cases. The Field Verification Operations Control System, which was developed by the Technologies Management Office, replaced the Paper-Based Operations Control System.

The new control system impacted a number of systems, processes and materials. It was necessary for the Geography Division and the Decennial Systems and Processing Office to modify the mechanism by which they delivered workload information and address data to the control system. Also, following the design of the Census Coverage Measurement control system from which it was adapted, the Field Verification Operations Control System was deployed to the Regional Census Centers rather than the Local Census Offices, creating challenges for both. The Local Census Offices were unable to access the system to manage the operation and produce listing materials. It was also the first and only time during the 2010 Census that the Regional Census Centers were responsible for keying and shipping activities to support a census field operation, which introduced additional risk to the operation.

Additionally, Headquarters staff planned and field staff implemented a 100 percent Quality Control operation to replace the planned sample Quality Control and 100 percent Delete Verification. This Quality Control replan minimized the changes needed to adapt the Census Coverage Measurement Operations Control System into the Field Verification Operations Control System and controlled the risk associated with implementing Field Verification on schedule. The replan required Headquarters staff to revise existing field procedures and training and develop some new procedures and training.

Operational Successes

Through a strong team effort, Headquarters staff overcame challenges and developed and implemented all contingency solutions required for the replan for Field Verification in just six weeks. Among these were rapid development efforts by the Technology Management Office, which included substantial changes to an existing system to develop the operational control system. Also notable were the adaptation Geography Division and the Decennial Systems and Processing Office made to their workflows and products, and the significant revisions the Field Division made to existing procedures and training for field staff. In addition, the Administrative and Management Services Division provided a means for LCO staff to view and print listing materials in the Local Census Offices even though the control system was only accessible in the Regional Census Centers. Specifically, the NRFU Shipping System was utilized to view and print listing pages, Cover/Daily Logs, and Address Binder and Map Pouch Labels.

Local Census Offices management staff was able to adapt to the contingency plans and use modified training and procedures to successfully train all field staff for production and quality control. Management and clerical staff in the Regional Census Centers were able to handle the extra work to support the operation, despite the late changes to the workflow processes. The operation was completed on schedule and under budget.

Data Assessment

The following table provides summary data for the research questions in this report.

Summary Data for the Field Verification Research Questions

Research Questions	Summary Data
1. What were the sources of the inputs going into the Field Verification operation?	<p>Total cases from all Non-ID sources: 329,525 (72.3% of total workload)</p> <ul style="list-style-type: none"> • Be Counted (Non-ID) – 202,335 addresses (44.4% of the total workload) • Telephone Questionnaire Assistance Fulfillment (Non-ID) – 62,751 (13.8%) • Telephone Questionnaire Assistance Interview (Non-ID) – 29,631 (6.5%) • Usual Home Elsewhere from (Non-ID): <ul style="list-style-type: none"> ○ Group Quarters Enumeration – 7,924 (1.7%) ○ Nonresponse Followup – 25,755 (5.6%) ○ Remote Alaska, Update Enumerate, and Remote Update Enumerate – 565 (0.1%) • Multiple Non-ID sources – 564 (0.1%) <p>Coverage Followup Unduplication cases: 126,388 (27.7%)</p> <p>Total Field Verification cases: 455,913</p>

Research Questions	Summary Data	
2. What was the Field Verification workload distribution?	Percentage Distribution of Workload by Regional Census Center	
	%	
	Atlanta	13.4
	Boston – Stateside	6.7
	Boston – Puerto Rico	1.9
	Charlotte	10.6
	Chicago	7.8
	Dallas	9.6
	Denver	6.0
	Detroit	6.0
	Kansas City	5.4
	Los Angeles	6.5
	New York	8.1
	Philadelphia	9.6
	Seattle	8.4
	Distribution of Assignment Areas by Type of Local Census Office	
		%
	Suburban/Rural	51.2
	Urban/Metropolitan	27.0
	Urban/Hard to Count	15.1
	Rural/Remote	5.2
	Puerto Rico	1.5
	Distribution by Type of Enumeration Area	%
	TEA 1: Mailout/Mailback (MO/MB)	91.5
	TEA 2: Update/Leave (U/L) – Stateside	3.8
	TEA 2: U/L – Puerto Rico	1.9
	TEA 3: Remote Update Enumeration (RUE)	0.0
	TEA 4: Remote Alaska (RA)	0.0
TEA 5: Update Enumerate (UE)	0.7	
TEA 6: Military	0.1	
TEA 7: Urban Update/Leave (UU/L)	1.9	
Distribution by State	%	
California	10.1	
New York	8.4	
Texas	7.0	
Florida	6.8	
Pennsylvania	5.2	
All Other States	62.4	

Research Questions	Summary Data
3. What was the production rate (number of cases completed per hour)?	<ul style="list-style-type: none"> • Listers averaged 1.88 cases per hour, which was 0.51 higher than the expected hourly production rate of 1.37. • Quality Control Listers averaged 2.12 cases per hour, which was 0.75 higher than the expected rate of 1.37.
4. What were the results of 100 percent Quality Control (QC) compared to results after production?	Final field status of addresses after production compared with QC: <ul style="list-style-type: none"> • Verify – 221,507 after production; 220,727 after 100% QC • Delete – 153,173 after production; 151,169 after 100% QC • Duplicate – 79,656 after production; 82,794 after 100% QC • “R”– 577 after production; 1,223 after 100% QC
5. What were the final field outcomes ² for address records?	Field Verification final field outcomes of addresses: <ul style="list-style-type: none"> • Verify – 221,153 (48.5% of the total workload) • Delete – 151,604 (33.3%) • Duplicate – 82,936 (18.2%) • “R”– 220 (0.0%)
6. What were the results of the update process to the MAF/TIGER database for address records?	Final MAF/TIGER database status of addresses <ul style="list-style-type: none"> • Verify – 221,066 (48.5% of the total workload) • Delete – 151,592 (33.3%) • Duplicate – 82,772 (18.2%) • Rejected – 263 (0.1%) • No update – 220 (0.0%)

Recommendations

Staff from Headquarters, Regional Census Centers, and the Local Census Offices submitted recommendations for the Field Verification operation.

Budget Planning Recommendation

Regarding the decennial cost modeling, the U.S. Census Bureau should consider the following recommendations:

- For a fully automated 2020 Census, the Field Division Headquarters staff must analyze the impacts on Local Census Offices staffing and tasks early in the decade. There may be significant changes in the budget models, for staff positions and budget assumptions, because of modernized data collection and training techniques that could be used in the 2020 Census.

² Final field outcome was largely determined by the QC action, but when the QC lister did not enter an action code, the Production action code was used. Tables 5.17, Table 5.18 and the associated text on pages 37-38 explain this in further detail.

- Decennial Management Division and Field Division should review the process and assumptions for determining “below-the-line” costs (e.g. per diem and other expenses) to ensure adequate funding for them.

Contingency Planning Recommendations

The Field Verification Subteam made this recommendation regarding contingency planning:

Census managers actively reviewed Project-level risk registers to determine if any project level risks were great enough to create program-level (i.e. 2010 Census) risk. The FV subteam recommended for elevation to a “high” status the risk associated with the operational control system for FV. However, it was determined early in the 2010 FV project life-cycle that the tolerance of high risk for design, development and deployment of the operational control system was acceptable to the organization. Given the eventual necessity of an operational replan just a few weeks before implementation, which required a number of system changes and also necessitated the change to a 100% QC, it is recommended that the organizational tolerance for risk during the 2010 Census should be reviewed, including the timing of the decision to pursue the contingency plan.

Operational Implementation Recommendations

The Field Verification Subteam made the following observations regarding implementation:

- Census Bureau Headquarters should provide more information from upstream processing in terms of workload distribution. For example, the geocodes from Non-ID Field Verification inputs could be provided on a flow basis to assist Field Headquarters.
- Stakeholders should consider an automated Crew Leader Delineation system for the 2020 Field Verification operation as an alternative to the paper-based system used in 2010 Field Verification.

Additionally, based on the dependency Field Verification has on block geocodes derived during Non-ID Processing, it is recommended that Census staff conduct further research to attempt to quantify the number of times a case was incorrectly geocoded during Non-ID Processing, which led to them being subsequently deleted. This research could help determine whether procedures should be changed to search for a case outside of the assigned block.

Field Training and Procedure Recommendations

- Some Listers made errors or took extra time performing work that was not required because of procedures they learned during previous 2010 Census operations. Field Verification Lister training should emphasize that listing procedures from other decennial operations should not be used during Field Verification. One element that could be added to training materials is information that compares Field Verification to other operations and illustrates how Field Verification work is different and requires a specific set of procedures.

- Stakeholders should evaluate the initial training program to determine if experienced workers could be trained via a self-study and job aid instead of classroom training. A field practice exercise could also be included in the initial training program.

Management and Staff Communications Recommendations

- Regarding program cost management, Stakeholders should determine methods to quickly identify the use of staff positions that are not authorized for an operation. Immediate action must be taken to reassign or convert unauthorized staff to a lower hourly pay rate through a personnel action change.
- Regarding Headquarters staff meetings to monitor the operation, the Field Verification Subteam should continue their meetings throughout the operation. For 2010 Field Verification, the subteam stopped meeting after Field Division began implementation. However, once implementation began the Headquarters staff attended the daily Operational Status meetings, of which Field Verification was a part.
- Develop a plan/process for reconciliation of AAs that will provide sufficient tracking of shipping from the field offices and receipt at NPC to ensure they can account for all binders. The process should include the ability to determine from system reports any missing binders and the ability to trace their source and status.

1. 2010 Field Verification Assessment Introduction

This section states the scope and purpose of this assessment and identifies the document stakeholders. It also provides background information and an operational overview for the Field Verification (FV) operation.

1.1 Scope and Purpose of this Assessment

The purpose of the *2010 Census Field Verification Operational Assessment* is to provide results, statistics, and analyses from the 2010 Census FV operation. Section 5 of this assessment answers the research questions that were developed by the 2010 FV Subteam and approved by the Address List Development Operations Implementation Team and the Census Integration Group/Executive Steering Committee.

The assessment provides an overview of the 2010 FV operation and a background of how the operation has evolved since Census 2000. This assessment covers the details of each aspect of the 2010 FV operation:

- Workloads and workflow
- Schedule and cost
- Automation implementation results
- Staffing and training
- Findings from debriefings and observations
- Lessons learned

This assessment does not provide detailed operational information and previously documented decisions, but provides references to the appropriate documents for such information. The References section in this report contains a list of reference documents, including edition dates and authors.

1.2 Intended Audience

This document is intended for the following users:

- Address List Development Operations Integration Team (ALD OIT)
- Census Integration Group/Executive Steering Committee (CIG/ESC)
- Decennial Leadership Group (DLG)
- Additional internal stakeholders, such as program managers and subject matter experts involved in the planning and implementation of the 2010 FV operation and the 2020 Census
- External stakeholders

2. Background

This topic summarizes the Census 2000 FV operation, the cancellation of the FV operation during the 2008 Census Dress Rehearsal, changes made for the 2010 FV operation, planning, development, and contingency plans implemented for 2010 FV, and similarities and differences between 2000 FV and 2010 FV.

Census 2000 Field Verification

According to the *Census 2000 Assessment of Field Verification*, the 2000 FV operation had two sources of address inputs. The first, similar to 2010 FV, was geocoded addresses from Non-ID Processing that did not match an address record in the census inventory. The second was addresses deleted in two or more previous operations, but the U.S. Census Bureau received a mail return (“double deletes” with a mail return).

The major objectives of the Census 2000 FV operation were to:

- Verify potential adds to the census address inventory
- Delete non-existent addresses
- Identify addresses as duplicates of other valid records

The operation was conducted in three waves from July 31 - August 22, 2000. A total of 884,896 cases went to 2000 FV, and the operation was conducted in 420,053 Assignment Areas (AAs). After the AAs were completed, the Local Census Office (LCO) staff keyed the FV results into the Operations Control System 2000 (OCS 2000). The Decennial Systems and Contract Management Office (DSCMO) and Geography Division (GEO) used the information to update the census address inventory.

2008 Census Dress Rehearsal Field Verification

FV was not in scope for the 2004 or 2006 Census Test efforts, but it was intended that FV would be included in the 2008 Census Dress Rehearsal. However, in late 2007, FV was de-scoped due to lack of Fiscal Year 2008 funding, along with the Non-ID operations that contribute addresses to the universe. Reasons for the reduced scope and canceled operations are detailed in 2008 Census Dress Rehearsal Memoranda Series No. 50, *Reduced Scope of the 2008 Census Dress Rehearsal and a One-Month Delay of Census Day*. The operational planning for FV dress rehearsal was used as the basis for planning the 2010 FV operation.

2010 FV Planning and Development

In planning and developing 2010 FV, Census Bureau Headquarters (HQ) staff used a structured approach to support key project management principles:

- Budget management
- Schedule management

- Risk management
- Document management (including materials for training field staff)
- Systems management (development and testing)

Two interdivisional teams were directly involved in the planning, development, and implementation of 2010 FV: ALD OIT and the 2010 FV Subteam, which reported to the ALD OIT. These teams followed formal project management principles and processes while planning activities for 2010 FV.

The 2010 FV Subteam planned the 2010 FV operation through development of a detailed operational plan and the execution of several activities to ensure readiness of all components and systems for 2010 FV.

The ALD OIT tracked the development and production of Integrated System Team (IST) deliverables related to 2010 FV. The team reviewed and ensured the IST functional requirements were appropriately defined to meet customer needs for each system. Software requirements were delivered to development teams.

Changes for the 2010 Field Verification Operation

According to the *2010 Field Verification Assessment Study Plan*, there were several significant changes made to 2010 FV from the 2000 operation:

- Duplicate addresses identified within the same block would be linked rather than simply removed from the census inventory after the address was marked duplicate by the Lister.
- A separate Quality Control (QC) staff would conduct a Dependent Quality Control (DQC) check of the production Lister work. Specifically, QC Listers were to examine a ten percent sample of verified addresses and conduct 100 percent Delete Verification (DV), which was a verification of all delete and duplicate cases. Additionally, the plan was to conduct Final Delete Verification (FDV), an operation designed to recheck addresses that were verified by the production Lister but then deleted by the QC Lister. The QC plan was later modified when the contingency plans for 2010 FV were implemented.

Contingency Plans for 2010 Field Verification

In June 2010, Census Bureau HQ management decided to implement two major contingency plans for 2010 FV:

- Field Verification Operations Control System (FVOCS) replaced the Paper-Based Operations Control System (PBOCS) because of performance issues and high project risks for 2010 FV as well as the other operations still using PBOCS.
- The 2010 FV QC plan was changed from a sample DQC to a 100 percent DQC of FV production cases; the DV, FDV, Office Review, and Repair components were eliminated

from the QC program. This decision minimized the changes needed to adapt the Continuous Measurement Operations Control System (CMOCS) for use in 2010 FV and the 100 percent dependent quality control controlled the risk associated with implementing 2010 FV on schedule.

The following changes were made to implement these contingency plans:

- CMOCS was modified to create FVOCS.
- FVOCS was deployed to the Regional Census Centers (RCCs) rather than the LCOs, which created several new workflow processes.
- Modifications were made to 2010 FV procedures and training for both office and field staff because of the 100 percent DQC canvass and elimination of DV, FDV, Office Review, and Repair.
- LCOs accessed Portable Document Format (PDF) files via the Nonresponse Followup (NRFU) Shipping System to print assignment materials for inclusion in the Field Assignment (FA) Binders.

The contingency plans had several impacts on 2010 FV preparation and implementation activities, some of which required completion in a few weeks or, in some cases, a few days:

- Technologies Management Office (TMO) development teams modified existing software to create FVOCS, tested the software, created a training database, and deployed the application.
- GEO and DSPO modified existing processes and systems to account for the new data transfers and testing with TMO. This included a new approach to universe creation where DSPO received input from both DSSD and GEO for the housing unit duplication cases in order to create the final universe for the operation as opposed to just GEO.
- The Address Coverage Operations Branch (ACOB) staff in the Field Division (FLD) created the *2010 Census FV Tracking Spreadsheet*, which was a stand-alone document used to track all AAs in FV.
- FLD HQ managers prepared briefing materials on the contingency plans and shared them with RCC managers via conference calls and Operations (Ops) Logs.
- ACOB identified all changes needed in existing manuals, training guides, and related materials for all staff levels. These changes were implemented by rewriting portions of documents, writing new documents, preparing errata spreadsheets with revisions to be made manually by LCOs, and distributing revised materials and revision instructions via Ops Logs.

- National Processing Center (NPC) printed both production and QC contingency training materials and sent them to all LCOs. The LCOs removed the old materials from their stored kits and inserted the contingency materials. Contingency materials were color coded so LCO staff could more easily determine whether or not someone was using the correct materials.
- NPC assembled and distributed additional QC Lister trainee and QC Lister supply kits to the LCOs needing them because of increased QC staffing. NPC prepared and shipped the kits in a compressed time frame.
- RCC staff was required to adjust to new workflow processes to handle additional keying and shipping activities that LCO staff would have carried out under the normal course of operations.
- LCO staff had to adjust to new workflow processes, such as printing listing materials from PDF files using the AMSD application that had formerly been intended exclusively for Non-Response Follow-up operational activities. Another example is the change in shipping destinations for completed census materials (i.e., RCCs instead of NPC) and providing data to the RCCs each day as part of assignment control activities in the field.

2010 Field Verification Operation Implementation

The 2010 Census FV fieldwork occurred July 21 through September 7, 2010. The 2010 FV was managed from 487 stateside and seven Puerto Rico LCOs. The expected production workload was 801,248 housing units (HUs); it was anticipated that the workload would be split evenly between the two sources: potential new addresses from Non-ID Processing and potentially duplicate housing units identified during person matching conducted for the Coverage Followup operation.

The objectives of the 2010 FV operation were to:

- Verify the existence of respondent-provided addresses that did not match to block-geocoded addresses already in the decennial census inventory. The U.S. Census Bureau primarily obtained these addresses via the Be Counted Program, Telephone Questionnaire Assistance (TQA) Fulfillment, or TQA Interview operations. Some addresses were also derived from “usual home elsewhere” (UHE) responses³ from field enumeration operations, including:
 - Group Quarters Enumeration (GQE)

³ A UHE response was generated when a living quarters was occupied by one or more people who had a usual residence at another location. A UHE unit was classified as vacant and the residents were counted at their usual residence, for which the address was sent to Non-ID Processing to be verified. The address information from In-Mover responses, which occurred when a person moved into a living quarters after Census Day, was also sent to Non-ID Processing. For the purposes of this assessment, both UHE and In-Mover responses are collectively referred to as ‘UHE responses.’

- Remote Alaska (RA)
- Update Enumerate (UE)
- Remote Update Enumerate (RUE)
- NRFU

Only the addresses from these operations that did not match an existing Master Address File/Topologically Integrated Geographic Encoding and Referencing database (MAF/TIGER database or MTdb) record, but could be assigned to a block, were included in the FV universe. For a complete explanation of these inputs, refer to the *2010 Census Detailed Operational Plan for the Non-ID Processing Operation*.

- Delete non-existent addresses
- Provide a final determination about potentially duplicate HUs within the same block identified as part of CFU Unduplication matching.

Crew Leader District Delineation

Before Crew Leader training in July 2010, LCO staff manually delineated Crew Leader Districts (CLDs) using large format grid maps and delineation worksheets. The LCOs attempted to keep the number of AAs about the same for each CLD. RCC staff keyed the delineation results into the FVOCS.

Production and Quality Control Phases

The 2010 FV fieldwork consisted of a production phase and a QC phase. The following subtopics describe each phase.

Field Verification Production

For the 2010 FV operation, Listers received FA Binders containing one or more AAs with Address Listing Pages, Cover/Daily Logs, and maps. The listing pages contained all known addresses in the block to aid the Lister in locating addresses and identifying duplicates.

The addresses that needed verification were identified on the listing pages. Using provided maps, Listers attempted to locate each address identified for 2010 FV and conduct an interview with an occupant to confirm address information in the assigned block. Listers then verified, deleted, or designated the address as a duplicate. Listers recorded map spots of any verified addresses that did not already have one.

Field Verification Quality Control

All 2010 FV assignments were subjected to a 100 percent QC process. A separate staff of QC Listers validated every 2010 FV address to ensure that the original Listers had accurately worked the addresses.

Verified addresses that went through production and QC were retained for subsequent census processing. Addresses that were deemed to be non-existent or duplicates of other census addresses were subsequently removed from the Census.

Keying and Shipping

After production and QC, the LCOs shipped completed FA Binders with annotated Address Listing Pages to the RCCs on a flow basis. RCC staff keyed the 2010 FV results into FVOCS, also on a flow. The TMO pulled the data each day and provided address record status updates to the Decennial Systems and Processing Office (DSPO) to update the Universe Control and Management (UCM) system with status and duplicate linkages. At the end of the operation, in a one-time delivery, DSPO passed the updates on to GEO, who updated the MTdb.

Upon completion of keying that included a QC component, the RCC checked out and shipped the FA Binders to the NPC on a flow basis. NPC separated maps out of the binders and checked the AAs into the Automated Tracking and Control System (ATAC). NPC scanned the maps and stored the associated digital images electronically. Afterward, the maps were stored in the 2010 Census Library, but not reinserted into the AA binders also stored there.

Census 2000 and 2010 Census Field Verification Operations – Similarities and Differences

Even though the major objectives of the Census 2000 FV operation were essentially the same as the 2010 FV objectives, there were differences in the operational scope, processes, and procedural approaches. Table 2.1 summarizes the similarities and differences between the FV operations in 2000 and 2010. Census 2000 FV did not include a separate staff for the QC operation; therefore, QC data from Census 2000 FV are not available or they are included in the production figures. All figures in Table 2.1 include stateside and Puerto Rico data.

Table 2.1: Similarities and Differences between 2000 and 2010 FV Operations

Category	2000 FV Actual	2010 FV Baseline	2010 FV Actual	Explanation
Dates of Fieldwork (Including QC)	7/31/00-8/22/00 (23 days)	8/6/10-9/8/10 (34 days)	7/21/10- 9/8/10 (50 days)	A few LCOs started early to allow for testing of FVOCS and ensure system readiness for all LCOs.

Category	2000 FV Actual	2010 FV Baseline	2010 FV Actual	Explanation
Estimated Production Workloads (HUs)	990,000	801,248	421,759	2010 baseline figure was based on 2000 Non-ID inputs and the Decennial Statistical Studies Division (DSSD) estimates for the CFU Unduplication workload. Because of the timing of the replan, the actual figures for the initial workload were already known.
Actual Production Workloads	Three waves (884,896 cases in 419,953 AAs)	One wave 801,249 cases in 400,625 AAs	Initial workload: 421,759 Supplemental: 34,154 Total: 455,913 cases in 267,183 AAs	The initial workload was derived from the Non-ID FV cutoff (5/28/10) and Wave 9a of CFU Unduplication matching. The supplemental workload contained additional Non-ID inputs up to the end of processing, on 8/4/10.
Average Cases (HUs) per AA	2.1	2.0	1.7	Assumption for the baseline plan was an average of two cases per AA based on the expected rate as indicated in the Census 2000 FV field procedures. Actual number of cases per AA was lower than anticipated, but this did not have a significant operational impact.

Category	2000 FV Actual	2010 FV Baseline	2010 FV Actual	Explanation
Actual QC Workload (HUs)	Unknown	337,276	455,913	In Census 2000, the QC workload was an unknown amount since it was a series of manually-derived samples from the production workload. For 201 FV, the baseline plan was a sample QC; actual plan was 100% QC.
Hourly Production Rate - Listing	Unknown	Expected – 1.37 cases per hour	Actual – 1.88 cases per hour	Actual production rate from Census 2000 is not recorded in the 2000 FV Assessment or documented elsewhere.
Hourly Production Rate - QC	Not applicable; QC was not a separate operation in 2000; QC data were included in production data	Expected – 1.37 cases per hour	Actual – 2.12 cases per hour	Expected QC rate was the same as Production because the procedures were identical. Actual rate was higher than expected due to experienced staff from previous 2010 Census operations.
Field Budget	\$18,397,364	\$39,297,287	\$33,769,964	The final “replan” budget was based on the actual workload.
Actual Field Cost	\$16,061,734 (92.6% of budget)	Not Applicable	\$21,013,625 (62.2% of budget)	Workload was only about 57% of the expected amount; production rate exceeded estimates.

Category	2000 FV Actual	2010 FV Baseline	2010 FV Actual	Explanation
Inputs	<p>1) Geocoded addresses from Non-ID Processing that did not match an address record in the census inventory</p> <p>2) Addresses deleted in two or more previous operations, but for which the Census Bureau received a mail return</p>	<p>1) Geocoded addresses from Non- ID Processing that did not match an address record in the census inventory</p> <p>2) Suspected within-block duplicates from CFU Unduplication matching</p>	No change from 2010 baseline	<p>While both 2000 and 2010 FV contained input from Non-ID Processing, the input for the remaining workloads differed. For 2010, it was no longer necessary to account for double deletes because of DV, which occurred during each preceding 2010 field operation. However, person-matching routines developed since the 2000 Census for the CFU operation provided a new source of work: potential within-block duplicate HUs.</p>

Category	2000 FV Actual	2010 FV Baseline	2010 FV Actual	Explanation
Handling Duplicate Records	No duplicate linkage in field, so no linkage in the DMAF or MAF. ⁴	When marking a record as a duplicate in the field, the Lister provided the line number on the listing pages of the record it duplicated. This information was passed on to HQ processing so that duplicates could be linked during UCM and MTdb update processing.	No change from baseline	In 2000 FV, suspected duplicates were marked with a separate action code (D2) on the listing page, but the MAF update process was the same as it was for a Delete (D1); both were considered a delete for purposes of updating the MAF. This meant that the duplicate record could be “resurrected” later (e.g., via the Delivery Sequence File refresh) and perpetuate the duplication. This was remedied in 2010 FV by linking duplicates in the MAF.
QC Procedures	Crew Leaders completed QC on manually selected samples within an FA.	10% sample QC of all verified records; 100% DV; FDV for any cases where QC deleted a record verified by a production lister.	100% QC of every record listed by production staff, performed by a separate QC staff.	The 100% QC minimized the changes needed for FVOCS and controlled the risk associated with implementing FV on schedule.

⁴ The Decennial Master Address File (DMAF) in 2000 was similar to the UCM in 2010. A primary purpose of both systems was to maintain the complete universe of census addresses, and control and track enumeration operations. Differences between the two systems reflect the expanded services provided by the corporate MAF, and advanced technologies and methodologies of the 2010 Census.

Category	2000 FV Actual	2010 FV Baseline	2010 FV Actual	Explanation
Office Review Process	Office clerks used a checklist to review registers for missing data and unreadable entries.	Office review of all FA Binders ensured that every FV case had an action code and, where applicable, duplicate linkage. Any binder failing office review was sent back to the QC staff for repair. Cases were sent through office review again upon return from repair.	No office review or repair	Because there was 100% QC in 2010 and Crew Leaders were instructed to review binders, an office review was deemed unnecessary. This approach ensured there would be sufficient time for shipping the AAs from the LCOs to the RCCs so the FV results could be keyed.
Outputs	The keyed field action (verify, delete, or duplicate) was passed on to GEO and DSCMO.	Status information for each FV case including the action code (verify, delete, or duplicate) and, where applicable, duplicate linkage information.	No change from baseline	In 2000, there was no duplicate linkage information to pass back to HQ processing. In 2010 FV, while the field staff entered the line number of the survivor record, FVOCS output contained the surviving MAF Identifier (MAFID) for the duplicate record so the duplicates could be linked in both UCM and the MTdb.

Sources: *Census 2000 Program Master Plan for Matching/Geocoding Non-MAF-ID Questionnaires*, December 2000; *Assessment of Field Verification*, July 24, 2001; 2000 and 2010 Cost and Progress Reports; *2010 Census Detailed Operational Plan for the Field Verification Operation*, August 16, 2010.

Census 2000 Recommendations Implemented in 2010 Field Verification

A recommendation from the *Census 2000 Assessment of Field Verification* was to redesign the FV procedures to capture enough information to link duplicate addresses so the census inventory could be updated. The MAF would then be updated to allow the corrections to apply to future operations beyond the decennial census.

This recommendation was implemented in 2010 with new procedures for 2010 FV Listers. After identifying a duplicate address, the 2010 FV Lister provided the line number on the listing page of the address within the AA/block that was to be retained. The linkage between the two records was provided for subsequent address update processing.

3. Methodology

This section describes the files used by DSSD in tabulating the assessment results and the types of addresses profiled in the results.

Files Used for Tabulating Assessment Results

Shortly after the 2010 FV operation ended, DSSD received the following 2010 FV specific files for use in tabulating assessment results:

- TMO provided a file to DSSD containing the FVOCS keying results, which included the production, QC, and final field results for each address.
- GEO provided 2010 FV Master Address File (MAF) Extract files that contained address information, geography, and the final FV MTdb status for FV universe records to DSSD.
- GEO provided an address update table that contained only the addresses that were updated in the MTdb for the 2010 FV operation to DSSD. (This file did not include records rejected from GEO processing.)
- GEO delivered a file containing tallies of the 2010 FV actions and rejects in the MTdb at the state and county level to DSSD.
- GEO provided a list of MAFIDs of the address records in the supplemental 2010 FV workload to DSSD.
- DSSD provided a list of MAFIDs of the address records in the initial 2010 FV workload from a CFU Unduplication source.

In addition to the files listed above, DSSD used the 2010 Final Tabulation MAF Extract files from GEO for much of the analysis (not to be confused with the 2010 FV MAF Extract files listed above). Those extract files contained address information, geography (official tabulation block codes), and the final MTdb status for all decennial records. The files also contained universe and operations flags that were used for tabulations of the characteristics of interest.

Identifying the 2010 FV Universe and Source Inputs

The universe of the 2010 FV operation workload was the set of HUs to be worked by Listers that appeared on the 2010 FV Address Listing Pages. The 2010 FV universe was comprised of three main components:

- Initial workload inputs from Non-ID sources.
- Initial workload inputs from a CFU Unduplication source.
- Supplemental workload inputs from Non-ID sources.

A number of files were used in order to identify the addresses in the 2010 FV workload. The 2010 FV MAF Extract files and a file containing a list of MAFIDs in the supplemental 2010 FV workload, which was provided by GEO, was used to distinguish the initial 2010 FV workload inputs from Non-ID input sources (CFUFVUNV=2 flag on the MAF Extract) from the supplemental 2010 FV workload inputs from Non-ID sources. A file containing a list of MAFIDs of the CFU Unduplication inputs, which was provided by DSSD, was used to distinguish the CFU Unduplication inputs from the Non-ID inputs into the 2010 FV workload.

Types of Addresses Profiled in the Assessment Results

DSSD evaluated 2010 FV addresses by type of address information (i.e. city-style, rural route, etc) contained on the listing pages. The addresses were defined primarily to categorize their potential to be located by Listers. Because the location house number and street name fields on the MAF were used first when populating the listing pages (while location ZIP code was not included) these fields were used in the criteria for determining a complete city-style address.⁵

DSSD classified addresses into six categories, based on the highest criteria met:

- Complete city-style-stateside: Included all stateside units that had complete city-style addresses (house number and street name).
- Complete city-style-Puerto Rico: Included all Puerto Rico units that had complete city-style addresses (house number and street name or urbanization name, or apartment complex name and structure ID).
- Complete rural route: Included units that did not have a complete city-style address but did have a complete rural route address, such as “Rural Route 2, Box 3”.
- Complete P.O. Box: Included units without a complete city-style or a complete rural route address, but did have a complete P.O. Box address, such as “P.O. Box 515”.
- Incomplete address: Included units that had some address information but without a complete address of any type.
- No address information: Included units that were missing house number, street name, Rural Route, and P.O. Box information.

Addresses were further delineated by whether or not they had had a physical/location description provided during a census field operation (e.g., brick house, blue shutters).

⁵ ZIP code was included to identify those address records as valid city-style addresses for mailing, as mailing information was used in filling the FV Address Listing Pages if location information was not present. In the absence of a block, ZIP code was required for matching and was important for accurate geocoding.

Type of Geography Used to Tabulate Data

2010 FV fieldwork was conducted using 2010 collection geography, which was defined by the 2010 collection state, collection county, and collection block fields on the MAF. However, 2010 tabulation geography was used for the tallies in this assessment for the purpose of consistency across assessments.

Number of Units at Basic Street Address

The number of units at a basic street address figures, featured in Tables 5.7, 5.8, 5.9, 5.22, 5.23, 5.24 and 5.25 were calculated using only the addresses eligible for decennial purposes (“in-census” records) at the time of the Final Tabulation universe delivery. This calculation included 2010 FV deletes for the purpose of evaluating the address characteristics of the original workload.

Distinctions were made in the definitions of a basic street address for stateside and Puerto Rico addresses due to the variation in address styles in those areas. A stateside basic street address was defined by a distinct house number and street name, in addition to other assorted street name prefixes and suffixes (e.g., east, old, bypass, etc.), within a collection block and ZIP code.

For Puerto Rico, a basic street address was defined three ways, because, unlike stateside, it is likely for address records that are part of multi-unit structures to have a filled apartment complex field in the MAF. The eligible Puerto Rico addresses in the Final Tabulation universe were allocated into three distinct datasets:

- Addresses with the apartment complex *and* building ID fields filled.
- Addresses with the apartment complex field filled and the building ID field blank.
- All remaining addresses.

A basic street address for the second dataset was defined by an apartment complex name within a collection block. The definition of a basic street address for the third and final dataset paralleled that of the stateside definition, with the exception of including Puerto Rico specific address fields (urbanization, ramal, and carretera).

4. Limitations

This section describes the limitations of the 2010 FV data analysis and advises stakeholders on interpreting data.

Analysis Covers Only Field Verification Results

The analysis of 2010 FV addresses from Non-ID Processing sources presented in this assessment includes only the verification of geocoded addresses that did not match to an address in the census universe. The data cannot be used to draw conclusions about any other components of the Non-ID questionnaire process or the CFU Unduplication process. For example, Table 5.26 in Section 5 shows the final 2010 FV field outcomes by the type of address shown on the 2010 FV Address Listing Pages. However, these results do not allow one to draw any conclusions about the Census Bureau's overall ability to geocode and match non city-style addresses. The other components of the Non-ID and CFU Unduplication matching processes are beyond the scope of this assessment.

Comparison of Results to Previous Censuses

The Types of Enumeration Areas (TEAs), enumeration methodologies, and analysis variables for the 2010 Census may differ from previous censuses. Caution should be taken when comparing results across censuses.

Type of Address Classification

The types of addresses featured in Tables 5.6 and 5.26 were determined by looking first at the location house number and street name fields (and comparable fields for Puerto Rico) in the MAF. If both of those fields were filled for a given address record, it was classified as a complete city-style address. However, for a particular record, it was possible that there may have been complete address information contained in one of those fields in the MAF and not the other due to inconsistencies in the way the form was filled out and/or data capture issues when the record was originally added to the MAF. Therefore, in this scenario, a complete house number and street name could have been contained in the street name field or location description field on the 2010 FV Address Listing Pages, and in turn, the number of city-style addresses in the 2010 FV workload could have been understated. On the other hand, the number of city-style addresses could potentially have been overstated if the information in the address fields was invalid or incomplete, as presence of data in the address fields in the MAF was the determining factor for the address type classification.

Dependency on Geocodes from Non-ID Processing

FV universe inputs from Non-ID Processing sources were dependent on the geocode that is provided in-house through automated software or clerical review. The FV operation was designed to confirm that a given address existed in the particular block to which it was geocoded. There have always been concerns that addresses existed, but in different blocks than those shown in the MAF and consequently on the FV Address Listing Pages. Those addresses that existed outside of the block in which they were shown on the listing pages were to be given a delete action by the Lister in the field and were subsequently deleted from the Census. (Note that these addresses remained in the MAF.) Therefore, if a Lister identified an existing address in an adjacent block, they had no option but to supply a delete action to the address they knew existed outside of the geocoded block.

Determination of the Number of Units at a Basic Street Address

A number of algorithms using various variables and hierarchies were considered in determining the number of units at each basic street address in the FV workload. Most of the methods yielded similar results. The decision was made to keep the definition of a basic street address as simple as possible by examining the location house number, street name, and street name prefixes and suffixes (along with urbanization, ramal, and carratera for Puerto Rico) of a particular address record. In addition to these address fields, apartment complex name and building ID number were also included in the basic street address definition for Puerto Rico.

If two or more address records in the same collection block had identical address information based on the criteria described in the Methodology Section above, they were considered part of the same basic street address, and thus, the same structure. If an address record that was actually part of a multi-unit structure on the ground had missing address information in the MAF it is unlikely that it would have matched to its counterparts using this method. Therefore, there could potentially be an undercount of the number and size of multi-unit structures if certain address information is missing from the MAF.

5. Results

This section presents the results of the 2010 FV operation focusing on the six research questions and six additional questions related to the operational components, such as workloads, budgets, and schedules.

The six research questions are:

1. What were the sources of the inputs going into the 2010 Field Verification operation?
2. What was the 2010 Field Verification workload distribution?
3. What was the production rate (cases completed per hour)?
4. What were the results of 100 percent QC compared to results after production?
5. What were the final field outcomes for address records?
6. What were the results of the MTdb update process for address records?
 - How many records were rejected and what were the reasons?
 - What were the final MTdb action codes?

Sections 5.2, 5.3, 5.4, 5.5, 5.6, and 5.7 present the results of the analysis of 2010 FV data and provide answers to each of the six research questions. Data are presented in tabular format with accompanying explanations and insights into the data analysis. DSSD staff collected assessment results, conducted quantitative and qualitative analyses, and prepared all data tables that appear in these sections.

Sections 5.8, 5.9, 5.10, 5.11, 5.12, and 5.13 provide answers to the following questions:

1. What was the expected workload and how did that compare with the actual workload?
 - What were the impacts to the program?
 - What was the productivity rate (cases per hour)?
 - What were the workflows?
2. How does the baselined schedule compare with the actual start and finish dates and what were the impacts to the program?
3. What was the expected budget and how did that compare with the actual cost and what were the impacts to the program?
4. What was the expected staffing and how did that compare with the actual staffing and what were the impacts to the program?
5. What were the major findings from debriefings and observations?
6. What were the key lessons learned and recommendations for the future?

5.1 Scope of the Assessment Data

To evaluate the 2010 Census FV operation, the following five areas were examined:

- Data inputs
- Production outcomes
- 100 percent QC outcomes
- Final MTdb outcomes
- Keying outcomes

The 2010 FV workload universe was the set of addresses that appeared on the initial 2010 FV Address Listing Pages, along with the supplemental 2010 FV cases that were worked and tracked separately from the original workload.

5.2 Research Question 1: What were the sources of the inputs going into the Field Verification operation?

The 2010 FV workload was comprised of address records from Non-ID Processing and CFU Unduplication sources. The Non-ID inputs included addresses from these operations:

- Be Counted
- TQA Fulfillment
- TQA Interview
- UHE responses from:
 - GQE
 - NRFU
 - RA
 - RUE
 - UE

For the UHE responses from the NRFU, RA, RUE, and UE operations, the D-1(E), *Enumerator Questionnaire*, contained several checkboxes in the “Interview Summary” section that allowed Enumerators to indicate if the respondents had a UHE or had moved into the HU after Census Day. A similar checkbox was included in the D-20, *Individual Census Report*, form to indicate GQE UHE responses. The checkboxes were used during response processing to determine if these interviews were Non-ID cases. If either one of the boxes for UHE was checked, the respondent was asked to supply the address they occupied on Census Day. DSPO forwarded those addresses to GEO.

Non-ID Processing attempted to match the respondent-supplied addresses to “in-census” records on the MTdb, and if unable to do so (and a block-level geocode could be obtained), the address was sent to FV. However, if a respondent-supplied address from a Non-ID source matched to an MTdb record that was *not* “in-census,” that record was sent to FV.

Refer to Table 5.1 for the distribution of inputs into 2010 FV for stateside and Puerto Rico.

Table 5.1: Distribution of Inputs into 2010 FV

Input Source	Stateside		Puerto Rico		Total	
	No.	%	No.	%	No.	%
Be Counted (Non-ID)	198,518	44.4	3,817	43.3	202,335	44.4
TQA Fulfillment (Non-ID)	62,432	14.0	319	3.6	62,751	13.8
TQA Interview (Non-ID)	29,513	6.6	118	1.3	29,631	6.5
GQE UHE (Non-ID)	7,871	1.8	53	0.6	7,924	1.7
NRFU UHE (Non-ID)	25,627	5.7	128	1.5	25,755	5.6
RA, UE, or RUE UHE (Non-ID)	565	0.1	0	0.0	565	0.1
Multiple Non-ID Sources	564	0.1	0	0.0	564	0.1
Total Non-ID	325,090	72.7	4,435	50.4	329,525	72.3
CFU Unduplication	122,016	27.3	4,372	49.6	126,388	27.7
Total	447,106	100.0	8,807	100.0	455,913	100.0

Source: 2010 Census Final Tabulation MAF Extract provided by GEO

Most of the 2010 FV workload inputs came from Non-ID sources (72.3 percent). As expected, addresses from Be Counted and TQA sources formed the most prevalent Non-ID input sources at 44.4 and 20.3 percent (13.8 percent from TQA Fulfillment and 6.5 percent from TQA Interview) of the total 2010 FV workload, respectively. These were the top two Non-ID inputs for the 2000 FV operation, as well. 2010 FV address inputs from CFU Unduplication accounted for 27.7 percent of the total workload.

Refer to Table 5.2 for the tallies and percentages of initial and supplemental Non-ID inputs compared with the CFU Unduplication inputs, separated by stateside and Puerto Rico. The final 2010 FV workload, including the supplemental cases, consisted of 455,913 addresses, of which 447,106 were stateside and 8,807 were in Puerto Rico.

Table 5.2: Distribution of Inputs into 2010 FV: Non-ID and CFU Unduplication

	Initial Non-ID		Supplemental Non-ID		CFU Unduplication		Total	
	No.	%	No.	%	No.	%	No.	%
Stateside	291,160	65.1	33,930	7.6	122,016	27.3	447,106	100.0
Puerto Rico	4,211	47.8	224	2.5	4,372	49.6	8,807	100.0
Total	295,371	64.8	34,154	7.5	126,388	27.7	455,913	100.0

Source: 2010 Census Final Tabulation MAF Extract provided by GEO

Note: Some percentage totals do not equal 100.0 due to rounding

Analysis of the 2010 FV Workload

Table 5.1 shows that 72.7 percent of the stateside 2010 FV workload was from a Non-ID input source, while the other 27.3 percent of the addresses were potential duplicates from CFU Unduplication processing. In comparison to stateside, the Puerto Rico workload from Non-ID sources was more evenly balanced with the CFU-source workload (50.4 percent and 49.6 percent, respectively). Proportionately, TQA contributed significantly less work to the Puerto Rico Non-ID workload, as compared to stateside Non-ID cases. Over 43 percent of the Puerto Rico workload was from a Be Counted source, but only about 7 percent of the total cases came from all other Non-ID sources.

Estimated and Actual Workloads

The estimated workload for 2010 FV was 801,249 addresses, as shown in Table 5.3.

Table 5.3: Distribution of Estimated Inputs into 2010 FV for both Stateside and Puerto Rico

Input Source	Estimated Workload	%
Non-ID	399,677	49.9
CFU Unduplication	401,572	50.1
Total	801,249	100.0

Source: ALD OIT Operational Status Report

Overall, the actual 2010 FV workload of 455,913 HUs was only 56.9 percent of the expected workload. The difference between the actual (126,388) and estimated (401,572) workload from a CFU Unduplication source contributed to most of the variance between the total estimated (801,249) and actual (455,913) FV workload. The CFU Unduplication workload estimation

was mainly based on 2006 Housing Unit Verification (HUV) testing data, where an estimated CFU match rate, distribution of matches and types, and data capture rates and assumptions were developed. The variance between the estimated and actual CFU Unduplication workload can likely be attributed to NRFU returns being processed later than expected and better person-matching than expected.

Analysis of the Supplemental Workload

Table 5.4 shows the numbers and percentages of input sources for the 34,154 supplemental cases that were in 2010 FV.

Table 5.4: Distribution of Supplemental Non-ID Inputs into 2010 FV

Input Source	Stateside		Puerto Rico		Total	
	No.	%	No.	%	No.	%
Be Counted (Non-ID)	1,940	5.7	68	30.4	2,008	5.9
TQA Fulfillment (Non-ID)	478	1.4	6	2.7	484	1.4
TQA Interview (Non-ID)	5,664	16.7	27	12.1	5,691	16.7
GQE UHE (Non-ID)	603	1.8	0	0.0	603	1.8
NRFU UHE (Non-ID)	25,156	74.1	123	54.9	25,279	74.0
RA, UE, or RUE UHE (Non-ID)	77	0.2	0	0.0	77	0.2
Multiple Non-ID Sources	12	0.0	0	0.0	12	0.0
Total	33,930	100.0	224	100.0	34,154	100.0

Source: 2010 Census Final Tabulation MAF Extract provided by GEO

Note: Some percentage totals do not equal 100.0 due to rounding.

The supplemental workload delivery resulted mainly from UHE Non-ID inputs from the NRFU operation, which were processed later than expected and did not make the cut-off date for the original delivery. Thus, 74.1 percent of the supplemental workload was comprised of addresses from the NRFU UHE Non-ID source. That source was followed by the TQA Interview input source, which accounted for 16.7 percent of the supplemental Non-ID workload.

Analysis of the Multiple Non-ID Sources

A total of 564 address records had multiple Non-ID sources. These records were identified through GEO or clerical matching. Table 5.5 shows the distribution of these 564 addresses with respect to input source.

Table 5.5: 2010 FV Distributions of Addresses with Multiple Non-ID Sources

Input Source	No.	%
Be Counted and GQE UHE	114	20.2
Be Counted and NRFU UHE	106	18.8
TQA Fulfillment and TQA Interview	86	15.2
Be Counted and TQA Fulfillment	82	14.5
Be Counted and TQA Interview	62	11.0
TQA Interview and NRFU UHE	39	6.9
TQA Fulfillment and NRFU UHE	37	6.6
GQE UHE and NRFU UHE	12	2.1
Records with more than two sources	11	2.0
TQA Fulfillment and GQE UHE	7	1.2
TQA Interview and GQE UHE	6	1.1
TQA Fulfillment and RA/UE/RUE UHE	1	0.2
TQA Interview and RA/UE/RUE UHE	1	0.2
Total	564	100.0

Source: 2010 Census Final Tabulation MAF Extract provided by GEO

Of the 564 records, 553 had two different Non-ID sources and the other 11 had at least three Non-ID sources. The most common combinations of Non-ID sources were Be Counted and GQE UHE (114 occurrences), Be Counted and NRFU UHE (106 occurrences), TQA Fulfillment and TQA Interview (86 occurrences), and Be Counted and TQA Fulfillment (82 occurrences). Examples of what may have occurred in these situations include:

- A respondent filled out a Be Counted form because he or she was temporarily staying at a GQ, and, a GQE (or NRFU) enumerator visited the respondent and filled out a GQE or NRFU UHE form for the same address (Be Counted and GQE or NRFU UHE).
- A person from a household called for a form and mailed it in, and another person from the same household called and completed a phone interview (TQA Fulfillment and TQA Interview).

- One or more persons from a household sent in a Be Counted form and also called for a form, received it, and mailed it back (Be Counted and TQA Fulfillment).

Analysis of the Address Types in the 2010 FV Workload

Table 5.6 presents the distribution of 2010 FV addresses by address type.

Table 5.6: Distribution of 2010 FV Addresses by Address Type

Type of Address	Stateside		Puerto Rico		Total	
	No.	%	No.	%	No.	%
Complete City-Style Address	439,197	98.2	5,526	62.7	444,723	97.5
with location description	37,296	8.3	2,706	30.7	40,002	8.8
without location description	401,901	89.9	2,820	32.0	404,721	88.8
Complete Rural Route Address	155	0.0	395	4.5	550	0.1
with location description	120	0.0	379	4.3	499	0.1
without location description	35	0.0	16	0.2	51	0.0
Complete P.O. Box Address	343	0.1	124	1.4	467	0.1
with location description	65	0.0	123	1.4	188	0.0
without location description	278	0.1	1	0.0	279	0.1
Incomplete Address	5,750	1.3	2,586	29.4	8,336	1.8
with location description	1,399	0.3	2,148	24.4	3,547	0.8
without location description	4,351	1.0	438	5.0	4,789	1.1
No Address Information	1,661	0.4	176	2.0	1,837	0.4
with location description	407	0.1	142	1.6	549	0.1
without location description	1,254	0.3	34	0.4	1,288	0.3
Total	447,106	100.0	8,807	100.0	455,913	100.0
with location description	39,287	8.8	5,498	62.4	44,785	9.8
without location description	407,819	91.2	3,309	37.6	411,128	90.2

Source: 2010 Census Final Tabulation MAF Extract provided by GEO

Over 97 percent of the entire 2010 FV workload consisted of units with a complete city-style address. Those addresses had both a house number and street name present on the 2010 FV Address Listing Pages. Just over 98 percent of stateside 2010 FV addresses were complete city-style addresses. Only 62.7 percent of the units in Puerto Rico had a city-style address, which was defined as having both a house number and a street name or urbanization name, or both a building number and an apartment complex name.

Nearly two percent of the total 2010 FV addresses had an incomplete address (no complete city-style address, or no rural route or P.O. Box). It is possible that there may have been complete address information contained in one address field in the MAF due to inconsistencies in the way the form was filled out and/or data capture issues. Thus, a complete house number and street name could have been contained in the street name field or location description field on the listing pages.

Nearly 1,300 records in the FV workload had no address information and no location description. This does not necessarily mean the Listers did not have any address information to verify. There could have been address information in MAF fields that were not included in the determination of the address type categories (such as Area Name). For Non-ID cases, specifically, it was possible that an address record went to clerical review with just a phone number and the clerk was able to contact the respondent to obtain a block geocode but neglected to update the address properly. For CFU Unduplication records with no address information or location description, the Listers may have only had a map spot.

Table 5.7 presents the distribution of 2010 FV addresses by the number of units at the basic street address.

Table 5.7: Distribution of 2010 FV Addresses by Number of Units at Basic Street Address

Size of Structure	Stateside		Puerto Rico		Total	
	No.	%	No.	%	No.	%
Single-Unit	251,936	56.4	6,560	74.5	258,496	56.7
Multi-Unit	195,170	43.7	2,247	25.5	197,417	43.3
2 - 4 Units	126,477	28.3	2,059	23.4	128,536	28.2
5 - 9 Units	18,306	4.1	107	1.2	18,413	4.0
10 - 19 Units	9,934	2.2	65	0.7	9,999	2.2
20 - 49 Units	11,365	2.5	5	0.1	11,370	2.5
50+ units	29,088	6.5	11	0.1	29,099	6.4
Total	447,106	100.0	8,807	100.0	455,913	100.0

Source: 2010 Census Final Tabulation MAF Extract provided by GEO

More than half (56.7 percent) of the addresses in the 2010 FV workload for both stateside and Puerto Rico were considered single-unit structures. Almost three-quarters of the 2010 FV workload addresses in Puerto Rico were in single-unit dwellings, compared to 56.4 percent of stateside addresses. About 91 percent of all addresses in the 2010 FV workload were in either single-unit structures or what are considered small multi-unit structures (2-19 units).

Table 5.8 shows the distribution of the stateside 2010 FV addresses by the number of units at a basic street address by input source.

Table 5.8: Distribution of 2010 FV Addresses by Number of Units at Basic Street Address by Input Source—Stateside Only

Size of Structure	Initial Non-ID		Supplemental Non-ID		CFU Unduplication	
	No.	%	No.	%	No.	%
Single-Unit	220,860	75.9	24,191	71.3	23,803	19.5
Multi-Unit	70,300	24.1	9,739	28.7	98,213	80.5
2 - 4 Units	29,941	10.3	4,233	12.5	91,487	75.0
5 - 9 Units	9,152	3.1	1,531	4.5	3,773	3.1
10 - 19 Units	6,336	2.2	921	2.7	1,156	0.9
20 - 49 Units	8,473	2.9	995	2.9	819	0.7
50+ units	16,398	5.6	2,059	6.1	978	0.8
Total	291,160	100.0	33,930	100.0	122,016	100.0

Source: 2010 Census Final Tabulation MAF Extract provided by GEO

The initial and supplemental portions of the stateside 2010 FV workload from Non-ID sources were distributed very similarly across the size of structure groups. Most of the addresses from those sources (75.9 percent of initial Non-ID and 71.3 of supplemental Non-ID workload) were from single-unit dwellings. The next highest proportion of 2010 FV addresses from Non-ID sources in terms of the number of units at the structure were addresses that belonged to structures with two-to-four units. A total of 10.3 percent of the initial 2010 FV workload addresses from a Non-ID source were part of a structure with two-to-four HUs; 12.5 percent of the supplemental 2010 FV workload addresses came from structures with two-to-four HUs.

In stark contrast with the Non-ID inputs, only 19.5 percent of the stateside 2010 FV workload inputs from CFU Unduplication source were single-unit addresses. Three-quarters of the stateside 2010 FV workload inputs from a CFU Unduplication source were part of structures with two-to-four HUs. This is not surprising given the common occurrence of census questionnaire misdelivery where USPS recognizes just one basic street address but the Census Bureau has recorded several distinct addresses there (i.e., houses that contain an “attic apt.” and/or “basement apt.”). Just 5.5 percent of the stateside inputs from CFU Unduplication were from addresses that belonged to structures with five or more HUs as compared to 13.8 percent and 16.2 percent for the initial and supplemental inputs from Non-ID, respectively.

Table 5.9 shows the distribution of the Puerto Rico 2010 FV addresses by the number of units at a basic street address by input source.

Table 5.9: Distribution of 2010 FV Addresses by Number of Units at Basic Street Address by Input Source—Puerto Rico Only

Size of Structure	Initial Non-ID		Supplemental Non-ID		CFU Unduplication	
	No.	%	No.	%	No.	%
Single-Unit	2,957	70.2	157	70.1	1,566	35.8
Multi-Unit	1,254	29.8	67	29.9	2,806	64.2
2 - 4 Units	486	11.5	33	14.7	1,957	44.8
5 - 9 Units	210	5.0	17	7.6	165	3.8
10 - 19 Units	173	4.1	5	2.2	154	3.5
20 - 49 Units	221	5.2	9	4.0	247	5.7
50+ units	164	3.9	3	1.3	283	6.5
Total	4,211	100.0	224	100.0	4,372	100.0

Source: 2010 Census Final Tabulation MAF Extract provided by GEO

Note: Some percentage totals do not equal 100.0 due to rounding

The distribution of the Puerto Rico 2010 FV workload from Non-ID sources by the number of units at the each basic street address was very similar to that of stateside. Just over 70 percent of both initial and supplemental Puerto Rico workloads from Non-ID sources were addresses from single-unit structures, while 11.5 percent of the initial Non-ID Puerto Rico workload and 14.7 percent of the supplemental Non-ID Puerto Rico workload were addresses from structures with two-to-four HUs.

Examining the Puerto Rico 2010 FV workload from a CFU Unduplication source, 44.8 percent were from structures with two-to-four HUs, while 35.8 percent were from single-unit structures. The remaining 19.5 percent of the addresses were from structures containing five or more HUs.

5.3 Research Question 2: What was the Field Verification workload distribution?

Table 5.10 presents the workload percentage distribution at the RCC level. A map of the boundaries of the twelve regional census centers is contained in Appendix F.

Table 5.10: Distribution of 2010 FV Workload by RCC

RCC	% of Total Workload	% of Original Non-ID Workload	% of CFU Unduplication Workload	% of Supplemental Non-ID Workload
Atlanta	13.4	14.1	12.1	12.6
Boston – Stateside	6.7	5.1	10.6	6.6
Boston – Puerto Rico	1.9	1.4	3.5	0.7
Charlotte	10.6	11.0	10.3	8.3
Chicago	7.8	9.2	4.8	6.7
Dallas	9.6	10.0	7.5	13.9
Denver	6.0	5.4	6.2	10.2
Detroit	6.0	6.5	5.0	5.1
Kansas City	5.4	5.7	4.1	7.6
Los Angeles	6.5	6.1	7.2	7.5
New York	8.1	7.7	10.0	4.3
Philadelphia	9.6	10.8	7.8	5.9
Seattle	8.4	7.1	11.0	10.6
Total	100.0	100.0	100.0	100.0

Source: 2010 FV Assessment Data provided by TMO

Note: Some percentage totals do not equal 100.0 due to rounding

The Atlanta RCC had more addresses in their 2010 FV workload than any other region, accounting for 13.4 percent of the total workload. The Atlanta RCC had the highest percentage of the initial Non-ID workload (14.1 percent) and CFU Unduplication workload (12.1 percent). This trend was expected as the Atlanta RCC had more “in-census” HUs than any other RCC (11.5 percent of the total national number of HUs).

The Dallas RCC had the highest percentage of supplemental Non-ID addresses with 13.9 percent of the total supplemental workload, followed by Atlanta at 12.6 percent.

Analysis of the Assignment Area Workload Distribution by Local Census Office Type

Table 5.11 presents the 2010 FV workload distribution by LCO type⁶.

Table 5.11: Distribution of 2010 FV Workload by Type of LCO

LCO Type	No. of AAs Containing FV Cases	% of AAs
Suburban/Rural	136,780	51.2
Urban/Metropolitan	72,216	27.0
Urban/Hard to Count (HTC)	40,243	15.1
Rural/Remote	13,829	5.2
Puerto Rico	4,115	1.5
Total	267,183	100.0

Source: 2010 FV Assessment Data provided by TMO

The LCO types were defined by Cost and Progress for budgeting purposes. Most 2010 FV AAs were in Suburban/Rural LCOs (51.2 percent). Urban/Metropolitan LCOs had 27 percent of the Assignment Areas (AAs) containing 2010 FV cases. The addresses in the 2010 FV workload spanned the entire nation and occurred in all 494 LCOs.

Analysis of Inputs by Local Census Office Type

Table 5.12 shows the distribution of inputs by source into the 2010 FV workload by the type of LCO in which they were located.

⁶ Please refer to Appendix E for definitions of the LCO types.

Table 5.12: Distribution of Inputs into 2010 FV by LCO Type (Suburban/Rural, Urban/Metro, and Urban/HTC)

Input Source	Suburban/Rural		Urban/Metropolitan		Urban/HTC	
	No.	%	No.	%	No.	%
Be Counted (Non-ID)	97,163	44.4	56,209	44.2	35,793	45.8
TQA Fulfillment (Non-ID)	35,027	16.0	20,116	15.8	4,576	5.9
TQA Interview (Non-ID)	16,364	7.5	8,262	6.5	2,980	3.8
GQE UHE (Non-ID)	3,638	1.7	2,130	1.7	1,713	2.2
NRFU UHE (Non-ID)	12,510	5.7	7,326	5.8	3,892	5.0
RA, UE, or RUE UHE (Non-ID)	350	0.2	176	0.1	6	0.0
Multiple Non-ID Sources	237	0.1	192	0.2	96	0.1
Total Non-ID	165,289	75.5	94,411	74.2	49,056	62.8
CFU Unduplication	53,766	24.5	32,868	25.8	29,024	37.2
Total	219,055	100.0	127,279	100.0	78,080	100.0

Source: 2010 Census Final Tabulation MAF Extract provided by GEO and 2010 FV Assessment Data provided by TMO

As indicated in Table 5.12, the Suburban/Rural LCOs had a total workload of 219,055 addresses, about 48 percent of the total FV workload of 455,913 addresses.

Refer to Table 5.13 for the inputs for rural/remote LCOs, and Puerto Rico. The lone Alaska LCO, which contained 1,795 2010 FV addresses, or about 0.4 percent of the total workload, was considered to be a Rural/Remote LCO.

Table 5.13: Distribution of Inputs into 2010 FV by LCO Type (Rural/Remote and Puerto Rico)

Input Source	Rural/Remote		Puerto Rico	
	No.	%	No.	%
Be Counted (Non-ID)	9,353	41.2	3,817	43.3
TQA Fulfillment (Non-ID)	2,713	12.0	319	3.6
TQA Interview (Non-ID)	1,907	8.4	118	1.3
GQE UHE (Non-ID)	390	1.7	53	0.6
NRFU UHE (Non-ID)	1,899	8.4	128	1.5
RA, UE, or RUE UHE (Non-ID)	33	0.1	0	0.0
Multiple Non-ID Sources	39	0.2	0	0.0
Total Non-ID	16,334	72.0	4,435	50.4
CFU Unduplication	6,358	28.0	4,372	49.6
Total	22,692	100.0	8,807	100.0

Source: 2010 Census Final Tabulation MAF Extract provided by GEO and 2010 FV Assessment
Data provided by TMO

Analysis of the 2010 FV Workload Distribution by Type of Enumeration Area

Table 5.14 presents workload distributions for the seven Type of Enumeration Area (TEA) categories.

Table 5.14: Distribution of 2010 FV Workload by Type of Enumeration Area

TEA	No.	%
TEA 1: Mailout/Mailback (MO/MB)	417,197	91.5
TEA 2: Update/Leave (U/L) – Stateside	17,471	3.8
TEA 2: U/L – Puerto Rico	8,807	1.9
TEA 3: RUE	36	0.0
TEA 4: RA	29	0.0
TEA 5: UE	3,351	0.7
TEA 6: Military	583	0.1
TEA 7: Urban Update/Leave (UU/L)	8,439	1.9
Total	455,913	100.0

Source: 2010 Census Final Tabulation MAF Extract provided by GEO

Note: Some percentage totals do not equal 100.0 due to rounding

The 2010 TEA Delineation was performed prior to the 2010 Address Canvassing operation to determine the types of enumeration that were to be implemented for every collection block in the country⁷.

A total of 91.5 percent of the 2010 FV workload belonged to blocks that were in Mailout/Mailback (MO/MB) areas. The distribution of 2010 FV addresses by TEA was similar to that of the all “in-census” HUs at the time of final tabulation⁸. Close to 90 percent of the total “in-census” HUs were in MO/MB areas.

⁷ Please refer to the *2010 Census Operational Assessment for the Type of Enumeration Area Delineation* for further information regarding TEAs.

⁸ The totals were representative of the “in-census” universe at the time of final tabulation which was prior to Census Unedited File creation.

Analysis of the 2010 FV Workload Distribution by State

In analyzing the workload by state, the five states with the highest workloads are listed in Table 5.15.

Table 5.15: Distribution of 2010 FV Workload by State

State	No.	% of Total FV Workload
California	46,249	10.1
New York	38,161	8.4
Texas	31,994	7.0
Florida	31,025	6.8
Pennsylvania	23,821	5.2
All Other States	284,663	62.4
Total	455,913	100.0

Source: 2010 Census Final Tabulation MAF Extract provided by GEO

California had 10.1 percent of the entire 2010 FV workload, which was the same proportion of total decennial HUs in the state. The same five states also had the most HUs in the census universe. Most proportions of the FV workload by state were similar to that of the “in-census” HU distribution. However, 8.4 percent of the FV workload was in New York compared to 6.2 percent of all decennial HUs.

The entire distribution of the FV workload and “in-census” addresses by state can be found in Appendix B and Appendix C, respectively.

5.4 Research Question 3: What was the production rate (number of cases per hour)?

Listers averaged 1.88 cases per hour, which was 0.51 higher than the expected hourly production rate of 1.37.

QC Listers had a 2.12 hourly production rate, which was 0.75 higher than expected.

The higher-than-expected production rates could be attributed to a highly qualified and experienced field workforce and low field employee turnover rates. A review of 2010 Census applicant testing data showed that the average test score for all applicants on the written test, *Field Employee Selection Aid*, D-267A or D-267B, was 92.17. In Census 2000, the average test score was 85.60 for all applicants.

Most Listers had successfully completed assignments for at least one other decennial field operation. A review of post-census selection data revealed that 81 percent of all field employees who were hired after address canvassing had worked at least one other 2010 Census operation.

5.5 Research Question 4: What were the results of 100 percent QC compared to results after production?

Table 5.16 presents the field status of 2010 FV addresses after production and after QC.

Table 5.16: Distribution of Final Field Status of 2010 FV Addresses After Production and After QC

Status	After Production		After QC	
	No.	%	No.	%
Address Coded as Verify	222,507	48.8	220,727	48.4
Address Coded as Delete	153,173	33.6	151,169	33.2
Address Coded as Duplicate	79,656	17.5	82,794	18.2
Address Coded as "R"	577	0.1	1,223	0.3
Total	455,913	100.0	455,913	100.0

Source: 2010 FV Assessment Data provided by TMO

Note: Some percentage totals do not equal 100.0 due to rounding

The 2010 FV Listers verified almost half of the addresses in both production and QC, as indicated in Table 5.16. The number of verifies and deletes decreased by close to one percent from production to QC. The most dramatic changes in field actions from production to QC came in the number of duplicates (about a four percent increase) and the number of addresses marked "R." An address coded as "R" in the FVOCS meant that there was no action recorded by the Lister on the listing pages. The number of "R" actions increased by 112 percent from 577 to 1,223 from production to QC.

The final QC outcomes in Table 5.16 do not coincide with the final field outcomes reported in Table 5.18 and Table 5.21. The rules in the FVOCS were designed to capture the production Lister's action as the final field action if a QC Lister did not visit the address for some reason. Therefore, the FVOCS accepted an "R" (i.e. no update to the MAF) as the final field action for a record only if both the production Lister *and* QC Lister actions on the listing pages were blank.

Table 5.17 shows the raw FVOCS keying totals for the production and QC Lister actions.

Table 5.17: Distribution of 2010 FV FVOCS Keying Outcomes

Status After Production	QC Action			
	Coded as Verify	Coded as Delete	Coded as Duplicate	Coded as "R"
Coded as Verify	203,207	13,267	5,607	426
Coded as Delete	13,494	134,908	4,336	435
Coded as Duplicate	3,825	2,886	72,803	142
Coded as "R"	201	108	48	220
QC Action Total	220,727	151,169	82,794	1,223

Source: 2010 FV Assessment Data provided by TMO

The final field status was determined by the QC outcome, except when the QC outcome was an "R." If the QC Lister did not record an action for a particular address, it was keyed as an "R" in the FVOCS, the production Lister action was used as the final field outcome. For example, there were 426 addresses that were coded as "verify" by production Listers and were not assigned actions by QC Listers. These address records were assigned a final field action as "verify" in the FVOCS because the QC Lister action was blank.

Table 5.18 shows how the final QC outcomes compared to the final field outcome reported in the FVOCS.

Table 5.18: Distribution of 2010 FV FVOCS QC Keying Outcomes Compared with Final Field Outcomes

	Status of QC			
	Coded as Verify	Coded as Delete	Coded as Duplicate	Coded as "R"
QC Action Total	220,727	151,169	82,794	1,223
Production Action when QC Action was Blank	426	435	142	220
Final Field Outcomes	221,153	151,604	82,936	220⁹

Source: 2010 FV Assessment Data provided by TMO

Notice there were 220 addresses with both a blank production and QC Lister action. This illustrates the importance of updating the MAF with the production action when there was no QC action taken; otherwise, we would not have updated those 1,223 records on the MAF.

Table 5.19 shows the likelihood of the QC Lister's action given the action the production Lister assigned a given address.

Table 5.19: Percentages of 2010 FV Field Outcomes from Production to QC

Status After Production	Status of QC				Total
	Coded as Verify	Coded as Delete	Coded as Duplicate	Coded as "R"	
Address Coded as Verify	91.3	6.0	2.5	0.2	100.0
Address Coded as Delete	8.8	88.1	2.8	0.3	100.0
Address Coded as Duplicate	4.8	3.6	91.4	0.2	100.0
Address Coded as "R"	34.8	18.7	8.3	38.1	100.0

Source: 2010 FV Assessment Data provided by TMO

Note: Some percentage totals do not equal 100.0 due to rounding

Overall, the QC Listers tended to agree with the production Listers in terms of the actions they assigned to a given address. If the production Lister verified an address or assigned a duplicate action, the QC Lister did the same about 91 percent of the time. If the production Lister

⁹ If the QC keyer's action was an "R," the FVOCS filled the final action with production action.

assigned a delete action, the QC Lister did the same 88.1 percent of the time. When the production Listers assigned a delete action to an address, the QC Lister verified the address 8.8 percent of the time as opposed to 4.8 percent of the time if the production Lister assigned a duplicate action.

Table 5.20: Percentages of 2010 FV Field Outcomes when there was a Discrepancy

Status After Production	Status of QC				Total
	Coded as Verify	Coded as Delete	Coded as Duplicate	Coded as "R"	
Address Coded as Verify	-	68.7	29.1	2.2	100.0
Address Coded as Delete	73.9	-	23.7	2.4	100.0
Address Coded as Duplicate	55.8	42.1	-	2.1	100.0
Address Coded as "R"	56.3	30.3	13.5	-	100.0

Source: 2010 FV Assessment Data provided by TMO

Note: Some percentage totals do not equal 100.0 due to rounding

For addresses assigned a delete action by the production Lister, the QC Lister assigned that same address a "V" (verified) action code, 73.9 percent of the time. This situation occurred 13,494 times, as shown in Table 5.17. If not for the 100 percent QC, it is likely that a portion of these valid addresses would have been deleted from the final census housing list.

5.6 Research Question 5: What were the final field outcomes for address records?

Table 5.21 presents the distribution of the final field outcomes for all FV universe records for stateside and Puerto Rico.

Table 5.21: Distribution of 2010 FV Final Field Outcomes of Addresses

	Coded as Verify		Coded as Delete		Coded as Duplicate		Coded as "R" (Lister action was blank)		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Stateside	215,074	48.1	150,055	33.6	81,778	18.3	199	0.0	447,106	100.0
Puerto Rico	6,079	69.0	1,549	17.6	1,158	13.2	21	0.2	8,807	100.0
Total	221,153	48.5	151,604	33.3	82,936	18.2	220	0.0	455,913	100.0

Source: 2010 FV Assessment Data provided by TMO

FV Listers verified almost half (48.5 percent) of the FV addresses. In Puerto Rico, Listers verified 69 percent of the 2010 FV addresses. The addresses coded as “R” indicated there was no entry in the Lister or QC Action Code columns on the 2010 FV Address Listing Page. There were 220 addresses coded as “R” as their final field status in the FVOCS.

Analysis of Final Field Outcomes by Input Source for Stateside Only

Table 5.22 presents data for final field outcomes by input source for stateside addresses. Addresses that came from a CFU Unduplication source were verified 75.5 percent of the time, which was the highest verify rate for any of the input sources.

Table 5.22: 2010 FV Final Stateside Field Outcomes by Input Source – Includes all 2010 FV Universe Inputs

Input Source	Coded as Verify		Coded as Delete		Coded as Duplicate		Coded as “R”		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Be Counted (Non-ID)	75,312	37.9	77,142	38.9	45,998	23.2	66	0.0	198,518	100.0
TQA Fulfillment (Non-ID)	26,056	41.7	26,078	41.8	10,281	16.5	17	0.0	62,432	100.0
TQA Interview (Non-ID)	11,752	39.8	11,897	40.3	5,852	19.8	12	0.0	29,513	100.0
GQE UHE (Non-ID)	2,147	27.3	3,769	47.9	1,952	24.8	3	0.0	7,871	100.0
NRFU UHE (Non-ID)	7,090	27.7	13,462	52.5	5,064	19.8	11	0.0	25,627	100.0
RA, RUE, or UE UHE (Non-ID)	294	52.0	211	37.4	60	10.6	0	0.0	565	100.0
Multiple Non-ID Sources	253	44.9	233	41.3	78	13.8	0	0.0	564	100.0
Total Non-ID	122,904	37.8	132,792	40.9	69,285	21.3	109	0.0	325,090	100.0
CFU Unduplication	92,170	75.5	17,263	14.2	12,493	10.2	90	0.1	122,016	100.0
Total	215,074	48.1	150,055	33.6	81,778	18.3	199	0.0	447,106	100.0

Source: 2010 Census Final Tabulation MAF Extract provided by GEO and the 2010 FV Assessment Data provided by TMO

The 2010 FV cost model predicted an 88.1 percent verify rate for inputs from a CFU Unduplication source. The predicted rate was based on results from the *2006 Census Test Evaluation #2: Coverage Improvement* report, which examined the 2006 CFU Housing Unit Verification¹⁰ (HUV) operation test. The 2006 CFU HUV test results deduced that misdelivery of forms was the most common reason for person duplication within a block. However, confirmed form misdeliveries that were sent to HUV in the 2006 test were not designated as actual duplicate HUs even though the people were believed to be duplicated. Hence, the 2006 report concluded that misdelivery leads to person duplication and not address duplication. This

¹⁰ It is important to note that HUV was implemented exclusively for the 2006 test and was replaced by FV for the 2010 Census. The operations had very similar procedures.

supports the low rate of duplicate actions in 2010 FV (10.2 percent). Although we theoretically expected a 50 percent verify rate and a 50 percent duplicate rate for these addresses, since both the expected verify and its expected duplicate address were to be worked by FV Listers, most (75.5 percent) of the expected duplicate addresses from CFU Unduplication were actually verified by Listers.

While 2010 FV did not yield as high a verification rate as the expected rate from the 2006 CFU HUV test results, the verification rate was still fairly high (75.5 percent), which lends further support to the theory that misdelivery plays a role in most within-block person duplication. Note that person duplication does not directly equate to address duplication.

Only 10.2 percent of the 2010 FV addresses from CFU Unduplication were assigned a duplicate action. In addition to form misdelivery, incomplete addresses on the address listing page may have contributed to the low rate of duplicate addresses. Also, the Listers may not have had a full understanding of the procedures for assigning duplicate actions. For example, they may have used a delete or verified action code instead of assigning a duplicate action code and identifying the line number of the address that was duplicated. Another possibility is that the expected rate was simply not correct.

The Non-ID cases on the listing pages were dependent on the geocode that was provided in-house through automated software and clerical review. The 2010 FV operation was designed to confirm whether an address existed in the particular block to which it was geocoded. It is possible that addresses exist, but were in different blocks than the blocks to which they were assigned. Thus, it is possible that addresses that were coded as nonexistent by the Listers, and subsequently deleted from the Census, actually did exist in an adjacent block.

As indicated in Table 5.22, only 37.8 percent of the addresses from Non-ID sources were verified to be existing addresses by Listers. As indicated in the *Census 2000 Assessment of Field Verification*, FV Listers verified 49.2 percent of the 468,549 Non-ID cases as residential addresses in Census 2000. For budgeting purposes, HQ staff used the 49.2 percent verify rate from Census 2000 as the predicted rate for the 2010 FV Non-ID cases. A predicted verify rate was used in the FV budget calculation for the purpose of determining the QC costs when delete verification was planned.

Listers coded a total of 40.9 percent of the addresses from Non-ID as nonexistent; 21.3 percent of the Non-ID addresses were duplicates of addresses in the same block.

Analysis of Final Field Outcomes by Input Source for Puerto Rico Only

Table 5.23 presents the final field outcomes by input source for Puerto Rico.

Table 5.23: 2010 FV Final Puerto Rico Field Outcomes by Input Source – Includes all 2010 FV Universe Inputs

Input Source	Coded as Verify		Coded as Delete		Coded as Duplicate		Coded as “R”		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Be Counted (Non-ID)	1,990	52.1	1,124	29.4	695	18.2	8	0.2	3,817	100.0
TQA Fulfillment (Non-ID)	169	53.0	107	33.5	41	12.9	2	0.6	319	100.0
TQA Interview (Non-ID)	58	49.2	38	32.2	22	18.6	0	0.0	118	100.0
GQE UHE (Non-ID)	10	18.9	13	24.5	30	56.6	0	0.0	53	100.0
NRFU UHE (Non-ID)	42	32.8	34	26.6	52	40.6	0	0.0	128	100.0
RA, RUE, or UE UHE (Non-ID)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100.0
Total Non-ID	2,269	51.2	1,316	29.7	840	18.9	10	0.2	4,435	100.0
CFU Unduplication	3,810	87.2	233	5.3	318	7.3	11	0.3	4,372	100.0
Total	6,079	69.0	1,549	17.6	1,158	13.1	21	0.2	8,807	100.0

Source: 2010 Final Tabulation MAF Extract provided by GEO and the 2010 FV Assessment Data provided by TMO

Note: N/A stands for Not Applicable. RA, RUE, and UE UHE (Non-ID) did not apply to Puerto Rico, where U/L was the only type of enumeration.

Note: Some percentage totals do not equal 100.0 due to rounding

Most (69 percent) of the FV addresses in Puerto Rico were verified by Listers. The proportion of verified addresses in Puerto Rico was much higher than the proportion of verified addresses stateside (48.1 percent). The large disparity was likely due to Puerto Rico having a higher proportion of its inputs from a CFU Unduplication source (49.6 percent in Puerto Rico compared to 27.3 percent stateside), which tended to be verified at a very high rate overall (75.9 percent).

Analysis of Final Field Outcomes by Input Source for Supplemental Non-ID Cases

As indicated in Table 5.24, Listers verified only 31.2 percent of the supplemental Non-ID addresses as existing addresses. Listers coded slightly over half of the addresses in the supplemental workload as deletes, and 18.4 percent as duplicates.

Table 5.24: 2010 FV Supplemental Non-ID Final Field Outcomes by Input Source – National Totals

Input Source	Coded as Verify		Coded as Delete		Coded as Duplicate		Coded as “R”		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Be Counted (Non-ID)	682	34.0	860	42.8	463	23.1	3	0.2	2,008	100.0
TQA Fulfillment (Non-ID)	202	41.7	236	48.8	46	9.5	0	0.0	484	100.0
TQA Interview (Non-ID)	2,583	45.4	2,479	43.6	626	11.0	3	0.1	5,691	100.0
GQE UHE (Non-ID)	160	26.5	297	49.3	146	24.2	0	0.0	603	100.0
NRFU UHE (Non-ID)	6,989	27.6	13,290	52.6	4,989	19.7	11	0.0	25,279	100.0
RA, RUE, or UE UHE (Non-ID)	27	35.1	33	42.9	17	22.1	0	0.0	77	100.0
Multiple Non-ID Sources	5	41.7	7	58.3	0	0.0	0	0.0	12	100.0
Total	10,648	31.2	17,202	50.4	6,287	18.4	17	0.0	34,154	100.0

Source: 2010 Census Final Tabulation MAF Extract provided by GEO and the 2010 FV Assessment Data provided by TMO

Note: Some percentage totals do not equal 100.0 due to rounding

Only 27.6 percent of the supplemental workload addresses from a NRFU UHE source were verified by Listers. Approximately 74 percent of the supplemental workload was from a NRFU UHE source. In terms of input source, most of the verify rates were down from the initial Non-ID workload compared to the supplemental workload.

Analysis of Final Field Outcomes by Type of Enumeration Area

Table 5.25 presents the final field outcomes of the entire FV universe by TEA.

Table 5.25: 2010 FV Final Field Outcomes by Type of Enumeration Area – Includes all 2010 FV Universe Inputs

TEA	Coded as Verify		Coded as Delete		Coded as Duplicate		Coded as "R"		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
TEA 1: MO/MB	200,611	48.1	140,042	33.6	76,380	18.3	164	0.0	417,197	100.0
TEA 2: U/L – Stateside	8,528	48.8	5,744	32.9	3,176	18.2	23	0.1	17,471	100.0
TEA 2: U/L – Puerto Rico	6,079	69.0	1,549	17.6	1,158	13.2	21	0.2	8,807	100.0
TEA 3: RUE	17	47.2	11	30.6	8	22.2	0	0.0	36	100.0
TEA 4: RA	0	0.0	29	100.0	0	0.0	0	0.0	29	100.0
TEA 5: UE	1,538	45.9	1,066	31.8	743	22.2	4	0.1	3,351	100.0
TEA 6: Military	230	39.5	280	48.0	73	12.5	0	0.0	583	100.0
TEA 7: UU/L	4,150	49.2	2,883	34.2	1,398	16.6	8	0.1	8,439	100.0
Total	221,153	48.5	151,604	33.3	82,936	18.2	220	0.0	455,913	100.0

Source: 2010 Final Tabulation Master Address File Extract (MAFX) files provided by GEO and the 2010 FV Assessment Data provided by TMO

Note: Some percentage totals do not equal 100.0 due to rounding

Close to half (48.1 percent) of the records from the MO/MB TEA were verified by Listers. Listers verified stateside addresses in U/L areas 48.8 percent of the time. One might expect that addresses in MO/MB areas would have a higher verify rate than those in U/L areas because they were more likely to have city-style addresses, and in turn are more likely to be accurately geocoded in the automated and clerical processes. Puerto Rico addresses, all of which were in U/L areas, were verified 69 percent of the time by Listers.

The Seattle RCC coded all 29 addresses in the RA area as deletes per HQ instructions. HQ determined it was not cost effective to attempt verification of these records given their remote location. Of the 220 "R"-coded addresses, 164 were from MO/MB areas.

Analysis of Final Field Outcomes by Address Type

Table 5.26 presents the final field outcomes by type of address.

Table 5.26: 2010 FV Final Field Outcomes by Address Type for Stateside and Puerto Rico

Type of Address	Coded as Verify		Coded as Delete		Coded as Duplicate		Coded as "R"		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Complete City-Style Address	217,040	48.8	146,308	32.9	81,190	18.3	185	0.0	444,723	100.0
with location description	25,752	64.4	8,187	20.5	6,028	15.1	35	0.1	40,002	100.0
without location description	191,288	47.3	138,121	34.1	75,162	18.6	150	0.0	404,721	100.0
Complete Rural Route Address	415	75.5	82	14.9	52	9.5	1	0.2	550	100.0
with location description	405	81.2	49	9.8	44	8.8	1	0.2	499	100.0
without location description	10	19.6	33	64.7	8	15.7	0	0.0	51	100.0
Complete Post Office Box Address	156	33.4	242	51.8	67	14.3	2	0.4	467	100.0
with location description	141	75.0	25	13.3	21	11.2	1	0.5	188	100.0
without location description	15	5.4	217	77.8	46	16.5	1	0.4	279	100.0
Incomplete Address	3,267	39.2	3,654	43.8	1,406	16.9	9	0.1	8,336	100.0
with location description	2,029	57.2	825	23.3	688	19.4	5	0.1	3,547	100.0
without location description	1,238	25.9	2,829	59.1	718	15.0	4	0.1	4,789	100.0
No Address Information	275	15.0	1,318	71.7	221	12.0	23	1.3	1,837	100.0
with location description	157	28.6	318	57.9	69	12.6	5	0.9	549	100.0
without location description	118	9.2	1,000	77.6	152	11.8	18	1.4	1,288	100.0
Total	221,153	48.5	151,604	33.3	82,936	18.2	220	0.0	455,913	100.0
with location description	28,484	63.6	9,404	21.0	6,850	15.3	47	0.1	44,785	100.0
without location description	192,669	46.9	142,200	34.6	76,086	18.5	173	0.0	411,128	100.0

Source: 2010 Final Tabulation files provided by GEO and the 2010 FV Assessment Data provided by TMO

Note: Some percentage totals do not equal 100.0 due to rounding

As indicated in Table 5.26, nearly half (48.8 percent) of the 444,723 complete city-style addresses were verified by Listers. Similar to the MO/MB TEA in Table 5.20, the expectation was city-style addresses would have a higher verify rate than noncity-style addresses, because

noncity-style addresses may have been more difficult to accurately geocode in the automated and clerical processes.

The 48.8 percent verify rate of the complete city-style addresses was virtually the same as the national verify rate, which was 48.5 percent. Addresses with no address information had the lowest verify rate (15 percent) of any address type, which was to be expected as it is difficult to locate an address with little to no address information. Whether the address was complete city-style, complete rural route, complete P.O. Box, incomplete, or had no address information, the verify rate increased if the address had a location description as opposed to the contrary if there was no location description. This illustrates the importance of gathering as much location information as possible for an address record. While only 9.8 percent of the 2010 FV workload had a location description, the overall verify rate of those addresses was 63.6 percent.

Analysis of Final Field Outcomes by Size of the Structure at the Basic Street Address

Table 5.27 presents the final field outcomes by the size of the structure at the basic street address.

Table 5.27: 2010 FV Final Field Outcomes by Size of Basic Street Address for Stateside and Puerto Rico

Size of Structure	Coded as Verify		Coded as Delete		Coded as Duplicate		Coded as "R"		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Single-Unit	102,660	39.7	102,924	39.8	52,772	20.4	140	0.1	258,496	100.0
Multi-Unit	118,493	60.0	48,680	24.7	30,164	15.3	80	0.0	197,417	100.0
2 - 4 Units	83,315	64.8	22,952	17.9	22,217	17.3	52	0.0	128,536	100.0
5 - 9 Units	9,091	49.4	6,026	32.7	3,287	17.9	9	0.1	18,413	100.0
10 - 19 Units	4,809	48.1	3,795	38.0	1,390	13.9	5	0.1	9,999	100.0
20 - 49 Units	5,835	51.3	4,390	38.6	1,142	10.0	3	0.0	11,370	100.0
50+ Units	15,443	53.1	11,517	39.6	2,128	7.3	11	0.0	29,099	100.0
Total	221,153	48.5	151,604	33.3	82,936	18.2	220	0.0	455,913	100.0

Source: 2010 Final Tabulation MAF Extract provided by GEO

Note: Some percentage totals do not equal 100.0 due to rounding

As indicated in Table 5.27, single-unit housing structures were verified only 39.7 percent of the time. This rate was much lower than the verify rate of the entire 2010 FV universe (48.5 percent). The expectation was that single-unit structures would be easier to locate by Listers than addresses in multi-unit structures (e.g., basement apartments). Addresses with 2-4 units at the structure had the highest verify rate at 64.8 percent, while the other multi-unit distinctions had verify rates around 50 percent. Overall, addresses at multi-unit structures were verified 60 percent of the time.

Table 5.28 presents the final field outcomes by the number of units at the basic street address for the initial Non-ID inputs into the 2010 FV workload.

Table 5.28: 2010 FV Final Field Outcomes by Size of Basic Street Address for Stateside and Puerto Rico—Initial Non-ID Inputs Only

Size of Structure	Coded as Verify		Coded as Delete		Coded as Duplicate		Coded as "R"		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Single-Unit	83,085	37.1	93,357	41.7	47,290	21.1	85	0.0	223,817	100.0
Multi-Unit	31,440	43.9	23,549	32.9	16,548	23.1	17	0.0	71,554	100.0
2 - 4 Units	10,992	36.1	7,527	24.7	11,901	39.1	7	0.0	30,427	100.0
5 - 9 Units	3,981	42.5	3,633	38.8	1,744	18.6	4	0.0	9,362	100.0
10 - 19 Units	3,066	47.1	2,567	39.4	875	13.4	1	0.0	6,509	100.0
20 - 49 Units	4,576	52.6	3,331	38.3	786	9.0	1	0.0	8,694	100.0
50+ Units	8,825	53.3	6,491	39.2	1,242	7.5	4	0.0	16,562	100.0
Total	114,525	38.8	116,906	39.6	63,838	21.6	102	0.0	295,371	100.0

Source: 2010 Final Tabulation MAF Extract provided by GEO

Note: Some percentage totals do not equal 100.0 due to rounding

Examining the addresses in the initial 2010 FV workload from Non-ID sources, only 37.1 percent of the single-unit addresses were verified. Note that 75.8 percent of the initial 2010 FV workload was single-unit dwellings. Single-unit addresses were deleted at a rate of 41.7 percent, which was the highest delete rate among the size of structure groups. Addresses from structures with two-to-four HUs were found to be duplicates 39.1 percent of the time. This was the highest duplicate rate in terms of the size of structure categories.

Table 5.29 presents the final field outcomes by the number of units at the basic street address for the supplemental Non-ID inputs into the 2010 FV workload.

Table 5.29: 2010 FV Final Field Outcomes by Size of Basic Street Address for Stateside and Puerto Rico—Supplemental Non-ID Inputs Only

Size of Structure	Coded as Verify		Coded as Delete		Coded as Duplicate		Coded as "R"		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Single-Unit	7,443	30.6	13,163	54.1	3,735	15.3	7	0.0	24,348	100.0
Multi-Unit	3,205	32.7	4,039	41.2	2,552	26.0	10	0.0	9,806	100.0
2 - 4 Units	1,395	32.7	1,333	31.2	1,535	36.0	3	0.1	4,266	100.0
5 - 9 Units	435	28.1	758	49.0	354	22.9	1	0.1	1,548	100.0
10 - 19 Units	249	26.9	525	56.7	151	16.3	1	0.1	926	100.0
20 - 49 Units	295	29.4	537	53.5	172	17.1	0	0.0	1,004	100.0
50+ Units	831	40.3	886	43.0	340	16.5	5	0.2	2,062	100.0
Total	10,648	31.2	17,202	50.4	6,287	18.4	17	0.0	34,154	100.0

Source: 2010 Final Tabulation MAF Extract provided by GEO

Note: Some percentage totals do not equal 100.0 due to rounding

Looking at the addresses in the supplemental 2010 FV workload from Non-ID sources, only 30.6 percent of the single-unit addresses were verified, as compared to 54.1 percent that were deleted. Again, we see that the highest duplicate rate is among addresses that belong to structures with two-to-four units.

Table 5.30 presents the final field outcomes by the number of units at the basic street address for the CFU Unduplication inputs into the 2010 FV workload.

Table 5.30: 2010 FV Final Field Outcomes by Size of Basic Street Address for Stateside and Puerto Rico—CFU Unduplication Inputs Only

Size of Structure	Coded as Verify		Coded as Delete		Coded as Duplicate		Coded as "R"		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Single-Unit	19,590	77.2	2,781	11.0	2,948	11.6	50	0.2	25,369	100.0
Multi-Unit	76,390	75.6	14,715	14.6	9,863	9.8	51	0.1	101,019	100.0
2 - 4 Units	70,860	75.8	13,634	14.6	8,910	9.5	40	0.0	93,444	100.0
5 - 9 Units	2,666	67.7	687	17.4	581	14.8	4	0.1	3,938	100.0
10 - 19 Units	942	71.9	178	13.6	187	14.3	3	0.2	1,310	100.0
20 - 49 Units	863	81.0	111	10.4	89	8.3	3	0.3	1,066	100.0
50+ Units	1,059	84.0	105	8.3	96	7.6	1	0.1	1,261	100.0
Total	95,980	75.9	17,496	13.8	12,811	10.1	101	0.1	126,388	100.0

Source: 2010 Final Tabulation MAF Extract provided by GEO

Note: Some percentage totals do not equal 100.0 due to rounding

In each of the size of structure groups, a majority of the addresses from a CFU Unduplication source were verified. Single-unit structures and addresses belonging to structures with two-to-four HUs (which accounted for about 94 percent of the workload from a CFU Unduplication source combined) were verified at a rate of 77.2 percent and 75.8 percent, respectively. Addresses from structures with five-to-nine HUs had the highest delete and duplicate rates at 17.4 and 14.8 percent, respectively.

5.7 Research Question 6: What were the results of the update process to the MTdb for address records?

Table 5.31 shows the distribution of the final MTdb status after FV for all 2010 FV universe records for stateside and Puerto Rico.

Table 5.31: Distribution of Final MTdb Status of Addresses after 2010 FV

	Coded as Verify		Coded as Delete		Coded as Duplicate		Rejected Records		No Update		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Stateside	214,994	48.1	150,043	33.6	81,623	18.3	247	0.1	199	0.0	447,106	100.0
Puerto Rico	6,072	68.9	1,549	17.6	1,149	13.0	16	0.2	21	0.2	8,807	100.0
Total	221,066	48.5	151,592	33.3	82,772	18.2	263	0.1	220	0.0	455,913	100.0

Source: 2010 Final Tabulation MAF Extract provided by GEO

Note: Some percentage totals do not equal 100.0 due to rounding

The updates to the MTdb were similar to the final field status of the records. The only difference was that 263 records were rejected by GEO as part of their MTdb update process, as indicated in Table 5.31. The address records with no update to the MTdb were those coded as “R” by the FVOCS keyers. Field Staff did not enter action codes for these addresses. There were no rejected records from the supplemental Non-ID workload.

Table 5.32 shows the distribution of the 2010 FV records rejected from GEO processing.

Table 5.32: Distribution of 2010 FV MTdb Rejects by Reason

Reason for Rejection	No.	%
Same unit treated as a duplicate and a survivor (valid)	236	89.7
Multiple transactions targeting same MAFID	27	10.3
Total	263	100.0

Source: 2010 FV tally file provided by GEO

Note: All 16 Puerto Rico rejects were due to same unit as survivor and retired.

When identifying a duplicate address, proper procedure was for the Lister to assign a “D2” (duplicate) action code to the address and subsequently provide the line number of the address on the listing page of which the address was a duplicate. As indicated in Table 5.31, there were 263 address records rejected during GEO processing, of which 236 matched to the same unit as a surviving record (i.e., the address on the listing page that the address is a duplicate of) and were retired. This type of MTdb reject indicates that the Lister identified an address as a duplicate, but instead of recording the line number of the surviving record on the listing page, he or she recorded either the line number of the address identified as the duplicate (i.e., it pointed back to itself) or they identified the surviving address as a duplicate (i.e., it pointed back to an address that was already identified as a duplicate).

The remaining 27 records were rejected because multiple transactions targeted the same MAFID on the MAF. This occurred because deletes from the Vacant/Delete Check (VDC) operation and 2010 FV updates to the MAF were processed concurrently. The 27 records were in both the VDC and 2010 FV universe. The VDC records were updated first, so the 2010 FV action was rejected because it was the second transaction targeting the same MAFID.

Table 5.33 shows the final field outcome for the records rejected from GEO processing. About 67 percent of the records rejected from MTdb processing were coded as either deletes or duplicates of other addresses by Listers.

Table 5.33: Distribution of 2010 FV Final Field Results for MTdb Rejected Records

	Coded as Verify		Coded as Delete		Coded as Duplicate		Total	
	No.	%	No.	%	No.	%	No.	%
Stateside	80	32.4	12	4.9	155	62.8	247	100.0
Puerto Rico	7	43.8	0	0.0	9	56.3	16	100.0
Total	87	33.1	12	4.6	164	62.4	263	100.0

Source: 2010 FV Assessment Data provided by TMO

Note: Some percentage totals do not equal 100.0 due to rounding

5.8 Operational Assessment Question 1: What was the expected workload and how did that compare with the actual? What were the impacts to the program? What was the productivity rate (cases per hour)? What were the workflows?

Production Workload Data

For budgeting purposes, the estimated 2010 FV production workload was 801,248 cases. See Table 5.3 for the counts for the Non-ID and CFU Unduplication portions of this official estimate. When the training and supply kit requirements were finalized in March 2010, the budget staff in FLD used forecasting models to determine estimated workloads for each of the 494 LCOs.

The actual 2010 FV workload, including the supplemental cases, consisted of 455,913 addresses, of which 447,106 were stateside and 8,807 were in Puerto Rico. Refer to Table 5.1 for further details on the workload distribution.

The 2010 FV CFU Unduplication workload was estimated to be 401,572 cases, but the actual workload was 126,388 cases. One reason for the significant difference was the delay in data capture of NRFU questionnaires, which meant that they didn't have the opportunity to be part of the matching until after the FV workload was determined. Another probable reason is that workloads were estimated based on duplication rates in previous censuses and tests, while the

2010 Census Address Canvassing improved the address frame compared to these previous measures.

The 2010 FV Non-ID workload was expected to be 399,676 cases. Due to an increase in promotional efforts in 2010, a large response was expected through the Be Counted and TQA programs. The marketing campaign in 2010 was more aggressive than the 2000 efforts, and the 2010 Partnership Program was significantly more robust, with almost eight times the census partnership staff used in 2000. However, the actual Non-ID workload for 2010 was 329,525, which was about 140,000 fewer cases than the 2000 workload of 468,549 and about 70,000 below the 2010 estimate.

QC Workload Data

The baseline plan estimated 2010 FV QC workload was 337,274 cases. However, the 2010 FV replan required a 100 percent QC of all production work. As a result, the final 2010 FV QC workload was equal to the production workload of 455,913 addresses.

Impacts of Differences in the Expected and Actual Workloads

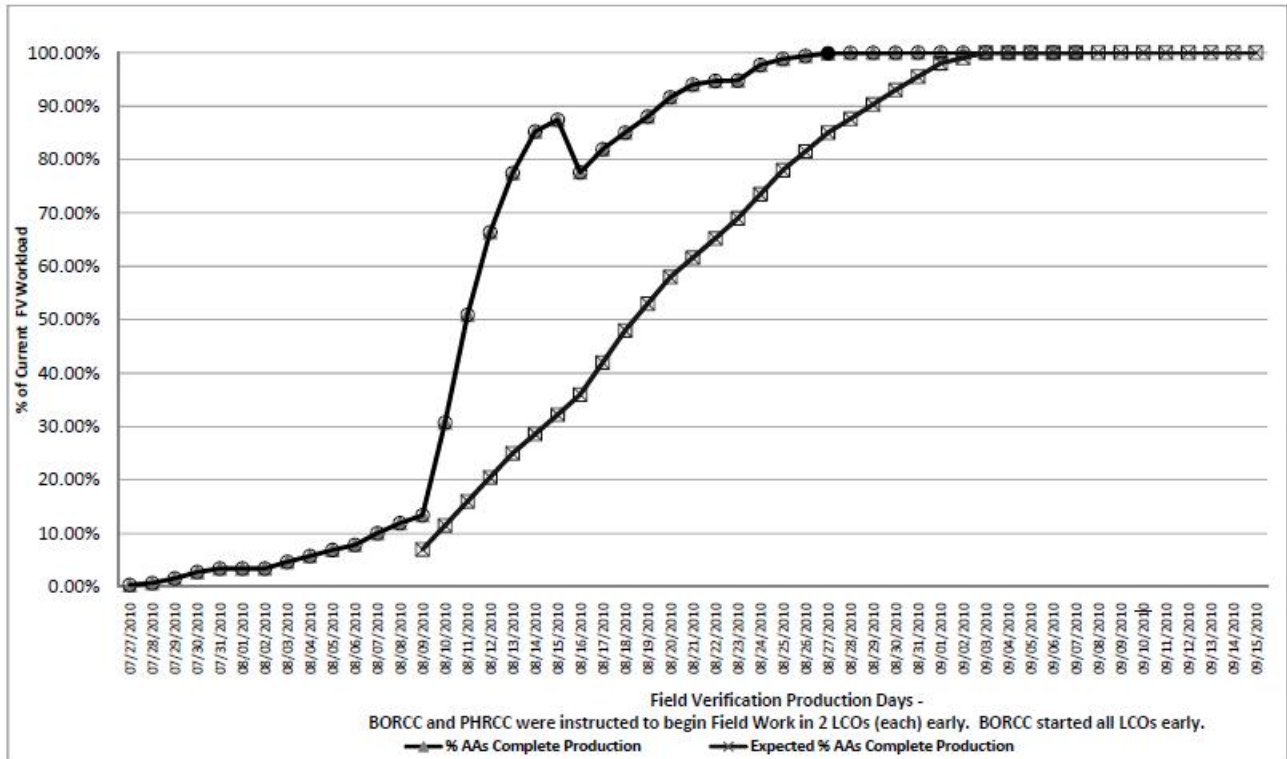
Because of lead time requirements for printing materials, shipment and staging of printed documents, kit preparation, and shipment of kits to 494 LCOs, FLD budget staff determined training and supply quantities in March 2010. The 2010 FV HU estimate at that time was 802,705 for production, which was nearly twice the actual workload of 455,913.

The actual 2010 FV production workload was not known until early July 2010. Because of lead time requirements for hiring staff and preparing for the operation, the RCCs and LCOs had to use initial production staffing goals that were considerably higher than the final authorized staffing. As a result, both Production and QC had more staff than indicated on the final authorization. Staffing is discussed further in Section 5.11.

Production Workflows – Daily Progress

The LCOs were successful in completing 2010 FV production on schedule. Figure 5.1 provides the field progress on a day-by-day timeline

Figure 5.1: 2010 Field Verification Production -- Actual vs. Expected Completion Rates for Assignment Areas



Source: ALD OIT Operational Status Report

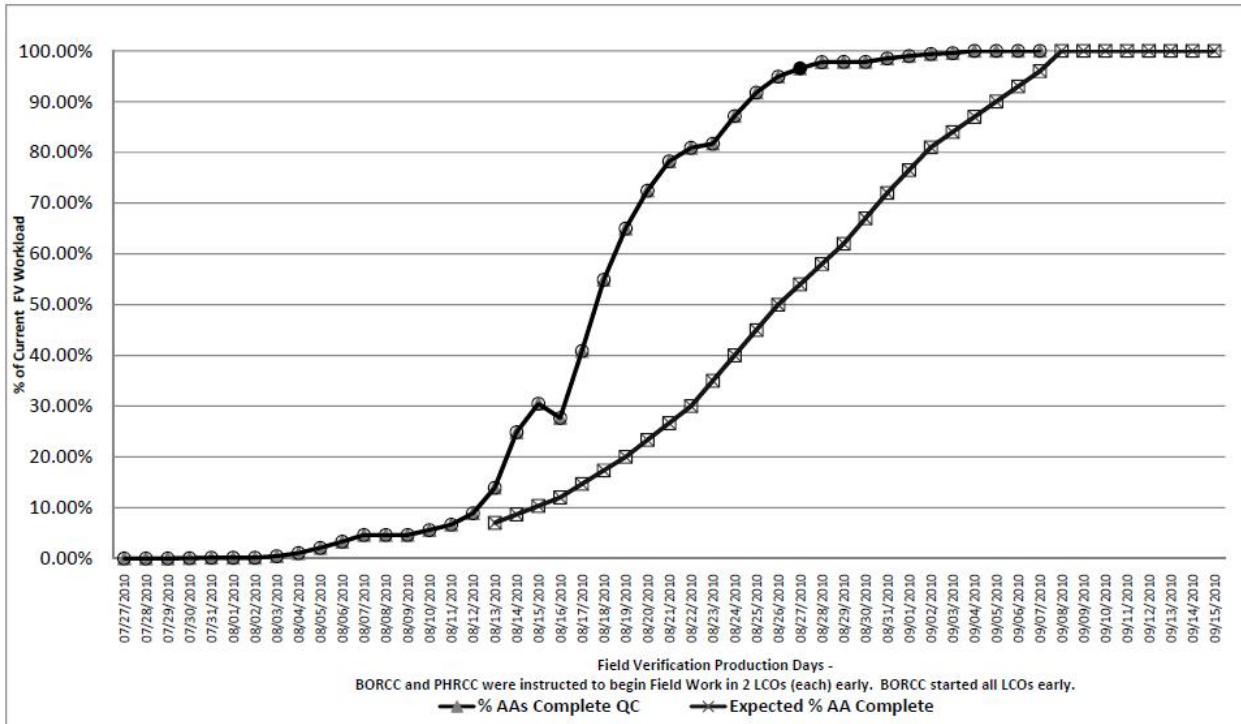
The minor drop in mid-August can be attributed to addition of the supplemental workload, which is described in Table 2.1. The spike of over 75 percent in the actual progress rate from August 9 -16, 2010, can be attributed to the following factors:

- Successful startup of the operation; all assignment materials were printed on time and the LCOs began either on or before the scheduled start date.
- Based on a review of post-census selection data, approximately 81 percent of the field staff had experience from previous operations. Experienced staff did not need administrative training; thus, some training sessions were conducted in less time than scheduled. Staff handled revised training and procedures with few problems.
- Based on Crew Leader debriefing data, 99 percent of Crew Leaders reported that all or most of their Listers understood FV concepts and procedures after receiving training.
- Based on Lister debriefing data, 97.3 percent of Listers reported that they fully or somewhat understood FV concepts and procedures after receiving training.
- The operation was not complex and there was no learning curve for experienced staff.

QC Workflows – Daily Progress

LCOs were also successful in meeting progress goals for 2010 FV QC, as indicated in Figure 5.2. The minor drop in mid-August can be attributed to the addition of the supplemental workload.

Figure 5.2: 2010 Field Verification Quality Control -- Actual vs. Expected Completion Rates for Assignment Areas



Source: ALD OIT Operational Status Report

Impacts of New Workflow Processes on RCC Activities

As a result of the 2010 FV contingency plan for FVOCS implementation and the changes in the QC operation, there were several new workflow processes and new challenges for RCC management. It was the first and only time during the 2010 Census that the RCCs were responsible for keying and shipping activities to support a census field operation.

LCO staffs had to adjust to new workflow processes, such as the change in shipping destinations for completed census materials and providing data to the RCCs each day as part of assignment control activities in the field.

The RCCs performed the following tasks, which would have been conducted by LCOs under normal circumstances:

- Generated assignment directories and provided files to the LCOs for use in assignment preparation
- Generated progress and cost reports and provided files to the LCOs

- Keyed data from assignment reports (received via a spreadsheet completed by the LCOs) and updated FVOCS; provided files to the LCOs for use in assignment control
- Keyed action codes for all completed 2010 FV addresses
- Shipped FA binders and maps to NPC

5.9 Operational Assessment Question 2: How does the baselined schedule compare with the actual start and finish dates and what were the impacts to the program?

2010 FV was completed on schedule. Refer to Table 5.34 for the baselined and actual dates for key 2010 FV activities.

Table 5.34: Baselined and Actual Start and Finish Dates for Key 2010 Field Verification Activities

Activity	Baselined Dates	Actual Dates
Train FV Production Crew Leaders	July 26 – 28, 2010	July 13 – 28, 2010
Train FV QC Crew Leaders	August 2 – 4, 2010	July 14 – August 4, 2010
Train FV Production Listers/Crew Leader Assistants	August 4 – 5, 2010	July 19 – August 5, 2010
Train FV QC Listers/Crew Leader Assistants	August 9 – 10, 2010	July 21 – August 10, 2010
Conduct FV Production	August 6 – September 3, 2010	July 21 – September 7, 2010 ¹¹
Conduct FV QC	August 11 – September 8, 2010	July 26 – September 7, 2010
RCC Keys FV Results/Conducts Keying QC	August 13 – September 13, 2010	August 5 – September 9, 2010

Source: Census 2010 Master Activity Schedule

Program Impacts of an Early Start in Some LCOs

¹¹ Production work was initially completed on August 30. It was then determined that about 30 AAs had been mistakenly sent to NPC instead of the RCCs for keying. Because it was deemed more expeditious to rework the AAs in Production and QC than to re-route the initial materials to the RCC from NPC, the rework of these AAs was completed on September 7, 2010 and the actual completion date for Production was updated accordingly. However, the QC work was all complete prior to September 8, 2010 so the operation is considered to have completed on time.

A small number of LCOs began training and finished training before the scheduled dates. By starting the operation earlier than scheduled in some areas, HQ staff had the opportunity to test and monitor the performance of the FVOCS before the operation started in all offices. The system performed well during this early testing period and did not require any changes before the operation began in all other LCOs in August 2010.

5.10 Operational Assessment Question 3: What was the expected budget and how did that compare with the actual cost and what were the impacts to the program?

Note: The cost results presented in this assessment were generated by program office staff using methods predating the US Census Bureau's commitment to comply with Government Accounting Office's cost estimating guidelines and the Society of Cost Estimating and Analysis best practices. Hence, while the Census Bureau believes these cost results are accurate and will meet the needs for which they will be used, the methods used for estimating costs of 2010 Census operations may not meet all of these guidelines and best practices. The Census Bureau will adhere to these guidelines in producing 2020 Census cost estimates.

Table 5.35 provides the budgeted amounts and the actual cost for both the Production and Quality Control staff for 2010 FV.

Table 5.35: Cost Summary for 2010 Field Verification Production and Quality Control

Cost Category	Production Staff			QC Staff		
	Replan Budget	Actual	% of Budget	Replan Budget	Actual	% of Budget
Training Hours	\$3,360,362	\$1,811,868	53.9	\$3,360,362	\$1,760,288	52.4
Field work Hours	\$10,204,709	\$6,324,142	62.0	\$10,204,709	\$5,713,182	56.0
Miles	\$3,251,162	\$2,541,102	78.2	\$3,251,162	\$2,588,453	79.6
Other (e.g., per diem)	\$68,749	\$151,056	219.7	\$68,749	\$123,538	179.7
Total Cost	\$16,884,982	\$10,677,112	63.2	\$16,884,982	\$10,061,923	59.6
Workload	455,913			455,913		
Cost Per Case¹²	\$37.05	\$23.75	63.2	\$37.04	\$22.34	59.6

Source: 2010 Census Field Verification Cost & Progress Reports

While spending was comparable for Production and QC staff for training, mileage and other expenses, interestingly salaries for QC field work were over \$600,000 less than production even though the workload was the same for both. Both staffs were over budget in the "Other" category, which includes per diem, tolls, and other miscellaneous expenses. While this was a small fraction of the overall budget, it is recommended that the 2020 FV cost model allow for other costs comparable to 2010 in terms of proportion of overall budget.

¹² Cost per case is calculated by dividing total cost by workload

Table 5.36 examines the overall Baseline and Replan budgets along with the total actual cost for conducting the operation, as well as the planned and actual workloads along with their associated costs per case.

Table 5.36: Overall Cost Summary for 2010 Field Verification

<i>Category</i>	<i>Baseline Budget</i>	<i>Replan Budget</i>	<i>Actual Cost</i>	<i>% of Replan Budget</i>
Total Cost	\$39,297,287	\$33,769,964	\$ 21,013,627	62.2
<i>Workload</i>	801,249	455,913	455,913	56.9
Cost Per Case	\$49.05	\$74.07	\$46.09	62.2

Sources: DMD Baseline and Replan Cost Models, 2010 Census Field Verification Cost & Progress Reports

Overall, the 2010 FV operation used \$21,013,625 (62.2 percent) of the FV Replan budget. However, it should be noted that the actual workload of 455,913 was only about 57 percent of the estimated workload of 801,249 cases. Actual cost per case was only about 62.2 percent of the \$74.07 per case planned for the combined Production and 100% QC work.

5.11 Operational Assessment Question 4: What was the expected staffing, how did that compare with the actual figures, and what were the impacts to the program?

The RCCs and LCOs had difficulty determining reasonable staffing numbers for 2010 FV because the workload distribution was not known until a few weeks before FV Crew Leader training. However, 2010 FV was the last major field operation conducted for the 2010 Census, and LCOs had a substantial pool of experienced field employees from which to select 2010 FV field staff. The LCOs completed their recruiting activities several weeks before hiring began for 2010 FV.

Staffing Strategy and Goals

The 2010 FV staffing strategy was to carry over experienced staff that had a status of “available for work” in the Decennial Applicant, Personnel, and Payroll System (DAPPS). FLD HQ advised the RCCs that former NRFU employees would be ideal candidates to reassign to training for the 2010 FV operation. NRFU Enumerators had considerable training and experience in using census maps, locating specific addresses, making contact with residents or knowledgeable persons, establishing rapport with respondents, and conducting interviews.

On June 17, 2010, FLD HQ delivered 2010 FV selection goals to the RCCs to provide the scope of the operation and help them plan their field staffing. The goals reflected the numbers of candidates that each LCO was authorized to select and invite to initial training as of June 17, 2010. These goals were based on the estimated workload known at that time.

The overall 2010 FV selection goals for each RCC are presented in Table 5.37.

Table 5.37: Initial Selection Goals for 2010 Field Verification

	Authorized Listers (Production)	Authorized Crew Leaders (Production)	Authorized Listers (QC)	Authorized Crew Leaders (QC)
Totals	14,787	1,535	5,803	582

Source: FLD Decennial Administrative Memorandum No. 10-72, Subject: June 17, 2010

Final Authorized Staff

FLD HQ revised the authorized staff for hiring after the actual 2010 FV workload figures were released in late June 2010 and the QC contingency plan for a 100 percent QC was finalized. Table 5.38 displays the revised authorized staff numbers.

Table 5.38: Final Authorized Staff for 2010 Field Verification

	Authorized Listers (Production)	Authorized Crew Leaders (Production)	Authorized Listers (QC)	Authorized Crew Leaders (QC)
Totals	7,857	666	7,857	666

Source: Staffing and Kits model, Modeling and Analysis Branch, FLD

Hiring

After the actual LCO workloads were known in late June 2010, each LCO received a staffing authorization that was used for hiring purposes. Hiring for 2010 FV began on July 1, 2010.

The LCOs hired enough applicants to cover all 2010 FV production and QC positions. Most Listers had successfully completed assignments for at least one other field operation and the number of new hires for 2010 FV (or those with no field experience) was a relatively small number nationwide. A review of post-census selection data revealed that 81 percent of all field employees hired after Address Canvassing had worked in at least one other operation.

Table 5.39 presents the numbers of positions filled for 2010 FV. The data include all replacement hires for field staff that resigned or were terminated during the operation. Crew Leader Assistants were hired as Listers.

Table 5.39: Number of Positions Filled for 2010 Field Verification

Operation	Position	Number of Staff
Field Verification Production	Crew Leader	1,375
	Crew Leader Assistant	938
	Lister	7,168
	Field Operations Supervisor	214
Total Production Hires		9,695
Field Verification QC	Crew Leader	921
	Crew Leader Assistant	946
	Lister	6,865
	Field Operations Supervisor	61
Total QC Hires		8,793
Field Verification Total (Production and QC)		18,488

Source: Special DAPPS Query for Distinct Employee IDs by Operation

5.12 Operational Assessment Question 5: What were the major findings from debriefings and Headquarters Staff observations?

Major Findings from Debriefing Questionnaires

FLD HQ provided debriefing questionnaires to a sample of LCO management staff, Crew Leaders, and Listers throughout the nation. Through a review of respondents' answers on the submitted questionnaires, these major findings were identified:

- Lister training was successful. Approximately 97 percent of Listers who responded to the Lister/CLA debriefing questionnaire reported that they fully or somewhat understood the FV procedures and concepts after completing their training sessions.
- Over 99 percent of Crew Leaders reported that all or most of their Listers understood 2010 FV concepts and procedures after receiving training.
- Over 95 percent of the Crew Leaders reported they had enough kits for Lister training sessions; the remaining Crew Leaders were short only one or two kits.
- LCO management staff indicated that the large format grid maps and the delineation procedures worked very well.
- Some LCO managers indicated that the RCCs were not entering data from the LCO-filled *Field Verification Tracking Spreadsheet* in a timely fashion. Thus, the LCO progress data were not as up to date as shown on the reports.
- Some experienced Listers made errors or took extra time performing work that was not required because of procedures they learned during previous Census operations.

- LCO management teams analyzed the following management reports to monitor specific aspects of the operation:
 - Managers used the D-201, *Master Assignment Report by AA*, to ensure that the proper Lister was assigned to the correct FA Binders.
 - Managers compared the D-201 report data to the *FV Tracking Spreadsheet* data each day to ensure RCC staff entered all AA completion results into FVOCS.
 - In addition to the D-201 reports, some LCOs used the D-370B and D-370B (QC), *CLD Progress Report*, each day to monitor progress of AAs in each CLD.
- About 62 percent of the Crew Leaders found that the D-201(FV), *Master Assignment Report by AA*, and D-1019, *Employee Roster*, were very or somewhat helpful in preparing Lister assignments.
- Some management reports were not as useful as expected. For example, the data in the D-220A and D-220A (QC), *Lister Level Performance Summary*, continually lagged the real time data, sometimes by several days. The operation progressed at a very fast rate, and the daily D-220 reports could not be used effectively for such a fast-paced operation.
- Some managers reported that the D-220 reports did not include data for all Listers. Field Division headquarters staff indicated that output on D-220 reports relied on Listers accurately recording cases completed on their daily payroll forms and the proper capture of those data during payroll keying. If the data were not on the payroll forms or they were not keyed, then the D-220 report was never accurate.
- There were mixed results on the usefulness of other management reports:
 - The D-220OR, *Performance Outlier Report*, was used daily in some offices and was found to be very useful. Other LCOs indicated the operation was completed by the time the data on the report showed any kind of trend. Others stated the report was not effective at all because it did not report some staff who were working regularly.
 - The D-342A, *AAs Not Returned to the Office*, was used daily by some LCOs, while other offices never used it. Some LCOs said the report was not available or was a duplication of other reports, such as the D-201, but simply in a different format.
 - Some LCOs used the D-370B, *Crew Leader District Progress Report*, every day while other relied mainly on the LCO level reports (D-370D), which some RCCs provided to all LCOs. Other LCOs never used the report or used it very infrequently.

- Some LCOs relied on their own manual record keeping and created their own ad hoc reports to enter real time data. Several managers indicated their locally created reports were the most useful monitoring tools.
- The distribution of Ops Logs was frequently mentioned as a successful means of communication.

Major Findings from Headquarters Staff Observations

A few Census HQ staff members observed various activities related to 2010 FV in the field. These major findings were identified from their observations reports.

- Procedures for conducting CLD delineation were unclear as to exactly how the D-975s, *CLD Delineation Worksheets*, were to be transmitted from the LCOs to the RCC.
- There was no formal QC process for checking the manual copying of numbers to different maps and forms during the CLD delineation.
- There was significant frustration on the part of the public in regards to the number of visits that Census Bureau field staff made previously over the course of 2010 operations.

6. Related Evaluations, Experiments, and/or Assessments

The 2010 Non-ID Processing Assessment provides information about the processes that led to the Non-ID Processing portion of the 2010 FV workload.

The 2010 Coverage Followup Assessment contains information about the processes that led to the CFU portion of the 2010 FV workload, as does the 2010 Effectiveness of Unduplication Evaluation.

7. Key Conclusions and Recommendations

Through the planning, development, and execution of the 2010 FV operation, the Census Bureau stakeholders accumulated knowledge and experience that will assist in more effective and efficient planning and development of future census operations. This section provides conclusions drawn from this assessment, highlights achievements of the 2010 Census, and identifies key recommendations to consider for implementation in the 2020 Census.

7.1 Conclusions

The assessment of the 2010 FV operation revealed major successes. LCO, RCC, and HQ staff applied their program management expertise in planning and implementing 2010 FV, such as:

- Producing a solid contingency plan late in the planning stage through an extraordinary team effort
- Implementing new processes and products as part of headquarters processing
- Developing, testing, and deploying FVOCS, the contingency operations control system, in a few weeks
- In a compressed time schedule, revising and writing new procedures and training materials to properly implement the contingency plan in the RCCs and LCOs
- Selecting highly qualified and experienced employees for field staff positions and training them effectively
- Implementing contingency keying and shipping operations in the RCCs, the first and only time such activities were conducted at those offices during the entire census
- Closely monitoring the operation to ensure it was completed on or ahead of schedule with no cost overruns.
- Communicating effectively and continuously to keep senior management and stakeholders aware of progress, costs, potential obstacles, and actions taken to solve problems
- Providing output files on a timely basis for completion of a post-census analysis and to address all assessment research questions

7.2 Recommendations

HQ and field staff from RCCs and LCOs submitted recommendations for the 2010 FV operation. Recommendations are grouped into the following subject matter areas:

- Budget planning
- Contingency planning
- Operational implementation
- Field training and procedures
- Management and staff communications

Budget Planning Recommendations

Regarding the decennial cost modeling, the Census Bureau should consider the following recommendations:

- For a fully automated 2020 census, the FLD HQ staff must analyze the impacts on LCO staffing and tasks early in the decade. There may be significant changes in the budget models, for staff positions and budget assumptions, because of modernized data collection and training techniques that could be used in the 2020 Census.
- DMD and FLD should review the process and assumptions for determining below-the-line costs and ensure proper funding for per diem and other expenses.

Contingency Planning Recommendations

The 2010 FV Subteam encountered challenges in identifying and assessing risks. They sometimes found it difficult to determine which risks and their scope should be included on the risk register. The team underwent a learning process as they worked out mitigation strategies and contingency plans.

Continually update or revise contingency planning, especially when it is known that a risk has a high probability of occurring. For the 2010 FV operation, the contingency plan for an alternate control system solution should have been completed prior to the performance risk probability reaching a high level.

Operational Implementation Recommendations

The 2010 FV Subteam made the following observations regarding implementation:

- Census Bureau HQ should provide more information from upstream processing in terms of workload distribution. For example, the geocodes of Non-ID FV inputs could be provided on a flow basis to assist the field staff.

- Stakeholders should work together to define requirements for an automated CLD delineation system for the 2020 FV operation as an alternative to the paper-based system used in 2010 FV.

Field Training and Procedures Recommendations

Some experienced Listers made errors or took extra time performing work that was not required because of procedures they learned during previous census operations. 2010 FV Lister training should emphasize that listing procedures from other operations should not be used during 2010 FV. One element that could be added to training materials is information that compares 2010 FV to other operations and illustrates how 2010 FV work is different and requires a specific set of procedures.

Stakeholders should evaluate the initial training program to determine if experienced workers could be trained via a self-study and job aid instead of classroom training. A field practice exercise could also be included in the initial training program.

Based on the dependency Field Verification has on block geocodes derived during Non-ID Processing, it is recommended that Census staff conduct further research to attempt to quantify the number of times a case was incorrectly geocoded during Non-ID Processing, which led to them being subsequently deleted. This research could help determine whether procedures should be changed to search for a case outside of the assigned block.

Management and Staff Communications Recommendations

Regarding program cost management, stakeholders should determine methods to identify more quickly the use of unauthorized staff positions for an operation. Immediate action must be taken to reassign or convert unauthorized staff to a lower hourly pay rate through a personnel action change.

Regarding HQ staff meetings to monitor the operation, the 2010 FV Subteam should continue their meetings throughout the operation. For 2010 FV, the Subteam stopped meeting after FLD began implementation.

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Field Division
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Geography Division
Technology Management Office

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Appendix A: Field Verification Assessment Acronyms and Initialisms

AA	Assignment Area	HQ	Headquarters
ACOB	Address Coverage Operations Branch	HTC	Hard to Count
ALD OIT	Address List Development Operations Implementation Team	HU	Housing Unit
ATAC	Automated Tracking and Control System	HUV	Housing Unit Verification
CFU	Coverage Followup	IST	Integrated System Team
CIG	Census Integration Group	LCO	Local Census Office
CLA	Crew Leader Assistant	MAB	Modeling and Analysis Branch
CLD	Crew Leader District	MAF	Master Address File
DACO	Decennial Address Coverage Operations	MAFID	Master Address File Identifier
DAPPS	Decennial Applicant, Personnel, and Payroll System	MAFX	MAF Extract
DLG	Decennial Leadership Group	MO/MB	Mailout/Mailback
DMAF	Decennial Master Address File	MTdb	MAF/TIGER database
DMD	Decennial Management Division	NPC	National Processing Center
DQC	Dependent Quality Control check	NRFU	Nonresponse Followup
DSCMO	Decennial Systems and Contract Management Office	OCS	Operations Control System
DSPO	Decennial Systems and Processing Office	PBOCS	Paper-Based Operations Control System
DSSD	Decennial Statistical Studies Division	QC	Quality Control
DV	Delete Verification	RA	Remote Alaska
FA	Field Assignment	RCC	Regional Census Center
FDV	Final Delete Verification	RUE	Remote Update Enumerate
FLD HQ	Field Division Headquarters	TEA	Type of Enumeration Area
FV	Field Verification	TIGER	Topologically Integrated Geographic Encoding and Referencing (system)
FVOCS	Field Verification Operations Control System	TMO	Technology Management Office
GEO	Geography Division	TQA	Telephone Questionnaire Assistance
GQE	Group Quarters Enumeration	U/L	Update/Leave
		UCM	Universe Control and Management
		UE	Update Enumerate
		UHE	Usual Home Elsewhere
		UU/L	Urban Update/Leave

Appendix B: Field Verification Workload by State

State	No.	%
California	46,249	10.1
New York	38,161	8.4
Texas	31,994	7.0
Florida	31,025	6.8
Pennsylvania	23,821	5.2
Illinois	19,273	4.2
Georgia	18,951	4.2
New Jersey	14,595	3.2
North Carolina	13,382	2.9
Ohio	12,323	2.7
Michigan	11,823	2.6
Maryland	11,353	2.5
Alabama	11,215	2.5
Indiana	10,064	2.2
Virginia	9,945	2.2
Massachusetts	9,923	2.2
South Carolina	9,287	2.0
Washington	9,236	2.0
Puerto Rico	8,807	1.9
Tennessee	7,824	1.7
Kentucky	7,741	1.7
Arizona	7,233	1.6
Missouri	6,735	1.5
Wisconsin	6,289	1.4
Mississippi	5,917	1.3
Louisiana	5,889	1.3
Oregon	5,767	1.3
Colorado	5,563	1.2
Minnesota	5,394	1.2
Connecticut	5,041	1.1

Oklahoma	3,933	0.9
Arkansas	3,766	0.8
New Mexico	3,741	0.8
West Virginia	3,095	0.7
Utah	2,972	0.7
Hawaii	2,542	0.6
Nevada	2,459	0.5
Iowa	2,458	0.5
Idaho	2,386	0.5
Kansas	2,157	0.5
South Dakota	1,841	0.4
Alaska	1,795	0.4
Rhode Island	1,711	0.4
New Hampshire	1,687	0.4
Maine	1,559	0.3
Nebraska	1,437	0.3
District of Columbia	1,315	0.3
Delaware	1,196	0.3
Vermont	1,045	0.2
Montana	724	0.2
North Dakota	692	0.2
Wyoming	582	0.1
Total	455,913	100.0

Source: 2010 Final Tabulation MAF Extract provided by GEO

Appendix C: Final Tabulation “In-Census” Housing Units by State

State	No.	%
California	13,988,879	10.1
Texas	10,350,804	7.5
Florida	9,282,564	6.7
New York	8,605,957	6.2
Pennsylvania	5,745,141	4.2
Illinois	5,444,521	3.9
Ohio	5,250,349	3.8
Michigan	4,707,818	3.4
North Carolina	4,593,960	3.3
Georgia	4,291,728	3.1
New Jersey	3,648,623	2.6
Virginia	3,480,390	2.5
Arizona	2,972,034	2.1
Washington	2,963,056	2.1
Tennessee	2,908,699	2.1
Massachusetts	2,893,023	2.1
Indiana	2,882,922	2.1
Missouri	2,813,660	2.0
Wisconsin	2,684,164	1.9
Maryland	2,462,695	1.8
Minnesota	2,399,241	1.7
Alabama	2,291,663	1.7
Colorado	2,273,491	1.6
South Carolina	2,260,953	1.6
Louisiana	2,076,696	1.5
Kentucky	2,016,096	1.5
Puerto Rico	1,728,558	1.2
Oklahoma	1,728,371	1.2
Oregon	1,717,078	1.2
Connecticut	1,565,252	1.1

State	No.	%
Arkansas	1,384,714	1.0
Iowa	1,370,328	1.0
Mississippi	1,343,738	1.0
Kansas	1,272,304	0.9
Nevada	1,229,744	0.9
Utah	1,006,065	0.7
New Mexico	981,524	0.7
West Virginia	926,328	0.7
Nebraska	820,989	0.6
Maine	749,504	0.5
Idaho	694,980	0.5
New Hampshire	629,225	0.5
Hawaii	537,034	0.4
Montana	508,091	0.4
Rhode Island	475,238	0.3
Delaware	417,315	0.3
South Dakota	377,496	0.3
Vermont	334,712	0.2
North Dakota	331,856	0.2
Alaska	327,313	0.2
District of Columbia	312,245	0.2
Wyoming	276,168	0.2
Total	138,335,297	100.0

Source: 2010 Final Tabulation MAF Extract provided by GEO

Appendix D: Final Tabulation “In-Census” Addresses by RCC

RCC	No.	%
Atlanta	15,865,956	11.5
Boston - Stateside	10,085,509	7.3
Boston - Puerto Rico	1,728,558	1.2
Charlotte	15,260,099	11.0
Chicago	11,011,602	8.0
Dallas	13,771,242	10.0
Denver	10,778,421	7.8
Detroit	10,884,499	7.9
Kansas City	10,971,051	7.9
Los Angeles	9,605,429	6.9
New York	7,256,151	5.2
Philadelphia	10,497,269	7.6
Seattle	10,619,511	7.7
Total	138,335,297	100.0

Source: 2010 Final Tabulation MAF Extract provided by GEO

Appendix E: LCO Type Descriptions

Office Type	Description	Land area covered	TEAs	Workload	Additional Guidelines
Type A (Urban/Hard to Count)	Urban inner city offices serving densely populated Hard-to-Enumerate (HTE) areas	less than 50 square miles	Primarily MO/MB; may include pockets of U/UE and/or U/UL	55,000 to 70,000 NRFU cases, about 1,100 NRFU frontloaded enumerators, total workload of <200,000 addresses	Majority of the census tracts (above 50%) should have high HTC/HTE scores (70 or greater). Mail Response Rates (MRRs) should be about 60% or lower in 2010 to qualify as a Type A office.
Type B (Urban/Metropolitan)	Similar to Type A offices, but covers urban and surrounding metropolitan areas, and may have higher workloads and more limited HTE areas	50 to 1,500 square miles, average: ~ 340 square miles.	Primarily MO/MB, possibly with some pockets of U/UL, U/UE, and/or Update/Leave (U/L).	70,000 to 90,000 NRFU cases, about 1,100 NRFU frontloaded enumerators, total workload of about 370,000 addresses	May contain census tracts with high HTE scores, but less than 50% of census tracts should be HTC/HTE in the Planning Database. Typical Mail Response Rates (MRRs) in Census 2000 were in the range of 60-80%, with the average being 70%.
Type C (Suburban/Rural)	Covers suburban areas, small and medium sized cities and towns and rural areas, and comprises the majority of LCOs	135 to 50,500 square miles, average: ~ 5,600 square miles	A mixture of Update/Leave and MO/MB and may include some Update/Enumerate (U/E).	70,000 to 105,000 NRFU cases, about 1,300 NRFU frontloaded enumerators, total workload of about 370,000 addresses	Typical Mail Response Rates (MRRs) in Census 2000 were in the range of 50-80%, with the average being 65%
Type D (Rural/Remote)	Covers exceptionally remote areas including some American Indian Reservations, and very large expanses of land, particularly in the western States	4,200 to 69,700 square miles, average: ~ 27,600 square miles	Mostly U/E, with limited U/L, MO/MB, and Remote Update/Enumerate	90,000 to 135,000 NRFU cases, about 1,500 NRFU frontloaded enumerators, total workload of about 470,000 addresses	Typical Mail Response Rates (MRRs) in Census 2000 were in the range of 45-70%, with the average being about 60%.

Type E (Alaska)	One LCO covers the entire State of Alaska	Just under 572,000 square miles	MO/MB, U/L, U/E, Remote Update/Enumerate, and Remote Alaska	105,000 NRFU cases, total workload of just under 286,000	
Type F (Puerto Rico)	Covers the entire Commonwealth of Puerto Rico	20 to 630 square miles, average: ~ 380 square miles	MO/MB and U/L	70,000 to 90,000 NRFU cases, about 1,000 NRFU frontloaded enumerators, total workload about 166,000 HUs	55.5% MRR

Sources: Census 2000/2010 Planning Spreadsheets

Appendix F: Map of 2010 Regional Census Centers

