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**2010 CENSUS PLANNING MEMORANDA SERIES**

**No. 190**

MEMORANDUM FOR      The Distribution List

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

Subject:                    2010 Census Nonresponse Followup Operations Assessment Report

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

If you have questions about this report, please contact Shelley Walker at (301) 763-4045.

Attachment

# 2010 Census Nonresponse Followup Operations Assessment

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

**FINAL**

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Decennial Management Division  
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## **Executive Summary**

The 2010 Nonresponse Followup Operation assessment reports the results of four 2010 Census field operations:

- Nonresponse Followup,
- Nonresponse Followup Reinterview,
- Nonresponse Followup Vacant Delete Check, and
- Nonresponse Followup Residual.

All four operations involve census enumerators interviewing and verifying the status of housing units in areas that received a mailback 2010 Census questionnaire but did not respond by mail.

The Nonresponse Followup Reinterview operation was a quality control check on the Nonresponse Followup enumerators' work.

The Nonresponse Followup Vacant Delete Check operation verified Nonresponse Followup vacant and nonexistent housing units. In addition to the housing unit verification, the Nonresponse Followup Vacant Delete Check Operation included a first time enumeration of housing units.

The Census Bureau developed the Nonresponse Followup Residual operation while Nonresponse Followup was in the field when Census Headquarters staff noticed there was potentially a large number of occupied housing units that lacked information about the number of people living in the housing unit. Nonresponse Followup Residual was the last attempt to complete a full interview for occupied housing units with no information about the number of people living there. Nonresponse Followup Residual also included enumeration of housing units for which we were missing data capture information.

### Workload, Schedule and Cost

The Nonresponse Followup Operations were conducted from mid-April through August 24<sup>th</sup>.

The first Nonresponse Followup operation in the field was Nonresponse Followup and officially began on May 1, although a few areas began work before that date. All but one of 494 local census offices reported finishing Nonresponse Followup by July 9<sup>th</sup>. The last local census office completed Nonresponse Followup on July 27<sup>th</sup>. The Nonresponse Followup workload totaled 47,197,405 housing units, and \$1,589,397,886 (70.7 percent) was spent of the estimated \$2,247,884,384 budget.

Nonresponse Followup Reinterview and the Nonresponse Followup operation were in the field concurrently, but Nonresponse Followup Reinterview started a week later to allow work to accumulate. Nonresponse Followup Reinterview ended three weeks later than Nonresponse Followup, to allow time to check on work completed late by Nonresponse Followup

enumerators. The Nonresponse Followup Reinterview workload totaled 1,888,148 housing units, and \$95,271,468 (101.3 percent) was spent of the estimated \$94,036,946 budget.

Nonresponse Followup Vacant Delete Check started once a local census office completed Nonresponse Followup. The earliest an enumerator completed a Nonresponse Followup Vacant Delete Check questionnaire was in the first week of June, but the bulk of cases was completed in July. In the first week of August, nearly 99 percent of all the Nonresponse Followup Vacant Delete Check workload was completed. The Nonresponse Followup Vacant Delete Check workload totaled 8,685,928 housing units and \$281,727,536 (115.3 percent) was spent of the \$244,284,616 estimated budget.

The Nonresponse Followup Residual operation was the last Nonresponse Followup operation in the field. It started August 9 and ended on August 24<sup>th</sup>. The Nonresponse Followup Residual workload totaled 728,823 housing units, and \$42,595,299 (136.1 percent) was spent of the \$31,287,851 estimated budget.

### Nonresponse Followup Outcomes

The initial Nonresponse Followup universe was 57,728,284 housing units - comprising approximately 1.5 million assignment areas. Through an automated process, prior to the start of the field work, the Decennial Systems and Processing Office removed 9,138,576 cases from the Nonresponse Followup workload; these were late mail returns received during the universe identification phase and prior to the release of the workload to the local census offices. Late mail returns were also removed from the Nonresponse Followup workload during a clerical process before address registers were distributed to the field staff. The clerical removals accounted for 1,991,217 additional housing units that did not require followup by an enumerator.

Of the housing units enumerated in Nonresponse Followup, 60.9 percent were occupied housing units, 30.0 percent were vacant housing units, and 8.5 percent did not exist. Of the occupied housing units in Nonresponse Followup, a household member was the respondent 75.7 percent of the time. A proxy was the respondent for approximately 24 percent of occupied interviews.

The Nonresponse Followup enumerators completed 811,985 questionnaires for added housing units. Out of all the added Nonresponse Followup questionnaires completed, 89.8 percent were successfully geocoded and assigned a Master Address File identification by the Geography Division. The adds that were not successfully geocoded did not contain enough valid address information to be assigned a Master Address File identification and if there were people on those forms they would not be counted in the final census counts.

### Nonresponse Followup Reinterview Outcomes

The Nonresponse Followup Reinterview workload was 1,894,644 housing units, and 93,634 were marked to replace NRFU data due to data falsification (confirmed or suspected) or other data errors (e.g., enumerator errors, respondent errors, etc.). There were 29,306 cases in Nonresponse Followup Reinterview that did not receive a final outcome code due mostly to missing, inconsistent, or late questionnaire data.

In Nonresponse Followup, 528,960 enumerators completed at least one questionnaire. Of those enumerators, the Nonresponse Followup Reinterview operation determined that 1,419 Nonresponse Followup enumerators had falsified data.

#### Nonresponse Followup Vacant Delete Check Outcomes

The Vacant Delete Check universe consisted of four sources:

- Nonresponse Followup cases classified as either a vacant housing unit or a delete that needed verification,
- The Supplemental Nonresponse Followup Universe,
- Blank mail returns (questionnaires that were mailed back but had not been filled out and not included in the Nonresponse Followup workload), and
- Housing units added by Vacant Delete Check enumerators.

The majority (64.8 percent) of the Vacant Delete Check workload consisted of verifying vacant and deleted Nonresponse Followup cases. Of the vacant housing units identified in Nonresponse Followup (that were not seasonally vacant) and sent to Vacant Delete Check, 72.5 percent were verified as vacant in Vacant Delete Check. From the housing units classified as deletes during Nonresponse Followup, 61.2 percent of the demolished/cannot locate, 62.0 percent of the nonresidential and 50.8 percent of the uninhabitable were verified as deletes in Vacant Delete Check.

The remainder of the Vacant Delete Check workload was enumerated for the first time in Vacant Delete Check. Of those housing units, 2,218,973 came from the Supplemental Nonresponse Universe. Several different sources contributed housing units to the Supplemental Nonresponse Universe. The largest source of housing units was the Local Update of Census Addresses Appeals operation. Housing units from that operation made up 51.9 percent of the Supplemental Nonresponse Universe in Vacant Delete Check.

Thirty-five percent of the Supplemental Universe was determined in Vacant Delete Check to be occupied housing units. Twenty percent of the Supplemental universe was determined to be vacant housing units and 44.5 percent of the housing units were marked for deletion.

Only 26.9 percent of the Local Update of Census Addresses were classified as occupied by Vacant Delete Check enumerators; 11.2 percent were classified as a duplicate of another existing housing unit.

The second largest portion of the first-time-enumerated housing units in Vacant Delete Check was from blank mail returns. There were 627,749 housing units in the Vacant Delete Check workload from blank mail returns. Of those housing units, 41.8 percent were classified as occupied, 49.6 percent as vacant, and 8.2 percent as deletes.

The Vacant Delete Check operation had a high percentage of interviews completed by proxy respondents. Proxy respondents completed 41.9 percent of the occupied interviews.

The enumerators added 219,074 housing units in Vacant Delete Check that were successfully geocoded and assigned a Master Address File identification by the Geography Division. Of those added housing units, 13,701 housing units were duplicates of housing units that Nonresponse Followup enumerators had also added.

#### Nonresponse Followup Residual Outcomes

The Nonresponse Followup Residual universe of 728,823 housing units consisted of two main sources. The first source was blank mail returns not enumerated in Vacant Delete Check; 57.2 percent of the housing units enumerated in Nonresponse Followup Residual fit this description. The second universe source was occupied housing units from Nonresponse Followup that did not have any information on the number of people living at the housing unit; 42.6 percent of the housing units were from this universe source.

Of the housing units in Nonresponse Followup Residual, 51.2 percent were classified as occupied, 40.7 percent were vacant, and 7.8 were classified as deletes. From the housing units that had been visited in Nonresponse Followup but no information was obtained on the number of people living there, 73.1 percent were verified as occupied in the Nonresponse Followup Residual operation. Of those, 93.1 percent had information after Nonresponse Followup Residual on the number of people living at the housing unit.

#### Automation

The enumerators used a paper questionnaire to interview housing unit residents and to document their work. Once the enumerators completed the questionnaires, staff checked them into the Paper-Based Operations Control System at the local census office. The Paper-Based Operations Control System was the first web-based solution used at the Census Bureau for managing most of the field operations from one centralized location while still maintaining a regional and local office-level control model. The Paper-Based Operations Control System was responsible for many essential functions, such as:

- removing late mail returns from the Nonresponse Followup workload before work was released to the local census offices,
- checking-in of completed questionnaires,
- creating reports for monitoring each operation,
- assigning work to crew leaders and enumerators,
- selecting questionnaires for Nonresponse Followup Reinterview,
- selecting eligible Nonresponse Followup questionnaires for Vacant Delete Check, and
- initially, it was tasked with the checking-out of questionnaires from the local census office to data capture centers.

During the course of the Nonresponse Followup operation there was a lag between the completion of the enumerator questionnaires and the check-in of those questionnaires into the Paper-Based Operations Control System. The lag between the completion and check-in of questionnaires started in the first week of May. The largest number of backlogged

questionnaires was on May 21<sup>st</sup> when 62 percent of the Nonresponse Followup cases were completed in the field while only 27 percent of the Nonresponse Followup workload was checked into the Paper-Based Operations Control System. The backlog did not get below five percent until June 8<sup>th</sup>, over a month after the official start of Nonresponse Followup. The backlog and lack of stability of the database created issues for the Decennial Management Division's Cost and Progress system, which affected the Census Bureau's ability to monitor the operations in real time.

The use of a paper questionnaire caused problems for each operation. When the clerks in the local census office checked completed Nonresponse Followup questionnaires in to the office, they would key the housing unit status into the Paper-Based Operations Control System. The system would then select questionnaires, based on the eligibility rules, for Vacant Delete Check. Due to errors in keying the housing unit status information into the Paper-Based Operations Control System, 148,611 Nonresponse Followup cases in Vacant Delete Check should not have been eligible for Vacant Delete Check. There were also instances of questionnaires being lost in transit to data capture centers, which required Census Headquarters Processing to create dummy returns based on the information keyed into the Paper-Based Operation Control System. Additionally, continuation forms needed to be linked to their parent form, which required tools, scripts, and queries to be generated by Census Headquarters Processing. The number of unlinked continuation forms was successfully reduced from hundreds of thousands down to a few thousand, but some still remained unlinked. There were also times when multiple questionnaires were completed for the same housing unit. To distinguish multiple questionnaires for the same housing unit, office clerks were required to assign a version number on the questionnaire, but this did not always happen. The key recommendations from the 2010 Nonresponse Followup Operations are the following:

- **Automate the questionnaire, initial observation forms, and all sources of data collection.**
- **Develop a data warehouse to create a consolidated repository of operational data that all systems can access.** This will facilitate the ability to monitor the progress of the Nonresponse Followup Operations in real time.
- **Streamline the Nonresponse Followup Operations and conduct Vacant Delete Check and Nonresponse Followup Residual concurrently with Nonresponse Followup as a quality check along with Nonresponse Followup Reinterview.<sup>1</sup>** If all of these four

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<sup>1</sup> In the 2006 Census Nonresponse Followup Operational test, we conducted the Vacant/Delete Check concurrently with Nonresponse Followup. One of the lessons learned following 2006 was to separate the Vacant/Delete Check from Nonresponse Followup and conduct it after production because it was difficult for the local census office to manage both operations simultaneously, under one assistant manager for field operations. If the recommendation to conduct Vacant/Delete Check under Nonresponse Followup is accepted in the future, we will need to revisit management issues.



operations are conducted at the same time, then the number of days spent in the field and the number of separate training materials that would have to be produced would be reduced. The quality of data from the later operations would improve because the interviews would take place closer to Census Day.

- **Avoid having to add late-planned operations and procedures.** For example, when initially planning the Nonresponse Operations, review the enumeration of housing units that surround colleges and universities to determine the most effective method to enumerate this universe. Also, include the planning of Nonresponse Followup Residual with the planning of the other Nonresponse Followup Operations.
- **Design and develop the contingency plans and systems in parallel with the production development in order to ensure the contingency plan is fully tested and ready when/if the need arises.**
- **Reconsider the housing unit status options presented to enumerators, the processing implications attached to each status, and the training provided to identify housing unit status.** Of the cases enumerated in Vacant Delete Check that had also been enumerated in Nonresponse Follow up only 59.0 percent had the exact same status code in Vacant Delete Check as they had in Nonresponse Follow up. The housing unit status designation, including the subcategories within vacant and deleted housing units, is incredibly important for an accurate census count of the population and housing.

# **1 INTRODUCTION**

## **1.1 Scope**

The purpose of the Nonresponse Followup Operations (NRO) Assessment is to document the results and major findings from the 2010 NRO, including topics such as workload, staffing, training, schedule, and cost. The NRO Assessment assesses the following field operations: Nonresponse Followup (NRFU), NRFU Reinterview (RI), NRFU Vacant Delete Check (VDC), and NRFU Residual (RES). In addition, the NRO assessment addresses the change control process, the use of automation, and other operation-specific assessment questions. This assessment will inform the Housing Unit Enumeration Operation Integration Team (HUE OIT), stakeholders, and decision makers of recommended changes or improvements for future censuses.

## **1.2 Intended Audience**

This document assumes that the reader has at least a basic understanding of the NRO. The goal is to use this document to help research, planning, and development teams planning the 2020 Census. For a basic understanding of the NRO, please refer to the Census 2010 Informational Memorandum No. 27, the 2010 Census Detailed Operations System Plan (DOSP) for Nonresponse Followup Operations (NRO). The DOSP is a document that describes the NRO in more detail.

# **2 BACKGROUND**

The NRO was the Census Bureau's effort to enumerate housing units and persons who did not respond to the census by mail. Temporary staff conducted the NRO interviews. The enumerators used the paper enumerator questionnaire (EQ) to conduct these interviews. The EQ collected information on the number of people who lived at the housing unit, demographic characteristics of the people living there, tenure of the household, and paradata related to the interview process (e.g. the language the interview was conducted in, number of contacts necessary to complete the interview, and if the interview was completed over the phone).

Before introducing and discussing the 2010 Census operations, we provide some history on Census 2000 and the mid-decade research that influenced the 2010 NRO.

## **2.1 Census 2000**

Four operations made up the NRO conducted in 2000: NRFU, NRFU RI, Coverage Improvement Followup (CIFU), and Residual-NRFU (R-NRFU). These correspond to the 2010 operations of NRFU, NRFU RI, VDC, and NRFU Residual.

### 2.1.1 2000 NRFU

In Census 2000, NRFU enumerators successfully enumerated more than 42 million housing units. The operation - scheduled to occur from April 27 through July 7, 2000 - finished ten days ahead of schedule and ran 7.23 percent over the approximately \$1.1 billion estimated budget. The cost per case was \$26.09 (\$33.04 in 2010 dollars<sup>2</sup>).

The goal of the 2000 NRFU operation was to obtain completed questionnaires from households in mailback areas who did not respond by mail. Housing units that did not have a return checked-in to the Decennial Master Address File (DMAF) by the time the Decennial Systems and Contracts Management Office (DSCMO) began identifying the NRFU universe were included in the NRFU universe. Although there was no official “cut” date to begin identifying the NRFU universe, the process of identifying the universe started on April 11, 2000 and continued through April 18.

Before DSCMO identified the initial NRFU universe, the system updated the universe with all currently checked-in returns. A subsequent late mail return (LMR) operation identified housing units checked in between April 11 and April 18. Census Headquarters sent a list of these case identifications to the local census offices (LCOs), and office clerks manually removed the LMRs from the address registers by striking through the housing unit address in the address register prior to the registers being assigned to the enumerators.

NRFU enumerators attempted to obtain Census Day residence and housing unit information from every housing unit designated for the operation. Enumerators visited each NRFU housing unit in their assignment area to collect as much information as possible on the enumerator short form questionnaire or the long form questionnaire at sampled housing units. In Puerto Rico (PR), enumerators used Spanish forms but had available English forms upon request. If an enumerator could not contact a household member at a followup housing unit by either personal visit or by phone after six attempts, the enumerator attempted to obtain the Census Day status of the housing unit and other required information from a knowledgeable non-household member.

Enumerators turned in their work, including their payroll form, each day to their Crew Leader (CL) or Crew Leader Assistant (CLA). CLs and their CLAs reviewed the questionnaires for completeness and returned completed forms to the LCOs on a flow basis.

LCO clerks reviewed the questionnaires to ensure that field staff filled critical items appropriately. If not, clerks returned the questionnaires to the field for completion. LCO clerks checked reviewed questionnaires into the Operations Control System 2000 (OCS 2000). During the check-in operation, the OCS 2000 indicated whether the system selected the case for the RI program.

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<sup>2</sup> The 2000 cost per case was adjusted into 2010 dollars using the Bureau of Labor Statistics online inflation calculator.

### **2.1.2 2000 NRFU RI**

The 2000 RI operation was a quality control operation conducted concurrently with NRFU. The purpose of the RI operation was to identify enumerators who intentionally did not follow procedures or falsified census data. The program had three RI components: random, administrative, and supplemental RI. This selection occurred early in the NRFU operation to quickly identify enumerators who were intentionally not following procedures or falsifying information. The administrative RI compared each enumerator's work to the work of other enumerators within the Crew Leader District (CLD). OCS2000 generated reports showing enumerators who were out of tolerance for the CLD. If an enumerator's data were out of tolerance, the office clerk performing the review would select the next ten cases for the enumerator for administrative RI. Finally, if the Office Operations Supervisor (OOS) felt that he/she needed more information to make a decision on an enumerator's work, then he/she could select additional cases for an enumerator for RI, constituting the supplemental RI workload.

RI case selection occurred during NRFU EQ check-in. Office clerks then transcribed the original NRFU information onto a RI form and forwarded the case to telephone RI, if a telephone number was available for the housing unit. If an office enumerator could not reach a respondent after six telephone attempts, or if no telephone number was available, the case went to an enumerator for personal visit. The RI enumerator made up to three personal visits to obtain an interview.

After the RI enumerator completed the interview, the RI enumerators classified cases with discrepancies as falsification, enumerator error, or respondent error. The OOS recorded completed RI cases for an enumerator on a RI Control Record and provided feedback for the enumerator as appropriate. The OOS and AMFO were also responsible for determining appropriate administrative actions for enumerators whose cases were classified by RI enumerators as having enumerator errors or data falsification.

### **2.1.3 2000 Coverage Improvement Followup (CIFU)**

In 2000, the Census Bureau conducted the Coverage Improvement Followup (CIFU) after the NRFU operation, which was similar to the 2010 VDC operation. The workload consisted of 8,854,304 housing units and included the enumeration of approximately 5.3 million people. Most of the workload consisted of housing units classified as vacant or delete in NRFU.

In addition to vacant and deletes from NRFU, the CIFU universe included:

- Units added (adds) from the New Construction operation
- Adds from the Update/Leave and Urban Update/Leave operations
- February 2000 and April 2000 USPS Delivery Sequence File adds
- Adds from the Local Update of Census Addresses 1998 and 1999 Appeals process
- Hialeah, Florida Local Census Office Nonresponse Followup units
- Blank mail returns
- Mail returns that were lost in transit to a data capture center

- Non-respondents in Panels 7, 8, and 9 of the Response Mode and Incentive Experiment

The CIFU workload did not include the following:

- Units identified as vacant or delete in two previous census operations
- Units identified as seasonal vacants, and
- Units identified as “Undeliverable as Addressed” (UAA) that were also found to be vacant or delete in NRFU.

#### **2.1.4 2000 Residual NRFU and POP 99s**

After NRFU, the Census Bureau conducted two late operations to re-enumerate more than 700,000 NRFU housing units. The operations were:

- 2000 R-NRFU
- 2000 POP-99<sup>3</sup>

The purpose of the 2000 R-NRFU operation was to re-enumerate NRFU housing units for which LCO staff checked out a completed questionnaire and sent it to be data captured but no data were captured for the case. The operation did not include NRFU cases that were also part of the CIFU. The 2000 R-NRFU workload consisted of 121,792 housing units. The second operation - 2000 POP-99 - re-enumerated housing units that enumerators identified as occupied during NRFU but could not obtain counts of persons living in the units on Census Day. These units were coded with a population count of 99 during NRFU production, thus the name of the operation. The workload for this universe was 589,232 housing units. Enumeration of 2000 R-NRFU and 2000 POP-99 cases followed the standard contact procedures implemented for NRFU.

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<sup>3</sup> Cases were coded POP-99 if they were found to be occupied but the population count was unknown. “POP” stands for “population count” here and in the rest of this document.

## 2.1.5 2000 Budgeted and Actual Costs

Overall, Census 2000 NRFU operations finished ahead of or on schedule and 10.6 percent over budget. Table 1 shows budgeted and actual workloads and costs for Census 2000 NRFU operations.

**Table 1: 2000 NRO Budgeted and Actual Costs**

	Budget		Actual		Variance	
	Workload	Budget	Workload	Actual	Variance	% Variance of Budget
Total NRO	53,983,183	\$1,242,559,183	53,834,341	\$1,374,411,824	(\$131,852,641)	(10.60%)
NRFU (includes POP-99)	45,387,349	\$1,067,593,202	42,269,216 <sup>4</sup>	\$1,123,563,961	(\$55,970,759)	(5.24%)
RI	1,134,685	\$24,664,854	2,507,836	\$44,207,867	(\$19,543,013)	(79.23%)
CIFU	7,461,149	\$150,301,127	8,936,370	\$203,206,785	(\$52,905,658)	(35.20%)
NRFU Res	N/A	N/A	120,919	\$3,433,211	N/A	N/A

Source: Assessment Report: Census 2000 Nonresponse Followup (NRFU)

Source: Assessment Report: Census 2000 Coverage Improvement Followup (CIFU)

### 2.1.5.1 2000 NRFU and POP 99s

The field costs for NRFU exceeded the planned budget by 5.24 percent. The main areas of over spending occurred in staffing, especially for CLs, and a lower than expected production rate.

In the area of staffing, we hired more staff than budgeted across all field positions. The impact of this was most noticeable in the CL category because CLs worked more production days and hours at a higher pay rate than other staff. This coupled with frontloading made CLs the leader in overspending. The actual production rate of 1.04 cases per hour compared to the budgeted rate of 1.35 per hour is evidence of lower than expected productivity. It appears that enumerators not being on the job long enough to develop efficient production strategies resulted in lower productivity.

With respect to the POP 99s, we never accounted for those cases in the Census 2000 allocation model. Hence, Table 1 only reflects an actual workload for this category. The NRFU actual cost includes the cost for these cases.

<sup>4</sup> In 2000, re-enumeration of POP 99 cases was part of NRFU and was not a separate operation. The actual NRFU workload of 42,269,216 housing units includes 584,072 POP-99 cases re-enumerated during production.

#### **2.1.5.2 2000 NRFU RI**

The RI operation ran 79.23 percent over budget, and ended with a workload that was 21 percent higher than planned. We modeled the operation with the assumption that office staff would complete approximately 1.1 million cases (50 percent of the RI workload) and field staff would complete the remaining 1.1 million. However, we were unable to distinguish between the cases office staff completed and the cases field staff completed because both office and field staff charged to the fieldwork project. We suspect that more RI cases were completed by personal visit than planned, which could have affected RI costs.

#### **2.1.5.3 2000 CIFU**

The CIFU operation exceeded its expected workload by 1.4 million housing units and its budget by 35.20 percent. Like NRFU, greater than planned staffing levels contributed to overspending in this program.

#### **2.1.5.4 2000 Residual NRFU**

Like the POP-99s, the Census 2000 allocation model did not account for Residual NRFU. The operation used a separate operation code so we were able to track the cost of following up on these cases. This in turn allowed us to compute a cost per case.

#### **2.1.6 2000 Recommendations**

The 2000 NRO yielded several major recommendations listed below. Information on how we addressed these recommendations in the 2010 NRO is in section 2.3.5 of this document.

- Monitor the followup workload in real-time to reduce the number of NRFU cases with unknown population counts and the number of lost NRFU enumerator returns.
- Periodically identify and remove additional late mail returns from the NRFU workload to reduce the NRFU workload and the number of housing units with multiple data captures.
- Implement a sufficient RI program to ensure the accuracy of the NRFU interviews and prevent falsification.
- Develop standards/benchmarks with which to measure/judge the results.

### **2.2 Mid-Decade Planning for 2010**

The beginning of a new decade historically defines the planning cycle for that decade's decennial census of population and housing, and the planning cycle for the 2010 Census was no exception. By 2002, Census Bureau managers had already begun early planning for the 2010 Census.

Key lessons from the Census 2000 experience suggested that the major challenges for the 2010 Census would revolve around the need to improve both data accuracy as well as data relevancy, while developing and implementing more cost effective operations. Furthermore, managers

anticipated they would need to meet these formidable challenges in an environment of increasingly rapid technological change and profoundly dramatic demographic diversity.

Census 2000, like other recent decennial censuses, included building a nationwide address file and collecting detailed demographic and socioeconomic data on about one-sixth of the population – the part of the census known as the long form or sample data. A close review of the challenges for the decade prompted Census Bureau managers to rethink the once-a-decade approach to building an address file and collecting long form data. As a result, managers determined that these two complex and costly operations should occur on an ongoing basis throughout the decade to increase timeliness and accuracy, while greatly simplifying the design for the actual enumeration in 2010. This led to the reengineering strategy for the 2010 Census of Population and Housing composed of the following:

- A modernized and maintained Master Address File/Topologically Integrated Geographic Encoding and Referencing (MAF/TIGER) address file and geographic database
- The full implementation of the American Community Survey to collect detailed demographic (i.e. long form) data
- A short form only 2010 Census optimally designed to take advantage of the opportunities afforded by the former two initiatives. ACS now collects the long form data.

The Census Bureau believed that the implementation of these three initiatives would enable the Census Bureau to meet its goals for the reengineered 2010 Census. These goals were:

- Improve accuracy (2010 Census specific)
- Reduce risks (2010 Census specific)
- Contain cost (2010 Census specific)
- Provide more relevant data (American Community Survey specific)

To design and implement an optimal short form only 2010 Census, the Census Bureau implemented a vigorous research, development, and testing program. The program included several special purpose tests, two census site tests, and a dress rehearsal of the actual 2010 Census plan. The rationale for having two site tests before the dress rehearsal was that it allowed for incremental and iterative development. The two tests would provide a number of opportunities to improve coverage and quality, increase efficiency, and contain costs.

However, realizing these opportunities required new methods and supporting systems. The first test in 2004 focused on new methods and gathering performance metrics. The subsequent test in 2006 focused on new and refined methods integrated with new systems and new infrastructure. The Census Bureau scheduled the full dress rehearsal for 2008 but ultimately canceled major components of the test (See Section 2.2.3. for more details).

### **2.2.1 2004 Census Test**

The 2004 Census Test objectives focused on new methods geared towards achieving the first three goals for the 2010 Census. One method was the development of a Handheld Computer



(HHC) - with global positioning system (GPS) capability. We assessed the impact of the device on field infrastructure and data processing during the 2004 Census Test NRFU operation.

The 2004 Census Test - conducted between April 24 and July 3, 2004 - took place in the mailback areas of Colquitt, Thomas and Tift counties in Southwest Georgia, and a portion of Northwestern Queens County in New York. The operation resulted in the enumeration of approximately 175,000 housing units across the two sites. Enumerators used a HHC to conduct interviews and collect map spots using GPS software, and used automated maps to locate their assignment areas and plan their routes.

#### **2.2.1.1 Comparisons of the 2004 Census Test NRFU to Census 2000 NRFU**

An important distinction between the 2004 Census Test and Census 2000 was the method of enumeration we used. In Census 2000, the data collection instrument was a paper EQ. In the 2004 Census Test as stated above we used an HHC. Consequently the findings of the 2004 Census Test presented here must be evaluated against this backdrop.

One of the major differences between a paper and an automated instrument is the time it takes the EQ to be checked in as complete and data captured. In a paper environment, EQs are turned in by enumerators to the CL who in turn submits the completed work to the LCO for check in via the OCS. After check in, the EQs are shipped to data capture centers for processing. The elapsed time from when the enumerator completes the EQ and it is turned into the office for check in and then shipped and data captured can span a few days.

In the 2004 Census Test enumerators conducted interviews using HHCs and during the evening they transmitted completed cases from their HHCs to the OCS. These transmissions to the OCS also constituted data capture of the EQs. In this environment the captured data for a case was available within hours of the interview.

Differences in check in data between Census 2000 and the 2004 Census Test were assumed to be a result of the automated environment as well as differences in the reduction of the NRFU universe. Finally, differences in the length of interviews were also attributed to automation.

During the test, we discovered functionality limitations with the HHC functionality. For example, there was no automated payroll, limited handling of apartment mix-ups, no CL functionality, and no report capability. We anticipated some of these limitations in 2004 and planned to improve the device functionality for the 2006 Census Test.

#### **2.2.1.2 Finding from 2004 as it relates to how we implemented NRFU in 2010**

Overall, it took NRFU enumerators more time to complete an interview in the 2004 Census Test than it did during Census 2000. On average, Georgia enumerators took 7.11 minutes and Queens enumerators took 8.21 minutes to finish an interview in 2004. The corresponding average for Census 2000 was 4.95 minutes.

### **2.2.1.3 Some conclusions from 2004 as they relate to how we implemented NRFU in 2010**

The Hand Held Computer system did not appear to improve the productivity of the NRFU operation out in the field. In 2004, the scheduled workload was not completed at the scheduled end of the NRFU operation and it took longer for enumerators to complete an interview using the Hand Held Computer in 2004 than it did in the paper environment of Census 2000 NRFU. Plausible reasons for the enumerator performance in 2004 are their inexperience with a virtual keyboard and stylus, their having to wait for screens to display before entering data, and a question sequence that forced a person by person repetition of the questions.

The automated reinterview did improve the efficiency and effectiveness of the reinterview data collection operation. At both sites in the 2004 Census Test, the NRFU reinterview workload was completed at a relatively constant rate throughout the reinterview operation. This is in contrast to the Census 2000 NRFU reinterview operation, where over half of the workload was completed within a two week period. During the 2004 Census Test, data transmitted from the original NRFU interview underwent an automated match to data transmitted from the NRFU reinterview operation via the automated Matching, Review, and Coding System (MaRCS). Clerks reviewed cases that failed automated matching. This replaced the 100 percent manual matching of original interview data to reinterview data that occurred during the Census 2000 NRFU reinterview operation and improved the flow of the reinterview operation.

The processing of Late Mail Returns after the beginning of the NRFU operation decreased the NRFU workload. The Late Mail Return reduction attributable to deletes after NRFU started was about 5.4 percent of the initial workload. However, due to automation we were also able to wait longer before sending the initial assignments, which probably accounted for some of these deletes from the NRFU universe. Given that households with Late Mail Returns received after the followup operation needs to begin are in the NRFU universe, there is potential for even larger decreases in the NRFU workload in future implementations.

### **2.2.2 2006 Census Test**

The objective of the 2006 Census Test was to assess the feasibility and effectiveness of using HHCs with improved functionality from the 2004 Census Test. Building on our experience from 2004, we streamlined the NRFU and VDC operations. We created a seamless NRFU/VDC operation that supported the follow-up of nonresponding households, and independently confirmed vacant and delete housing units identified during NRFU. The 2006 NRFU/VDC operation - conducted in Travis County, Texas - included a workload of approximately 210,000 housing units. The NRFU portion of the operation began on April 24, 2006 and ended on July 1, 2006. The VDC portion began on May 1, 2006 and ended on July 6, 2006. New functionality on the 2006 HHC included:

- Payroll data entry
- CL assignment management (CLAM) - management reports on the HHC for CLs to manage the enumerators' work
- Fully translated Spanish instrument

- Separate and improved RI instrument

The separate RI instrument provided more flexibility and options for handling RI situations than in 2004. For example, RI enumerators were able to collect roster information for a household - used for matching against the production data - if the respondent said a NRFU enumerator had already visited the household. This option was not available in 2004. In 2004, if a respondent indicated that an enumerator had already visited his/her household, the RI enumerator would abruptly end the interview without asking additional questions. As in 2004, we successfully used MaRCS to facilitate automated selection, matching, review, and coding functionality for RI.

#### **2.2.2.1 Some findings from 2006 as they relate to how we implemented NRFU in 2010**

Overall, the system infrastructure supported implementation of the NRFU/Vacant Delete Check seamless enumeration operation. For example,

- Cases were accurately identified and routed to Vacant Delete Check and Reinterview,
- Late Mail Returns were removed from, and Blank Mail Returns (Reverse Check-ins) were added to, the workload successfully, and
- A separate Reinterview instrument provided more flexibility and options for handling RI situations. For example, the Reinterview enumerators were able to collect roster information for the household in the event a respondent had been visited by a NRFU enumerator. This option was not available in 2004. In the 2004 NRFU, if a respondent indicated they had been visited by a NRFU enumerator, the Reinterview enumerator would abruptly end the interview without asking any additional questions or obtaining any additional information.

On the other hand, implementing NRFU and Vacant Delete Check concurrently caused operational and managerial problems. For example:

- It proved to be very chaotic for the Assistant Manager for Field Operations to manage the constantly changing Vacant Delete Check workload. The constant updates made it difficult to track what was done and what needed to be done. In addition, not having a predefined workload made it difficult to adequately staff the operation. Not knowing how large the Vacant Delete Check workload would be, it was virtually impossible to project the number of staff needed and recruit/train them in a timely manner.
- The nature of the Vacant Delete Check workload also increased the respondent burden on apartment managers. Because the workload was dynamic, multi-unit cases were received/identified one at a time; therefore enumerators never had a complete list of all vacant units in an apartment complex before they visited the complex. This resulted in multiple visits to the same location, which irritated apartment managers and ultimately impacted their willingness to cooperate.

- A few late mail returns were identified after the case was classified as a vacant or delete and transferred to the Vacant Delete Check operation. Once it was in Vacant Delete Check, the system would not let anyone assign the case because it was identified as a late mail return. On the other hand, the case/unit could not be removed from the workload because it had not been worked. These cases had to be manually removed by the Technologies Management Office.
- Late identification of Reinterview “hard fail” (or enumerator falsification) cases resulted in production problems. The local census office did not identify most hard fail situations until late in the operation - after NRFU production had ended. As a result, the local census office had to rehire production staff to rework the cases of the “hard fail” enumerator. The rework also generated cases for the Vacant Delete Check operation and the process became a recurring cycle.

### Effect on Data Quality

- There were 25,835 late mail returns removed from the NRFU/Vacant Delete Check workload. In other words, there were almost twenty-six thousand housing units that did not have to be visited and enumerated.
- There were 23,096 cases in the Vacant Delete Check workload: 19,432 Vacants and 3,664 Deletes. Approximately 11.8 percent (or 2,298) of the ‘Vacants’ were verified as ‘Occupied;’ 484 ‘Deletes’ (or 13.2 percent) were verified as ‘Occupied’ and 537 ‘Deletes’ (or 14.7 percent) were verified as ‘Vacants.’
- The 2006 item nonresponse rates for relationship, sex, age, Hispanic Origin, race, and tenure were lower than the Census 2000 rates for Austin, Texas; the item nonresponse rates for first name, middle name, and last name (and any combination thereof) were higher in 2006 than in 2000. In addition, nonresponse rates for month, day, and year of birth were higher in 2006 than 2000. However, the ‘age and year of birth’ item nonresponse rate was lower in 2006.
- The nonresponse rate for ‘Race’ was 1.6 percent, which is less than half the Census 2000 rate of 3.5 percent for Austin, Texas, and significantly less than the 2004 rates in New York (22.4 percent) and Georgia (5.5 percent). The nonresponse rate for ‘Hispanic Origin’ was lower in the 2006 Census Test (1.0 percent) than in Census 2000 (2.7 percent), but higher than the 2004 rates in New York (0.4 percent) and Georgia (less than 0.1 percent).
- The item nonresponse rates for Spanish interviews in the 2006 test were lower than the item nonresponse rates for the 2006 English interviews; this is consistent with what we saw in the 2004 Census Test.

Can we reduce the amount of household imputation necessary by collecting basic pieces of information (known as “Just in Case” information) at the time of refusals?

- We collected “Population count Only” for approximately 1.1 percent (or 1,245 units) of the 2006 NRFU workload, which is more than twice as many as was collected in the 2004 NRFU operation. Had we not collected this information, these cases would have been considered noninterviews because they lacked any information about the status of the housing unit.
- There were 2,472 “Noninterviews” in the 2006 test, which accounts for 2.1 percent of the 2006 NRFU workload. More than 13 percent of the noninterviews contained a “Just in Case” population count. Had we not collected this information, these cases would have remained noninterviews and the household size would have required imputation. Of the noninterviews without a “Just in Case” population count, 19.0 percent contained a “Just in Case” housing unit status, reducing the amount of housing unit status and occupancy status imputation that would have been necessary.

### Recommendations

Although the 2006 Census Test was conducted with an automated instrument, and the recommendations from the test tended to relate to the benefits of automation, there were also general recommendations. The recommendations were:

- Separate the NRFU and VDC operations
- Rework “Hard Fail” Cases in Reinterview instead of during Production
- Continue collecting “Just in Case” (JIC) information
- Continue to Monitor Noninterviews
- Investigate Ways to Improve Item Nonresponse Rates

### **2.2.3 2008 NRFU Dress Rehearsal (DR)**

On April 4, 2006, the Census Bureau awarded a Field Data Collection Automation (FDCA) contract to the Harris Corporation to design and develop the systems, software, and hardware necessary to conduct the field data collection for the 2008 Census Dress Rehearsal and 2010 Census. We worked with the Harris Corporation to develop an integrated schedule for the 2008 Census Dress Rehearsal (DR) operations, but identified conflicts related to the delivery of the Address Canvassing (AC) Mobile Computing Environment (MCE) and Office Computing Environment (OCE) software that precluded an on-time start of the 2008 AC operation.

We continued our plans for an automated 2008 DR NRFU operation knowing that the DR marked the final step in our decade of research and testing leading up to the implementation of the 2010 Census. However, in 2007 we observed the HHC in Census-like conditions during the AC operation, which exposed a number of performance issues with the devices, such as slow and inconsistent data processing, the magnitude of which was not clear.

Budget constraints in the form of a continuing resolution at the start of fiscal year 2008 also affected the DR schedule, ultimately resulting in reduced scope of the 2008 Census DR and the

one-month delay of Census Day from April 1, 2008 to May 1, 2008 (Vitrano, 2007). A later revision to the descoping resulted in the elimination of NRO from the DR in order to focus on development for the 2010 Census .

On April 3, 2008, Secretary of Commerce, Carlos Gutierrez, announced we would no longer implement an automated data collection operation for 2010 NRFU. This decision required a re-plan for the 2010 NRFU operations to reflect the use of a paper EQ and signaled the cancellation of the 2008 DR NRFU. On May 8, 2008, we submitted documentation to the Department of Commerce outlining the operational decisions for conducting the 2010 Census NRFU on paper.

One of the major impacts of the decision to implement a paper NRFU was that we needed to make changes to the OCS. Because of the need for late changes, the Census Bureau identified the development of the OCS as high risk and made a decision to bring the development of the OCS back in-house to mitigate the risk. Decennial Systems Processing Office<sup>5</sup> (DSPO) staff developed an OCS for a paper-based NRFU within an 18-month timeframe utilizing, when appropriate, existing functionality from other paper-based Census Bureau operations. This proved to be a formidable task given the time we would normally allocate for developing and testing a control system before deploying it for field data collection activities.

#### **2.2.4 Thread Test**

After the decision to remove the responsibility from FDCA for developing the Paper-Based Operations Control System (PBOCS), the Census Bureau began an intensive review and development process to identify how the PBOCS would be developed and tested. The testing strategy built upon and leveraged functionalities tested in the 2006 Census Test, the 2008 Census Dress Rehearsal, cognitive interviews, and lessons learned from Census 2000 in implementing the paper instrument.

The NRFU Thread Test validated the design of the PBOCS and core functionality critical to conducting NRFU. The test provided stakeholders an opportunity to validate that the core functionality worked as required and to identify areas that needed refinement. We established two “pseudo” LCOs to conduct the testing and field representatives were brought in from the regional offices to participate in the testing.

The test did not include a “live field test” because after assessing the option, it was determined that it was too risky to load and test developmental software in the existing LCO infrastructure while Address Canvass and Group Quarters Validation operations were in production. It also did not include the enumeration of respondents, because the Census Bureau has a proven history of using a paper instrument. The test also did not include NRFU RI functionality, including the interface with MaRCS.

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<sup>5</sup> This area is now referred to as the Decennial Systems and Contracts Management Office (DSCMO).

We conducted the test from April 20 to April 23, 2009. The test identified function areas that needed corrective action; however, there were no major system problems preventing deployment of the control system to the field.

## **2.3 2010 Census**

### **2.3.1 NRFU**

The 2010 NRFU was the largest field operation in the 2010 Census, designed to enumerate households in mailback<sup>6</sup> areas who did not return a census questionnaire by mail or complete an interview by telephone by the time the NRFU universe was determined in the second week of April. Enumerators visited each housing unit in the NRFU universe to determine its Census Day (April 1, 2010) status and to complete an EQ. If an enumerator discovered any housing units while working their assignment that were not on the assignment list, they added the housing unit address to their address list and enumerated it with an EQ. The address list contained all units in an assignment area and indicated which units required followup. In cases where a respondent moved in after Census Day (In-movers) or where a whole household had a usual home elsewhere (WHUHE), the respondent usually served as a proxy for the household. Additionally, the enumerator gave the respondent an opportunity to complete an interview for the housing unit where he or she lived on April 1, 2010.

Regional Census Centers (RCCs) were temporary offices that managed the 2010 Census within a geographical jurisdiction. Twelve RCCs were established in twelve cities where permanent Census Bureau Regional Offices (ROs) are located. In addition, there was a Puerto Rico Area Office established to manage all census work in Puerto Rico. The 12 RCCs managed 494 LCOs that supervised decennial operations in specific geographic areas. Each LCO reported to the RCC that was responsible for its geographic area. The LCO staff supervised the field staff in its area and provided support to them. LCO staff consisted of both office staff and field staff. Office staff worked on a variety of operations conducted out of the LCO and received specific training for each operation. The NRO operations required the following field staff positions: Field Operations Supervisors (FOS), CLs, CLAs, and enumerators. The hierarchy of the field and office staff, for both production and RI, is shown in Figure 1.

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<sup>6</sup> Mailback areas include four Type of Enumeration Areas (1, 2, 6, 7). For a description of the Type of Enumeration Areas see the Type of Enumeration Area Assessment.

**Figure 1: Organizational Chart for the NRFU Operational Staff**



Source: Nonresponse Followup Crew Leader Manual

The PBOCS was a Census Bureau-designed system that allowed LCO staff to track field assignments and manage the operations in the field. The PBOCS provided functionality such as case assignment, check-in and check-out of cases, and check-out of questionnaires for shipping to the DRIS. Additionally, the PBOCS was designed to print enumerator assignment materials, such as over 10 million address listing pages, 47 million questionnaire labels, and over 3 million binder and map pouch labels.

Headquarters managed the NRO via the DMD Cost and Progress System (C&P). The system tracked the cost and progress of the NRO at the National, RCC and LCO levels. Tracking of the NRO began with FOS training and continued through the closeout of NRO. NRFU production -



planned as a 10-week operation from May 1 to July 10, 2010 - had an estimated workload of approximately 48 million cases after the removal of LMRs.

An early enumeration was conducted in a small number of areas prior to May 1 in order to enumerate students before they left for the semester break. The regions researched which colleges and universities ended their semesters early, and identified nearby blocks that were thought to contain off campus housing. The regions divided these areas into two groups depending on how early the colleges and universities let out: Early Early and Early NRFU.

The Early Early NRFU was conducted before the NRFU universe was available to the LCOs. Since there was no NRFU assignment list at this time, Early Early NRFU involved canvassing and enumerating all HUs in the selected blocks. Early NRFU was conducted after the NRFU universe was available to the LCO, but before the official start of NRFU. Since the NRFU address list was available for Early NRFU, we enumerated HUs that did not return a mailback form. EQs from the early enumeration were held in the LCOs until the NRFU universe was deployed and were then checked in and processed as NRFU cases. EQs completed during Early Early NRFU were matched against the NRFU cases once the universe was deployed to the LCO. The number of cases worked during the Early NRFU operations is unknown because it was not a part of the original NRFU design and Early NRFU was not tracked separately.

The initial NRFU universe was 57,728,284 housing units - comprising approximately 1.5 million assignment areas. Through an automated process, DSPO removed 9,138,576 LMRs from the NRFU workload for mail returns received during the universe identification phase and prior to the release of the workload to the LCO. After this automated removal, DSPO continued to receive daily transmissions from the Decennial Response Integration System (DRIS) containing LMR check-in information. PBOCS was updated with LMR check-in data throughout the NRFU operation.

LMRs were also removed from the NRFU workload during a clerical process prior to the distribution of the address registers to the field staff. Address registers - numbered uniquely by assignment area - were distributed to the field in two phases. The first phase was the even numbered registers and the second was the odd numbered registers. The “odd” and “even” approach was the method used to spread out the amount of work in the LCO. The even numbered registers were distributed during the week of enumerator training and the odd numbered registers were distributed the first week of the operation. In both instances, LMR listings were printed prior to the distribution of the registers and used to identify housing unit addresses that needed to be lined through (to indicate that the enumerator did not need to visit that housing unit) before sending the registers to the field for follow up. A later LMR removal also occurred during the final closeout of the operation, using the accumulated check-in data in PBOCS. In all, the clerical removals accounted for 1,991,217 housing units that did not require follow up by an enumerator.

Table 2 shows how the NRFU workload decreased during the month of April as late mail returns were received at the data capture centers. The data in Table 2 come from PBOCS reports.

**Table 2: Impact of LMRs on NRFU Workload**

<b>NRFU Universe</b>	<b>Number of Questionnaires</b>
Initial NRFU Workload: Questionnaires in the UCM ‘cut’ (April 7, 2010)	57,728,284
Late Mail Returns Received between April 7 and April 19 and removed from the workload	9,138,576
Initial NRFU Workload Deployed to LCOs	48,589,708
Late Mail Returns Received After April 19	1,991,217
Initial NRFU Workload after Removal of all LMRs	46,598,491
Source: PBOCS	

According to PBOCS, there were 46,598,491 cases in the NRFU universe to be assigned to enumerators. That figure does not include housing units that were added by enumerators as they conducted their work in the field.

After DSPO made assignments available through PBOCS, LCO staff printed address listing pages which listed all the addresses for a given assignment area with nonresponding cases clearly identified. Each assignment area included approximately 40 housing units for followup. LCO staff assembled NRFU registers (with binder register labels) - usually one binder per assignment area - to include the following major materials.

- Address listing pages (see Appendix A)
- Cover page/Quality assurance review page
- Special notice page (provided instructions/reminders)
- Add pages (See Appendix B)
- Map envelopes with block locator maps and block maps
- Questionnaires with processing IDs
- Unlabeled questionnaires for added cases

LCO clerks checked out assignment area registers to CLs through an automated function performed in PBOCS. Then, CLs distributed work to enumerators, documenting assignment history on the coverage page.

As an enumerator completed interviews, he or she delivered the completed questionnaires along with his or her payroll form (D-308) to the CL, usually on a daily basis<sup>7</sup>. The CL checked the questionnaires for completeness and errors and delivered the questionnaires to the LCO. LCO staff performed an office review and checked-in the questionnaires using PBOCS (which was used for assignment management in all decennial field operations). Check-in consisted of keying specific data items, such as the name of the enumerator, the housing unit status, the population count, the vacancy type, the type of respondent, and whether or not the enumerator collected a

<sup>7</sup> A full description of enumerator forms and materials is available in the *2010 Census Nonresponse Followup (NRFU) Enumerator Manual (D-547)*.

telephone number. The PBOCS performed consistency checks to ensure that, for example, if the housing unit status was occupied, the population count was not zero. In addition, if the population count was greater than five, the system prompted the clerk to check for continuation forms and the continuation forms were electronically associated with the parent EQ. After check-in of the EQs was complete, they were shipped to DRIS for data capture.

Once all EQs for an assignment area (AA) were shipped, the original plan was to store the AA binders and ship all binders together at the end of the operation to NPC for storage. However, since PBOCS experienced challenges printing the assignment listings, we decided to reuse the NRFU binders for the VDC and NRFU Residual operations. Reusing the binders reduced the volume of printing for these subsequent operations and the demands on the PBOCS.

### **2.3.2 NRFU RI**

The 2010 Census marked the first time that we used an independent RI office staff. The RI office staff along with the RI field staff conducted a quality check concurrently during NRFU. A sample of NRFU cases was selected for the NRFU RI for a second visit by a different enumerator to ensure that NRFU enumerators did not intentionally violate procedures or, falsify census data.

The LCO RI staff first attempted to contact RI cases by telephone. Cases that could not be completed by telephone were assigned to a RI field enumerator on a case-by-case basis (i.e., not by assignment area) to be completed by personal visit. The RI consisted of verifying that the household had been visited by a Census Bureau enumerator, obtaining the Census Day status for the unit and, if occupied, the housing unit roster. The RI enumerator completed a full interview if the respondent could not confirm that someone from the household completed a questionnaire with a NRFU enumerator.

As the RI enumerator completed followup interviews, he or she delivered the completed RI questionnaires along with his or her payroll form (D-308) to the RI CL, usually on a daily basis. The RI CL checked the questionnaires for completeness and errors and delivered the questionnaires to the LCO. LCO staff performed an office review, checked in the questionnaires using the PBOCS, and shipped the questionnaires to DRIS for data capture.

There were four sampling categories for RI selection:

*Random:* Random RI involved reinterviewing a random sample of the eligible cases completed by every NRFU enumerator. PBOCS selected the cases from NRFU for random RI. The criteria for NRFU cases to be eligible for random RI were:

- Either an Occupied, Vacant-Usual Home Elsewhere, or Empty Mobile Home/Trailer Site status,

- Not a close out case<sup>8</sup>, in-mover add, or UHE add, and
- The Population Count was not equal to 99, and
- An earlier version of the case was not selected for RI.

The random sample was designed to be approximately four percent of the eligible cases from the NRFU universe.

*Supplemental:* Supplemental RI allowed the LCO staff to select additional cases for an enumerator if they suspected the enumerator might not be following procedures, or needed more information to code a case. MaRCS did most of the selection of Supplemental RI cases. In addition, PBOCS selected some supplemental cases for enumerators identified by MaRCS.

*Outlier:* Based on weekly statistical calculations, MaRCS flagged enumerators as outliers if characteristics of their work differed significantly from characteristics of other enumerators in the same CLD. MaRCS then automatically selected Outlier RI cases for all outlier enumerators.

*Hard Fail:* An enumerator was flagged as a hard fail if an RI outcome or their supervisor determined that the enumerator falsified their work. Once an enumerator was flagged as a hard fail, all of the enumerator's checked-in, eligible cases went to Hard Fail RI to check if the enumerator falsified other work and to collect replacement data for any cases that were falsified.

The RI operation utilized Census MaRCS to select certain types of RI cases (i.e. outlier, supplemental, hard fail RI cases, and enumerators for supplemental RI), and facilitated the review and coding of RI cases. The system allowed clerks to view the body of work (e.g., all the cases an enumerator or RI enumerator had completed) in order to assess the specific RI case for the enumerator that was under review by the clerk. It also reduced the RI coding at the LCO because automated and NPC clerical matching resolved 79 percent of the cases. This was the first time we used an automated matching process for RI during the decennial census.

The timeframe between when the NRFU and RI EQs left the LCO and when the scanned information from them was returned to Census MaRCS for matching was called the NRFU latency. Initially, DRIS estimated that the latency period would be approximately 38 days. This was because mailback forms had priority capture. However, this latency period would have been detrimental to the reinterview program that attempts to detect early falsification of enumerators. In order to reduce the latency to ten days, DRIS prioritized scanning of the NRFU forms and delivered to Census MaRCS interim data that had only gone through optical character

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<sup>8</sup> These are cases that had not been completed when the operation had to end so they were given a status of 'closeout' to finish the operation.

recognition and optical mark recognition capture, rather than through all phases of data capture including keying and keying quality control.

After data capturing RI EQs, DRIS transmitted RI data to Census MaRCS for computer and clerical matching, to compare the RI case data to the original NRFU case data. All completed RI cases first underwent computer matching. Computer matching was two-fold. First, it matched cases at the household-level, then the person-level. If the RI case did not pass computer matching, it underwent clerical matching by trained National Processing Center (NPC) and LCO MaRCS clerks. The number of cases that underwent each type of matching process is documented in the 2010 NRFU RI Quality Process report. The objective of reinterview was to determine a final RI outcome for each case, such as “pass,” “soft fail” for enumerator mistakes, and “hard fail” for falsification.

LCOs also used Census MaRCS to produce reports for monitoring the performance of the RI operation.

RI ran concurrently with NRFU from May 3 to July 31. Telephone RI started May 3, a couple of days after the start of NRFU. Personal visit followup was originally scheduled to start May 7 but was changed to May 13 to allow work to accumulate for the RI enumerators. The operation was originally scheduled to finish on July 27. However, at the end of June we made a late change to revise the official end date to July 31 due to the late identification of hard fail cases in selected LCOs. The July 27<sup>th</sup> end date did not allow enough time to return to the field and complete those recently-identified cases. Although the July 31 change was adopted, the master activity schedule was not updated with this change.

### **2.3.3 VDC**

VDC was a separate operation beginning after an LCO completed its NRFU workload. One purpose of VDC was to verify the status of cases identified during NRFU as vacant or nonexistent on Census Day. Vacant and nonexistent housing units are required to be verified to ensure that housing units are not misclassified and people are not missed. However, not all cases marked in NRFU as vacant and nonexistent were eligible for VDC. Vacant-Usual Home Elsewhere (UHE), Empty Mobile Home/Trailer Sites, and duplicate cases were not eligible for VDC but were eligible to be checked in NRFU RI (duplicates were also not eligible for RI). Other vacant and delete cases were not required to go to VDC because we had another acceptable source of information that we were able to use to verify the case status. These additional sources included:

- Information from the United States Postal Service (USPS) indicating the housing unit was marked as undeliverable-as-addressed (UAA) or
- Case marked as a nonexistent in the Update/Leave (UL) operation or

- Case was located on a military base<sup>9</sup>, or
- A completed mailback return was received for the case.

NRFU vacant-delete cases that met one of the criteria above were excluded from VDC. In addition to eligible vacants and deletes from NRFU, the VDC workload also included cases added to the Master Address File (MAF) Extract too late to be included in NRFU. One source of these late cases was the Supplemental Universe. The Supplemental Universe consisted of cases added via:

- the Spring 2010 Delivery Sequence File (DSF) Refresh,
- The New Construction operation,
- Local Update of Census Addresses (LUCA) appeals,
- Added units from the Update/Leave operation,
- Cases from the Ungeocoded operation
- Cases from the Info-Comm Operation, and,
- Count Review.

The LUCA Appeals workload was much larger than expected. Combined with the new operation to geocode previously-ungeocoded addresses, there was a significant increase in the expected VDC workload from the Supplemental universe. This increased VDC workload, as well as the knowledge that these addresses would not receive either a census questionnaire or a visit from census personnel until July 2010, resulted in what was referred to as the Late Add Mailing Operation.

Selected addresses received a questionnaire in the mail, two to five weeks after the primary questionnaire mailing. The selected addresses had to be in Type of Enumeration Area (TEA) 1 or 6 (Mailout/Mailback or Military) and come from one of the following sources:

- Reinstated LUCA appeals;
- Geocoded addresses from research on ungeocoded addresses; and,
- Spring 2010 USPS Delivery Sequence File address adds.

Addresses that did not respond to the mailing were visited in the VDC operation.

The VDC workload also consisted of housing units that had mail returns that were determined to be blank after data capture (also known as reverse check-in cases)<sup>10</sup>. VDC followed similar field procedures as NRFU and utilized the PBOCS for case management.

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<sup>9</sup> Military officials reviewed the findings of NRFU enumerators and confirmed any housing units classified by the enumerator as vacant or delete, thus providing the verification that VDC enumerators provide for other housing units.

<sup>10</sup> Returns that were determined to be blank could actually have contained some writing on them, such as notes on the back side, or even a population count provided with no other information.

The major difference in the field enumeration between NRFU and VDC was that VDC did not have a separate RI operation that checked for falsification. Instead, all cases enumerated for the first time (supplemental and blank mail return cases) identified as vacant or delete during VDC were subject to a telephone VDC RI to confirm their occupancy status. During check-in, PBOCS identified and displayed such cases for office clerks to followup on. There was no field enumeration for VDC RI, so cases were confirmed by telephone or not at all. Another difference between the two operations is that the VDC enumerators did not have a complete address list. The VDC enumerator's address binder did not contain any address information on addresses that were received as late mail returns.

Originally, for the NRFU cases that needed a verification in VDC, if the VDC housing unit status differed from the NRFU housing unit status the case was to undergo adjudication in the LCO. The adjudication process would have involved PBOCS notifying the LCO staff that the case required investigation. This investigation would have required LCO staff to make a determination on which housing unit status to accept. This functionality, however, was not implemented due to concerns that there would be inconsistencies in the ways that LCO staff made determinations on which housing unit status to accept. Instead, the final housing unit status of the case was decided during processing after the end of field data collection based on pre-defined decennial rules (Pennington 2010), as we also did in Census 2000.

#### **2.3.4 NRFU Residual**

The NRFU Residual was a late field operation to close out NRFU and ensure accountability for every NRFU housing unit. During the NRFU reconciliation and closeout process, the Census Bureau identified 729,143 housing units that required a follow-up visit by the field staff. This follow-up was NRFU Residual. The NRFU Residual workload was comprised of two categories of housing units. The first category was housing units that consisted of a subset of late mail return (LMR) cases that were returned to the data capture centers, but the respondent did not complete the questionnaire. This category totaled 415,204 housing units. The second category consisted of 313,939 housing units representing occupied housing units where the NRFU enumerator could not determine the population count (i.e., cases coded as POP-99s) and it was not a refusal.

#### **2.3.5 Recommendations from 2000 and How Census Addressed Them in 2010**

The Census 2000 NRO yielded several major recommendations. We incorporated these recommendations into the 2010 Census design, facilitating our ability to conduct a successful 2010 Census. Below are the 2000 NRO recommendations and explanations on how we addressed them in the 2010 Census.

- Monitor the followup workload in real-time to reduce the number of NRFU cases with unknown population counts and the number of lost NRFU enumerator returns.

**2010** - During the course of the operation, the LCO managed the occupied cases with an unknown population count (POP 99s) by instructing enumerators to make additional attempts to obtain population count information for these housing units.

*It was challenging to monitor EQs that were checked out of the LCOs but never made it to the data capture centers. Identification of these cases during NRFU was not always successful and so we later reconciled these cases during the NRFU Residual Operation - a late operation implemented in the middle of August.*

- Periodically identify and remove additional late mail returns from the NRFU workload to reduce the NRFU workload and the number of housing units with multiple data captures.

**2010** - The decision not to use an automated instrument for the 2010 NRFU operation and to return to a paper EQ prevented us from gleaning the full benefits of real time updating that automation offers. In an effort to reduce the NRFU workload as efficiently as possible, we conducted the removal of LMRs three times during the NRFU operation. The first LMR removal was an automated process and occurred before the LCOs received their NRFU workloads.

*The second LMR removal was clerical. LCO staff printed LMR listings a couple of days before distributing the enumerator assignments and manually lined through (to indicate that the enumerator did not need to visit that housing unit) any housing units on the assignment area registers that appeared on the LMR listing sheet.*

*The final LMR removal was also clerical. This LMR removal occurred towards the end of NRFU as part of the closeout process for the operation. During the closeout phase of the operation, field staff returned remaining work to the LCO for consolidation and redistribution to enumerators. LCO clerks also removed LMRs during this phase before sending the closeout assignments back to the field*

- Implement a sufficient RI program to ensure the accuracy of the NRFU interviews and prevent falsification.

**2010** - During the decade, we tested the use of the Census Matching, Review, and Coding System (MaRCS) that allowed us to perform automated matching of the RI and original EQs, with subsequent clerical matching by clerks at the National Processing Center (NPC) in Jeffersonville, Indiana, and finally the office staff in the LCOs. The Census MaRCS software allowed automated quality checks that improved the efficiency of the RI operation. Intercensal testing provided evidence that MaRCS could provide worthwhile efficiencies to a process that had many opportunities to be error-prone. In addition, there was a separate RI staff in the LCO to manage all RI activities, which eliminated the competing priorities for the LCO and field managers and ensured effective implementation of the RI operation. Finally, introducing more automation into the selection process for RI cases ensured the RI sample design was implemented correctly and controlled appropriately.



- Develop standards/benchmarks with which to measure/judge the results.

*2010 – Decennial Management Division (DMD) Headquarters (HQ) reports incorporated daily-expected cost and progress data developed by Field Division (FLD) to monitor progress of the operation.*

### **2.3.6 NRO Automation**

The NROs used four Integral Systems and eight Support Systems to prepare, conduct, and complete back-end activities. A description of each automated system is below.

#### **2.3.6.1 Integral Systems**

##### Decennial Applicant, Personnel and Payroll System (DAPPS)

DAPPS processes applicants, including hiring, personnel actions, and time and expenses entries related to Decennial temporary workforce payrolls. DAPPS facilitated the processing of personnel and payroll information for NRO. NRO field and office staffs submitted daily payroll information via the D-308 paper-based form. At the LCO, payroll forms were then keyed into DAPPS. During the conduct of NRO, 20,468,443 daily D-308s were keyed into DAPPS. DAPPS also developed a contingency check-out system in the LCOs that handled all of the checking out of forms sent to the data capture centers.

##### Paper-Based Operations Control System (PBOCS)

PBOCS supported assignment management functions performed in the LCO that were specific to the NRO. This included assignment of work, check-in of cases into the LCO, and creating reports for monitoring NRO progress.

##### Field Data Collection Automation – Office Computing Environment (FDCA-OCE)

FDCA-OCE consisted of hardware, software, telecommunications, technical procedures, training materials, and applications to enable staff to carry out 2010 Census operations. The FDCA-OCE also included a Map Printing System that allowed printing of small format maps for the operations.

##### Census Matching, Review, and Coding System (Census MaRCS)

Census MaRCS was a system that supported the NRFU RI operation. The NRFU RI operation utilized Census MaRCS to select certain types of NRFU RI cases, match interview information, facilitate review, and code final outcomes for NRFU RI cases. Census MaRCS selected outlier RI cases, hard fail RI cases, most supplemental NRFU RI cases, and supplemental NRFU RI enumerators. Census MaRCS transmitted data to PBOCS. Once RI forms were completed and data captured, Census MaRCS performed automated matching of the original interview data and NRFU RI data, followed by clerical reviews in NPC or the LCO, if necessary, to determine a

final RI outcome. Census MaRCS also produced reports that were used for monitoring the performance of NRFU RI.

### **2.3.6.2 Support Systems**

#### Master Address File/Topologically Integrated Geographic Encoding and Referencing System (MAF/TIGER)

The MAF/TIGER system provided geographic services required by the NRO operations. This included:

- Delineation and maintenance of geographic areas,
- Mapping,
- Address geocoding and matching,
- Address List, and
- Creation of geographic data extracts.

#### Universe Control and Management System (UCM)

The UCM system provided the capability to create, maintain, distribute, and update all Census operations universes. The UCM system was responsible for taking information from the MAF/TIGER database to create the operation universe. The population and status of housing units from PBOCS updated UCM during the NRO Operations. The system also adjudicated the status of the NRFU and VDC EQs, when the case status of the VDC EQ differed from that of the NRFU EQ. This function was originally planned as an LCO activity; but the plan was revised because the system functionality could not be developed within the PBOCS without introducing significant risk to the stability of the PBOCS.

#### Response Processing System (RPS)

RPS received questionnaire response data from DRIS and was the repository for all such data throughout the NRO operations.

#### Decennial Response Integration System (DRIS)

DRIS data captured questionnaire response data from paper questionnaires and updated the universal response database schema with questionnaire response data, and passed this information to RPS. DRIS also transmitted raw questionnaire data to Census MaRCS.

#### DMD Cost and Progress System

The DMD Cost and Progress (C&P) system tracked the cost and operational progress of the NRO operations. Tracking of the NRO operations started with the training of the FOS and continued through the closeout of NRO operations. During the course of the operation, the DMD C&P system interfaced with DAPPS, PBOCS, and Census MaRCS to extract the appropriate data to produce reports.

### Census Evaluation and Experiments System (CEE)

The CEE system interfaced with DRIS and PBOCS to receive auxiliary data captured from questionnaires and from PBOCS.

### National Processing Center - Automated Tracking and Control System (NPC-ATAC)

NPC-ATAC tracked receipt of AA binders, including address listing pages, and CL observation forms mailed from the LCOs to NPC.

### Visual Basic Key from Paper (VB KFP)

VB KFP was an NPC system that keyed data from the CL observation forms for NRFU and NRFU RI.

## **3 METHODOLOGY**

### **3.1 Research Questions**

Table 3 outlines the questions in the NRO Study Plan and shows where we answered these questions in the NRO Assessment. The question outline mirrors the same format as in the Results Section 5 of this Assessment.

**Table 3: NRO Study Plan Questions Mapped to NRO Assessment Sections**

<b>Questions</b>	<b>Results Section</b>
<b>3.1.1 Workload and Outcomes</b>	
<b>3.1.1.1 NRFU</b>	
1. How was the NRFU workload established and what were the outcomes from the NRFU operation?	5.1.1.1
1a. What was the NRFU initial universe?	2.3.1
1b. How did the workload change after late mail returns were identified and removed?	2.3.1
1c. How many cases were added to the NRFU workload?	5.1.1.7
1d. What percent of NRFU units were classified as occupied, vacant or delete?	5.1.1.2
1e. How did the accumulation of outcomes change over time?	5.1.1.3.1
2. How often did the undercount question result in enumerators collecting	5.1.1.5.2

Questions	Results Section
additional names?	
3. How often did the overcount question flag roster names?	5.1.1.5.3
4. Did the enumerator follow field procedures regarding the Residence Rules section of the Information Sheet?	5.1.1.5.4
5. What was the distribution of completed interviews by personal visit and telephone?	5.1.1.4.2
6. How many continuation forms were used?	5.1.1.5.1
7. How many proxies were used? How many times did proxies report a housing unit to be vacant, occupied, etc.	5.1.1.4.3, 5.1.1.5
8. In what languages were the interviews conducted?	5.1.1.4.1
9. How many refusals were there?	5.1.1.2.1
10. What was the demographic/characteristic distribution of the responses (considering household tenure, relationship, age, sex, race, and Hispanic origin for each person)?	5.1.1.6
<b>3.1.1.2 NRFU RI</b>	
11. What were the outcomes and major findings of NRFU Reinterview?	
11a. What was the NRFU RI workload?	5.1.2.1
11b. How many of the NRFU original cases were marked for replacement with RI data?	5.1.2.1
11c. How many enumerators received a “Hard Fail” by the end of the NRFU RI operation?	5.1.2.1
11d. How many RI cases did not receive a final outcome code?	5.1.2.1
12. How often did the undercount question result in enumerators collecting additional names?	5.1.2.6.2
13. How often did the overcount question flag roster names?	5.1.2.6.3
14. What was the distribution of completed interviews by personal visit and telephone?	5.1.2.5.2
15. How many continuation forms were used?	5.1.2.6.1
16. How many proxies were used? How many times did proxies report a housing unit to be vacant, occupied, etc?	5.1.2.5.3

Questions	Results Section
17. In what languages were the interviews conducted?	5.1.2.5.1
18. How many refusals were there?	5.1.2.3.1
19. What was the demographic/characteristic distribution of the responses (considering household tenure, relationship, age, sex, race, and Hispanic origin for each person)?	5.1.2.7
<b>3.1.1.3 VDC</b>	
20. What was the 2010 VDC workload and what were the outcomes from the VDC operation?	
20a. How many cases in the VDC workload were from the supplemental NRFU universe?	5.1.3.1
20b. How many cases in the VDC workload were vacant or deletes identified during NRFU production?	5.1.3.1
20c. How many cases in the VDC workload were reverse check-ins?	5.1.3.1
20d. Of the supplemental universe of VDC cases, how many cases had a final status of vacant? How many cases were deleted? How many were occupied?	5.1.3.1
20e. Of the vacants or deletes identified during NRFU production, how many cases had a final status of vacant? How many cases were deleted? How many cases were occupied?	5.1.3.1
20f. Of the vacants and deletes identified during NRFU production, what was the adjudication workload (of status discrepancies between NRFU and VDC)?	Not answered <sup>11</sup>
20g. How many times was the VDC status taken over the production status?	Same as 21f
20h. How many cases were reassigned during adjudication?	Same as 21f
21. How often did the undercount question result in enumerators collecting additional names?	5.1.3.10.2
22. How often did the overcount question flag roster names?	5.1.3.10.3

<sup>11</sup> We were unable to answer this question due to changes in the operation that occurred after the development of the research questions. NRFU VDC adjudication was not implemented. The final housing unit status of the case was decided during post processing based on pre-defined rules, as opposed to during office adjudication. This was also the procedure implemented in the Census 2000.

Questions	Results Section
23. What was the distribution of completed interviews by personal visit and telephone?	5.1.3.9.2
24. How many continuation forms were used?	5.1.3.10.1
25. How many proxies were used? How many times did proxies report a housing unit to be vacant vs. occupied, etc?	5.1.3.9.3
26. In what languages were the interviews conducted?	5.1.3.9.1
27. How many refusals were there?	5.1.3.10.1
28. What was the demographic/characteristic distribution of the responses (considering household tenure, relationship, age, sex, race, and Hispanic origin for each person)?	5.1.3.11
<b>3.1.1.4 NRFU Residual</b>	
29. What was the NRFU Residual workload?	5.1.4.1
30. How often did the undercount question result in enumerators collecting additional names?	5.1.4.6.2
31. How often did the overcount question flag roster names?	5.1.4.6.3
32. What was the distribution of completed interviews by personal visit and telephone?	5.1.4.5.2
33. How many continuation forms were used?	5.1.4.6.1
34. How many proxies were used? How many times did proxies report a housing unit to be vacant, occupied, etc?	5.1.4.5.3
35. In what languages were the interviews conducted?	5.1.4.5.1
36. How many refusals were there?	5.1.4.1
37. What was the demographic/characteristic distribution of the responses (considering household tenure, relationship, age, sex, race, and Hispanic origin for each person)?	5.1.4.7
<b>3.1.2 Cost, Staffing and Production Rates</b>	
	5.2
38. How did the budgeted costs for the operations compare to the actuals?	5.2.1.1, 5.2.2.1, 5.2.3.1, 5.2.4.1
39. How did the actual staffing levels and production rates compare to the budgeted estimates for NRFU, NRFU RI, VDC, and NRFU Residual?	5.2.1.6, 5.2.1.3,

Questions	Results Section
	5.2.2.4, 5.2.2.3, 5.2.3.6, 5.2.3.3, 5.2.4.3
<b>3.1.3 Training</b>	
40. What happened during training for the NRO operations?	
40a. Did we conduct field and NPC training on schedule? (NRFU, NRFU RI, VDC)	5.3.1.1, 5.3.1.2, 5.3.2.1, 5.3.2.2 , 5.3.4
40b. Was the training time allotted sufficient to complete the training? (Were sections of training skipped, missed, or assigned as self-study that were not supposed to be?)	5.3.1.1, 5.3.1.2, 5.3.2.2
40c. Did training prepare the office/field staff for their job? <sup>12</sup>	5.3.1.1, 5.3.1.2
40d. Did training prepare the NPC Clerks for their job?	5.3.2.2
<b>3.1.4 Schedule</b>	
41. How did the planned start and finish dates for the operations compare to the actual for NRFU, NRFU RI, VDC, and NRFU Residual?	5.4.1, 5.4.2, 5.4.3
<b>3.1.5 Change Control</b>	
42. What were the primary reasons for implementing schedule changes (for example, multiple changes to baseline dates, incorrect durations, and late changes to the program)?	5.5
43. Was the change control process easy to execute?	5.5
44. What were the primary reasons for implementing requirement changes?	5.5

<sup>12</sup> In this assessment, we only address whether training prepared field staff to perform their jobs. No debriefings were conducted for NRFU office staff training and so we were not able to answer the office staff part of this question. Training for LCO MaRCS clerks is addressed in the NRFU RI Quality Profile.

Questions	Results Section
<b>3.1.6 Automation</b>	
45. What types of automation problems did we experience? What was the frequency of the problems and how were they resolved?	5.7

## **3.2 Data File Sources**

### **3.2.1 DMD Cost and Progress**

Managers and team members used the DMD C&P to monitor costs and check-in data during the operation. DMD C&P tallied data, but information was not reported at the housing unit level. DMD C&P received data from areas including DAPPS, PBOCS, the DMD Budget Formulation Branch, Census MaRCS, and UCM.

PBOCS provided DMD C&P with daily check-in data at the national, RCC, and LCO level. Using national-level DMD C&P data, we produced tables that show cumulative check-ins summarized by week.

Using LCO-level daily check-in data, we calculated what date each LCO reached 100 percent check-in for NRFU and VDC. For VDC, we also estimated what days each LCO started the operation, based on the first cases checked in. We used this information to make statements on how long it took LCOs to finish NRFU and VDC.

### **3.2.2 2010 Decennial Response Files (DRF)**

The DRF includes the core response data that made up the Universal Response Database from all EQs that were data captured. In addition, the DRF included records for cases that were not data captured but only had data from PBOCS. DSPO created the DRF.

### **3.2.3 Auxiliary Questionnaire Data (AUX)**

The data-captured data from all the EQs that were not core response data were included on the AUX file. DRIS transferred these data daily to Decennial Statistical Studies Division (DSSD). The AUX data were merged to the DRF via the unique Document ID assigned to each paper EQ for this assessment.



### **3.2.4 Census MaRCS**

Census MaRCS data facilitated the NRFU RI operation. Census MaRCS data files contained data-captured EQs but only contained the initial version of the data-captured EQ through DRIS scanning, not the final data capture record through DRIS keying.

### **3.2.5 VDC RI RCC Spreadsheet**

The RCCs completed spreadsheets that documented progress of VDC RI (i.e., verification of cases enumerated for the first time in VDC and having a vacant or delete status). The RCCs sent the spreadsheets to FLD who then sent them to the Quality Assurance Branch (QAB) in DSSD for analysis.

### **3.2.6 FLD Cost and Staffing Spreadsheets**

FLD created spreadsheets based on DMD Budget Formulation, DAPPS, and universe data to show staffing, production rates, budget, and actual cost data. We used these data to address the Cost, Production Rates, and Staffing portion of this assessment.

### **3.2.7 Master Activities Schedule (MAS)**

The Master Activities Schedule (MAS) documented the baseline and actual start and finish dates for all scheduled activities. Following the completion of the 2010 Census, the DMD management information systems (MIS) staff provided a spreadsheet of baseline and actual dates, related operations and other information for each activity line. Using sort and filter functionality in Microsoft Excel, we were able to determine how many NRO lines were on schedule or late.

### **3.2.8 Field and Office Staff Debriefings**

At the completion of NRO, FLD conducted debriefings with LCO staff and enumerators. The Census HQ FLD documented these findings. FLD Quality Assurance Branch also distributed and tallied the responses from LCO debriefing questionnaires regarding RI-specific topics and Census MaRCS.

### **3.2.9 NPC MaRCS Debriefings**

Staff from the DSSD QAB conducted debriefings with the clerks that used MaRCS in NPC. DSSD QAB documented and summarized the outcome of the NPC clerk debriefings.

### **3.2.10 Initial Observation Reports**

NRFU and NRFU RI CLs or CLAs observed each enumerator or RI enumerator, respectively, conduct at least one interview, called an Initial Observation. This was done for both NRFU and NRFU RI enumerators. The Census Bureau mandated that all enumerators undergo an Initial

Observation during the first week after training when the enumerator had been given their first assignment. The CL or CLA documented their observation on the Observation Checklist (Form D-1222 (NRFU/NRFU RI)). The completed Observation Checklists were data captured by NPC and sent to DSSD for analysis.

### **3.2.11 Field Observation Reports**

Census HQ staff had the opportunity to observe NRO enumerators, CLs, and LCO staff. After the Census HQ staff completed their observations, they documented their findings in a field observation report.

### **3.2.12 DMD Change Control Forms**

A change control form documented all changes to the NRO baseline. For a Change Control form to be implemented, it needed approval from the Housing Unit Enumeration-Operation Integration Team (HUE-OIT) and the Census Integration Group (CIG).

### **3.2.13 Risk Register**

The HUE-OIT documented risks associated with completing NRO. The risks were assigned a probability and impact rating. DMD documented and maintained the risks in the Risk Register.

### **3.2.14 Lessons Learned**

After the NRO field operations were completed, DMD conducted several Lessons Learned sessions with Census HQ and NPC staff involved in the design and monitoring of NRO. Census HQ and NPC staff documented successes, problems, and recommendations for NRO.

### **3.2.15 MaRCS Trouble Reports**

The Decennial Operations Technical Support (DOTS) system exported all of the remedy tickets assigned to MaRCS to the DSSD and FLD QAB staff.

### **3.2.16 Behavior Coding**

The Center for Survey Measurement conducted a behavior coding study that focused on the NRFU interviewer-administered survey instrument. The purpose was to identify problems with how interviewers ask, and respondents answer questions. A total of 204 audiotaped interviews were gathered from eight sites across the United States during observations for the Comparative Ethnographic Studies of Enumeration Methods and Coverage evaluation. The sample included interviews from eight racial and/or ethnic communities including American Indian, Alaska Native, Asian, Black, non-Hispanic White, Native Hawaiian and Other Pacific Islander, and

Hispanic.<sup>13</sup> The sample was not intended to be a representative sample, but rather a sample of convenience (see Schwede 2009 for how the sites were selected). In addition, 11 tapes were gathered from the NRFU operation in Puerto Rico solely for this project to examine a small sample of Spanish-language interviews.<sup>14</sup>

Behavior coders applied a prescribed framework of behavior codes to interviewer and respondent behaviors by listening to the audiotapes and following the interview's progress by reading along with a blank NRFU questionnaire. By comparing the written document to the interviewers' recitation of the questions, coders made assessments about whether and to what extent the interviewers read the questions exactly as worded. Coders also made assessments regarding whether or not the respondents' answers to the questions could be easily classified into the existing response categories, i.e., were "codable." For more information on the NRFU behavior coding study, refer to Childs' "Behavior Coding of the 2010 Nonresponse Followup (NRFU) Interviews Report."

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<sup>13</sup> The eighth site was a "generalized" site that represented different racial and ethnic groups within the site.

<sup>14</sup> Because there was not a full Spanish-language questionnaire outside of Puerto Rico, a full evaluation of the Spanish translation was not possible for this study. Stateside Spanish NRFU interviews are within the scope of another evaluation of enumeration of non-English-speaking households by Pan (2010). In addition to the 11 Puerto Rico Spanish cases, four cases were recorded as mixed language. These were primarily conducted in English, but had some Spanish in parts of the interview as well.

### 3.3 Assessment Topics and Sources Mapping

Table 4 lists the major topics that are addressed in this assessment, along with the corresponding data sources for each topic.

**Table 4: NRO Assessment Topic and Sources**

NRO Assessment Topic	NRO Assessment Data Sources													
	DMD Cost and Progress	Auxiliary Questionnaire Data	2010 Decennial Response Files (DRF)	Census MaRCS	VDC RI RCC Spreadsheets	FLD Cost and Staffing Spreadsheets	Master Activities Schedule	Field and Office Staff Debriefings (MAS)	NPC MaRCS Debriefings	Initial Observation Forms	Field Observation Forms	DMD Change Control Reports	Risk Register	Lessons Learned
Universe	X	X	X											
Housing Unit Status		X												
Interview Completion and Case Check-in	X	X	X											
Interview Characteristics		X	X					X	X					X
Standard Demographic Tables			X											
Added Housing Units		X												
VDC RI				X										
Cost, Staffing and Production Rates					X									
Training						X	X	X	X					
Schedule						X								
Change Control										X				
Risk Management												X		
Automation													X	X

## **4 LIMITATIONS**

### **4.1 Paper Questionnaires – Universe Discrepancies**

There are three major data sources for this assessment: DMD C&P, the DRF, and Census MaRCS. All three sources have a different number of cases in the universe for the four NRO operations. The data files from the sources were created at different times and had different parameters for what was an acceptable return for the operation's universe, so there is not one static universe for each operation identifiable in the data.

The DMD C&P data do not exist at a housing unit level and cannot be reconciled with the other two sources. The DMD C&P data also do not contain any cases not checked in to PBOCS.

The DRF file contains operation code discrepancies, multiple versions of units, dummy returns for cases that were created because only PBOCS data existed, and has added housing units associated with addresses.

The MaRCS data do not contain data that were not data captured, only contain one data captured record for each unit, do not contain the final data captured data, contain cases with incorrect operation codes, and do not contain any geocoding information for added housing units.

To best analyze these operations, a different universe is inevitable when looking at results that are only available from each source. Thus, the total number of housing units will differ slightly between tables that used different data sources.

### **4.2 Paper Questionnaires – Incomplete Data**

The use of paper questionnaires required the enumerators to take the effort to write neatly, complete all required sections of the EQ, and write in correct information in the data fields. This unfortunately did not always happen. When enumerators wrote in invalid dates or contradictory information, the responses were ignored or coding rules were established to document the outcomes from the data fields.

### **4.3 Added Address Data**

When enumerators added EQs for UHE or missing housing units, the enumerators documented the address of these housing units on the EQ. The address information analyzed in the results section for the added EQs only reports the presence of information and not the validity of the data.

### **4.4 Early NRFU and Early Early NRFU**

Neither of these operations was part of the original NRFU design and so a system was not developed that could identify either the areas selected to be included in these operations or the number of housing units that were enumerated early. EQs for housing units that were enumerated early were not checked in until NRFU started. Therefore, results of Early Early NRFU and Early NRFU cannot be reported separately from NRFU in this report.

## **4.5 MaRCS Remedy Tickets**

Census MaRCS facilitated the matching, review and coding for both NRFU and the Update Enumerate operation. All Census MaRCS problem tickets were managed together for UE and NRFU, and there is no way to determine which tickets were submitted for each operation. Therefore, our analysis of Census MaRCS problem tickets includes some UE issues as well as NRFU.

## **5 RESULTS**

This section presents the answers to each of the research questions mentioned in Section 3, Methodology. The research questions are answered in the following order.

- Section 5.1 discusses the workload and operational results for each of the four NRO field operations.
- Section 5.2 discusses the cost and staffing of the NRO.
- Section 5.3 discusses the training provided to NRO staff.
- Section 5.4 discusses the schedule for the NRO.
- Section 5.5 discusses the change control process.
- Section 5.6 discusses the risks identified for NRO and how they were managed.
- Section 5.7 discusses the automation components of the NRO.

### **5.1 Workload and Outcomes**

This assessment is documenting the field results of each NRO operation. This section presents the workload for each operation, results to each of the operation-specific research questions, and results to the specific assessment questions. Section 5.1 is divided into four components, one for each of the four operations.

- Section 5.1.1 discusses NRFU results.
- Section 5.1.2 discusses NRFU RI results.
- Section 5.1.3 discusses VDC results.
- Section 5.1.4 discusses NRFU RES results.

The results in Section 5.1 present the information that was written by enumerators onto the EQs. This includes paradata about the interviews (language of interview, number of contacts, etc) as well as data from answers provided by respondents to the census questions (demographics, the undercount question, etc.). The section also presents when the workload was completed in the field and when cases were checked in to PBOCS.

#### **5.1.1 NRFU**

The NRFU operation was the largest of the NROs and the single largest field enumeration operation in the 2010 Census.

The results presented within Section 5.1.1 cover the following topics:

- Section 5.1.1.1 discusses the formation of the NRFU analysis universe.
- Section 5.1.1.2 discusses the housing unit status of cases worked in NRFU.
- Section 5.1.1.3 discusses the timing when NRFU interviews were completed and when they were checked-in.
- Section 5.1.1.4 discusses characteristics of NRFU interviews, notably key paradata results.
- Section 5.1.1.5 discusses characteristics of occupied housing units.
- Section 5.1.1.6 presents the standard demographic tables for NRFU.
- Section 5.1.1.7 discusses housing units added during NRFU.

### **5.1.1.1 Formation of the Analysis Universe**

As mentioned in the Limitations Section (Section 4), there were three primary data sources used to report on the results of the NRO: the DRF, MaRCS, and C&P. The DRF is the data source used to produce the majority of results in this section. Further discussion of the MaRCS data is in Section 5.1.2 and further discussion of the DMD C&P data is in Section 5.7.2.5.

The DRF contained information for every data captured questionnaire completed by a respondent or an enumerator for a housing unit during the 2010 Census. The data on the DRF were not “cleaned,” so for this analysis we encountered cases on the DRF with operation code discrepancies, multiple versions of the same questionnaire, and information for added housing units. The DRF also contained “dummy returns,” which were primarily cases where a housing unit status and population count had been entered into PBOCS but the return had not been received by RPS (these are discussed in more detail on the next page).

These characteristics made it challenging to identify the correct universes for each of the field operations. We used the three variables below (form type, operation code, and type of enumeration area) to identify the field operation in which a case was worked.

1. The form type of the questionnaire
  - a. Every questionnaire on the DRF has a form type. There were two different questionnaires within NRO based on the language and intended location of the questionnaire. There were also two Reinterview questionnaires:
    - i. Stateside English production,
    - ii. Puerto Rico Spanish production,
    - iii. Stateside English Reinterview, and
    - iv. Puerto Rico Spanish Reinterview.
  - b. The stateside English production form was used in the NRFU, VDC, NRFU Residual, Update Enumerate, Remote Update Enumerate, and Remote Alaska Operations.
  - c. The Puerto Rico Spanish production form was used in NRFU, VDC and NRFU Residual.
  - d. The stateside English Reinterview form was used in the NRFU RI and UE RI operations.
  - e. The Puerto Rico Spanish Reinterview form was used in the NRFU RI operation.
  - f. All cases within the same operation should have used the same type of EQ and so should all have the same form type on the DRF.
2. The operation code (also known as op code)

- a. Operation codes existed for all census operations, including Mailout/Mailback, Telephone Questionnaire Assistance, and Enumeration at Transitory Locations.
  - b. Each component of NRO had a distinct op code (NRFU, NRFU RI, VDC, and NRFU RES).
  - c. The op code was printed on the address label attached to each EQ, or hand-written in for added cases.
3. The Type of Enumeration Area (TEA). There were seven TEAs used in the 2010 Census:
- a. Mailout/Mailback (MOMB) (TEA 1),
  - b. Update/Leave (UL) (TEA 2),
  - c. Remote Update Enumerate (TEA 3),
  - d. Remote Alaska (TEA 4),
  - e. Update Enumerate (TEA 5),
  - f. Military (TEA 6),
  - g. Urban Update/Leave (TEA 7)

For NRO operations, all added cases that were not from Usual Home Elsewhere (UHE) situations or mover situations should have come from the MOMB, UL, Military, or Urban UL TEAs.<sup>15</sup>

In theory, a case worked in NRFU would have a stateside or Puerto Rico production EQ form type, the NRFU op code, and come from TEA 1, 2, 6, or 7. Similar expectations existed for each of the other NRO operations. However, there were a number of situations that created inconsistent values between these three variables.

- Sometimes the original questionnaire was damaged and the data had to be transcribed onto a blank questionnaire. During the transcription, the Census ID or the Op Code could have been transcribed incorrectly.
- Some RI form types had an op code for a production operation, or production form types had an op code for a RI operation.
- Some completed questionnaires did not arrive at a data capture center. In those cases, the LCO office staff entered basic information into PBOCS. HQ processing created ‘dummy returns’ for each such questionnaire using the data from PBOCS. Dummy returns had a different value for form type than the typical EQs.
- Dummy returns did not have an operation code.
- There are cases in the DRF where one variable indicated the case was worked in an NRO operation but another variable indicated it was worked in a different operation. For example, some cases had an EQ form type but an op code for a Census operation that did not use an EQ, such as Enumeration at Transitory Locations, which had a different form type.
- Additionally, there were cases completed by an Update Enumerate enumerator as an added case for a respondent’s regular address that resided in a NRFU-eligible TEA. For such a case, the op code would have been UE to reflect the operation that collected the data, but the TEA would have been set based on the collected address.

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<sup>15</sup> Added cases will be discussed in more depth in Section 5.1.1.7.



When the form type, op code, and TEA were conflicting, a determination was made as to which operation the case should be analyzed within. We prioritized form type first, then the op code variables. If the op code was not present, then the case was assigned an op code based on its TEA. If the TEA was zero or undetermined, then the case was placed in NRFU, since NRFU was the largest operation and thus the most likely place the case was worked. This process established the total number of questionnaires on the DRF that were associated with NRO for this assessment.

For this analysis, we wanted to assess the results of one EQ for each address. However, there could be more than one EQ linked to an address on the DRF. There are two primary reasons for this: multiple data captures of an EQ and additional fieldwork done by enumerators to revisit an address.

1. One questionnaire could have been data captured more than once, so a record exists for every time that questionnaire was captured. While there would then be multiple questionnaires on the DRF, they do not represent additional work done by an enumerator.
2. If there was an issue with the questionnaire, the production staff could rework cases after an earlier version of the questionnaire was checked in to the control system at the LCO. For instance, if managers reviewed reports and recognized coverage problems such as the existence of a large number of non-interviews or other questionable data quality indicators, they could prepare another address label and have another questionnaire completed for the same address. Multiple questionnaires then exist on the DRF for the same address from the same operation, and they represent additional work done by an enumerator. Whenever a replacement questionnaire was checked in to the control system and was received by Census processing, it became the record of choice.

The majority of the research questions require results tabulated using only one questionnaire per housing unit to accurately report what happened in NRFU at an address. If every questionnaire contained on the DRF was included in the analysis, the statistics would be inaccurate.

Thus, we identified one primary questionnaire per address for this assessment. The primary questionnaire per address within a field operation was selected by choosing the questionnaire with the highest version number. The LCO office staff was instructed to enter an increased version number on a questionnaire that was reworked. If there were still multiple unique questionnaires with the same version number, the questionnaire that was processed last according to the FORM\_SEQ variable was selected as the primary questionnaire.

As described above, the data on the DRF had to be subsetted to identify each operation's universe. Table 5 shows the results of the subsetting efforts. The top row in Table 5 is the total number of EQs associated with NRFU on the DRF, including multiple copies of the same questionnaire and added questionnaires that were not able to be successfully geocoded to a block within a state and county. The second row removes multiple copies of the same questionnaire. The third row removes all questionnaires that were for an added housing unit which were not geocoded and assigned to an address. There were 82,739<sup>16</sup> Adds not geocoded and removed from the NRFU universe. The last row in the table removes multiple questionnaires generated for an address due to rework. There were

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<sup>16</sup> These cases will be discussed again in Section 5.1.1.7.

768,288 additional questionnaires completed for housing units in the NRFU universe. The universe used to analyze the results of the NRFU operation from the DRF in this assessment is 47,197,405 unique housing units.

**Table 5: NRFU Universe**

<b>NRFU Universe Characteristics</b>	<b>Number of Questionnaires</b>
All Questionnaires on the DRF (including Adds not geocoded and assigned to an address)	48,081,738
Unique Questionnaires on the DRF (including Adds not geocoded and assigned to an address)	48,048,432
Unique Questionnaires on the DRF (only including Adds geocoded and assigned to an address)	47,965,693
Unique Housing Units on the DRF (only including Adds geocoded and assigned to an address)	47,197,405

Source: DRF

### 5.1.1.2 NRFU Housing Unit Status

When an enumerator interviewed a respondent for a NRFU address, they were to first confirm that they were at the right address. After that, they were to determine whether the housing unit was occupied on April 1, if it was vacant on April 1, or if it should be deleted from the address list for a variety of reasons. Ultimately, this information was recorded in Item A of the Interview Summary section of the EQ. There were eight options available for the enumerator to designate what the unit status was on April 1, 2010, as shown in the first column of Figure 2. The last five status descriptions in that column all describe a housing unit to be deleted from the address list.<sup>17</sup>

**Figure 2: Interview Summary Section of the EQ**

**INTERVIEW SUMMARY**

**A. Unit Status on April 1, 2010**

- ☐ Occupied
- ☐ Vacant - regular
- ☐ Vacant - usual home elsewhere
- ☐ Demolished/burned out/cannot locate
- ☐ Nonresidential
- ☐ Empty mobile home/trailer site
- ☐ Uninhabitable (open to elements, condemned, under construction)
- ☐ Duplicate – record ID of Dup.

**B. If vacant, ask: Which category best describes this vacant unit as of April 1, 2010? (Read categories.)**

- ☐ For rent
- ☐ For sale only
- ☐ Rented, not occupied
- ☐ Sold, not occupied
- ☐ For seasonal, recreational or occasional use
- ☐ For migrant workers
- ☐ Other vacant

**C. Number of people listed on form(s) =**

1 - 49 = Total people  
00 = Vacant  
98 = Delete  
99 = POP unknown

<sup>17</sup> We will refer to these cases as ‘deletes’ throughout the assessment, but it is important to note that they might not ultimately have been deleted from the address list. That decision was made in back-end processing when examining the cumulative questionnaires from all operations for that address.

The status as marked in Item A, the population count from Item C (also shown in Figure 2), and the total number of data-defined people<sup>18</sup> on the form were used subsequently in data processing to determine if an address was occupied, vacant, to be deleted from the address register, or had an unresolved status. For instance, if a housing unit was identified as vacant in Item A, had no data-defined people, but had a population count between 1 and 97 in Item C, the final status was set as unresolved. These values were designated in the variable PP\_HOUSING\_STATUS<sup>19</sup>. Table 6 shows the distribution of housing unit status for the addresses visited in NRFU.

**Table 6: NRFU Housing Unit Status**

Housing Unit Status	Number of Housing Units	Percent
Occupied	28,756,540	60.9%
Vacant	14,175,704	30.0%
Delete	4,010,387	8.5%
Unresolved	254,774	0.5%
<b>Total</b>	<b>47,197,405</b>	<b>100.0%<sup>20</sup></b>

Source: DRF

Of the 47,197,405 housing units visited in NRFU, 60.9 percent were found to be occupied. An additional 30 percent were vacant housing units, 8.5 percent were marked to be deleted, and 0.5 percent were considered unresolved.

One research question asks for the number of times that NRFU enumerators were unable to complete an interview for a housing unit because the possible respondents refused to complete an interview. This information was captured on the back page of the EQ where enumerators were to mark the REF box on the EQ for refusals. This appeared under the Interview Summary with a series of boxes that applied to other situations. Figure 3 shows these data capture fields.

**Figure 3: Flags on the EQ to Report Certain Interview Characteristics**

UHE	MOV	PI	REF
E. <input type="checkbox"/>	F. <input type="checkbox"/>	G. <input type="checkbox"/>	H. <input type="checkbox"/>
CO	REP	VDC	
I. <input type="checkbox"/>	J. <input type="checkbox"/>	K. <input type="checkbox"/>	
JIC1	JIC2		
L. <input type="checkbox"/>	M. <input type="checkbox"/>		

<sup>18</sup> A data-defined person is a person who has at least two pieces of information to describe them; these responses could be a name containing at least three legal characters, a relationship, sex, age or date of birth, Hispanic origin, or race.

<sup>19</sup> See the Specification for the Linking of Enumerator Supplemental Forms and Assigning the 2010 Census Return Housing Unit Status (Barrett 2010) for information on how PP\_HOUSING\_STATUS was set.

<sup>20</sup> This column does not total 100.0% due to rounding.

Table 7 shows the number of housing units marked as refusals during the NRFU operation, by housing unit status. This does not capture the number of times enumerators reported in the Record of Contacts section if an initial contact was a refusal.

<b>Table 7: Housing Units Reported as Refusals During NRFU</b>			
<b>Housing Unit Status</b>	<b>Number of Housing Units</b>	<b>Number of Refusals</b>	<b>Refusal Percentage</b>
Occupied	28,756,540	310,450	1.1%
Vacant	14,175,704	24,791	0.2%
Delete	4,010,387	7,872	0.2%
Unresolved	254,774	8,554	3.4%
<b>Total Housing Units</b>	<b>47,197,405</b>	<b>351,667</b>	<b>0.7%</b>

Source: DRF

Of the 47,197,405 housing units in NRFU, there were 351,667 (0.7 percent) that were marked as a refusal on the questionnaire. Of the housing units that had an unresolved status, 3.4 percent were flagged as refusals. The higher refusal rate is an additional indication that the enumerator had difficulties completing these cases.

The following sections explore occupied, vacant, and deleted housing units in more depth.

#### **5.1.1.2.1 Occupied Housing Units**

The 28,756,540 occupied housing units in NRFU were classified based on the reported population count of the housing unit (as captured in Item C from Figure 2):

- 1-49 = a 'valid' population count. We instructed the enumerators to collect only person information for at most 49 people.
- Blank, 0, 50-98='invalid' population count. A population count in this range indicates an invalid population count for an occupied housing unit.
- 99 = population count unknown. There are instances when an enumerator could confirm an address is occupied but was unable to collect any information about the number of people living or staying at that address. Enumerators were instructed to give these housing units a population count of 99.

Table 8 shows how often each of these three types of population counts was recorded in conjunction with a reported refusal.

**Table 8: Types of Refusals for NRFU Occupied Housing Units**

<b>Type of Population Count</b>	<b>Number of Housing Units</b>	<b>Percent</b>
Valid population count	182,863	58.9%
Invalid population count	2,238	0.7%
Unknown population count	125,349	40.4%
<b>Occupied Refusals</b>	<b>310,450</b>	<b>100.0%</b>

Source: DRF

Table 8 shows that 58.9 percent of the refusals in NRFU had a valid population count, while 40.4 percent had an unknown population count.

#### 5.1.1.2.2 Vacant Housing Units

Table 6 showed that 14,175,704 housing units were determined to be vacant during NRFU. There are two primary types of vacant housing units, as listed in Item A from the Interview Summary in Figure 2. The first type, called “regular” vacant, are those units that are normally occupied year-round but are for sale, for rent, or otherwise uninhabited on Census Day. The second class of vacant units is called “usual home elsewhere” vacant, or UHEs. Vacant housing units classified as UHEs might be occupied only on weekends or seasonally. There are also housing units that were marked as both Regular and UHE vacant on the questionnaire. Those vacant housing units were classified in this assessment as Vacant-Unknown. Table 9 describes the distribution of vacant housing units among the three vacant categories.

**Table 9: Types of NRFU Vacant Housing Units**

<b>Vacant Type</b>	<b>Number of Housing Units</b>	<b>Percent</b>
Regular	10,713,658	75.6%
Usual Home Elsewhere (UHE)	3,449,235	24.3%
Unknown	12,811	0.1%
<b>Total Vacant Housing Units</b>	<b>14,175,704</b>	<b>100.0%</b>

Source: DRF

Table 9 reports that 75.6 percent of all vacant units were vacant-regular, while 24.3 percent were UHEs. Only 0.1 percent were unknown.

### 5.1.1.2.3 Delete Housing Units

Table 6 showed that 4,010,387 housing units were marked to be deleted during NRFU. There are five classes of deletes, as seen in Item A of Figure 2:

- Demolished/Burned Out/Cannot Locate,
- Nonresidential,
- Empty Mobile Home/Trailer Site,
- Uninhabitable, and
- Duplicate.

If an enumerator indicated two or more delete classifications for an address, then it was coded as a Delete-Unknown. Table 10 shows the distribution of deletes in NRFU.

**Table 10: Types of NRFU Delete Housing Units**

<b>Delete Type</b>	<b>Number of Housing Units</b>	<b>Percent</b>
Demolished/Burned Out/Cannot Locate	1,550,941	38.7%
Nonresidential	658,485	16.4%
Empty Mobile Home/Trailer Site	413,205	10.3%
Uninhabitable	807,058	20.1%
Duplicate	559,023	13.9%
Delete Unknown	21,675	0.5%
<b>Total Deleted Housing Units</b>	<b>4,010,387</b>	<b>100.0%<sup>21</sup></b>

Source: DRF

The majority of deletes (38.7 percent) were classified as housing units that were demolished, burned out, or could not be located. An additional 20.1 percent were classified as uninhabitable, 16.4 percent were classified as nonresidential, and 13.9 percent were a duplicated address of another housing unit. Empty Mobile Home/Trailer Sites accounted for 10.3 percent of all deletes. A unique classification could not be determined for 0.5 percent of the deletes.

### 5.1.1.3 Interview Completion and Case Check-in

Section 5.1.1.3 presents information about when NRFU cases were completed in the field and when they were checked-in by the office. These results answer the research questions regarding how the planned start and finish dates for the NRFU operation compared to the actual start and finish dates, and how the accumulation of outcomes changed over time.

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<sup>21</sup> This column does not total 100.0% due to rounding.

### 5.1.1.3.1 Interview Completion Dates

The NRFU operation was officially scheduled to begin on May 1, 2010. Training for the majority of enumerators was conducted from April 25<sup>th</sup> to April 29<sup>th</sup>.<sup>22</sup> A small number of areas started NRFU prior to May 1 due to the need to enumerate certain areas of the country earlier. These were primarily areas with a large number of college students in off-campus housing, who might have moved out by May 1<sup>st</sup> because their semester had ended but who should have been counted at that residence. There are no data available to identify the areas that implemented Early NRFU or Early Early NRFU.

Completion results use the dates reported by the enumerator or CL in the Certification section of the EQ, which should best reflect the actual date that an interview was completed. Figure 4 shows the Certification section of the EQ.

**Figure 4: Enumerator Certification Section of the EQ**

The screenshot shows a light blue form titled "CERTIFICATION" in a dark blue rounded rectangle. Below the title, there is a statement: "I certify that the entries I have made on this questionnaire are true and correct to the best of my knowledge." To the left of this statement are two input fields: "Enumerator's signature" (a long horizontal box) and "Employee ID" (a box divided into four smaller sections). Below these is a date selection area with "Month" and "Day" labels and two small input boxes. To the right of the statement is another date selection area with "Crew Leader's initials" (two small boxes), "CLD number" (a box divided into two sections), and another "Month" and "Day" date selection area.

If the enumerator provided a valid date of completion, then that date was used for the subsequent tables. However, if the enumerator's date fields were invalid or blank, and the CL certification dates were valid, then the CL dates were used as the date of completion. Table 11 shows the distribution of completed cases by week.

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<sup>22</sup> Training will be discussed in depth in section 5.3.

**Table 11: NRFU Housing Units Completed By Week<sup>23</sup>**

Week	Housing Units Completed	Percent	Cumulative Percent
4/01 - 4/03	8,522	<0.1%	<0.1%
4/04 - 4/10	21,649	<0.1%	0.1%
4/11 - 4/17	35,633	0.1%	0.1%
4/18 - 4/24	42,776	0.1%	0.2%
4/25 - 4/30	897,485	1.9%	2.1%
5/01 - 5/08      Start of NRFU	10,488,338	22.2%	24.4%
5/09 - 5/15	9,799,293	20.8%	45.1%
5/16 - 5/22	8,853,582	18.8%	63.9%
5/23 - 5/29	6,809,268	14.4%	78.3%
5/30 - 6/05	4,452,359	9.4%	87.7%
6/06 - 6/12	3,240,081	6.9%	94.6%
6/13 - 6/19	1,592,457	3.4%	98.0%
6/20 - 6/26	642,469	1.4%	99.3%
6/27 - 7/03	142,321	0.3%	99.6%
7/04 - 7/10      End of NRFU	16,841	<0.1%	99.7%
7/11 - 7/17	4,437	<0.1%	99.7%
7/18 - 7/24	4,144	<0.1%	99.7%
7/25 - 7/31	3,690	<0.1%	99.7%
8/01 - 8/07	19,080	<0.1%	99.7%
8/08 - 8/14	16,548	<0.1%	99.8%
8/15 - 8/21	12,897	<0.1%	99.8%
8/22 - 8/28	8,763	<0.1%	99.8%
8/29 - 9/04	1,649	<0.1%	99.8%
Missing/Out of Range	83,123	0.2%	100.0%
<b>Total Housing Units</b>	<b>47,197,405</b>	<b>100.0%<sup>24</sup></b>	<b>100.0%</b>

Source: DRF and AUX

Table 11 shows that approximately three-fourths of the NRFU workload was completed in the month of May. There were still some late returns being completed in July after the official end date of July 10<sup>th</sup>. This was partly due to one LCO that had to rework all of their NRFU cases due to concerns of LCO-wide falsification; as a result, they worked on NRFU through July and were the last LCO to complete their work.

The cases in early April could have been Early NRFU cases or Early Early NRFU cases, but also could be cases worked in UE that we incorrectly categorized as NRFU cases, or cases worked in ETL that

<sup>23</sup> Some rows in the table do not contain seven days. This is to show the start and end dates of the operation.

<sup>24</sup> This column does not total 100.0% due to rounding.

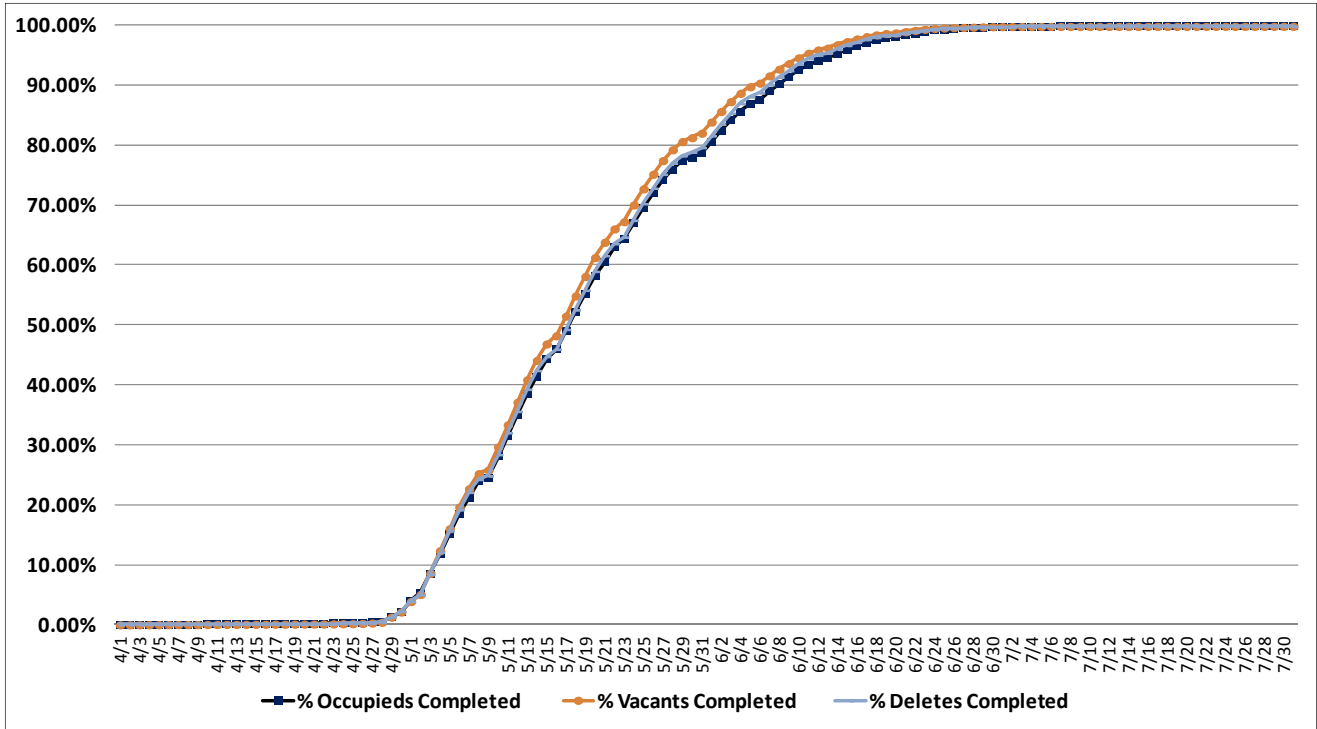


used the incorrect form type. The spike in the number of cases worked in August likely reflects incorrect op codes being used for cases in the NRFU Residual or VDC workload.

Of the entire NRFU universe, 0.2 percent of cases were either missing a date in the Certification section, the date written was before April 1, or the date was after September 4<sup>th</sup>. Dates could have been captured incorrectly due to handwriting and legibility issues inherent in using a paper questionnaire. All data collection activities had to be completed by August 25<sup>th</sup> so questionnaires could arrive in time to data capture centers to be processed.

Figure 5, Table 12, Table 13, and Table 14 show the number of occupied, vacant, and deleted housing units completed each week.

**Figure 5: Cumulative Percent Occupied, Vacant, and Delete Completed NRFU Cases by Day**



Source: DRF and AUX

All three statuses were completed at about the same rate each week. The vacant housing units were completed slightly faster than the occupied or deleted housing units. For instance, by the end of the week of May 16<sup>th</sup>, 66.0 percent of the vacant housing units were completed while only 62.9 percent of the occupied housing units and 63.5 percent of the delete housing units were completed.

**Table 12: NRFU Occupied Housing Units Completed By Week<sup>25</sup>**

<b>Week</b>	<b>Housing Units Completed</b>	<b>Percent</b>	<b>Cumulative Percent</b>
4/01 - 4/03	5,225	<0.1%	<0.1%
4/04 - 4/10	13,491	<0.1%	0.1%
4/11 - 4/17	25,797	0.1%	0.2%
4/18 - 4/24	29,613	0.1%	0.3%
4/25 - 4/30	529,967	1.8%	2.1%
5/01 - 5/08, Start of NRFU	6,273,473	21.8%	23.9%
5/09 - 5/15	5,867,258	20.4%	44.3%
5/16 - 5/22	5,344,862	18.6%	62.9%
5/23 - 5/29	4,130,098	14.4%	77.3%
5/30 - 6/05	2,744,785	9.5%	86.8%
6/06 - 6/12	2,079,313	7.2%	94.0%
6/13 - 6/19	1,069,893	3.7%	97.8%
6/20 - 6/26	448,288	1.6%	99.3%
6/27 - 7/03	104,162	0.4%	99.7%
7/04 - 7/10, End of NRFU	12,470	<0.1%	99.7%
7/11 - 7/17	2,928	<0.1%	99.7%
7/18 - 7/24	2,780	<0.1%	99.7%
7/25 - 7/31	2,367	<0.1%	99.8%
8/01 - 8/07	10,825	<0.1%	99.8%
8/08 - 8/14	9,965	<0.1%	99.8%
8/15 - 8/21	7,948	<0.1%	99.9%
8/22 - 8/28	5,450	<0.1%	99.9%
8/29 - 9/04	1,012	<0.1%	99.9%
Missing/Out of Range	34,570	0.1%	100.0%
<b>Total Occupied Housing Units</b>	<b>28,756,540</b>	<b>100.0%<sup>26</sup></b>	<b>100.0%</b>

Source: DRF and AUX

<sup>25</sup> Some rows in the table do not contain seven days. This is to show the start and end dates of the operation.<sup>26</sup> This column does not total 100.0% due to rounding.

**Table 13: NRFU Vacant Housing Units Completed By Week<sup>27</sup>**

<b>Week</b>	<b>Housing Units Completed</b>	<b>Percent</b>	<b>Cumulative Percent</b>
4/01 - 4/03	2,376	<0.1%	<0.1%
4/04 - 4/10	6,227	<0.1%	0.1%
4/11 - 4/17	8,069	0.1%	0.1%
4/18 - 4/24	10,483	0.1%	0.2%
4/25 - 4/30	277,856	2.0%	2.2%
5/01 - 5/08, Start of NRFU	3,270,716	23.1%	25.2%
5/09 - 5/15	3,064,989	21.6%	46.8%
5/16 - 5/22	2,719,735	19.2%	66.0%
5/23 - 5/29	2,064,452	14.6%	80.6%
5/30 - 6/05	1,295,926	9.1%	89.7%
6/06 - 6/12	869,206	6.1%	95.9%
6/13 - 6/19	388,587	2.7%	98.6%
6/20 - 6/26	140,129	1.0%	99.6%
6/27 - 7/03	26,404	0.2%	99.8%
7/04 - 7/10, End of NRFU	2,500	<0.1%	99.8%
7/11 - 7/17	1,027	<0.1%	99.8%
7/18 - 7/24	857	<0.1%	99.8%
7/25 - 7/31	831	<0.1%	99.8%
8/01 - 8/07	5,204	<0.1%	99.9%
8/08 - 8/14	4,828	<0.1%	99.9%
8/15 - 8/21	3,747	<0.1%	99.9%
8/22 - 8/28	2,505	<0.1%	99.9%
8/29 - 9/04	486	<0.1%	99.9%
Missing/Out of Range	8,564	0.1%	100.0%
<b>Total Vacant Housing Units</b>	<b>14,175,704</b>	<b>100.0%</b>	<b>100.0%</b>

Source: DRF and AUX

<sup>27</sup> Some rows in the table do not contain seven days. This is to show the start and end dates of the operation.

**Table 14: NRFU Delete Housing Units Completed By Week<sup>28</sup>**

<b>Week</b>	<b>Housing Units Completed</b>	<b>Percent</b>	<b>Cumulative Percent</b>
4/01 - 4/03	860	<0.1%	<0.1%
4/04 - 4/10	1,784	<0.1%	0.1%
4/11 - 4/17	1,550	<0.1%	0.1%
4/18 - 4/24	2,418	0.1%	0.2%
4/25 - 4/30	83,686	2.1%	2.3%
5/01 - 5/08, Start of NRFU	881,929	22.0%	24.2%
5/09 - 5/15	820,302	20.5%	44.7%
5/16 - 5/22	752,467	18.8%	63.5%
5/23 - 5/29	586,965	14.6%	78.1%
5/30 - 6/05	393,759	9.8%	87.9%
6/06 - 6/12	278,578	6.9%	94.9%
6/13 - 6/19	127,275	3.2%	98.0%
6/20 - 6/26	49,955	1.2%	99.3%
6/27 - 7/03	10,517	0.3%	99.5%
7/04 - 7/10, End of NRFU	1,709	<0.1%	99.6%
7/11 - 7/17	450	<0.1%	99.6%
7/18 - 7/24	481	<0.1%	99.6%
7/25 - 7/31	461	<0.1%	99.6%
8/01 - 8/07	2,833	0.1%	99.7%
8/08 - 8/14	1,659	<0.1%	99.7%
8/15 - 8/21	1,127	<0.1%	99.8%
8/22 - 8/28	757	<0.1%	99.8%
8/29 - 9/04	141	<0.1%	99.8%
Missing/Out of Range	8,724	0.2%	100.0%
<b>Total Delete Housing Units</b>	<b>4,010,387</b>	<b>100.0%<sup>29</sup></b>	<b>100.0%</b>

Source: DRF and AUX

**5.1.1.3.2 Check-in**Completion Dates Compared to PBOCS Check-in Data

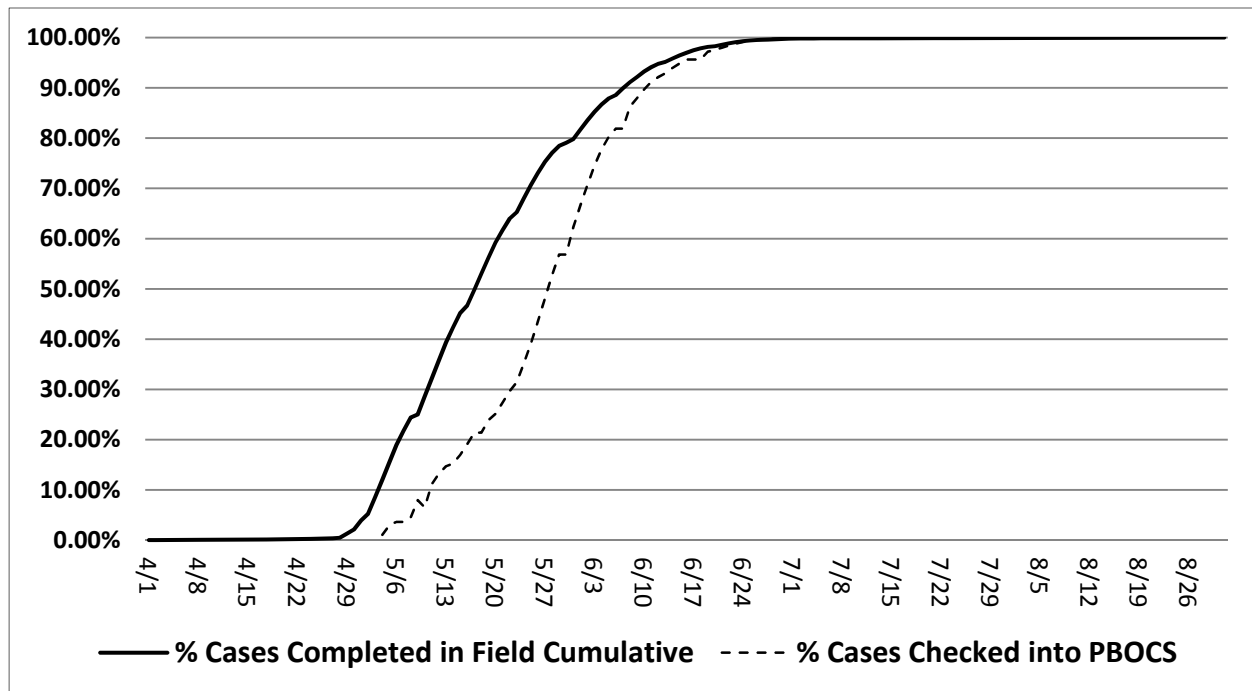
The previous tables presented data from the DRF and AUX files that reflect when cases were completed in the field. Once a NRFU case was completed by an enumerator and reviewed by the CL, it was sent to the LCO to be checked in to PBOCS. The timing of when cases were checked into PBOCS is important because those check-in data were used to create the RI assignments.

<sup>28</sup> Some rows in the table do not contain seven days. This is to show the start and end dates of the operation.

<sup>29</sup> This column does not total 100.0% due to rounding.

See Figure 6 for the difference in the percentage of cases completed in the field and the percentage checked into PBOCS. The solid line represents the completion rates shown before in Figure 5.

**Figure 6: Time Between Completion of NRFU Cases and Office Check-in**



Source: DRF, AUX, and DMD C&P

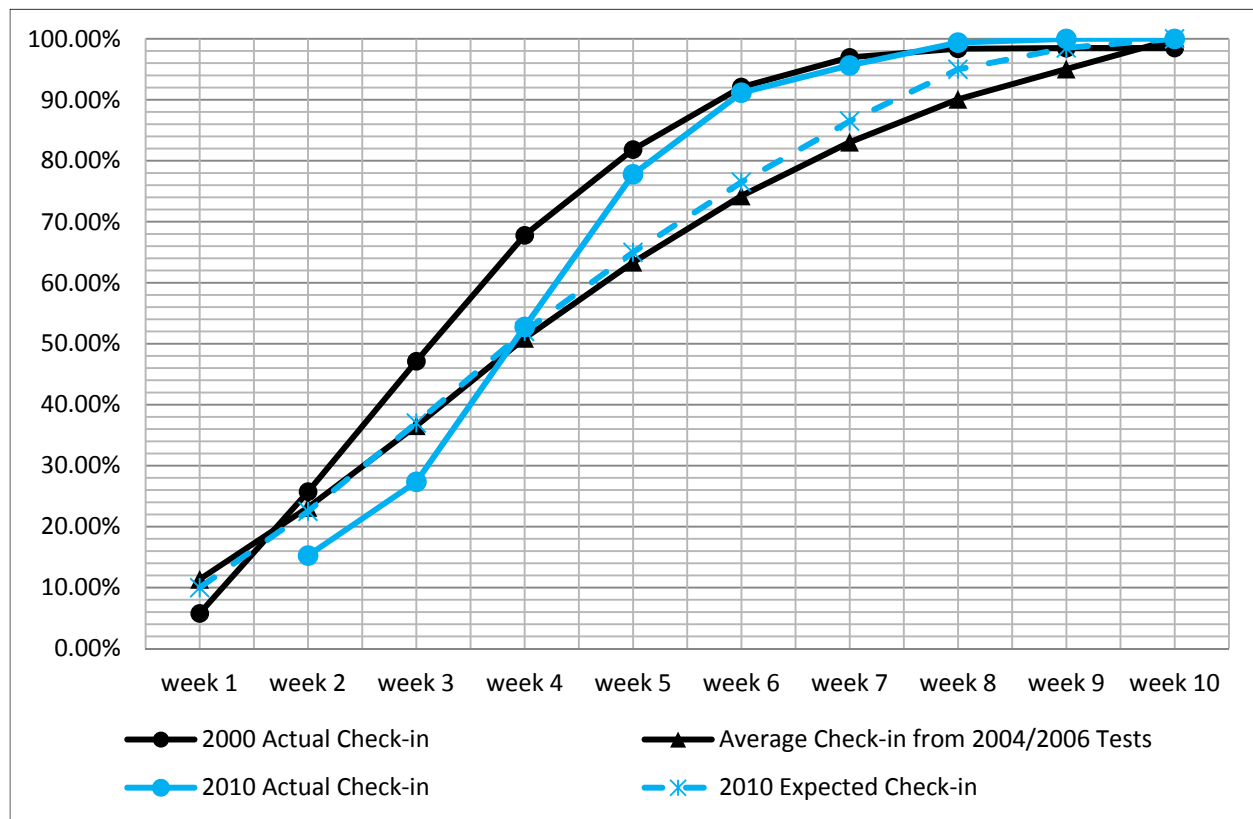
Due to issues with PBOCS, a large backlog was created at check-in, as shown in Figure 6. The largest estimated amount of backlog was on May 21<sup>st</sup>. On May 21<sup>st</sup>, 62 percent of the NRFU cases were completed while only 27 percent of the NRFU workload was checked in to PBOCS. The backlog did not get below five percent until June 8<sup>th</sup>. The estimated check-in backlog peaked at nearly 12 million cases during the last week of May. However, the estimated backlog was almost entirely cleared by the end of the first week in June.

The PBOCS check-in backlog created an inaccurate picture while monitoring NRFU production of the number of cases actually completed by enumerators.

#### Determining Expected Check-in Goals

Cumulative check-in data were used to monitor progress daily, during the course of the operation. We compared cumulative check-in data against expected check-in goals, determined during NRFU planning. Census created daily check-in goals for NRFU based on experience gained from Census 2000 and intercensal tests. As discussed further on the next page of this section, 2010 NRFU check-in significantly exceeded check-in goals.

**Figure 7: 2010 Expected Check-in based on Census 2000 and Intercensal Tests – Compared to 2010 Actual Check-in**



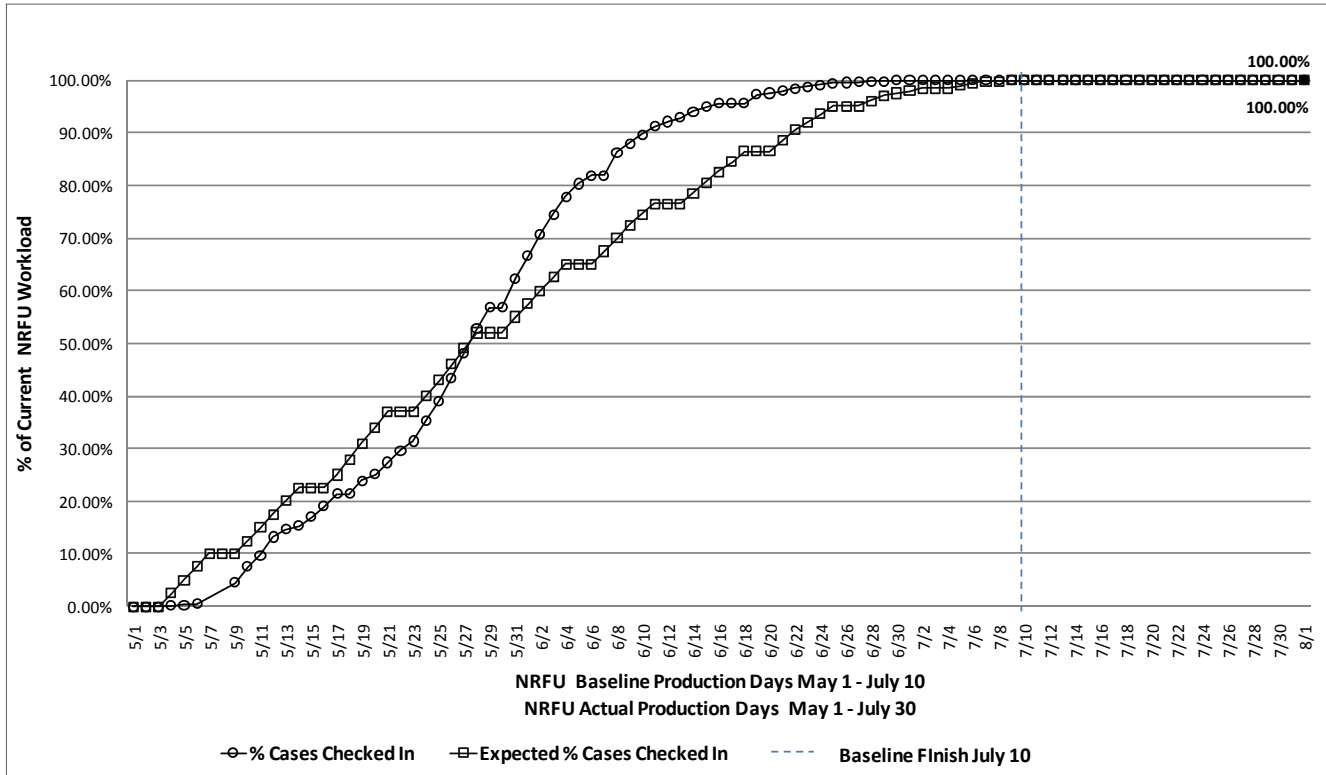
Source: 2000, 2004, 2006, and 2010 DMD C&P  
Source: 2010 FLD Expected Check-in Goals

Figure 7 compares 2010 NRFU actual and expected check-in, in addition to actual check-in from Census 2000 and the intercensal tests. The figure shows that 2010 NRFU check-in more closely mirrored Census 2000 check-in than 2010 expected check-in. The expected check-in - closely based on observations from the intercensal tests - proved to be under-ambitious for the 2010 Census. Similar to Census 2000, NRFU generally finished early and, on a national level, check-in exceeded 90 percent by the sixth week of the operation.

#### Actual Check-in compared with Expected Check-in

NRFU production - scheduled May 1 to July 10 - started on time and finished a day early on July 9 with the exception of one LCO. Figure 8 depicts the cumulative percent of NRFU questionnaires checked-in daily compared to the expected check-in rates at the national level.

**Figure 8: Percent of Actual NRFU Cases Checked-In Compared to Expected**



Source: DMD C&P

Initially, actual check-in was lower than expected, however, by the end of May actual check-in started to reach and exceed expected goals. The discrepancy between actual check-in and expected check-in observed in May is in part due to the backlog in check-in experienced throughout the LCOs. The incremental flat lines in the expected percent complete represent weekends. Although work continued over the weekend, all NROs were budgeted on a 5-day calendar, and so the expected line does not include any additional progress for the weekends.

Table 15 summarizes NRFU check-in by week at the national level.

**Table 15: Distribution of NRFU Questionnaires Checked-in by Week**

Week	Date	Cumulative Number of EQs Checked-in	Cumulative Percent of EQs Checked-in	Expected Percent of EQs Checked-in
1	May 1 – May 7*	217,116	0.45%	10.0%
2	May 8 – May 14	7,166,390	15.3%	22.5%
3	May 15 - May 21	12,828,983	27.4%	37.0%
4	May 22 - May 28	24,735,536	52.8%	52.0%
5	May 29 - June 4	36,507,785	77.8%	65.0%
6	June 5 - June 11	42,792,935	91.2%	76.5%
7	June 12 - June 18**	44,978,045	95.6%	86.5%
8	June 19 - June 25	46,911,002	99.4%	95.0%
9	June 26 - July 2	47,221,994	100.0%	98.5%
10	July 3 - July 9	47,234,591	100.0%	99.9%
11	July 10 - July 16	47,234,791	100.0%	100.0%
12	July 17 - July 23	47,233,318	100.0%	100.0%
13	July 24 - July 30	47,235,198	100.0%	100.0%

Source: DMD C&P

\* Check-in is as of 05/06/10. Data as of 05/07/10 were not available.

\*\* Check-in is as of 06/16/10. Data as of 06/18/10 were not available.

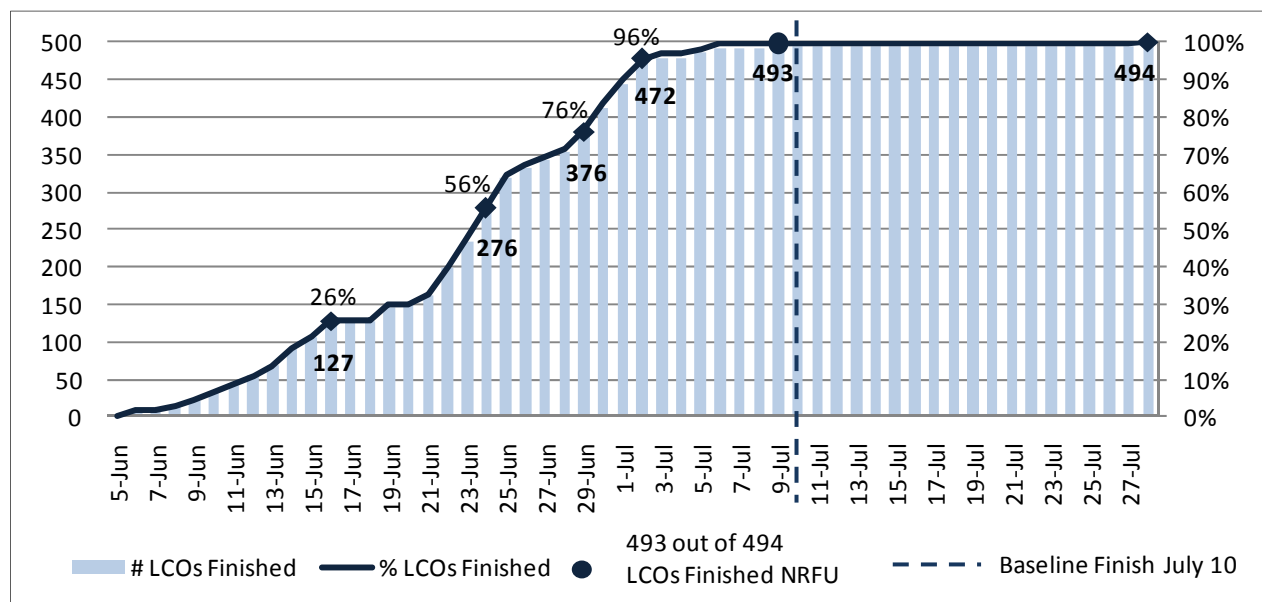
By the end of the fourth week of the operation, over 50 percent of NRFU cases had been checked in, at the national level. At the end of week 7, more than 95 percent of cases had been checked in, and by the end of week 10, all LCOs had finished NRFU with the exception of one. The final LCO finished NRFU by the end of week 13 on July 29.

#### 5.1.1.3.3 LCO Completion

There were 494 total LCOs. Figure 9 illustrates when LCOs finished NRFU by day. The bars in the chart represent the cumulative number of LCOs completed by day and correspond to the left y-axis. The dark line represents the cumulative percent of LCOs completed by day and corresponds to the right y-axis.



**Figure 9: Dates LCOs Finished NRFU, Cumulatively by Day**



Source: DMD C&P

Individual LCOs started to finish NRFU as early as June 5 and by June 24, more than two weeks before the baseline end date, more than half of the LCOs were 100 percent checked in.

Table 16 groups LCOs in ranges based on when they finished NRFU in relation to the baseline finish date of July 10.

**Table 16: LCOs Check-In Completion by Week**

Completion Relative to Baseline Finish	Number of LCOs	Percent of LCOs	Cumulative Number of LCOs	Cumulative Percent of LCOs
<b>4 weeks or more Ahead</b>	55	11.1%	55	11.1%
<b>3 Weeks Ahead</b>	92	18.6%	147	29.8%
<b>2 Weeks Ahead</b>	184	37.3%	331	67.0%
<b>1 Week Ahead</b>	148	30.0%	479	97.0%
<b>1 – 6 days Ahead</b>	14	2.8%	493	99.8%
<b>Baseline Finish (July 10)</b>	0	0%	493	99.8%

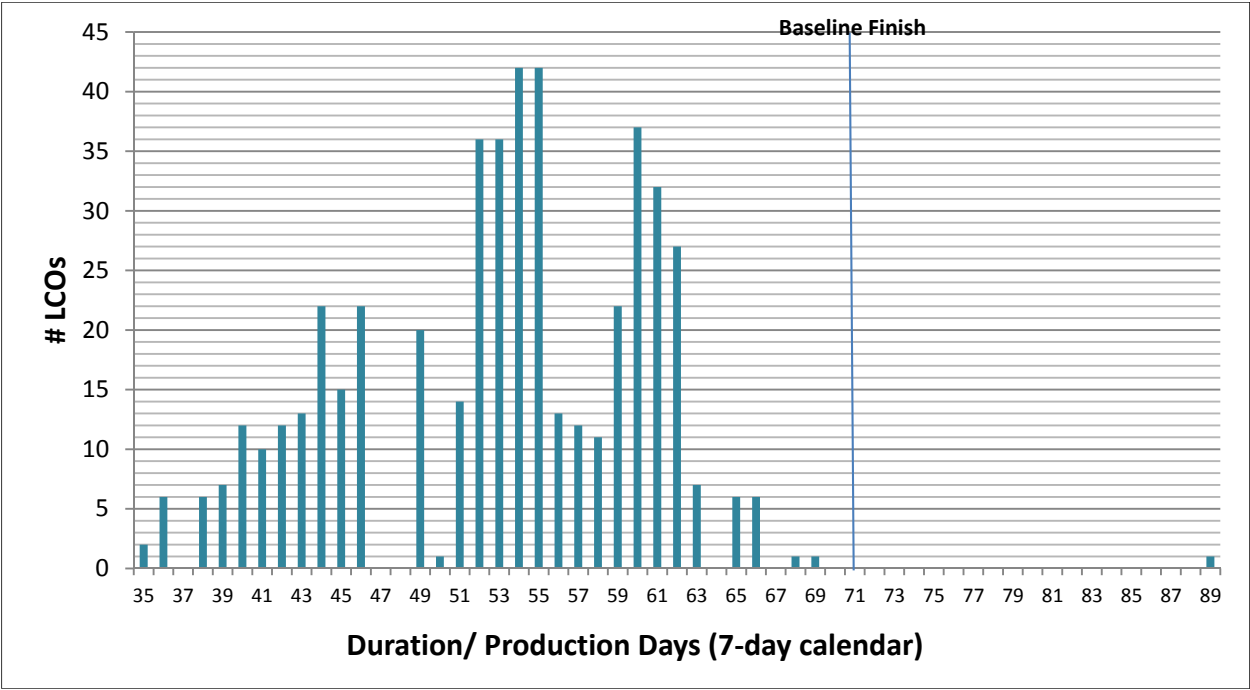
Note: The last LCO finished late on July 30.

Source: DMD C&P

Cumulatively, 67 percent of the LCOs were finished two weeks or more ahead of schedule, and 97.0 percent of the LCOs were finished one week or more ahead of schedule. The majority of the LCOs finished NRFU ahead of schedule, taking fewer than the budgeted number of days to complete the operation.

Figure 10 shows a distribution of the durations that the LCOs took to complete the operation. Although the operation was budgeted on a 5-day calendar and scheduled on a 6-day calendar, the data below are on a 7-day calendar due to limitations in the analysis method used. Durations were calculated by subtracting the start date of NRFU (May 1) from the last day that cases were checked in for that LCO.

**Figure 10: Duration of NRFU (in Days) by LCOs**



Source: DMD C&P

The baseline schedule for conducting NRFU was May 1 through July 10 (71 days on a 7-day calendar). The average LCO completed NRFU in 53 days on a 7-day calendar.

**5.1.1.4 Interview Characteristics**

The following section presents some paradata about the interviews with NRFU respondents, including the language in which the interviews were conducted, the number of contacts that enumerators made to enumerate a housing unit, and the type of respondents who completed NRFU interviews.

**5.1.1.4.1 Language**

As seen in Figure 11, the EQ asked enumerators to record the language in which the majority of an interview was conducted via checkboxes for English and Spanish, the two most common languages, as well as Other.

**Figure 11: Language Section of the EQ**

**D. What language was the majority of the interview conducted in?**

☐ English

☐ Spanish

☐ Other – Specify language number from flashcard →

Other languages were to be indicated using the number assigned to them on the Language Identification Flashcard (shown in Appendix C). There were 51 languages officially supported and identified on the Language Identification Flashcard. Table 17 shows the top five languages in which NRFU interviews were conducted.

**Table 17: Top Five Languages in which NRFU Interviews were Conducted**

Language	Total	Percent
English	43,656,556	92.5%
Spanish	1,970,493	4.2%
Chinese	40,137	0.1%
Russian	12,335	<0.1%
Korean	11,688	<0.1%
All other languages	61,536	0.1%
Multiple languages indicated	68,487	0.1%
Unknown	1,376,173	2.9%
<b>Total Housing Units</b>	<b>47,197,405</b>	<b>100.0%</b> <sup>30</sup>

Source: DRF and AUX

English was the most common language spoken, accounting for 92.5 percent of all NRFU interviews. Spanish was spoken for 4.2 percent of NRFU interviews, Chinese was spoken for 0.1 percent of interviews, and both Russian and Korean were spoken less than 0.1 percent of the time. The top five languages after English (Spanish, Chinese, Russian, Korean, and Vietnamese) are the same five languages into which the language fulfillment program<sup>31</sup> translated questionnaires.

Of the 1,970,493 NRFU interviews conducted in Spanish, 747,081 (37.9 percent) of those were interviews conducted in Puerto Rico.

An additional three rows are shown at the bottom of Table 17. The ‘All other languages’ row condenses the 45 additional languages that are on the Language Identification flashcard. The distribution of those languages is provided in Appendix D. The ‘Multiple languages indicated’ row reflects the interviews where both the English and Spanish boxes were marked, or where one of those boxes was marked and a number was also written in to indicate a different language from the flashcard.

<sup>30</sup> This column does not total 100.0% due to rounding.

<sup>31</sup> The language fulfillment program consisted of the questionnaires that were available in English, Spanish, Chinese, Russian, Korean, and Vietnamese that respondents could obtain if they called the Telephone Questionnaire Assistance phone number and requested a form in those languages.

We do not know if this was intended to indicate that the interview took place using a mix of languages (or at different points of time with different respondents) or if it reflects an error by the enumerator. More interviews fit that description (68,487 interviews) than for any single language besides English and Spanish.

Additionally, the language of interview was unknown for 2.9 percent of all NRFU interviews. This is a sizable number of interviews and could influence the distribution of languages if this information had been recorded.

Appendix D shows the distribution of all languages in which a NRFU interview was conducted.

5.1.1.4.2 Record of Contact

The following tables document how many times an enumerator had to contact a housing unit before a completed interview was obtained. Enumerators were told not to contact an address more than six times and there was only space to record six contacts, but that does not guarantee they did not make more than six contacts. There were also some experimental EQs used only during NRFU that had either four or five spaces provided for enumerators in the Record of Contact section, instead of six. We did not distinguish those questionnaires in our analysis here. A full discussion of those questionnaires and the use of the Record of Contact boxes can be found in the Nonresponse Followup Contact Strategy Experiment Final Report (Compton, 2011).

If no one answered the door at a housing unit, enumerators were instructed to leave a Notice of Visit form (shown in Appendix E). For each attempted contact to an address, the enumerator was supposed to write the month and day of the contact, the time of day, and what the outcome of the visit was, as well as whether the attempt was in person or over the telephone, as seen in Figure 12.

Figure 12: Enumerator Record of Contact Section of the EQ

RECORD OF CONTACT					
Type	Mo	Day	Time	Outcome	
<input checked="" type="checkbox"/> Personal				<input type="checkbox"/> a.m. <input type="checkbox"/> p.m.	
<input type="checkbox"/> Personal				<input type="checkbox"/> a.m. <input type="checkbox"/> p.m.	
<input type="checkbox"/> Telephone				<input type="checkbox"/> a.m. <input type="checkbox"/> p.m.	
<input type="checkbox"/> Personal				<input type="checkbox"/> a.m. <input type="checkbox"/> p.m.	
<input type="checkbox"/> Telephone				<input type="checkbox"/> a.m. <input type="checkbox"/> p.m.	

OUTCOME CODES: NV = Left Notice of visit NC = No contact RE = Refusal CI = Conducted Interview OT = Other

Not all information needed to be filled in to be counted as a contact for this assessment. For a contact to be counted as valid, a space in the Record of Contact section had to have a mark in one of five boxes: the Personal visit box, Telephone visit box, Outcome box, Day, or Month of contact. For the first Record of Contact space, the Personal visit box was already filled in so one of the other three key boxes had to be marked in that space in order for it to qualify as a contact. These criteria were established by the authors of the Nonresponse Followup Contact Strategy Experiment Final Report and are discussed in more detail in that report. We used the same criteria in this assessment to be consistent and comparable across reports.

The first contact to a housing unit by NRFU enumerators was required to be a personal visit but they were trained in how to conduct telephone interviews and were allowed to use that mode for subsequent contacts. Enumerators could leave their phone number on the Notice of Visit and encourage respondents to call them back, acquire a phone number from a cooperative respondent who could not complete an interview at that time, or acquire a phone number from a neighbor or other knowledgeable source.

Table 18 shows the distribution of the number of contacts made to a housing unit in order to obtain a completed interview. The first column contains all 47,197,405 housing units in NRFU. Subsequent columns look strictly at housing units by their final occupancy status.<sup>32</sup> Dummy returns do not have any information available on the Record of Contact and are reflected in the row for ‘Unknown’ number of contacts. They are the only returns represented in that row.

**Table 18: Number of Contact Attempts Made to NRFU Housing Units**

<b>Number of Contact Attempts</b>	<b>Overall Contact Attempts</b>	<b>Overall Percent</b>	<b>Occupied Count Attempts</b>	<b>Occupied Percent</b>	<b>Vacant Count Attempts</b>	<b>Vacant Percent</b>	<b>Delete Count Attempts</b>	<b>Delete Percent</b>
0 <sup>33</sup>	194,788	0.4%	26,833	0.1%	15,162	0.1%	122,320	3.1%
1	19,468,931	41.3%	11,143,912	38.8%	5,787,422	40.8%	2,415,823	60.2%
2	11,711,051	24.8%	6,708,508	23.3%	4,080,491	28.8%	873,095	21.8%
3	7,727,427	16.4%	5,026,232	17.5%	2,329,747	16.4%	344,883	8.6%
4	4,198,759	8.9%	2,865,757	10.0%	1,170,460	8.3%	149,696	3.7%
5	1,719,824	3.6%	1,278,096	4.4%	386,103	2.7%	50,632	1.3%
6	2,160,888	4.6%	1,693,182	5.9%	404,602	2.9%	53,938	1.3%
Unknown	15,737	<0.1%	14,020	<0.1%	1,717	<0.1%	0	0.0%
<b>Total Housing Units</b>	<b>47,197,405</b>	<b>100.0%</b>	<b>28,756,540</b>	<b>100.0%</b>	<b>14,175,704</b>	<b>100.0%</b>	<b>4,010,387</b>	<b>100.0%</b>

Source: DRF and AUX

Of the 47,197,405 housing units in NRFU, 41.3 percent of them were contacted only one time. In NRFU, 3.6 percent of the housing units were contacted five times, but 4.6 percent were contacted six times. This could happen if an enumerator recorded contacts 1 through 5 but then left the sixth space blank until they were able to complete an interview. Six is the maximum number of contacts we can report, even though that address could have been contacted more than six times.

<sup>32</sup> Housing units with an unresolved status are reflected in the “All Housing Units” column but are not reported in their own column.

<sup>33</sup> Cases with zero contacts reflect the number of cases that did not meet our criteria for documenting a valid record of contact.

Comparing the columns in Table 18 that contain the universes of occupied, vacant, and deleted housing units, the deleted housing units were much more likely to only require one contact (60.2 percent of the time). They also have the highest percentage of cases that purportedly received zero contacts (3.1 percent). Occupied housing units had the highest percentage of cases requiring six contacts (5.9 percent).

Enumerators could contact an address either in person or over the telephone (after the first personal visit). Table 19 shows the distribution of contacts for telephone calls.

**Table 19: Number of Telephone Contact Attempts Made to NRFU Housing Units<sup>34</sup>**

<b>Number of Telephone Contact Attempts</b>	<b>Overall Contact Attempts</b>	<b>Overall Percent</b>	<b>Occupied Count Attempts</b>	<b>Occupied Percent</b>	<b>Vacant Count Attempts</b>	<b>Vacant Percent</b>	<b>Delete Count Attempts</b>	<b>Delete Percent</b>
0	41,599,740	88.1%	25,501,989	88.7%	12,172,461	85.9%	3,689,718	92.0%
1	4,550,748	9.6%	2,587,856	9.0%	1,666,546	11.8%	280,428	7.0%
2	749,903	1.6%	464,352	1.6%	252,510	1.8%	30,748	0.8%
3	234,752	0.5%	158,521	0.6%	67,729	0.5%	7,697	0.2%
4	39,996	0.1%	25,892	0.1%	12,463	0.1%	1,490	<0.1%
5	6,529	<0.1%	3,910	<0.1%	2,278	<0.1%	306	<0.1%
Unknown	15,737	<0.1%	14,020	<0.1%	1,717	<0.1%	0	0.0%
<b>Total Housing Units</b>	<b>47,197,405</b>	<b>100.0%</b>	<b>28,756,540</b>	<b>100.0%</b>	<b>14,175,704</b>	<b>100.0%</b>	<b>4,010,387</b>	<b>100.0%</b>

Source: DRF and AUX

Overall, more than eleven percent of the NRFU universe was contacted at least once by telephone. Housing units that were found to be vacant were the most likely to incorporate a telephone contact. This could be a result of calling real estate agents or property management offices. Because the first record of contact was pre-filled on the EQ as a personal visit, it was not possible to record six telephone contacts (and procedurally should not have happened).

<sup>34</sup> Some columns do not total 100.0% due to rounding.

Table 20 shows the distribution of personal visit contacts made to housing units in NRFU. As shown in Figure 12, the first record of contact was pre-filled as a personal visit. Housing units reported in Table 20 to have zero personal contacts are those that did not fill in enough information on the EQ to meet our criteria for a contact.

**Table 20: Number of Personal Contact Attempts Made to NRFU Housing Units<sup>35</sup>**

<b>Number of Personal Contact Attempts</b>	<b>Overall Contact Attempts</b>	<b>Overall Percent</b>	<b>Occupied Count Attempts</b>	<b>Occupied Percent</b>	<b>Vacant Count Attempts</b>	<b>Vacant Percent</b>	<b>Delete Count Attempts</b>	<b>Delete Percent</b>
0	230,155	0.5%	48,005	0.2%	26,246	0.2%	124,843	3.1%
1	22,959,369	48.6%	12,942,737	45.0%	7,180,956	50.7%	2,697,094	67.3%
2	10,801,778	22.9%	6,500,198	22.6%	3,542,247	25.0%	718,193	17.9%
3	7,274,990	15.4%	4,892,840	17.0%	2,065,528	14.6%	292,624	7.3%
4	3,232,718	6.8%	2,273,196	7.9%	842,741	5.9%	106,860	2.7%
5	1,393,190	3.0%	1,066,650	3.7%	284,071	2.0%	38,143	1.0%
6	1,289,468	2.7%	1,018,894	3.5%	232,198	1.6%	32,630	0.8%
Unknown	15,737	<0.1%	14,020	<0.1%	1,717	<0.1%	0	0.0%
<b>Total Housing Units</b>	<b>47,197,405</b>	<b>100.0%</b>	<b>28,756,540</b>	<b>100.0%</b>	<b>14,175,704</b>	<b>100.0%</b>	<b>4,010,387</b>	<b>100.0%</b>

Source: DRF and AUX

Housing units classified as delete had the highest percentage of cases with zero personal contacts, which indicates a lack of data in the Record of Contact section of the EQ for those cases. Housing units classified as occupied were the most likely to require more than two personal visits.

Table 21 shows what mode the presumed last contact was with a housing unit. Enumerators had been trained on conducting telephone interviews and were allowed to use that mode when available. Cases with an unknown final contact either had zero contacts identified, were dummy returns, or did not mark the checkbox to distinguish if it was an in-person visit or a telephone visit for the last box utilized in the record of contact section.

<sup>35</sup> Some columns do not total 100.0% due to rounding.



**Table 21: Type of Final Contact for Housing Units in NRFU, by Housing Unit Status<sup>36</sup>**

	<b>Total Cases</b>		<b>Occupied</b>		<b>Vacant</b>		<b>Delete</b>	
<b>Final Contact</b>	<b>Totals</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>
Personal Visit	40,345,456	85.5%	24,808,778	86.3%	11,853,459	83.6%	3,486,570	86.9%
Telephone	4,556,475	9.7%	2,510,124	8.7%	1,744,119	12.3%	285,972	7.1%
Unknown	2,295,474	4.9%	1,437,638	5.0%	578,126	4.1%	237,845	5.9%
<b>Total Housing Units</b>	<b>47,197,405</b>	<b>100.0%</b>	<b>28,756,540</b>	<b>100.0%</b>	<b>14,175,704</b>	<b>100.0%</b>	<b>4,010,387</b>	<b>100.0%</b>

Source: DRF and AUX

Table 21 reports that the final mode of contact was in person in 85.5 percent of all NRFU cases. An additional 9.7 percent were completed by telephone and 4.9 percent of cases had an unknown mode as the final contact. Vacant housing units had the largest percentage of final contacts done over the telephone. The high telephone rate could be attributed to vacant housing units that were for sale or rent where the enumerator contacted a realtor to verify the housing unit as vacant.

#### 5.1.1.4.3 Type of Respondent

To complete a questionnaire for an address, an enumerator was instructed to interview a household member who lived at the address on April 1, 2010. Household members are preferred respondents because they can generally provide more information about the household than neighbors or another proxy. If a household member that lived at the address on April 1, 2010 was not available, or if the housing unit was vacant or flagged for deletion, then the enumerator could interview a proxy.

A proxy is someone who provides information about the NRFU address but is not a member of the NRFU household. NRFU enumerators should only have spoken with a proxy respondent if they were unable to talk to a household member. There are two types of proxy respondents. The first type of proxy is a household respondent that moved into the address after April 1, 2010. The second type is a neighbor or someone else who is informed about the status of the address on April 1, 2010.

On the last page of the EQ, enumerators were to identify who the respondent was for the interview, as seen in Figure 13. Questions R1 and R2 were to be used for a possible reinterview at that address. Question R3 indicates whether the respondent was a household member on

<sup>36</sup> Some columns do not total 100.0% due to rounding.

April 1 or a proxy respondent. The category under R3 labeled “Household member – Moved in after April 1, 2010” represents proxy respondents who are called “in-movers”.

**Figure 13: Respondent Information Section of the EQ**

**RESPONDENT INFORMATION**

**R1. (Ask or verify) What is your name?**

First Name MI

\_\_\_\_\_

Last Name

\_\_\_\_\_

Address of proxy

\_\_\_\_\_

\_\_\_\_\_

**R2. What is your phone number and best time to call?**

Area Code Number

\_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_

☐ Day ☐ Evening ☐ Either

**R3. Respondent Type –**

☐ Household member – Lived here on April 1, 2010

☐ Household member – Moved in after April 1, 2010

☐ Neighbor or other proxy

Table 22 shows the type of respondents for housing units interviewed during the NRFU operation, by housing unit status. Housing units with an unresolved status are included in the total but are not reported separately.

**Table 22: Type of Respondent for NRFU Interviews, By Housing Unit Status**

	Total Cases		Occupied		Vacant		Delete	
<b>Respondent Type</b>	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>
Household Member	22,276,261	47.2%	21,770,449	75.7%	267,988	1.9%	227,426	5.7%
Unknown Type	484,392	1.0%	153,961	0.5%	80,115	0.6%	188,283	4.7%
All Proxy	24,436,752	51.8%	6,832,130	23.8%	13,827,601	97.5%	359,4678	89.6%
Proxy Types								
In-mover	1,186,835	2.5%	177,799	0.6%	994,018	7.0%	9,415	0.2%
Neighbor or other	23,246,937	49.3%	6,653,649	23.1%	12,831,439	90.5%	3,585,147	89.4%
Both marked	2,980	<0.1%	682	<0.1%	2,144	<0.1%	116	<0.1%
<b>Total Housing Units</b>	<b>47,197,405</b>	<b>100.0%</b>	<b>28,756,540</b>	<b>100.0%</b>	<b>14,175,704</b>	<b>100.0%</b>	<b>4,010,387</b>	<b>100.0%</b>

Source: DRF

Information was collected for more than half of all the NRFU housing units by a proxy respondent – either someone who moved in after April 1 or a neighbor or other proxy (landlord, property manager, etc). A neighbor or other proxy accounted for 49.3 percent of all respondents while in-mover proxies were 2.5 percent of all respondents. Actual April 1 household members were 47.2 percent of all respondents. There were an additional one percent of respondents who could not be categorized, either because the enumerator left this question blank or because the boxes were marked for being both a household member on April 1 and for being a proxy.

We expect to have a large number of proxy respondents when looking at the entire 47,197,405 housing units in NRFU, because over a third of those cases were found to be either vacant or deletes (shown in Table 6), where it would theoretically not be possible to speak with a household member as the respondent.

When looking strictly at occupied housing units, the percent of respondents who were household members increases to 75.7 percent, (compared to the overall 47.2 percent). A proxy was the respondent for approximately 24 percent of all occupied interviews. Housing units that were marked as vacant reported an April 1 household member as the respondent in 1.9 percent of the interviews, which is incompatible with our definitions of household members and vacant units. Housing units that were marked for deletion reported an April 1 household member in 5.7 percent of the cases. This could be possible for housing units marked as duplicates but otherwise is incompatible with our definitions of household members and deleted units.

### **5.1.1.5 Characteristics of Occupied Housing Units**

The tables in this section will discuss characteristics of the occupied housing units that were interviewed during NRFU. This section will include results on occupied housing units' reported population count, answers to the undercount question, and answers to the overcount question. There is also a discussion of how enumerators presented the Residence Rule to respondents.

#### **5.1.1.5.1 Household Population Count**

After an address had been classified as occupied, the next piece of information collected was the number of people that live or stayed there. This is called the population count. The population count can be reported by looking at either:

- the preliminary population count that the respondent stated at the beginning of the interview,
- the number of data-defined persons (DDPs) on the form, or,
- the enumerator-reported population count in Item C of the Interview Summary (seen in Figure 2), the final population count ascertained by the end of the interview by the enumerator. That variable also captures information about whether a unit was known to be occupied, but had an unknown population count (POP 99 cases).

The preliminary population count could undercount people if the respondent remembered to count some people as the interview progressed. The number of DDPs could also undercount people if respondents did not want to provide the demographic information necessary for an individual to be data-defined.

Table 23 shows the distribution of population count within occupied housing units contacted during NRFU using both the enumerator-reported population count and the number of data-defined people. The number of data-defined persons and enumerator-reported population count are reported because they are the two population counts that are used for assigning a housing unit status.

**Table 23: Population Count of Housing Units found to be Occupied During NRFU<sup>37</sup>**

Population Count	Enumerator-Reported		Data-defined People	
	Number of Housing Units	Percent	Number of Housing Units	Percent
0	7,592	<0.1%	2,281,501	7.9%
1	8,017,024	27.9%	7,540,196	26.2%
2	7,617,370	26.5%	7,105,428	24.7%
3	4,736,534	16.5%	4,455,938	15.5%
4	4,063,824	14.1%	3,805,087	13.2%
5	2,209,082	7.7%	2,121,579	7.4%
6	855,809	3.0%	802,259	2.8%
7	396,434	1.4%	339,818	1.2%
8	174,781	0.6%	152,693	0.5%
9	80,346	0.3%	70,810	0.2%
10	42,658	0.1%	41,910	0.1%
11 – 15	42,443	0.1%	36,426	0.1%
16 – 20	2,916	<0.1%	2,194	<0.1%
21 – 30	1,521	<0.1%	427	<0.1%
31 – 40	366	<0.1%	130	<0.1%
41 – 49	793	<0.1%	124	<0.1%
50 – 97	2,128	<0.1%	20	<0.1%
98 (Delete)	453	<0.1%	N/A <sup>38</sup>	N/A
99 (Unknown)	492,515	1.7%	N/A	N/A
Missing	11,951	<0.1%	N/A	N/A
<b>Total Occupied Housing Units</b>	<b>28,756,540</b>	<b>100.0%</b>	<b>28,756,540</b>	<b>100.0%</b>

Source: DRF

There are some population count values in Table 23 that do not make sense for occupied units; population counts of zero, population counts of 50 or higher (the census had set 49 as the maximum allowable reported number of people living in a housing unit), or population counts of 98 (which indicated that the housing unit should be deleted). On a paper questionnaire, it is possible to have conflicting pieces of information due to enumerator or data capture errors. We report here the data as captured from the questionnaire.

Table 23 shows that 7.9 percent of occupied housing units did not provide enough information about individuals for anyone to be flagged as a data-defined person. There were 492,515

<sup>37</sup> These columns do not total 100.0% due to rounding.

<sup>38</sup> Not Applicable

housing units where the enumerator did not know the population count. Table 24 reports how many of those were also marked as being refusals.

<b>Table 24: Unknown Population Counts in NRFU Occupied Housing Units</b>		
<b>Refusal Status</b>	<b>Number of Housing Units</b>	<b>Percent</b>
Refusals	125,349	25.5%
Not a Refusal	367,166	74.5%
<b>Unknown Population Counts</b>	<b>492,515</b>	<b>100.0%</b>

Source: DRF

Table 24 shows that 74.5 percent of the housing units with an unknown population count were not marked as refusals.

Table 25 shows the number of continuation forms used to enumerate people at each address in NRFU. The parent EQ only had space to roster five people in a household. If more than five people lived at an address, then enumerators had to use a continuation form. Continuation forms did not have any of the beginning or concluding questions printed on them; they only collected person-level data for up to five persons on each continuation form.

<b>Table 25: Number of Continuation Forms used per Address in NRFU</b>		
<b>Number of Continuation Forms</b>	<b>Number of Housing Units</b>	<b>Percent<sup>39</sup></b>
0	27,272,458	94.8%
1	1,443,038	5.0%
2	37,911	0.1%
3	2,356	<0.1%
4	358	<0.1%
5	126	<0.1%
6	77	<0.1%
7	63	<0.1%
8	63	<0.1%
9	80	<0.1%
10	5	<0.1%
11	3	<0.1%
12	1	<0.1%
13	1	<0.1%
<b>Total Occupied Housing Units</b>	<b>28,756,540</b>	<b>100.0%</b>

Source: DRF

<sup>39</sup> This column does not total 100.0% due to rounding.

Table 25 shows that the majority of housing units enumerated in NRFU (94.8 percent) did not utilize a continuation form. If a housing unit had up to five people enumerated, a continuation form was not needed. Housing units with six to 10 people enumerated would have required one continuation form. Five percent of the occupied addresses required one continuation form.

### 5.1.1.5.2 Undercount

After the household roster and demographic characteristics were collected during the NRFU interview, the enumerator asked a series of questions that probed if anyone else might have been staying at the address on Census Day (Figure 14).

**Figure 14: Undercount Question Section of the EQ**

**H1. We do not want to miss any people who might have been staying here on April 1.**  
**Were there any additional people that you didn't mention, for example:**

Babies?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Foster children?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Any other relatives?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Roommates?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Any other nonrelatives?	<input type="checkbox"/> Yes	<input type="checkbox"/> No

**How about anyone else staying here on April 1 who had no permanent place to live?** ☐ Yes ☐ No

*If yes to any category, ask: What is that person's name?*

First Name	Last Name
<input type="text"/>	<input type="text"/>

**Anyone else?**

First Name	Last Name
<input type="text"/>	<input type="text"/>

*Do not list any people recorded for this question on the inside pages or on a continuation form.*

These questions are called undercount questions, because they attempt to identify housing units that might not have a complete roster. Table 26 shows the frequency that each probe was marked with an affirmative answer, including one row for housing units that said 'Yes' to more than one of the probes.

**Table 26: Distribution of Answers to the Undercount Probes at Occupied NRFU Housing Units**

<b>Undercount Category</b>	<b>Number of Housing Units</b>	<b>Percent</b>
Only 'No' category marked	24,621,318	85.6%
At least one category marked	433,397	1.5% <sup>40</sup>
Babies only	51,350	0.2%
Foster children only	7,404	<0.1%
Any other relatives only	213,445	0.7%
Roommates only	43,690	0.2%
Any other nonrelatives only	51,859	0.2%
Anyone else staying on April 1 who had no permanent place to live only	44,381	0.2%
Multiple categories marked	21,268	0.1%
Missing (All boxes blank)	3,701,825	12.9%
<b>Total Occupied Housing Units</b>	<b>28,756,540</b>	<b>100.0%</b>

Source: DRF

Table 26 shows that the most successful probe was for “other relatives,” which 0.7 percent of occupied housing units answered affirmatively. At least one undercount category was marked in 1.5 percent of NRFU interviews with occupied housing units. None of the boxes were marked in 12.9 percent of the interviews.

If the respondent answered ‘yes’ to any of the probes, the NRFU enumerator was to collect a maximum of two names for the people who were possibly undercounted, as shown in Figure 14. The enumerator was not supposed to open the questionnaire and add these individuals to the previously-collected household roster. Instead, a followup telephone call to clarify the household roster was made to eligible housing units as part of the Coverage Followup Operation (Kostanich 2009).

For all occupied housing units that gave a positive answer to an undercount category, Table 27 shows how often the name fields were used at the end of the undercount question. For this assessment, the name fields were not inspected for validity; any entry would have been captured as a valid name in the following tables.

<sup>40</sup> The subcategories in this column do not total 1.5% due to rounding.



**Table 27: Number of Undercount Names Reported when Any Undercount Category  
Marked in NRFU Occupied Housing Units**

<b>Total Number of Names</b>	<b>Total</b>	<b>Percent</b>
Zero Names	26,593	6.1%
One Name	329,687	76.1%
Two Names	77,117	17.8%
<b>Total Occupied Housing Units with Category Selected</b>	<b>433,397</b>	<b>100.0%</b>

Source: DRF and AUX

Table 27 reports that two names were provided for 17.8 percent of the housing units that positively marked an undercount category, while no names were provided for 6.1 percent of the housing units.

Table 28 shows how often a name was provided to the enumerator for each specific undercount category.

**Table 28: Number of Undercount Names Reported for Specific Undercount Category Marked in NRFU Occupied Housing Units**

<b>Undercount Category with Number of Names</b>	<b>Total</b>	<b>Percent<sup>41</sup></b>
<b>Babies only</b>		
Zero Names	4,721	9.2%
One Name	39,381	76.7%
Two Names	7,248	14.1%
<b>Total</b>	<b>51,350</b>	<b>100.0%</b>
<b>Foster children only</b>		
Zero Names	1,154	15.6%
One Name	4,447	60.1%
Two Names	1,803	24.4%
<b>Total</b>	<b>7,404</b>	<b>100.0%</b>
<b>Any other relatives only</b>		
Zero Names	7,003	3.3%
One Name	167,707	78.6%
Two Names	38,735	18.1%
<b>Total</b>	<b>213,445</b>	<b>100.0%</b>
<b>Roommates only</b>		
Zero Names	4,288	9.8%
One Name	34,916	79.9%
Two Names	4,486	10.3%
<b>Total</b>	<b>43,690</b>	<b>100.0%</b>
<b>Any other nonrelatives only</b>		
Zero Names	3,487	6.7%
One Name	43,209	83.3%
Two Names	5,163	10.0%
<b>Total</b>	<b>51,859</b>	<b>100.0%</b>
<b>Anyone else only</b>		
Zero Names	2,647	6.0%
One Name	36,608	82.5%
Two Names	5,126	11.5%
<b>Total</b>	<b>44,381</b>	<b>100.0%</b>
<b>Multiple</b>		
Zero Names	3,293	15.5%
One Name	3,419	16.1%
Two Names	14,556	68.4%
<b>Total</b>	<b>21,268</b>	<b>100.0%</b>
<b>None<sup>42</sup></b>		
Zero Names	28,306,428	99.9%
One Name	13,965	<0.1%
Two Names	2,750	<0.1%
<b>Total</b>	<b>28,323,143</b>	<b>100.0%</b>

Source: DRF and AUX

<sup>41</sup> This column may not total 100.0% due to rounding.

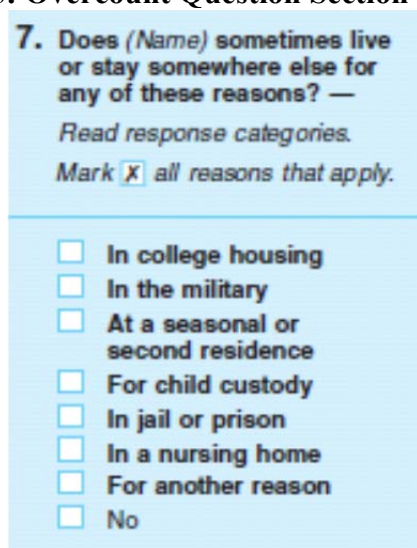
<sup>42</sup> These numbers include both “Missing” and “Only ‘No’ category marked” rows from Table 26.

In Table 28, the “other relatives” category could be considered the most successful probe since only 3.3 percent of people who answered did not provide a name. Respondents who indicated a foster child might have been undercounted were the least likely to provide a name; 15.6 percent of those cases did not provide a name. Respondents who indicated multiple categories were the most likely to provide two names, 68.4 percent of the time. There were also housing units that did not mark an undercount category but at least one name was still provided. As mentioned earlier however, the names fields were not inspected for validity.

#### 5.1.1.5.3 Overcount

The overcount question was asked for every person rostered on the EQ. It was the last person-level question and is shown in Figure 15.

**Figure 15: Overcount Question Section of the EQ**



**7. Does (Name) sometimes live or stay somewhere else for any of these reasons? —**  
*Read response categories.*  
 Mark ☒ all reasons that apply.

- ☐ In college housing
- ☐ In the military
- ☐ At a seasonal or second residence
- ☐ For child custody
- ☐ In jail or prison
- ☐ In a nursing home
- ☐ For another reason
- ☐ No

Results of the overcount question are shown in Table 29. The overcount question seeks to identify if a person might have been counted by the Census at an additional location. To clarify these living situations, followup contacts were made in the Coverage Followup Operation to housing units that met eligibility criteria (Kostanich, 2009). The universe in Table 29 is made up of all data-defined persons in occupied housing units. There were 70,914,526 such people captured during NRFU.

**Table 29: Overcount Category for Data-defined People in NRFU Occupied Housing units**

<b>Overcount Category</b>	<b>Number of People</b>	<b>Percent<sup>43</sup></b>
None	67,946,756	95.8%
At least one category marked	2,967,770	4.2%
College Housing only	232,415	0.3%
Military only	225,573	0.3%
Seasonal/Second Home only	1,122,113	1.6%
Child Custody only	678,426	1.0%
Jail or Prison only	33,056	<0.1%
Nursing Home only	28,651	<0.1%
Another Reason only	600,088	0.8%
Multiple Categories	47,448	0.1%
<b>Total People in Occupied Housing Units</b>	<b>70,914,526</b>	<b>100.0%</b>

Source: DRF

The vast majority of people (95.8 percent) did not indicate they lived or stayed anywhere else besides the NRFU address. The most common positive reply to the overcount question was for a seasonal or second home, which described 1.6 percent of people. An additional 1.0 percent of people stayed elsewhere for child custody and 0.8 percent stayed elsewhere for another undefined reason. Both military reasons and college reasons were cited for 0.3 percent of people, while 0.1 percent reported more than one reason why they stayed somewhere else.

#### **5.1.1.5.4 “Who to Count” and Information Sheet Usage**

During every NRFU interview, the NRFU enumerator was instructed to give each respondent an Information Sheet, as past census tests have shown a need for a visual aid to assist the respondent in answering some of the questions in the NRFU interview. The Information Sheet used in the 2010 Census included information about confidentiality, who to include in the housing unit, relationship categories, Hispanic origin categories, and race categories. The Information Sheet (also referred to as the flashcard) can be found in Appendix E. When the enumerator asked the respondent how many people lived in the housing unit, they were to direct the respondent to read the “Who To Count on April 1st” section of the Information Sheet, which summarized the census residence rule and situations.

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<sup>43</sup> The subcategories do not total 4.2% due to rounding.

Figure 16: “Who to Count” Section of the Information Sheet

WHO TO COUNT ON APRIL 1 <sup>st</sup>	
We need to count people where they live and sleep most of the time.	
<b><u>Do NOT include:</u></b>	<b><u>Do include:</u></b>
<ul style="list-style-type: none"><li>• College students who live away from this address most of the year</li><li>• Armed Forces personnel who live away</li><li>• People in a nursing home, mental hospital, etc. on April 1, 2010</li><li>• People in jail, prison, detention facility, etc. on April 1, 2010</li></ul>	<ul style="list-style-type: none"><li>• Babies and children living here, including foster children</li><li>• Roommates</li><li>• Boarders</li><li>• People staying here on April 1, 2010 who have no permanent place to live</li></ul>

Census Bureau enumerator procedures instructed the enumerator to:

1. Hand the Information Sheet to the respondent at the beginning of the interview, and
2. Read verbatim the text in Question S5 that says,  
*“We need to count people where they live and sleep most of the time. Please look at List A. It contains examples of people who should and should not be counted at this place. Based on these examples, how many people were living or staying in this (house/apartment/mobile home) on April 1?”*

We used the following sources to analyze the use of the Information Sheet and the reading of the questionnaire verbatim:

- NRFU Enumerator Debriefings
  - A debriefing questionnaire was completed by 18,432 NRFU enumerators at the completion of the NRFU operation.
  - The questionnaire covered a range of topics related to their work in the field, including the use of the Information Sheet.

- NRFU Crew Leader Debriefings
  - A debriefing questionnaire was completed by 1,650 NRFU CLs at the completion of the NRFU operation.
  - The questionnaire covered a range of topics related to their work in the field, including their observations of enumerators at the very beginning of the NRFU operation.
- Crew Leader Observations of Enumerators
  - CLs were supposed to observe all enumerators on the job in the days after training ended. This was to ensure that enumerators were following procedures and getting feedback early about any improvements they needed to make.
  - The CLs were to record results of an observation on a printed observation checklist. The checklists were collected and shipped to NPC for data capture.
- Trip reports by HQ observers
  - All HQ staff who traveled to observe operations in the field were required to write a report of their observations.
  - A few reports provided relevant anecdotes about the use of the Information Sheet and the verbatim reading of question text.
- Behavior Coding of NRFU Stateside Enumerators
  - 204 audiotapes were collected of NRFU interviews and behavior coded by trained telephone center staff. The sample of interviews was not intended to be a representative sample but a sample of convenience.
  - The audiotaping was done as part of research to identify problems with how enumerators ask questions and how respondents answer questions.
- Observational Study of NRFU Enumerators in Puerto Rico
  - 18 NRFU interviews were observed in the San Juan, PR metropolitan area.
  - This observational study was specifically interested in the physical usage of the Information Sheet.

All the above sources have possible bias inherent in them, notably that the enumerators were being observed and so might have been more attentive to following the field procedures than they otherwise would have been.

### Information Sheet Usage

The first thing we looked at was how often the Information Sheet was given to respondents and utilized during the interview. Enumerators who completed a debriefing questionnaire were given five options to describe the frequency of their actions: Always, Often, Sometimes, Rarely, and Never.

For instance, when enumerators were asked on the debriefing questionnaire how often they gave respondents a copy of the Information Sheet, 75.2 percent of enumerators said ‘Always’ and 21.1 percent said ‘Often’. For the 1.5 percent who said ‘Rarely’ or ‘Never’, some reasons were because the interview was a telephone interview, or because they canvassed a large number of seasonal and vacant homes. Other responses included, “Never gave respondents the

[Information Sheet] because I only had one and I basically explained the confidentiality,” and “Most people I interviewed were fully aware of everything on Info Sheet.” Approximately 9.8 percent of the enumerators reported that the “Who to count on April 1<sup>st</sup>” section of the Information Sheet was the section least likely to be read. Sixty-eight percent of the enumerators report that respondents rarely or never had questions about the “Who to count on April 1<sup>st</sup>” section.

When CLs were asked on the debriefing questionnaire how often enumerators handed the Information Sheet to respondents during their initial observations, 79.3 percent said enumerators ‘Always’ handed it out while 0.6 percent said they ‘Never’ did.

There were 273,798 initial observation checklists (conducted by the CL of their enumerators) that reported 2.2 percent of the observed enumerators failed to provide the Information Sheet to the respondent.

The NRFU Behavior Coding study was an audio-taped study only, so we cannot know for sure how often an Information Sheet was handed to these respondents. However, in the reading of the question, the “Who to Count” list (List A) was not referred to in 35 percent of cases.

The results of the observational study in Puerto Rico reported that the Information Sheet was handed to the respondent in all 18 of the observed interviews. In 10 of them, it was handed face-up (with the confidentiality and ‘Who to Count’ information showing).

There are also some anecdotal accounts of Information Sheet usage available from a handful of trip reports. Some notable quotations include:

- “The enumerators would rush through the interview and procedures quickly. Some did not provide the confidentiality information sheet or information to respondents. Others would provide the sheet and information but would not explain other information on the sheet, for example, the response options to questions on the reverse side.” (De la Cruz, 2010)
- “One of the interviews was interesting because the respondent could not read. The enumerator read to him the confidentiality notice and all parts of the Info Sheet.” (Jackson, 2010)
- “[One] enumerator never gave the respondent a flashcard at any point during the interview, which the CL pointed out after we had left. [Another] enumerator conducted two phone interviews with respondents. He gave a brief overview of the confidentiality notice to each respondent and didn’t refer to the other lists in any way.” (Heimel, 2010)

### Verbatim Reading of Text

The second point we looked for was how often the wording in Question S5 was read verbatim as intended. There is no information available from either the enumerator or CL debriefings to answer this. The CL’s initial observation checklists only asked one overarching question about

how often questions were read as worded within an interview, not about the verbatim reading of individual questions. Verbatim reading was also not a component of the observational study done in Puerto Rico.

Trip reports by HQ observers offer some anecdotes about the verbatim reading of questions. It should be noted, though, that observers often were not able to see the questionnaire as an interview progressed and many were not familiar with the exact text, so the commentary offered by trip reports likely only catches major omissions or major changes to the scripted text.

- “Most of the enumerators that I observed were not reading or asking questions as worded.” (de la Cruz, 2010)
- “Because they tried to be quick, they did not read all questions verbatim. Instead, if the respondent showed they were getting annoyed, losing interest, or getting aggravated, the enumerators asked an abbreviated version of the question.” (Hughes, 2010)
- “The NRFU production enumerator completed three interviews and left five notices of visits. The enumerator did an excellent job of conducting the interviews. He read the EQs verbatim to the respondents and the respondents seemed very comfortable with answering the questions due to his easygoing interview style.” (Jackson, 2010)
- “The enumerator in Petaluma conducted three interviews. She did an excellent job of reading the questions verbatim.” (Jackson, 2010)

The behavior coding study was the primary resource for this research question. Again, the question text that was intended to be read verbatim was:

*“We need to count people where they live and sleep most of the time. Please look at List A. It contains examples of people who should and should not be counted at this place. Based on these examples, how many people were living or staying in this (house/apartment/mobile home) on April 1?”*

The question was read with a major change in 58 percent of the cases in this study. Examples of major changes include not reading the first sentence, omitting the reference to List A, not actually asking the question, omitting the reference date of April 1, or omitting one or both of the critical concepts of “living” and “staying.” Complete results of this study are available in Childs, 2011.

### Conclusion on the Outcome of “Who to Count” Research

In conclusion, it seems that the Information Sheet was handed to the respondent more frequently and consistently than in previous census tests. Whether the residence rule question was read verbatim might have depended on the enumerator and the situation, but HQ could consider including more emphasis on key concepts and the importance of verbatim reading in future census trainings. We conclude that the field procedures were followed a considerable proportion of time in NRFU.



However, this might have been less true as NRO operations continued. Anecdotal sources from NRFU RI, VDC, and NRFU Residual indicate that the procedures were followed less closely as time passed, perhaps due to enumerator fatigue or increased respondent impatience.

#### 5.1.1.6 Standard Demographic Tables

There were 70,914,526 data-defined persons included on 28,756,540 NRFU forms for occupied housing units in the 2010 Census. This section will present the demographic characteristics for these persons on the NRFU form. Table 30 through Table 34 gives NRFU person demographic characteristics: age, Hispanic origin, race, relationship to person 1, and sex. Age was calculated based on the date of birth provided; if no date of birth was provided then the write-in age was used. Age was calculated only if the date of birth fell within valid date ranges. Similarly, the calculated age or write-in age was used only if it fell within valid age ranges; otherwise it was considered missing. Table 35 gives the distribution of tenure responses for housing units included in the NRFU operation.

Because the demographic data used in this assessment are unedited, direct comparisons with published 2010 Census results are not possible. These tables include a row for people with missing values for the specific characteristic. The data in published Census reports have undergone editing and imputation, and therefore will have no missing values.

**Table 30: Standard Assessment Demographic Table for Age in NRFU Interviews**

<b>Age</b>	<b>Number of People</b>	<b>Percent<sup>44</sup></b>
Under 5 years	5,266,640	7.4%
5 to 9 years	5,071,197	7.2%
10 to 14 years	4,725,145	6.7%
15 to 19 years	4,592,352	6.5%
20 to 24 years	4,935,232	7.0%
25 to 29 years	4,960,786	7.0%
30 to 34 years	4,552,813	6.4%
35 to 39 years	4,325,075	6.1%
40 to 44 years	4,010,663	5.7%
45 to 49 years	3,815,459	5.4%
50 to 54 years	3,194,080	4.5%
55 to 59 years	2,424,110	3.4%
60 to 64 years	1,792,656	2.5%
65+ years	3,891,445	5.5%
Missing	13,356,873	18.8%
<b>Total</b>	<b>70,914,526</b>	<b>100.0%</b>

Source: DRF

<sup>44</sup> This column does not total 100.0% due to rounding.

**Table 31: Standard Assessment Demographic Table for Hispanic Origin in NRFU Interviews**

<b>Hispanic Origin</b>	<b>Number of People</b>	<b>Percent</b>
Not Hispanic or Latino checkbox only	52,574,969	74.1%
Mexican checkbox only	9,253,558	13.0%
Puerto Rican checkbox only	2,273,761	3.2%
Cuban checkbox only	308,852	0.4%
Another Hispanic checkbox only	456,453	0.6%
Multiple checkboxes	86,617	0.1%
Both Checkbox and Write-in	3,217,607	4.5%
Write-in Only	158,741	0.2%
Missing	2,583,968	3.6%
<b>Total</b>	<b>70,914,526</b>	<b>100.0%</b>

Source: DRF

**Table 32: Standard Assessment Demographic Table for Race in NRFU Interviews**

<b>Race</b>	<b>Number of People</b>	<b>Percent</b>
White checkbox alone	41,961,890	59.2%
Black or African American checkbox alone	10,567,446	14.9%
American Indian and Alaska Native checkbox alone	187,205	0.3%
Asian Indian checkbox alone	845,114	1.2%
Chinese checkbox alone	557,764	0.8%
Filipino checkbox alone	515,059	0.7%
Japanese checkbox alone	108,791	0.2%
Korean checkbox alone	323,623	0.5%
Vietnamese checkbox alone	315,689	0.4%
Other Asian checkbox alone	11,788	<0.1%
Native Hawaiian checkbox alone	46,895	0.1%
Guamanian or Chamorro checkbox alone	31,710	<0.1%
Samoan checkbox alone	45,228	0.1%
Other Pacific Islander checkbox alone	4,376	<0.1%
Some Other Race checkbox alone	252,887	0.4%
Multiple checkboxes	86,617	0.1%
Both Checkbox and Write-in	10,942,610	15.4%
Write-in Only	287,871	0.4%
Missing	2,592,702	3.7%
<b>Total</b>	<b>70,914,526</b>	<b>100.0%</b>

Source: DRF

**Table 33: Standard Assessment Demographic Table for Relationship Status in NRFU Interviews**

<b>Relationship Status</b>	<b>Number of People</b>	<b>Percent</b>
Householder	26,397,819	37.2%
Husband or Wife of Householder	9,844,350	13.9%
Biological Son or Daughter of Householder	20,897,461	29.5%
Adopted Son or Daughter of Householder	372,666	0.5%
Stepson or Stepdaughter of Householder	1,120,183	1.6%
Brother or Sister of Householder	1,117,855	1.6%
Father or Mother of Householder	978,867	1.4%
Grandchild of Householder	1,436,628	2.0%
Parent-in-law of Householder	178,755	0.3%
Son-in-law or Daughter-in-law of Householder	252,049	0.4%
Other Relative	1,455,019	2.1%
Roomer or Boarder	360,995	0.5%
Housemate or Roommate	2,146,507	3.0%
Unmarried Partner	1,969,242	2.8%
Other Nonrelative	1,119,810	1.6%
Two or more relationships	53,853	0.1%
Missing	1,212,467	1.7%
<b>Total</b>	<b>70,914,526</b>	<b>100.0%</b>

Source: DRF

**Table 34: Standard Assessment Demographic Table for Sex in NRFU Interviews**

<b>Sex</b>	<b>Number of People</b>	<b>Percent<sup>45</sup></b>
Male	35,297,046	49.8%
Female	34,781,507	49.0%
Both	14,238	<0.1%
Missing	821,735	1.2%
<b>Total</b>	<b>70,914,526</b>	<b>100.0%</b>

Source: DRF

<sup>45</sup> This column does not total 100.0% due to rounding.

**Table 35: Standard Assessment Demographic Table for Tenure in NRFU Interviews**

<b>Tenure</b>	<b>Number of Housing Units</b>	<b>Percent<sup>46</sup></b>
Owned with a mortgage or a loan	8,374,378	29.1%
Owned without a mortgage or a loan	3,303,194	11.5%
Rented	13,129,892	45.7%
Occupied without payment of rent	486,879	1.7%
Multiple	14,157	<0.1%
Missing	3,448,040	12.0%
<b>Total</b>	<b>28,756,540</b>	<b>100.0%</b>

Source: DRF

These distributions may vary across different census operations due to differences in corresponding populations and census procedures.

#### **5.1.1.7 Added Housing Units to the Workload**

The following section discusses housing units that were not part of an enumerators' assigned work but were either visited or discussed during the course of an interview, as described below. In Table 5, we noted that 82,739 cases were removed from the universe that was the basis for all previous NRFU analysis. Those cases were added housing units that did not have enough address information to be geocoded and assigned a MAFID so were not eligible for inclusion in the census. Since they represent work done by enumerators however, they are included in this section initially and delineated again in Table 39.

NRFU enumerators visited housing units in mailback areas that did not return a Census questionnaire by mail or complete an interview by telephone by the time the NRFU universe was determined in the second week of April. The housing units eligible for being visited in NRFU if a return was not received by this date were pre-determined using addresses on the Master Address File (MAF). Each enumerator received an address list that contained all housing units in an assignment area and indicated which of those units required followup. However, it was possible for enumerators to discover housing units that were not on the assignment list. These might have been recently constructed housing units, or hard to locate units like basement apartments. If an enumerator discovered a housing unit that was not on their assignment list, they added the housing unit address to their address list and enumerated it with an EQ. These are the only type of cases that FLD and PBOCS identified as adds during NRFU.

However, the decennial census recognizes another type of housing units added to the workload that are the result of complex living situations. In cases where a respondent moved in after Census Day (In-movers) or where a whole household had a usual home elsewhere (WHUHE), the enumerator could have completed an EQ for the housing unit where the respondent lived on April 1, 2010. These housing units were not added to an enumerator's assignment list so they

<sup>46</sup> This column does not total 100.0% due to rounding.

were not considered to be ‘adds’ by FLD. However, since they created an additional EQ with a handwritten address that needed to be geocoded, they were considered to be potentially added housing units, (in addition to the FLD-accepted adds mentioned above) and they will be included in the discussion in this section. These potentially added housing units could already exist in the Census housing unit universe.

#### **5.1.1.7.1 Characteristics of Added Housing Units**

Enumerators may encounter atypical situations while out in the field. One of the things they are trained to handle but do not encounter very often is the need to add a housing unit to their workload. As stated in Section 5.1.1.7 there are two reasons why an enumerator might have to add a housing unit.

The first reason involves respondent-provided adds, which are In-mover or WHUHE cases. Housing units that were enumerated for one of these two living situations are called Type A cases. The second reason for adding a housing unit was if an enumerator observed a housing unit that was missing from their address binder. These housing units, which result from an enumerator finding a housing unit that is visibly in their block but not on the printed address list of their assignment area, are called Type C cases.<sup>47</sup>

The type of add was an important factor in how the add was treated by Census HQ processing. Type A cases were supposed to have at least one person listed at the address to be processed, since by nature they should be occupied housing units. This was determined if one person at the housing unit had a value of one for the variable Person Number Computed (PNC). Even though Type A cases were to be processed only if one person was counted on the form, there were some Type A cases without a person record that were incorrectly included for processing. The variable PNC is used in the subsequent tables to differentiate the Type A cases.

Type C cases were processed regardless of how many people were listed on the added EQ. Table 36 shows the number of added housing units in NRFU for each type.

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<sup>47</sup> There were also Type B adds in the census, which came from Be Counted forms where the checkbox had been marked to indicate the respondent had no address on April 1. Type A adds could also have been generated from other census operations, including Telephone Questionnaire Assistance and Group Quarters Enumeration. Type C adds could have been generated by any field operation, including NRFU VDC and UE.

**Table 36: Type of Potentially Added Housing Units Found in NRFU**

<b>Type</b>	<b>Number of Housing Units</b>	<b>Percent<sup>48</sup></b>
Type A (PNC=1)	139,324	17.2%
Type A (PNC=0)	10,988	1.4%
Type C	661,673	81.5%
<b>Total</b>	<b>811,985</b>	<b>100.0%</b>

Source: DRF

The majority of added housing units in NRFU (81.5 percent) were Type C cases. There were almost 11,000 Type A cases that appear to have been incorrectly included for processing.

Subsequent tables in this section show the completeness of address information collected for adds on the stateside and Puerto Rico EQs. Since the collected address information differed between Puerto Rico and stateside adds, Table 37 presents the distribution of types of adds in stateside and Puerto Rico separately.

**Table 37: Frequency of Potentially Added Housing Units in NRFU, in Stateside or Puerto Rico**

<b>Type</b>	<b>Stateside</b>		<b>Puerto Rico</b>	
	<b>Number of Housing Units</b>	<b>Percent</b>	<b>Number of Housing Units</b>	<b>Percent</b>
Type A (PNC=1)	138,242	17.5	1,082	5.3
Type A (PNC=0)	10,937	1.4	51	0.3
Type C	642,535	81.2	19,138	94.4
<b>Total</b>	<b>791,714</b>	<b>100.0<sup>49</sup></b>	<b>20,271</b>	<b>100.0</b>

Source: DRF

Type C cases were the most common in both Puerto Rico (94.4 percent) and stateside (81.2 percent).

Type A cases can also be further grouped into two living situations, as described earlier in this section. One living situation is for people who have a UHE; the second living situation is for people who moved. These two classifications were supposed to have been indicated by the enumerator on the back side of the EQ, in boxes labeled UHE and MOV (shown in Figure 3). The presence of a mark in either of those boxes was necessary to be classified as Type A for this analysis. Table 38 shows the number of cases that fit each description.

<sup>48</sup> This column does not total 100.0% due to rounding.

<sup>49</sup> This column does not total 100.0% due to rounding.

**Table 38: Frequency of Living Situations Identified for Type A Cases in NRFU**

<b>Type A Living Situations</b>	<b>Type A with PNC=1</b>		<b>Type A with PNC=0</b>	
	<b>Number</b>	<b>Percent<sup>50</sup></b>	<b>Number</b>	<b>Percent</b>
UHE	16,613	11.9%	6,972	63.5%
Movers	121,947	87.5%	3,957	36.0%
Marked both UHE and Movers	764	0.5%	59	0.5%
<b>Total Type A Cases</b>	<b>139,324</b>	<b>100.0%</b>	<b>10,988</b>	<b>100.0%</b>

Source: DRF

For the Type A cases that listed at least one person on the EQ, Table 38 shows that 87.5 percent of them were movers. For the Type A cases without person data however, 63.5 percent were addresses reported as a UHE. It is unclear why there is such a difference in the distribution of living situations for the two Type A classifications.

All added housing units went through a process by the Geography Division that attempted to geocode and then assign a MAFID to the address. Addresses with a MAFID are eligible to be in the census. If the address information provided by the enumerator was not sufficient for Geography to identify a geocode (state, county and census block must be identifiable), then it was not assigned a MAFID and not included on the state-level data files. Table 39 shows the frequency with which GEO was able to successfully geocode, assign MAFIDs to added housing units, and thus allocate them to a state for apportionment.

**Table 39: Frequency that Added Housing Units from NRFU Are Associated with a State**

<b>Outcome</b>	<b>Number of Housing Units</b>	<b>Percent</b>
In a State and coded to a Block	729,246	89.8%
Not associated with a State	82,739	10.2%
<b>Total Adds</b>	<b>811,985</b>	<b>100.0%</b>

Source: DRF

Table 39 reports that 10.2 percent of all added housing units were not able to be placed in a state and so were not included in the final census count. Since Type C cases were physically visible to the enumerator, we assume that those adds should have a high rate of being successfully geocoded during processing. Table 40 shows the distribution of processing results by type of add.

<sup>50</sup> This column does not total 100.0% due to rounding.

**Table 40: Frequency that Added Housing Units from NRFU Are Associated with a State, by Type**

Outcome	Type A (PNC=1)		Type A (PNC=0)		Type C	
	Number of Housing Units	Percent	Number of Housing Units	Percent	Number of Housing Units	Percent
In a State and coded to a Block	116,957	83.9%	6,984	63.6%	605,305	91.5%
Not associated with a State	22,367	16.1%	4,004	36.4%	56,368	8.5%
<b>Total Cases</b>	<b>139,324</b>	<b>100.0%</b>	<b>10,988</b>	<b>100.0%</b>	<b>661,673</b>	<b>100.0%</b>

Source: DRF

Table 40 shows that Type A cases without a valid person record were the most likely to not be associated with a state after Geography Division's processing, 36.4 percent of the time. Type C cases were not associated with a state on the DRF file in 8.5 percent of the cases. For these cases GEO was unable to successfully geocode and assign MAFIDs.

#### 5.1.1.7.2 Geography of Potentially Added Housing Units

The address information necessary for geocoding was always the same for Type A and Type C cases (State, County, and Block). However, for Type A cases, the only information that enumerators could provide GEO about the added housing unit was the standard address information (street name, city, state), since the respondent was discussing their previous address or other address that might have been in another state. This information had to be complete enough for GEO to identify a county and block during processing. The enumerator would not have known the LCO, County Code, Tract Code or Block Code for those addresses. For Type C cases however, the enumerator was expected to provide the information to be geocoded since the added housing unit should have been in their assignment area. The state, county, and block codes were printed on the Address List Page and Add Page that enumerators received with their assignments (shown in Appendix A and B, respectively). The Type C added housing unit was expected to have the same state, county and block code as the addresses printed on their Address List Page.

Because of the differences in when enumerators collected address information and the availability of it, there were two places on an EQ where enumerators could record geographic and address information about the added housing units. First, on the front of the EQ, there were fields to be filled for a Type C Add that captured the Collection Geography - LCO, State, County, Tract, Block, Assignment Area (AA) and map spot. These fields are shown on the right side of Figure 17 and Figure 18. Figure 17 is the stateside EQ and Figure 18 is the Puerto Rico EQ.



Figure 17: Address Field Section – Stateside EQ

United States Census 2010

U.S. DEPARTMENT OF COMMERCE  
Economics and Statistics Administration  
U.S. CENSUS BUREAU

**ENUMERATOR QUESTIONNAIRE**

Unit ID

LCO State County

Tract Block

AA Map Spot

← APPLY LABEL HERE →

Are there any continuation forms for this address?

☐ Yes → Number of forms

☐ No

Figure 18: Address Field Section - Puerto Rico EQ

Censo 2010 Puerto Rico

Departamento de Comercio de los EE.UU.  
Administración de Economía y Estadísticas  
Negociado del Censo de los EE.UU.

**CUESTIONARIO DEL ENUMERADOR**

Identificación de la Unidad

LCO Municipio

Sector Bloque

AA Punto en el mapa

← PEGUE ETIQUETA AQUÍ →

¿Hay algún cuestionario de continuación para esta dirección?

☐ Sí → Cantidad de formas

☐ No

Figure 17 and Figure 18 show that the stateside and Puerto Rico EQs captured almost the same geographic information on the front of the EQ. The only distinction was on the Puerto Rico EQ, which had the State code pre-printed on the form.

The second place where address information was captured for added housing units was near the end of the questionnaire, in question H3, when the scripted interview with the respondent was ending. This was to be used with Type A cases. The design of question H3 indicates an

enumerator could collect both city-style address and rural route address information, as shown in Figure 19 and Figure 20. However, there was no clear instruction to the enumerator on which type of address information to collect for different situations. For instance, the enumerator should not collect a hybrid of city-style and rural route information (i.e. a street name and rural route if the respondent had both to provide). When this did happen, it created complications for the automated address matching. GEO had to do considerable pre-processing to try to identify what type of address was collected, because the appropriate indicators (i.e., a checkbox that indicates whether the address is a rural route or city-style format) were not included in the questionnaire design. In the future, there should be clear instructions to the enumerator about what to do in different types of situations. Some examples of potentially difficult address situations were:

- A respondent might have indicated he or she lived at a structure that had a city-style address for emergency services but a rural route address for mailing purposes.
- A respondent could have lived in an area without posted house numbers, but there were street names, and the rural route addresses were generally used as the ‘formal addresses.

These ambiguities lead to questions about how the address information was captured, and therefore presents limitations in assessing the completeness, and indirectly the quality, of the address data. Figure 19 shows these address fields on the stateside EQ and Figure 20 presents the Puerto Rico EQ.

**Figure 19: Section H3 – Stateside EQ**

**H3.** *If there is not an address label affixed, or if the address label includes only a location description, ask – What is the address of this unit?*

House number	Street name or rural route address
<input type="text"/>	<input type="text"/>
Apartment number	<input type="text"/>
<input type="text"/>	<input type="text"/>
City	State      ZIP Code
<input type="text"/>	<input type="text"/> <input type="text"/>

*Go to respondent information on back page.*

**Figure 20: Section H3 - Puerto Rico EQ**

**H3.** *Si no hay una etiqueta de dirección adjunta, o si la etiqueta de dirección solamente incluye una descripción de lugar, pregunte – ¿Cuál es la dirección de esta unidad?*

Número de casa	Nombre de calle o dirección estilo rural
<input type="text"/>	<input type="text"/>
Urbanización(Urb)/Condominio(Cond)/Residencial(Res)	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	Designación de Unidad - Edificio y Apartamento
<input type="text"/>	<input type="text"/>
Municipio	Código postal
<input type="text"/>	<input type="text"/> <input type="text"/>

*Vaya a la Información del Respondedor en la última página.*

In Section H3, stateside EQs collected:

- House number,
- Street name or rural route address,
- Apartment number,
- City,
- State, and
- ZIP Code

Puerto Rico EQs had slightly different address fields in H3, collecting:

- Numero de casa (house number),
- Nombre de calle o direccion estilo rural (Street name or rural route address),
- Urbanizacion/Condominio/Residencial(Urbanization/Condominium/Residential)
- Designacion de Unidad(Apartment Number),
- Municipio, and
- Codigo postal (ZIP code)

To assess if the added housing units could be found on the ground by a Census enumerator in the future, the information collected in the address fields is extremely important. Some of the address components, and combinations thereof, are critical to locate the structure on the ground.

The potential address combinations depend on whether the add information was collected using a stateside or Puerto Rico form. These combinations were created with guidance from GEO.

#### **5.1.1.7.2.1 Address Information of Type A Cases**

For Type A cases from stateside questionnaires, the address fields necessary for a complete record came only from the H3 question and were:

- House Number,
- Street Name, and
- ZIP Code.

For Type A cases in Puerto Rico, there were two combinations of address fields that could comprise a complete record, again using only address information collected in question H3. An address needed to meet one of these two combinations to be complete:

1. Combination 1:
  - Numero de casa,
  - Nombre de calle o direccion estilo rural or Urbanizacion/Condominio/Residencial, and
  - Codigo postal
2. Combination 2:
  - Designacion de Unidad,
  - Urbanizacion/Condominio/Residencial, and
  - Codigo postal or State

The analysis performed using these address fields confirmed only that the necessary fields were filled, but not that the data in the fields were valid and correct.

Table 41 shows the address combinations for all stateside Type A cases.

**Table 41: Content of Address Fields for All Stateside Type A Cases from NRFU**

<b>House Number, Street Name, and ZIP Code</b>	<b>Type A with PNC=1</b>		<b>Type A with PNC=0</b>	
	<b>Number</b>	<b>Percent<sup>51</sup></b>	<b>Number</b>	<b>Percent</b>
All filled	123,918	89.6%	6,226	56.9%
All blank	5,974	4.3%	4,244	38.8%
At least one field filled but not all	8,350	6.0%	467	4.3%
<b>Total Stateside Type A Cases</b>	<b>138,242</b>	<b>100.0%</b>	<b>10,937</b>	<b>100.0%</b>

Source: DRF

The Type A cases with a valid person record were more likely to have complete information provided (89.6 percent) than Type A cases without a valid person record (56.9 percent ). The adds without a person record had no information written in to the three key address fields (house number, street name and ZIP code) 38.8 percent of the time as compared to only 4.3 percent of the time when a valid person record was present.

Table 42 shows the address combinations for all Puerto Rico Type A cases. If an address met the criteria for both combinations, it is counted in Combination 1 for this assessment. Therefore, to be counted in Combination 2 an address could not have had a house number. Combination 1 is used as the preferred category, if both combinations were met, because it is believed that, given the form design, there is a greater chance the address information in Combination 1 is correct. It is also believed that more of the addresses in Puerto Rico conform to Combination 1 than Combination 2. These are addresses that were collected during a NRFU interview that took place in Puerto Rico. The address itself, however, could be located stateside because the respondent reported it as his or her previous residence, or a UHE.

<sup>51</sup> This column does not total 100.0% due to rounding.

**Table 42: Content of Address Fields for All Puerto Rico Type A Cases from NRFU**

<b>Address Field Groupings</b>	<b>Type A with PNC=1</b>		<b>Type A with PNC=0</b>	
	<b>Number</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>
Combination 1				
All Filled	630	58.2%	36	70.6%
All Blank	35	3.2%	4	7.8%
Combination 2				
All Filled	85	7.9%	1	2.0%
All Blank	2	0.2%	0	0.0%
At least 1 field filled, but not all, of (Numero de casa, Designacion de Unidad, Nombre de calle o direccion estilo rural, Urbanizacion/Condominio/Residencia, Codigo postal, or State)	330	30.5%	10	19.6%
<b>Total Puerto Rico Type A Cases</b>	<b>1,082</b>	<b>100.0%</b>	<b>51</b>	<b>100.0%</b>

Source: DRF

The rate of completeness was lower for Type A cases in Puerto Rico cases that provided a valid person record (58.2 percent) when compared to stateside Type A cases with a valid person record in Table 41 (89.6 percent). The Type A cases on Puerto Rico EQs with no valid person record also had a higher percent of complete address field for Combination 1 (70.6 percent) than did Type A cases with a valid person record (58.2 percent).

#### **5.1.1.7.2.2 Address Information of Type C Adds**

In the summer of 2010, GEO noticed a large number of records getting rejected during automated Master Address File/Topologically Integrated Geographic Encoding and Referencing database (MTdb) processing for incomplete or invalid geocodes. As a result, GEO applied the automated geocoding software to ‘save’ some of the cases since they would come directly from a questionnaire. There were 40,215 cases geocoded from this additional matching.

For an enumerator to find a Type C case in the future, a combination of address fields was needed from both question H3 and the geographic fields on the front of the EQ. The necessary fields for stateside Type C addresses are:

- House Number (H3),
- Street Name (H3),
- Block (EQ front),
- County (EQ front), and
- State (EQ front)

The necessary address fields for Type C Puerto Rico addresses, and the section of the EQ they come from, are:

1. Combination 1:
  - Numero de casa (H3),
  - Nombre de calle o direccion estilo rural or Urbanizacion/Condominio/Residencia (H3),
  - Block (EQ Front),
  - Municipio (EQ Front), and
  - State (EQ Front).
2. Combination 2:
  - Designacion de Unidad (H3),
  - Urbanizacion/Condominio/Residencial (H3),
  - Block (EQ Front),
  - Municipio (EQ Front), and
  - State (EQ front).

The next two tables show the number of Type C cases with these address fields filled. Table 43 reports the completeness of address information collected on all stateside Type C Adds.

**Table 43: Content of Address Fields for All Stateside Type C Adds from NRFU**

<b>House Number, Street Name, Block, County, and State</b>	<b>Number</b>	<b>Percent</b>
All filled	483,885	75.3%
All blank	21,660	3.4%
At least one field filled but not all	136,990	21.3%
<b>Total Stateside Type C Cases</b>	<b>642,535</b>	<b>100.0%</b>

Source: DRF

Table 43 reports that 3.4 percent of Type C cases from stateside enumerators were missing information for all five of the address fields investigated for this table, while 75.3 percent had information in all five address fields.

Table 44 shows the completeness of address information collected on all Puerto Rico Type C cases.

**Table 44: Content of Address Fields for All Puerto Rico Type C Cases from NRFU**

<b>Address Field Groupings</b>	<b>Number</b>	<b>Percent<sup>52</sup></b>
Combination 1		
All filled	9,611	50.2%
All blank	0	0.0%
Combination 2		
All filled	2,515	13.1%
All blank	0	0.0%
At least 1 field filled, but not all, of (Numero de casa, Designacion de Unidad, Nombre de calle o direccion estilo rural, Urbanizacion/Condominio/Residencial, Block, Municipio, State)	7,012	36.6%
<b>Total Puerto Rico Type C Cases</b>	<b>19,138</b>	<b>100.0%</b>

Source: DRF

Table 44 reports that all Type C cases from Puerto Rico enumerators had at least one piece of address information, and 63.4 percent had all required address fields filled for at least one of the two combinations. The pre-printed State codes on all the Puerto Rico questionnaires accounts for the high percentage of required address fields being filled.

<sup>52</sup> This column does not total 100.0% due to rounding.



### 5.1.2 NRFU RI

NRFU RI was the primary quality control vehicle for the 2010 NRFU operation. A sample of NRFU cases were selected for the NRFU RI for a second contact by a different enumerator to ensure that NRFU enumerators followed procedures and did not falsify data, either intentionally or unintentionally. The background to the RI operation was provided in Section 2.3.2.

The LCO RI staff first attempted to contact RI cases by telephone. Figure 21 shows the information that was transcribed from the NRFU EQ onto each RI questionnaire to facilitate contact with the original respondent.

**Figure 21: Original Respondent Information on the RI EQ**

The form is titled "ORIGINAL RESPONDENT INFORMATION" in a green header. It is divided into two columns. The left column contains fields OR1, OR3, and OR5. The right column contains fields OR2, OR4, and a NOTES section.

**OR1. Original Respondents Name –**  
[Text input field]

**OR2. Telephone Number and Best Time to Contact?**  
( ) - - ☐ Day ☐ Evening ☐ Either

**OR3. Original Respondent Type –**  
☐ Household member – Lived here on April 1, 2010  
☐ Household member – Moved in after April 1, 2010  
☐ Is Neighbor or other proxy

**OR4. Address –**  
[Three horizontal lines for address entry]

**OR5. Original Interview Language –**  
☐ English  
☐ Spanish  
☐ Other – Specify language number from flashcard → [Two small boxes]

**NOTES**  
[Three horizontal lines for notes entry]

Cases that could not be completed by telephone were assigned to a RI field enumerator to be completed by personal visit. The RI consisted of verifying that a NRFU enumerator conducted an interview, obtaining the census day status for the unit, and, if occupied, the housing unit roster. The RI enumerator completed a full interview only if the respondent could not confirm that someone from the household completed a questionnaire with a NRFU enumerator. Because of the difference in purpose and procedures, the RI questionnaire had a different introduction than the NRFU questionnaire, as shown in Figure 22.

Figure 22: Introduction Section of the RI EQ

**INTRODUCTION**

**S1.** Hello, I'm (name) from the U.S. Census Bureau. (Show ID). May I speak to (Original respondent's name)?  
☐ Yes – Continue with question S2  
☐ No – Confirm address and ask when original respondent is available. If unable to reinterview the original respondent, interview a knowledgeable proxy, starting with S2.

**S2.** I'm here to check on the quality of our census interviews. This interview should take about 10 minutes. (Hand respondent Information Sheet.) The first part of this sheet explains that your answers are confidential. We will refer to this sheet throughout the interview.  
 – If talking to someone at original respondent address – Continue with S3  
 – Otherwise – Skip to S4

**S3.** Were you or someone in your household recently interviewed by the Census Bureau about (read address)?  
☐ Yes  
☐ No

**S4.** Did anyone live at (read address) on April 1, 2010?  
☐ Yes – Continue with S5.  
☐ No – Skip to back page.

**S5.** Is this (house/apartment/mobile home) a vacation or seasonal home, or does someone in this household usually live here?  
☐ Vacation or seasonal home or held for occasional use – Skip to back page  
☐ Usually lives here – Continue with S6

**S6.** We need to count people where they live and sleep most of the time.  
 Please look at list A. It contains examples of people who should and should not be counted at this place.  
 Based on these examples, how many people were living or staying in this (house/apartment/mobile home) on April 1, 2010?  
 = Number of People

ENUMERATOR ITEM: Did the respondent confirm that the original interview was conducted (S3 = "Yes")?  
☐ Yes – Complete only Questions 1 for all household members, then skip to back page  
☐ No – Conduct full interview

A detailed description and in-depth analysis of the NRFU RI operation is reported in the 2010 Census Nonresponse Followup Reinterview Quality Profile. Section 5.1.2.1 contains highlights from that report. Subsequent sections contain data similar to what was reported for NRFU:

- Section 5.1.2.1 discusses the RI workload and quality control outcomes.
- Section 5.1.2.2 discusses the formation of the analysis universe
- Section 5.1.2.3 discusses the housing unit status of cases worked in RI.
- Section 5.1.2.4 discusses the timing when RI interviews were completed and when they were checked-in.
- Section 5.1.2.5 discusses characteristics of RI interviews, notably key paradata results.
- Section 5.1.2.6 discusses characteristics of occupied housing units.
- Section 5.1.2.7 presents the standard demographic tables for RI.
- Section 5.1.2.8 states that no housing units were added during RI.

#### 5.1.2.1 RI Workload and Quality Control Outcomes

The NRFU RI workload included a sample of eligible NRFU cases selected for RI through random, supplemental, outlier, and hard fail selection. NRFU cases that met one of the following criteria were ineligible for RI:

- Regular vacants,
- most deletes<sup>53</sup>,
- an enumerator-reported population count of 99,

<sup>53</sup> The delete status Empty Mobile Home/Trailer Site was eligible for NRFU RI.

- closeout cases<sup>54</sup>, or
- Type A add cases for WHUHE or In-mover situations.

Data were used from MaRCS to analyze the number of cases selected by RI type and their RI outcomes. As stated in Section 4.1, the universe in MaRCS differs from the universe in the DRF.<sup>55</sup> Of the 47,367,647 NRFU cases in MaRCS, 31,991,588 cases (67.5 percent) were eligible for NRFU RI. Table 45 shows the cases selected for RI by selection type, as a percentage of the NRFU eligible cases.

**Table 45: Distribution of NRFU RI Universe by RI Type**

	<b>Cases</b>	<b>Percent of Eligible<sup>56</sup></b>
Total Selected for RI	1,894,644	5.9%
Random	1,525,297	4.8%
Outlier	247,511	0.8%
Supplemental	14,412	<0.1%
Hard Fail	107,444	0.3%
<b>NRFU Eligible for RI</b>	<b>31,991,588</b>	<b>100.0%</b>

Source: MaRCS

The total NRFU RI workload included 1,894,664 cases, which was 5.9 percent of the eligible NRFU cases in MaRCS. The overall RI selection rate of 5.9 percent was higher than the expected rate of 5.5 percent predominantly because PBOCS selected 4.8 percent of all eligible cases for random RI, when we expected four percent. This most likely happened because of the PBOCS requirement to select a percentage of cases for each enumerator, beginning with one of the first three cases checked in for each enumerator, and not a percentage across all cases. The result is that enumerators who only completed a few eligible cases had very high selection rates.

<sup>54</sup> These are cases that had not been completed when the operation had to end so they were given a status of 'closeout' to finish the operation.

<sup>55</sup> The differing universes are due to several factors. One factor causing the difference is that MaRCS NRFU workload includes NRFU Adds that were not geocoded to an address. The vintage of the MaRCS data is before GEO received the data for geocoding added housing units to an address and the linking of duplicate addresses. The cases that were not able to be geocoded to an address were not included in the previous DRF NRFU workload analysis because they did not represent an actual address. If two Census IDs were linked because they were the same address, only one of those questionnaires was included in the previous analysis. The MaRCS data also include all cases with an original NRFU operation code. The corrections made from the operation code recode (described in Section 5.1.1.1) were not made to the MaRCS data.

<sup>56</sup> This column does not total 100.0% since the top row is the only subset of interest from the entire eligible universe.

There was a checkbox on the RI form where the enumerator could indicate that the RI respondent was the same person as the original respondent. Table 46 shows how often this happened, by original NRFU respondent type and by housing unit status.

**Table 46: Distribution of RI Cases with Original NRFU Respondent**

	RI Cases Received	RI Done with Original NRFU Respondent?			
		Yes		No	
<b>All Cases</b>	<b>1,869,505</b>	<b>1,245,894</b>	<b>66.6%</b>	<b>623,611</b>	<b>33.4%</b>
By NRFU Respondent Type*					
Household Member	1,211,372	861,987	71.2%	349,385	28.8%
HH Member after Census Day	27,509	16,843	61.2%	10,666	38.8%
Proxy	622,759	363,197	58.3%	259,562	41.7%
By NRFU Housing Unit Status*					
Occupied	1,598,554	1,087,190	68.0%	511,364	32.0%
Vacant – Regular	25,334	8,253	32.6%	17,081	67.4%
Vacant – UHE	213,555	132,538	62.1%	81,017	37.9%
Uninhabitable	2,868	878	30.6%	1,990	69.4%
Nonresidential	908	295	32.5%	613	67.5%
Empty Mobile Home	21,063	13,421	63.7%	7,642	36.3%
Demolished/Cannot Locate	1,781	535	30.0%	1,246	70.0%
Duplicate	1,024	304	29.7%	720	70.3%

Source: MaRCS

\* The RI Cases Received in these categories do not add up to the total cases because some cases were missing the category field.

Table 46 indicates that of the 1,869,505 RI cases with DRIS data received, 66.6 percent were completed with the same respondent who completed the NRFU interview. The RI enumerators managed to interview the original NRFU respondent most often when that respondent was a household member and the NRFU housing unit status was occupied. All of the cases that were ineligible for RI (Vacant-regular, Uninhabitable, Nonresidential, Demolished, and Duplicate) had a much lower rate of original respondent contact than the cases that were eligible for RI.

After an RI interview was completed, all RI cases had an outcome attributed to the case by MaRCS or the QA staff, based on how the RI interview data compared to the original NRFU interview data. There were seven possible final outcomes that an RI case could be assigned.

- Pass – the case passed RI matching at the computer, NPC, or LCO stage where the original data were verified to be consistent with the RI data, with no suspicion of falsification.
- Soft Fail - the LCO QC staff determined that the discrepant data were the result of enumerator error (an honest mistake) and not the result of deliberate falsification or violation of procedures.
- Hard Fail - after investigating a case, the Assistant Manager for Quality Assurance (AMQA) determined that the case showed deliberate falsification or violation of

procedures by the enumerator. The Assistant Manager of Field Operations (AMFO) and/or LCO Manager agreed with this determination.

- Don't Know - Suspect (DK - Susp) – the LCO QC staff suspected that there might have been falsification, but the outcome of the investigation was inconclusive.
- Don't Know - No Suspect (DK - No Susp) – the LCO QC staff did not suspect falsification, but the outcome of the investigation was inconclusive.
- LCO Relief – the AMQA used this outcome to close out cases when there was not enough time to complete the investigation process. This should have been used as a last resort and only after the RCC activated this outcome for the LCO. The MaRCS also automatically assigned this outcome to cases that did not pass computer matching but the data were received after the MaRCS coding effort ended.
- RINI - RI Noninterviews

Some RI cases were not assigned any of the above outcomes because data were lost or could not be processed into MaRCS. These cases are reflected below in Table 47 under the column labeled “None.”

Table 47 displays the distribution of final RI outcomes by selection type.

**Table 47: Final RI Outcomes in MaRCS**

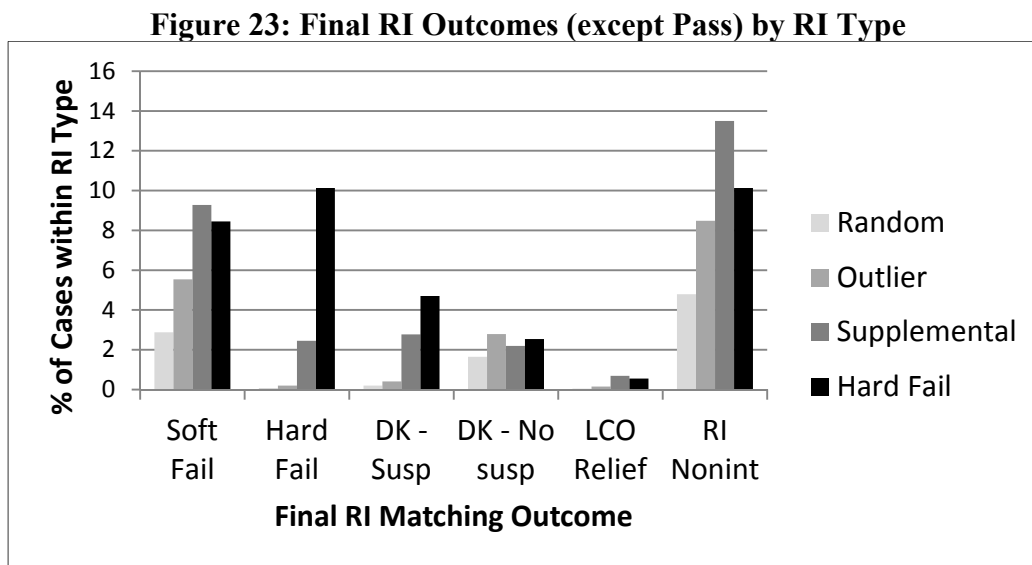
<b>RI Type</b>	<b>Pass</b>	<b>Soft Fail</b>	<b>Hard Fail</b>	<b>DK-Susp</b>	<b>DK-No Susp</b>	<b>LCO Relief</b>	<b>RINI</b>	<b>None</b>	<b>Total<sup>57</sup></b>
Random	1,358,497 (89.1%)	43,914 (2.9%)	1,188 (0.1%)	3,123 (0.2%)	25,145 (1.7%)	744 (0.1%)	73,096 (4.8%)	19,590 (1.3%)	<b>1,525,297 (100.0%)</b>
Outlier	201,227 (81.3%)	13,712 (5.5%)	489 (0.2%)	1,014 (0.4%)	6,903 (2.8%)	365 (0.2%)	21,000 (8.5%)	2,801 (1.1%)	<b>247,511 (100.0%)</b>
Supplemental	9,798 (68.0%)	1,338 (9.3%)	353 (2.5%)	399 (2.8%)	315 (2.2%)	99 (0.7%)	1,945 (13.5%)	165 (1.1%)	<b>14,412 (100.0%)</b>
Hard Fail	63,276 (58.9%)	9,079 (8.5%)	10,882 (10.1%)	5,050 (4.7%)	2,731 (2.5%)	589 (0.6%)	10,884 (10.1%)	4,953 (4.6%)	<b>107,444 (100.0%)</b>
All	1,632,798 (86.2%)	68,043 (3.6%)	12,912 (0.7%)	9,586 (0.5%)	35,094 (1.9%)	1,797 (0.1%)	106,925 (5.6%)	27,509 (1.5%)	<b>1,894,664 (100.0%)</b>

Source: MaRCS

Of all RI cases, 86.2 percent received a Pass outcome, 3.6 percent identified unintentional NRFU enumerator errors (Soft Fail), and 0.7 percent found intentional enumerator falsification (Hard Fail). Of all RI cases, 1.5 percent never received an RI matching outcome due to various issues that we explore later.

<sup>57</sup> These rows may not total 100.0% due to rounding.

Figure 23 graphically illustrates the different RI outcome rates by RI type. Random RI had the lowest percent of all non-pass outcomes in Figure 23 because, as noted above, it had the highest overall Pass rate of 89.1 percent. The Supplemental RI resulted in the highest rate of unintentional errors (Soft Fail), while the Outlier RI resulted in the highest rate of Don't Know – No Suspect cases. Not surprisingly, Hard Fail RI had the highest rates of Hard Fail and Don't know – Suspect cases.



Source: MaRCS

An unexpected observation in Figure 23 is that supplemental cases had the highest rate of RI non-interviews. This is surprising since supplemental cases are cases that LCOs specifically selected to be included in RI, so we would expect the LCOs to make every attempt to complete them. However, this also could be an indication that the types of cases selected for Supplemental RI involved difficult original respondents who were even less likely to respond to yet another interview.

As mentioned before, 1.5 percent of all RI cases did not receive any RI matching outcome. Table 48 identifies the reasons for missing RI matching outcomes, along with the count and percent of cases affected by each circumstance.

**Table 48: Reasons for RI Cases with No Final RI Matching Outcome<sup>58</sup>**

<b>Reason for missing RI matching outcome</b>	<b>Cases</b>	<b>Percent</b>
MaRCS selected cases with invalid Case IDs	121	0.4%
MaRCS selected ineligible cases later removed	2,928	10.0%
MaRCS never received any data from DRIS	32	0.1%
MaRCS never received the RI case from DRIS	5,745	19.6%
MaRCS never received the NRFU case from DRIS	2,523	8.6%
Unexpected data errors prevented any matching	16,152	55.1%
Undetected defects in MaRCS prevented matching	8	<0.1%
MaRCS received all data after RI closeout – LCO Relief	1,786	6.1%
LCO did not have time before RI closeout – LCO Relief	11	<0.1%
<b>Total RI cases with LCO Relief or no MaRCS outcome</b>	<b>29,306</b>	<b>100.0%</b>

Source: MaRCS

More than half of the cases with no final RI matching outcome did not receive a final outcome because something in the data prevented MaRCS from loading the complete cases into the database for matching and review. Almost 20 percent did not receive final outcomes because MaRCS never received the RI data. It is likely that the majority of unexpected data errors and all of the MaRCS selection of invalid Case IDs and ineligible cases were a direct result of the contingency not to use PBOCS data. All of these issues would have been avoidable - except for the 11 legitimate LCO Relief cases - if we had used an automated data collection instrument along with sufficient software and interface testing.

When the AMQA determined the enumerator falsified data or intentionally violated procedures, the Census MaRCS allowed the AMQA to code the case as a “Hard Fail.” The LCO’s AMQA was the only person who could assign a “Hard Fail” code. When a “Hard Fail” case occurred, the Census MaRCS identified the enumerator as “Hard Fail” and initiated Hard Fail RI. Hard Fail RI entailed placing all eligible cases completed by the “Hard Fail” enumerator that were not previously reinterviewed into RI. These Hard Fail RI cases were completed in the field in the same manner as other NRFU RI cases. Thus, all cases completed by a “Hard Fail” enumerator went to RI. All cases previously assigned to the “Hard Fail” enumerator but not yet completed were reassigned to another NRFU enumerator. When the NRFU RI operation was complete, the Census MaRCS created the Fail File, to be delivered to the DSPO. The Fail File contained a list of NRFU cases for which the response data should be replaced by the NRFU RI data in Census processing because the NRFU RI data were expected to be of better quality. The Fail File contained the following types of cases:

<sup>58</sup> This column does not total 100.0% due to rounding.

- All Hard Fail Cases
- All Soft Fail Cases
- All DK-Susp Cases
- DK- No Susp Cases for “Hard Fail” enumerators
- LCO Relief Cases for “Hard Fail” enumerators

Table 49 shows the count of cases on the Fail File by final RI outcome and the amount of data collected during the RI. If a housing unit was found to be occupied in RI and the respondent confirmed that a NRFU enumerator had visited and conducted an interview, the enumerator was to collect just a roster of names for the people enumerated there. If the respondent said they had not been contacted before or could not confirm that the interview took place, then the RI enumerator was to continue and collect all the data asked for on the EQ.

**Table 49: Cases on Fail File by RI Outcome and Data Collected<sup>59</sup>**

<b>Final RI Matching Outcome</b>	<b>Total Cases</b>	<b>Not Occupied</b>	<b>Occupied</b>	<b>Occupied RI data collected (and percent of occupied cases)</b>		
				<b>Full Interview</b>	<b>Names Only</b>	<b>No Person Data</b>
Soft Fail	67,977	15,279 (22.5%)	52,698 (77.5%)	21,812 (41.4%)	25,796 (49.0%)	5,090 (9.7%)
Hard Fail	12,910	3,149 (24.4%)	9,761 (75.6%)	7,080 (72.5%)	2,184 (22.4%)	497 (5.1%)
Don't Know – Suspect	9,572	2,273 (23.7%)	7,299 (76.3%)	4,215 (57.7%)	2,373 (32.5%)	711 (9.7%)
Don't Know – No Suspect	2,817	778 (27.6%)	2,039 (72.4%)	1,087 (53.3%)	695 (34.1%)	257 (12.6%)
LCO Relief	358	55 (15.4%)	303 (84.6%)	167 (55.1%)	95 (31.4%)	41 (13.5%)
<b>All Fail File Cases</b>	<b>93,634</b>	<b>21,534 (23.0%)</b>	<b>72,100 (77.0%)</b>	<b>34,361 (47.7%)</b>	<b>31,143 (43.2%)</b>	<b>6,596 (9.1%)</b>

Source: MaRCS

<sup>59</sup> 348 cases on the Fail File from the Lexington, KY proxy rework effort are not included in this table. There was a special NRFU rework effort in the Lexington, KY LCO to replace proxy cases that should have been interviews with household members. This rework was done by selecting specially identified cases for RI. These data were replaced in post-processing only if the reworked case was done with a household member. If the reworked case was done with a proxy, the original NRFU interview was kept.



As reported in Table 49, there were 93,634 RI cases (or 4.9 percent of the NRFU RI cases) where the RI data were designated to replace the NRFU data; 72,100 (or 77 percent) of those cases represented occupied households. Of the occupied households, 47.7 percent had all demographic data collected; 43.2 percent had just household member names and 9.1 percent had no person data at all. Cases with a Soft Fail outcome were the only cases with fewer complete interviews than name-only interviews in RI.

During the NRFU operation, there were 528,960 different enumerators who completed at least one NRFU case. Of these, only 1,419 (or 0.3%) were hard failed. When an enumerator was discovered falsifying data outside the RI program (usually by their NRFU supervisors), they were flagged as Non-RI fail. There were 291 of these hard-failed enumerators. The remaining 1,128 enumerators found through the RI program had at least one RI case with a hard fail outcome.

### 5.1.2.2 Formation of DRF Analysis Universe

The following NRFU RI results used data collected on the DRF for the analysis. As stated in Section 4.1, the universe of cases from MaRCS that was used in Section 5.1.2.1 differs from the universe of cases identified from the DRF that will be used in the subsequent sections.

The top row in Table 50 is the total number of EQs associated with NRFU RI on the DRF, including multiple copies of the same questionnaire. The second row removes the multiple copies of the same questionnaire. The last row in the table removes duplicated questionnaires generated for an address that were due to rework. The universe of cases worked in NRFU RI from the DRF in this assessment is 1,888,148 unique housing units.

**Table 50: NRFU RI Universe**

<b>NRFU RI Universe Characteristics</b>	<b>Number of Questionnaires</b>
All Questionnaires on the DRF	1,924,749
Unique Questionnaires on the DRF	1,924,580
Unique Housing Units on the DRF	1,888,148

Source: DRF

### 5.1.2.3 NRFU RI Housing Unit Status

Table 51 shows the housing unit status distribution for housing units contacted in NRFU RI.

**Table 51: NRFU RI Housing Unit Status**

<b>Housing Unit Status</b>	<b>Number of Housing Units</b>	<b>Percent</b>
Occupied	1,582,163	83.8%
Vacant	257,919	13.7%
Delete	30,633	1.6%
Unresolved	17,433	0.9%
<b>Total Housing Units</b>	<b>1,888,148</b>	<b>100.0%</b>

Source: DRF

Of the 1,888,148 housing units visited in NRFU RI, 83.8 percent were found to be occupied. An additional 13.7 percent were vacant housing units, 1.6 percent were marked to be deleted, and 0.9 percent were considered unresolved. This distribution, with an emphasis on occupied housing units, makes sense since the majority of vacant and delete cases were ineligible for RI and therefore the majority of the RI workload came from housing units found to be occupied in NRFU.

Table 52 shows the number of housing units marked as refusals during the NRFU RI operation, by housing unit status.

**Table 52: NRFU RI Refusals**

<b>Housing Unit Status</b>	<b>Number of Housing Units</b>	<b>Number of Refusals</b>	<b>Refusal Percentage</b>
Occupied	1,582,163	19,700	1.2%
Vacant	257,919	600	0.2%
Delete	30,633	97	0.3%
Unresolved	17,433	3,935	22.6%
<b>Total Housing Units</b>	<b>1,888,148</b>	<b>24,332</b>	<b>1.3%</b>

Source: DRF

Of the 1,888,148 housing units in NRFU RI, there were 24,332 (1.3 percent) that were marked as a refusal on the questionnaire. Of the housing units that had an unresolved status, 22.6 percent were flagged as refusals.

The following tables explore the occupied, vacant, and deleted housing units in more depth.

#### **5.1.2.3.1 Occupied Housing Units**

The reported population count of an occupied housing unit (as captured in Item C from Figure 2) was considered valid if it was from 1 to 49, inclusive. A population count for an occupied housing unit was considered invalid if it was either blank, zero, or ranged from 50 to 98. A value of 99 indicated the population count was unknown to the enumerator. Table 53 shows how often each of these three types of population counts was recorded in conjunction with a reported refusal.

**Table 53: Types of Refusals for NRFU RI Occupied Housing Units**

<b>Type of Population Count</b>	<b>Number of Housing Units</b>	<b>Percent<sup>60</sup></b>
Valid population count	4,692	23.8%
Invalid population count	300	1.5%
Unknown population count	14,708	74.7%
<b>Refusals</b>	<b>19,700</b>	<b>100.0%</b>

Source: DRF

Table 53 shows that 74.7 percent of the refusals had an unknown population count .

#### **5.1.2.3.2 Vacant Housing Units**

Table 51 showed that 257,919 of the housing units in NRFU RI were identified as vacant. Table 54 describes the distribution of vacant housing units between vacant-regular and UHE.

**Table 54: Types of NRFU RI Vacant Housing Units**

<b>Vacant Type</b>	<b>Number of Housing units</b>	<b>Percent</b>
Regular	100,578	39.0%
Usual Home Elsewhere (UHE)	157,049	60.9%
Unknown	292	0.1%
<b>Total Vacant Housing Units</b>	<b>257,919</b>	<b>100.0%</b>

Source: DRF

Of the 257,919 housing units identified as vacant, 60.9 percent were classified as UHEs, while 39.0 percent were classified as vacant-regular.

#### **5.1.2.3.3 Delete Housing Units**

Table 51 showed that 30,633 housing units were marked to be deleted during NRFU RI. Table 55 shows the distribution of deletes in NRFU RI.

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<sup>60</sup> This column does not total 100.0% due to rounding.

**Table 55: Types of NRFU RI Delete Housing Units**

<b>Delete Type</b>	<b>Number of Housing Units</b>	<b>Percent</b>
Demolished/Burned Out/Cannot Locate	9,494	31.0%
Nonresidential	3,978	13.0%
Empty Mobile Home/Trailer Site	10,803	35.3%
Uninhabitable	5,235	17.1%
Duplicate	873	2.8%
Delete Unknown	250	0.8%
<b>Total Deleted Housing Units</b>	<b>30,633</b>	<b>100.0%</b>

Source: DRF

The majority of deletes (35.3 percent) were classified as housing units that were Empty Mobile Home/Trailer Sites, which was an RI-eligible case type from NRFU. An additional 31.0 percent were classified as “demolished/burned out/cannot locate,” 17.1 percent were classified as uninhabitable, and 13.0 percent were nonresidential.

#### **5.1.2.4 Interview Completion and Case Check-in**

Section 5.1.2.4 presents information about when NRFU RI cases were completed in the field and when they were checked-in by the office. These results answer the research questions regarding how the planned start and finish dates for the RI operation compared to the actual start and finish dates, and how the accumulation of outcomes changed over time.

##### **5.1.2.4.1 Interview Completion Dates**

The NRFU RI operation was officially scheduled to begin on May 13, 2010 for personal visit followup<sup>61</sup>, but telephone RI was scheduled to begin on May 3. Table 56 shows the progress of all NRFU RI cases through the spring and summer of 2010. These results use the dates reported by the enumerator or CL in the Certification section of the RI EQ, which should best reflect the actual date that an interview was completed (Figure 4 showed the Certification section of the NRFU EQ, which contains the same fields as the RI EQ).

<sup>61</sup> Personal visit followup was originally scheduled to start May 7 but was changed to May 13 to allow work to accumulate for the RI enumerators.

**Table 56: NRFU RI Housing Units Completed By Week**

<b>Week</b>	<b>Total for that Time Period</b>	<b>Percent for that Time Period<sup>62</sup></b>	<b>Cumulative Percent</b>
4/01 - 4/03	295	<0.1%	<0.1%
4/04 - 4/10	664	<0.1%	0.1%
4/11 - 4/17	660	<0.1%	0.1%
4/18 - 4/24	384	<0.1%	0.1%
4/25 - 5/01	622	<0.1%	0.1%
5/02 - 5/06*	13,941	0.7%	0.9%
5/07 - 5/08      Official Start of NRFU RI	16,248	0.9%	1.7%
5/09 - 5/15	177,821	9.4%	11.2%
5/16 - 5/22	201,249	10.7%	21.8%
5/23 - 5/29	240,421	12.7%	34.5%
5/30 - 6/05	285,633	15.1%	49.7%
6/06 - 6/12	274,169	14.5%	64.2%
6/13 - 6/19	209,335	11.1%	75.3%
6/20 - 6/26	143,864	7.6%	82.9%
6/27 - 7/03	119,698	6.3%	89.2%
7/04 - 7/10	75,838	4.0%	93.3%
7/11 - 7/17	59,002	3.1%	96.4%
7/18 - 7/24	34,700	1.8%	98.2%
7/25 - 7/31      Official End of NRFU RI	19,247	1.0%	99.2%
8/01 - 8/07	451	<0.1%	99.3%
8/08 - 8/14	477	<0.1%	99.3%
8/15 - 8/21	274	<0.1%	99.3%
8/22 - 8/28	195	<0.1%	99.3%
8/29 - 9/04	55	<0.1%	99.3%
Missing/Out of Range	12,905	0.7%	100.0%
<b>Total Housing Units</b>	<b>1,888,148</b>	<b>100.0%</b>	<b>100.0%</b>

Source: DRF and Aux

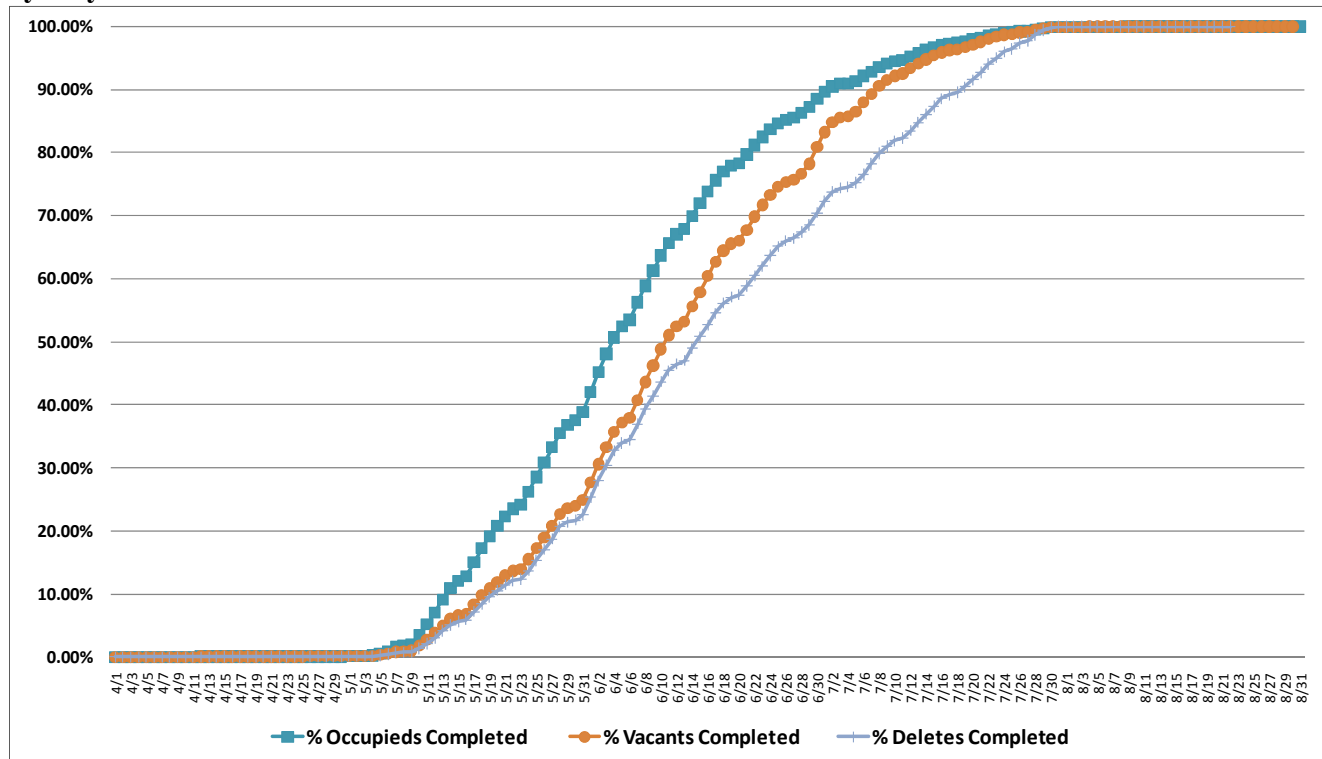
\* Telephone RI began on May 3<sup>rd</sup>.

Nearly 99 percent of the NRFU RI work was completed by July 31<sup>st</sup>, the official revised end date of the operation. Approximately 96 percent of the NRFU RI workload was completed two weeks prior to July 31<sup>st</sup>.

Figure 24, Table 57, Table 58, and Table 59 show the percentage of occupied, vacant, and deleted housing units completed by week.

<sup>62</sup> This column does not total 100.0% due to rounding.

**Figure 24: Cumulative Percent Occupied, Vacant, and Delete Completed NRFU RI Cases by Day**



Source: DRF and AUX

The occupied housing units were finished slightly sooner than the vacant and deleted housing units. About 90 percent of the occupied housing units were finished by July 3<sup>rd</sup> and 90 percent of the vacant housing units were completed during the week of July 4<sup>th</sup>. Of the deleted housing units, 90 percent were not completed until the week of July 18<sup>th</sup>.

**Table 57: NRFU RI Occupied Housing Units Completed By Week**

<b>Week</b>	<b>Total for that Time Period</b>	<b>Percent for that Time Period<sup>63</sup></b>	<b>Cumulative Percent</b>
4/01 - 4/03	243	<0.1%	<0.1%
4/04 - 4/10	560	<0.1%	0.1%
4/11 - 4/17	554	<0.1%	0.1%
4/18 - 4/24	304	<0.1%	0.1%
4/25 - 5/01	522	<0.1%	0.1%
5/02 - 5/06*	12,784	0.8%	0.9%
5/07 - 5/08      Official Start of NRFU RI	14,927	0.9%	1.9%
5/09 - 5/15	160,844	10.2%	12.1%
5/16 - 5/22	178,988	11.3%	23.4%
5/23 - 5/29	210,175	13.3%	36.7%
5/30 - 6/05	245,070	15.5%	52.1%
6/06 - 6/12	229,476	14.5%	66.6%
6/13 - 6/19	170,539	10.8%	77.4%
6/20 - 6/26	114,745	7.3%	84.7%
6/27 - 7/03	89,789	5.7%	90.4%
7/04 - 7/10	55,682	3.5%	93.9%
7/11 - 7/17	45,424	2.9%	96.7%
7/18 - 7/24	26,067	1.6%	98.4%
7/25 - 7/31      Official End of NRFU RI	14,366	0.9%	99.3%
8/01 - 8/07	410	<0.1%	99.3%
8/08 - 8/14	438	<0.1%	99.4%
8/15 - 8/21	230	<0.1%	99.4%
8/22 - 8/28	168	<0.1%	99.4%
8/29 - 9/04	45	<0.1%	99.4%
Missing/Out of Range	9,813	0.6%	100.0%
<b>Total Occupied Housing Units</b>	<b>1,582,163</b>	<b>100.0%</b>	<b>100.0%</b>

Source: DRF and Aux

\* Telephone RI began on May 3<sup>rd</sup>.

<sup>63</sup> This column does not total 100.0% due to rounding.

**Table 58: NRFU RI Vacant Housing Units Completed By Week**

<b>Week</b>	<b>Total for that Time Period</b>	<b>Percent for that Time Period<sup>64</sup></b>	<b>Cumulative Percent</b>
4/01 - 4/03	47	<0.1%	<0.1%
4/04 - 4/10	89	<0.1%	0.1%
4/11 - 4/17	91	<0.1%	0.1%
4/18 - 4/24	65	<0.1%	0.1%
4/25 - 5/01	84	<0.1%	0.1%
5/02 - 5/06*	987	0.4%	0.5%
5/07 - 5/08      Official Start of NRFU RI	1,150	0.4%	1.0%
5/09 - 5/15	14,364	5.6%	6.5%
5/16 - 5/22	18,129	7.0%	13.6%
5/23 - 5/29	25,575	9.9%	23.5%
5/30 - 6/05	34,932	13.5%	37.0%
6/06 - 6/12	39,039	15.1%	52.2%
6/13 - 6/19	33,721	13.1%	65.2%
6/20 - 6/26	24,970	9.7%	74.9%
6/27 - 7/03	26,247	10.2%	85.1%
7/04 - 7/10	16,998	6.6%	91.7%
7/11 - 7/17	10,461	4.1%	95.7%
7/18 - 7/24	6,152	2.4%	98.1%
7/25 - 7/31      Official End of NRFU RI	3,312	1.3%	99.4%
8/01 - 8/07	39	<0.1%	99.4%
8/08 - 8/14	34	<0.1%	99.4%
8/15 - 8/21	33	<0.1%	99.5%
8/22 - 8/28	20	<0.1%	99.5%
8/29 - 9/04	8	<0.1%	99.5%
Missing/Out of Range	1,372	0.5%	100.0%
<b>Total Vacant Housing Units</b>	<b>257,919</b>	<b>100.0%</b>	<b>100.0%</b>

Source: DRF and Aux

\* Telephone RI began on May 3<sup>rd</sup>.<sup>64</sup> This column does not total 100.0% due to rounding.



**Table 59: NRFU RI Delete Housing Units Completed By Week**

<b>Week</b>	<b>Total for that Time Period</b>	<b>Percent for that Time Period<sup>65</sup></b>	<b>Cumulative Percent</b>
4/01 - 4/03	4	<0.1%	<0.1%
4/04 - 4/10	10	<0.1%	<0.1%
4/11 - 4/17	8	<0.1%	0.1%
4/18 - 4/24	9	<0.1%	0.1%
4/25 - 5/01	8	<0.1%	0.1%
5/02 - 5/06*	94	0.3%	0.4%
5/07 - 5/08      Official Start of NRFU RI	110	0.4%	0.8%
5/09 - 5/15	1,478	4.8%	5.6%
5/16 - 5/22	1,960	6.4%	12.0%
5/23 - 5/29	2,834	9.3%	21.3%
5/30 - 6/05	3,797	12.4%	33.7%
6/06 - 6/12	3,801	12.4%	46.1%
6/13 - 6/19	3,231	10.5%	56.6%
6/20 - 6/26	2,701	8.8%	65.4%
6/27 - 7/03	2,549	8.3%	73.8%
7/04 - 7/10	2,282	7.4%	81.2%
7/11 - 7/17	2,213	7.2%	88.4%
7/18 - 7/24	2,087	6.8%	95.2%
7/25 - 7/31      Official End of NRFU RI	1,192	3.9%	99.1%
8/01 - 8/07	0	0.0%	99.1%
8/08 - 8/14	1	<0.1%	99.1%
8/15 - 8/21	6	<0.1%	99.2%
8/22 - 8/28	4	<0.1%	99.2%
8/29 - 9/04	2	<0.1%	99.2%
Missing/Out of Range	252	0.8%	100.0%
<b>Total Deleted Housing Units</b>	<b>30,633</b>	<b>100.0%</b>	<b>100.0%</b>

Source: DRF and Aux

\* Telephone RI began on May 3<sup>rd</sup>.

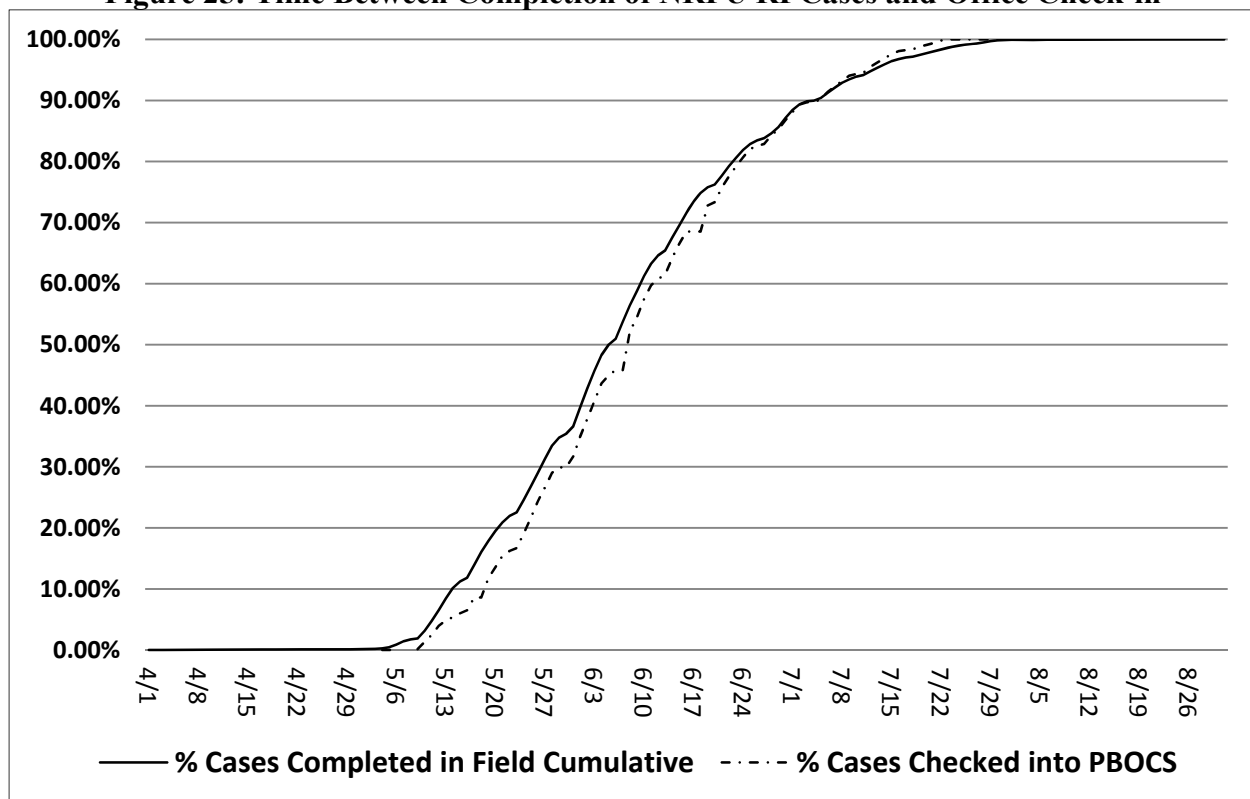
#### **5.1.2.4.2 Check-in**

##### Completion Dates Compared to PBOCS Check-in Data

Once the NRFU RI cases were completed, they were checked in to PBOCS. Figure 25 shows the difference in the percentage of cases completed in the field and the those checked into PBOCS.

<sup>65</sup> This column does not total 100.0% due to rounding.

**Figure 25: Time Between Completion of NRFU RI Cases and Office Check-in**



Source: DRF, AUX, and DMD C&P

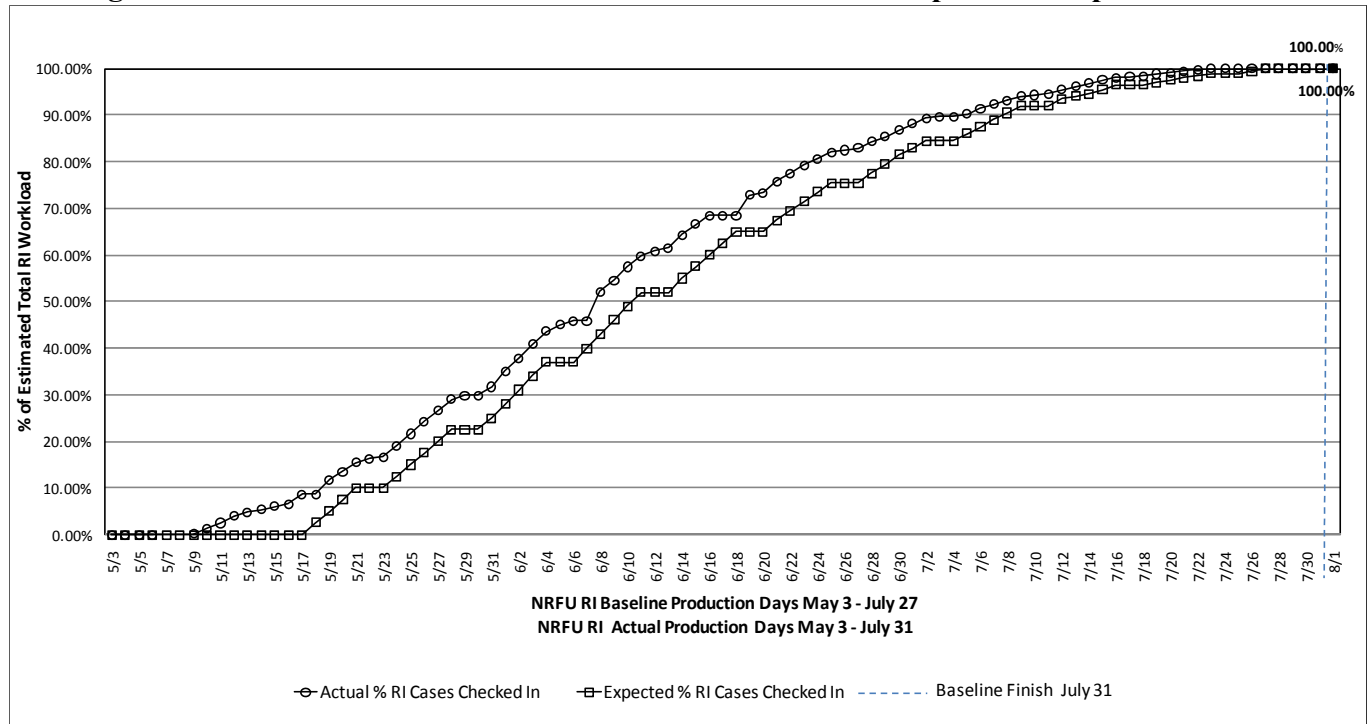
Unlike with NRFU, there was very little backlog at PBOCS for the NRFU RI cases. The largest amount of backlog happened during an eleven-day period from May 15<sup>th</sup> to May 25<sup>th</sup>. In that period, the backlog each day was between 5 percent and 7.5 percent.

#### Actual Check-in Compared to Expected Check-in

Figure 26 depicts the cumulative percent of NRFU RI questionnaires checked in daily compared to the expected check-in rates at the national level. NRFU RI was scheduled from May 3<sup>rd</sup> (for telephone followup) and May 13<sup>th</sup> (for personal visit followup) to July 31<sup>st</sup><sup>66</sup>.

<sup>66</sup> The master activity schedule states a baseline end date of July 27. We extended the end date to July 31 and did not update the official schedule. See section 2.3.2 for more information on RI conduct dates.

**Figure 26: Percent of Actual NRFU RI Cases Checked-in Compared to Expected**



Source: Cost and Progress

Throughout most of the operation, actual check-in rates exceeded expected rates; however, they followed the pattern of expected rates closely. Table 60 summarizes NRFU RI check-in by week at the national level.

**Table 60: Distribution of NRFU RI Questionnaires Checked-in by Week**

<b>Week</b>	<b>Date</b>	<b>Cumulative Number of EQs Checked-in</b>	<b>Cumulative Percent of EQs Checked-in</b>	<b>Expected Percent of EQs Checked-in</b>
1	May 3 – May 9	2,607	0.1%	<0.1%
2	May 10 – May 16	119,585	6.5%	<0.1%
3	May 17 - May 23	307,169	16.7%	10.0%
4	May 24 - May 30	549,659	29.9%	22.5%
5	May 31 - June 6	843,345	45.8%	37.0%
6	June 7 - June 13	1,131,490	61.5%	52.0%
7	June 14 - June 20	1,355,566	73.4%	65.0%
8	June 21 - June 27	1,534,267	82.9%	75.5%
9	June 28 - July 4	1,661,073	89.7%	84.5%
10	July 5 - July 11	1,750,220	94.5%	92.0%
11	July 12 - July 18	1,821,513	98.4%	96.5%
12	July 19 - July 25	1,859,349	100%	99.0%
13	July 26 - August 1	1,882,817	100%	100.0%

Source: DMD C&P

By the end of the sixth week of the operation, over 60 percent of NRFU RI cases had been checked in at the national level. At the end of week ten, nearly 95 percent of cases had been checked in, and by the end of week 13, all LCOs had finished NRFU RI. Since the numbers in Table 60 come from DMD C&P, the universe number differs from that reported using the DRF.

#### **5.1.2.5 Interview Characteristics**

The following section presents some paradata about the interviews with NRFU RI respondents, including the language in which interviews were conducted, the number of contacts that enumerators made to enumerate a housing unit, and the type of respondents who completed NRFU RI interviews.

##### **5.1.2.5.1 Language**

Table 61 shows the top five languages that the NRFU RI enumerators used to complete an interview.

**Table 61: Top Five Languages in which NRFU RI Interviews were Conducted**

<b>Language</b>	<b>Number of Housing Units</b>	<b>Percent<sup>67</sup></b>
English	1,726,372	91.4%
Spanish	93,914	5.0%
Chinese	2,376	0.1%
Russian	1,024	0.1%
Korean	932	<0.1%
All other languages	4,241	0.2%
Multiple languages indicated	1,836	0.1%
Unknown language	57,453	3.0%
<b>Total Housing Units</b>	<b>1,888,148</b>	<b>100.0%</b>

Source: DRF and AUX

English was the most frequent language used; 91.4 percent of the interviews were conducted in English. Spanish was the second most used language to complete an interview. Of all of the NRFU RI interviews, 5.0 percent were completed in Spanish. Of the 93,914 NRFU RI interviews conducted in Spanish, 24,919 (26.5 percent) of those were interviews conducted in Puerto Rico.

The ‘All other languages’ row condenses the 45 additional languages that were on the language identification flashcard. The distribution of those languages is provided in Appendix D. The ‘Multiple languages indicated’ row reflects the interviews where both the English and Spanish boxes were marked, or where one of those boxes was marked and a number was also written in to indicate a different language from the flashcard.

<sup>67</sup> This column does not total 100.0% due to rounding.

#### 5.1.2.5.2 Record of Contact

Table 62 shows the distribution of the number of contacts made to an address in order to obtain a completed interview. The first column contains all 1,888,148 housing units in NRFU RI. Subsequent columns look strictly at housing units by their final occupancy status.

**Table 62: Number of Contact Attempts Made to NRFU RI Housing Units<sup>68</sup>**

<b>Number of Contact Attempts</b>	<b>Overall Contact Attempts</b>	<b>Overall Percent</b>	<b>Occupied Count Attempts</b>	<b>Occupied Percent</b>	<b>Vacant Count Attempts</b>	<b>Vacant Percent</b>	<b>Delete Count Attempts</b>	<b>Delete Percent</b>
0	11,240	0.6%	5,768	0.4%	2,875	1.1%	1,522	5.0%
1	612,832	32.5%	505,958	32.0%	91,951	35.7%	11,517	37.6%
2	401,939	21.3%	333,999	21.1%	59,087	22.9%	6,600	21.5%
3	274,402	14.5%	230,434	14.6%	37,512	14.5%	4,054	13.2%
4	260,846	13.8%	223,010	14.1%	31,818	12.3%	3,751	12.2%
5	148,303	7.9%	128,376	8.1%	16,863	6.5%	1,718	5.6%
6	178,586	9.5%	154,618	9.8%	17,813	6.9%	1,471	4.8%
<b>Total Housing Units</b>	<b>1,888,148</b>	<b>100.0%</b>	<b>1,582,163</b>	<b>100.0%</b>	<b>257,919</b>	<b>100.0%</b>	<b>30,633</b>	<b>100.0%</b>

Source: DRF and AUX

Of the 1,888,148 housing units in NRFU RI, 32.5 percent of them were contacted only one time. In NRFU RI, 7.9 percent of the housing units were visited five times, but 9.5 percent were visited six times, which are higher rates than was seen in NRFU. In NRFU, 3.6 percent of the housing units were visited five times, while 4.6 percent were visited six times.

<sup>68</sup> These columns do not total 100.0% due to rounding.

Comparing the occupied, vacant, and delete columns in Table 62, the deleted housing units have a high percentage of “zero” reported contacts, at 5.0 percent. Occupied housing units had the highest percentage of cases requiring six contacts (9.8 percent). Besides those differences, there is not that much difference in the distribution of contacts among the housing status codes.

Enumerators could contact an address either in person or over the telephone after the required initial personal visit. Table 63 shows the distribution of contacts for telephone calls and Table 64 shows the distribution for personal visits.

**Table 63: Number of Telephone Contact Attempts Made to NRFU RI Housing Units<sup>69</sup>**

<b>Number of Contact Attempts</b>	<b>Overall Contact Attempts</b>	<b>Overall Percent</b>	<b>Occupied Count Attempts</b>	<b>Occupied Percent</b>	<b>Vacant Count Attempts</b>	<b>Vacant Percent</b>	<b>Delete Count Attempts</b>	<b>Delete Percent</b>
0	292,917	15.5%	230,910	14.6%	47,195	18.3%	9,784	31.9%
1	648,002	34.3%	540,468	34.2%	94,321	36.6%	9,376	30.6%
2	376,792	20.0%	317,852	20.1%	51,709	20.0%	4,878	15.9%
3	513,404	27.2%	445,142	28.1%	56,692	22.0%	5,915	19.3%
4	52,654	2.8%	44,308	2.8%	7,254	2.8%	602	2.0%
5	3,852	0.2%	3,056	0.2%	666	0.3%	72	0.2%
6	527	<0.1%	427	<0.1%	82	<0.1%	6	<0.1%
<b>Total Housing Units</b>	<b>1,888,148</b>	<b>100.0%</b>	<b>1,582,163</b>	<b>100.0%</b>	<b>257,919</b>	<b>100.0%</b>	<b>30,633</b>	<b>100.0%</b>

Source: DRF and AUX

A large majority of the NRFU RI cases made at least one telephone contact to a housing unit. Only 15.5 percent of the NRFU RI housing units did not receive one telephone contact. This is a result of the availability of a phone number provided on the NRFU questionnaire and transcribed onto the NRFU RI questionnaire.

<sup>69</sup> These columns do not total 100.0% due to rounding.

**Table 64: Number of Personal Visit Contacts Attempts Made to NRFU RI Housing Units<sup>70</sup>**

<b>Number of Contact Attempts</b>	<b>Overall Contact Attempts</b>	<b>Overall Percent</b>	<b>Occupied Count Attempts</b>	<b>Occupied Percent</b>	<b>Vacant Count Attempts</b>	<b>Vacant Percent</b>	<b>Delete Count Attempts</b>	<b>Delete Percent</b>
0	903,865	47.9%	759,274	48.0%	127,266	49.3%	12,532	40.9%
1	468,342	24.8%	384,165	24.3%	68,681	26.6%	11,556	37.7%
2	244,496	12.9%	206,786	13.1%	31,785	12.3%	3,776	12.3%
3	214,442	11.4%	183,116	11.6%	23,950	9.3%	2,115	6.9%
4	34,872	1.8%	29,674	1.9%	4,120	1.6%	412	1.3%
5	14,219	0.8%	12,293	0.8%	1,433	0.6%	148	0.5%
6	7,912	0.4%	6,855	0.4%	684	0.3%	94	0.3%
<b>Total Housing Units</b>	<b>1,888,148</b>	<b>100.0%</b>	<b>1,582,163</b>	<b>100.0%</b>	<b>257,919</b>	<b>100.0%</b>	<b>30,633</b>	<b>100.0%</b>

Source: DRF and AUX

Nearly half of all NRFU RI cases were completed without one personal visit to the address. As discussed above this is due to the availability of a respondent telephone number. Table 65 shows the final contact made by an enumerator to complete the NRFU RI questionnaire.

<sup>70</sup> These columns do not total 100.0% due to rounding.



**Table 65: Type of Final Contact for Housing Units in NRFU RI, by Housing Unit Status**

<b>Final Contact</b>	<b>Total Cases</b>		<b>Occupied</b>		<b>Vacant</b>		<b>Delete</b>	
	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>
Personal Visit	900,329	47.7%	754,788	47.7%	117,321	45.5%	16,791	54.8%
Telephone	948,505	50.2%	799,066	50.5%	133,446	51.7%	11,637	38.0%
Unknown	39,314	2.1%	28,309	1.8%	7,152	2.8%	2,205	7.2%
<b>Total Housing Units</b>	<b>1,888,148</b>	<b>100.0%</b>	<b>1,582,163</b>	<b>100.0%</b>	<b>257,919</b>	<b>100.0%</b>	<b>30,633</b>	<b>100.0%</b>

Source: DRF and AUX

Fifty percent of NRFU RI interviews were completed over the telephone. Surprisingly, 38 percent of the deletes were completed with a telephone call. This may be due to Empty Mobile Home/Trailer Sites being the only delete type eligible for RI. That delete categorization could lend itself to having a proxy respondent that can complete the interview over the phone and without an enumerator visit (e.g., a mobile home park manager).

#### **5.1.2.5.3 Type of Respondent**

Table 66 shows the respondent types for all of the NRFU RI interviews. Housing units with an unresolved status are included in the column with all cases but are not given their own column in this table.

**Table 66: Type of Respondent for NRFU RI Interviews, by Housing Unit Status**

<b>Respondent Type</b>	<b>Total Cases</b>		<b>Occupied</b>		<b>Vacant</b>		<b>Delete</b>	
	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>
Household Member	1,145,335	60.7%	1,131,119	71.5%	12,329	4.8%	869	2.8%
Unknown Type	47,235	2.5%	28,594	1.8%	5,675	2.2%	2,743	9.0%
All Proxy	695,578	36.8%	422,450	26.7%	239,915	93.0%	27,021	88.2%
Proxy Types								
In-mover	31,040	1.6%	10,563	0.7%	19,994	7.8%	172	0.6%
Neighbor or other	664,524	35.2%	411,880	26.0%	219,915	85.3%	26,849	87.6%
Both marked	14	<0.1%	7	<0.1%	6	<0.1%	0	0.0%
<b>Total Housing Units</b>	<b>1,888,148</b>	<b>100.0%</b>	<b>1,582,163</b>	<b>100.0%</b>	<b>257,919</b>	<b>100.0%</b>	<b>30,633</b>	<b>100.0%</b>

Source: DRF and AUX

The first column of Table 65 shows that information was collected from an April 1 household member for more than half of all the NRFU RI housing units (60.7 percent).

When looking strictly at vacant housing units, there is a much higher rate of proxy respondents (85.3 percent of all vacant interviews were with a neighbor or other proxy). Similarly, housing units marked for deletion reported interviewing a neighbor or other proxy 87.6 percent of the time. The second most common category of respondent for deleted housing units was an unknown respondent (9.0 percent). As seen in NRFU, both vacant and deleted housing units reported interviewing April 1 household members, which is incompatible with our definitions.

Additionally, for the RI cases identified in MaRCS data, Table 46 showed how the respondents in RI compared to the NRFU respondent for that housing unit.

### **5.1.2.6 Characteristics of Occupied Housing Units**

The tables in this section will discuss characteristics of the occupied housing units that completed a full interview during RI. The NRFU RI questionnaire only collected a full interview if the NRFU RI respondent did not report that they were interviewed previously in NRFU. If they did report being interviewed previously, only the first and last names of household members were collected. If only a name was provided, then the person record was not considered data-defined.

Section 5.1.2.6 will report on characteristics for the 270,069 RI housing units that were reported to be occupied and for which at least one data-defined person was enumerated. Given the limitations in the data, this section includes cases that were not on the Fail File.

#### **5.1.2.6.1 Household Population Count**

Table 67 shows the distribution of the enumerator-reported population counts and the number of data-defined people at each address.

**Table 67: Population Count of Housing Units found to be Occupied During NRFU RI<sup>71</sup>**

<b>Population Count</b>	<b>Enumerator-Reported</b>		<b>Data-defined People</b>	
	<b>Number of Housing Units</b>	<b>Percent</b>	<b>Number of Housing Units</b>	<b>Percent</b>
0	83	<0.1%	0	0.0%
1	87,961	32.6%	103,200	38.2%
2	72,503	26.8%	70,952	26.3%
3	41,576	15.4%	39,490	14.6%
4	34,513	12.8%	30,772	11.4%
5	17,669	6.5%	15,985	5.9%
6	7,111	2.6%	5,452	2.0%
7	4,677	1.7%	2,237	0.8%
8	1,384	0.5%	1,002	0.4%
9	687	0.3%	462	0.2%
10	324	0.1%	265	0.1%
11 – 15	401	0.1%	235	0.1%
16 – 20	19	<0.1%	9	<0.1%
21 – 30	19	<0.1%	3	<0.1%
31 – 40	6	<0.1%	2	<0.1%
41 – 49	1	<0.1%	0	0.0%
50 – 97	14	<0.1%	3	<0.1%
98 (Delete)	5	<0.1%	N/A	N/A
99 (Unknown)	870	0.3%	N/A	N/A
Missing	246	0.1%	N/A	N/A
<b>Total Occupied Housing Units</b>	<b>270,069</b>	<b>100.0%</b>	<b>270,069</b>	<b>100.0%</b>

Source: DRF

The distribution of enumerator-reported population counts is similar to the NRFU distribution of enumerator-reported population counts, but there was a higher percent of one-person households enumerated in RI (32.6 percent). This could be because one-person households were a possible flag for outlier RI interviews. Table 67 also shows a much higher rate of housing units with one data-defined person (38.2 percent) than housing units with one enumerator-reported person (32.6 percent). This could be a result of enumerators not following procedures and just listing the respondent on the roster instead of the whole household. It could have also resulted from NRFU RI have a higher amount of proxy respondents than NRFU. A proxy respondent might not know the detailed demographic information that classifies a person as data-defined.

<sup>71</sup> These columns do not total 100.0% due to rounding.

Table 68 shows the number of continuation forms used to enumerate people at each address in NRFU RI.

**Table 68: Number of Continuation Forms used at an Occupied Address  
During NRFU RI**

<b>Number of Continuation Forms</b>	<b>Number of Housing Units</b>	<b>Percent</b>
0	259,371	96.0%
1	10,428	3.9%
2	252	0.1%
3	10	<0.1%
4	3	<0.1%
5	0	0.0%
6	0	0.0%
7	2	<0.1%
8	0	0.0%
9	0	0.0%
10	2	<0.1%
11	0	0.0%
12	0	0.0%
13	0	0.0%
14	1	<0.1%
<b>Total Occupied Housing Units</b>	<b>270,069</b>	<b>100.0%</b>

Source: DRF

Table 68 shows that while the majority of housing units (96.0 percent) enumerated in RI did not use a continuation form, 3.9 percent used exactly one form and an additional 0.1 percent used more than one continuation form.

#### **5.1.2.6.2 Undercount**

Table 69 shows the frequency that each probe was marked with an affirmative answer, including one row for housing units that had multiple undercount categories marked.

**Table 69: Distribution of Answers to the Undercount Probes at NRFU RI Occupied Housing Units**

<b>Undercount Category</b>	<b>Total</b>	<b>Percent</b>
Only 'No' category marked	190,497	70.5%
At least one category	2,408	0.9%
Babies only	336	0.1%
Foster children only	43	<0.1%
Any other relatives only	1,002	0.4%
Roommates only	304	0.1%
Any other nonrelatives only	285	0.1%
Anyone else staying on April 1 who had no permanent place to live	262	0.1%
Multiple categories marked	176	0.1%
Missing (all boxes blank)	77,164	28.6%
<b>Total Occupied Housing Units</b>	<b>270,069</b>	<b>100.0%</b>

Source: DRF

Of the housing units that indicated an undercount category, the most common category was “any other relatives”. Over a quarter of the questionnaires (28.6 percent) had no checkboxes marked on the form, to indicate either a ‘no’ or a ‘yes’ reply.

Table 70 shows how often the name fields were used at the end of the undercount question. For this assessment, the name fields were not inspected for validity; any non-blank entry would have been captured as a name in the following tables.

**Table 70: Number of Undercount Names Reported when Any Undercount Category Marked in NRFU RI Occupied Housing Units**

<b>Total Number of Names</b>	<b>Total</b>	<b>Percent</b>
Zero Names	424	17.6%
One Name	1,613	67.0%
Two Names	371	15.4%
<b>Total Occupied Housing Units with Category Selected</b>	<b>2,408</b>	<b>100.0%</b>

Source: DRF and AUX

Table 70 shows that 67.0 percent of the occupied cases that answered ‘yes’ to the undercount category provided one name, 17.6 percent did not provide a name, and 15.4 percent provided two names.

Table 71 shows how often a name was provided to the enumerator when a respondent had replied affirmatively to specific undercount categories.

**Table 71: Number of Undercount Names Reported for Specific Undercount Category Marked in NRFU RI Occupied Housing Units**

<b>Undercount Category with Number of Names</b>	<b>Total</b>	<b>Percent<sup>72</sup></b>
<b>Babies only</b>		
Zero Names	85	25.3%
One Name	209	62.2%
Two Names	42	12.5%
<b>Total</b>	<b>336</b>	<b>100.0%</b>
<b>Foster children only</b>		
Zero Names	7	16.3%
One Name	22	51.2%
Two Names	14	32.6%
<b>Total</b>	<b>43</b>	<b>100.0%</b>
<b>Any other relatives only</b>		
Zero Names	120	12.0%
One Name	723	72.2%
Two Names	159	15.9%
<b>Total</b>	<b>1002</b>	<b>100.0%</b>
<b>Roommates only</b>		
Zero Names	75	24.7%
One Name	205	67.4%
Two Names	24	7.9%
<b>Total</b>	<b>304</b>	<b>100.0%</b>
<b>Any other nonrelatives only</b>		
Zero Names	49	17.2%
One Name	212	74.4%
Two Names	24	8.4%
<b>Total</b>	<b>285</b>	<b>100.0%</b>
<b>Anyone else only</b>		
Zero Names	24	9.2%
One Name	204	77.9%
Two Names	34	13.0%
<b>Total</b>	<b>262</b>	<b>100.0%</b>
<b>Multiple</b>		
Zero Names	64	36.4%
One Name	38	21.6%
Two Names	74	42.1%
<b>Total</b>	<b>176</b>	<b>100.0%</b>
<b>None<sup>73</sup></b>		
Zero Names	267,453	99.9%
One Name	174	0.1%
Two Names	34	<0.1%
<b>Total</b>	<b>267,661</b>	<b>100.0%</b>

Source: DRF and AUX

<sup>72</sup> This column may not total 100.0% due to rounding.

<sup>73</sup> These numbers include both rows “Missing” and “Only ‘No’ category marked” from Table 69.

Housing units that answered ‘yes’ to multiple undercount categories were the most likely to provide the names of two people (42.1 percent), but also the most likely to provide zero names (36.4 percent). The “any other relative” was the most frequently marked undercount category. When that category was marked, only 12.0 percent of the cases did not provide a name, one of the most successful categories.

### 5.1.2.6.3 Overcount

Table 72 describes the outcome of the overcount question, asked for each person. The universe in Table 72 consists of data-defined people in an occupied housing unit. There were 633,092 such people captured during NRFU RI.

**Table 72: Overcount Category for Data-defined People in NRFU RI Occupied Housing Units**

<b>Overcount Category</b>	<b>Number of People</b>	<b>Percent</b>
None	614,417	97.1%
At least one category marked	18,675	2.9%
College Housing only	1,692	0.3%
Military only	1,319	0.2%
Seasonal/Second Home only	6,241	1.0%
Child Custody only	3,201	0.5%
Jail or Prison only	273	<0.1%
Nursing Home only	224	<0.1%
Another Reason only	5,194	0.8%
Multiple Categories	531	0.1%
<b>Total People in Occupied Housing Units</b>	<b>633,092</b>	<b>100.0%</b>

Source: DRF

The vast majority of people (97.1 percent) did not indicate they lived or stayed anywhere else besides the NRFU RI address. Of those who replied they did live somewhere else, a seasonal or second home was the most frequent response with 1.0 percent.



### 5.1.2.7 Standard Demographic Tables

There were 633,092 data-defined persons included on 270,069 NRFU RI forms that completed a full interview in the 2010 Census. This section will present the demographic characteristics for these persons on the NRFU RI form. Table 73 through Table 77 present NRFU RI person demographic characteristics: age, Hispanic origin, race, relationship to person 1, and sex. Age was calculated based on the date of birth provided; if no date of birth was provided then the write-in age was used. Age was calculated only if the date of birth fell within valid date ranges. Similarly, the calculated age or write-in age was used only if it fell within valid age ranges; otherwise it was considered missing. Table 78 gives the distribution of tenure responses for housing units included in the NRFU RI operation.

Because the demographic data used in this assessment are unedited, direct comparisons with published 2010 Census results are not possible. These tables include a row for people with missing values for the specific characteristic. The data in published Census reports have undergone editing and imputation, and therefore will have no missing values.

**Table 73: Standard Assessment Demographic Table for Age in NRFU RI Interviews**

<b>Age</b>	<b>Number of People</b>	<b>Percent<sup>74</sup></b>
Under 5 years	27,234	4.3%
5 to 9 years	25,624	4.1%
10 to 14 years	23,953	3.8%
15 to 19 years	26,439	4.2%
20 to 24 years	29,140	4.6%
25 to 29 years	27,604	4.4%
30 to 34 years	23,901	3.8%
35 to 39 years	22,768	3.6%
40 to 44 years	21,227	3.4%
45 to 49 years	20,495	3.2%
50 to 54 years	17,546	2.8%
55 to 59 years	12,873	2.0%
60 to 64 years	9,665	1.5%
65+ years	23,159	3.7%
Missing	321,464	50.8%
<b>Total</b>	<b>633,092</b>	<b>100.0%</b>

Source: DRF

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<sup>74</sup> This column does not total 100.0% due to rounding.

**Table 74: Standard Assessment Demographic Table for Hispanic Origin in NRFU RI Interviews**

<b>Hispanic Origin</b>	<b>Number of People</b>	<b>Percent</b>
Not Hispanic or Latino checkbox only	378,281	59.8%
Mexican checkbox only	61,383	9.7%
Puerto Rican checkbox only	12,331	2.0%
Cuban checkbox only	1,539	0.2%
Another Hispanic checkbox only	4,749	0.8%
Multiple checkboxes	494	0.1%
Both Checkbox and Write-in	21,141	3.3%
Write-in Only	2,244	0.4%
Missing	150,930	23.8%
<b>Total</b>	<b>633,092</b>	<b>100.0%</b>

Source: DRF

**Table 75: Standard Assessment Demographic Table for Race in NRFU RI Interviews**

<b>Race</b>	<b>Number of People</b>	<b>Percent</b>
White checkbox alone	290,917	46.0%
Black or African American checkbox alone	99,064	15.7%
American Indian and Alaska Native checkbox alone	1,937	0.3%
Asian Indian checkbox alone	5,130	0.8%
Chinese checkbox alone	4,516	0.7%
Filipino checkbox alone	3,587	0.6%
Japanese checkbox alone	836	0.1%
Korean checkbox alone	2,173	0.3%
Vietnamese checkbox alone	2,437	0.4%
Other Asian checkbox alone	219	0.0%
Native Hawaiian checkbox alone	348	0.1%
Guamanian or Chamorro checkbox alone	313	0.1%
Samoan checkbox alone	343	0.1%
Other Pacific Islander checkbox alone	43	0.0%
Some Other Race checkbox alone	2,062	0.3%
Multiple checkboxes	6,874	1.1%
Both Checkbox and Write-in	60,043	9.5%
Write-in Only	4,024	0.6%
Missing	148,226	23.4%
<b>Total</b>	<b>633,092</b>	<b>100.0%</b>

Source: DRF

**Table 76: Standard Assessment Demographic Table for Relationship Status in NRFU RI Interviews**

<b>Relationship Status</b>	<b>Number of People</b>	<b>Percent</b>
Householder	253,567	40.1%
Husband or Wife of Householder	79,429	12.5%
Biological Son or Daughter of Householder	162,386	25.6%
Adopted Son or Daughter of Householder	2,887	0.5%
Stepson or Stepdaughter of Householder	6,478	1.0%
Brother or Sister of Householder	10,714	1.7%
Father or Mother of Householder	9,517	1.5%
Grandchild of Householder	10,467	1.7%
Parent-in-law of Householder	1,236	0.2%
Son-in-law or Daughter-in-law of Householder	1,777	0.3%
Other Relative	10,502	1.7%
Roomer or Boarder	3,460	0.5%
Housemate or Roommate	18,834	3.0%
Unmarried Partner	13,106	2.1%
Other Nonrelative	8,360	1.3%
Two or more relationships	320	0.1%
Missing	40,052	6.3%
<b>Total</b>	<b>633,092</b>	<b>100.0%</b>

Source: DRF

**Table 77: Standard Assessment Demographic Table for Sex in NRFU RI Interviews**

<b>Sex</b>	<b>Number of People</b>	<b>Percent</b>
Male	296,728	46.9%
Female	289,990	45.8%
Both	79	0.0%
Missing	46,295	7.3%
<b>Total</b>	<b>633,092</b>	<b>100.0%</b>

Source: DRF

**Table 78: Standard Assessment Demographic Table for Tenure in NRFU RI Interviews**

<b>Tenure</b>	<b>Number of Housing Units</b>	<b>Percent</b>
Owned with a mortgage or a loan	49,591	18.4%
Owned without a mortgage or a loan	20,415	7.6%
Rented	108,884	40.3%
Occupied without payment of rent	3,254	1.2%
Multiple	89	<0.1%
Missing	87,836	32.5%
<b>Total</b>	<b>270,069</b>	<b>100.0%</b>

Source: DRF

These distributions may vary across different census operations due to differences in corresponding populations and census procedures.

#### **5.1.2.8 Added Housing Units**

The Reinterview operation did not allow for enumerators to add housing units. The RI enumerators were strictly tasked with verifying the work of the NRFU enumerators. Adding housing units was not part of their training and there were no address fields on the RI EQ in which to collect address information. Thus, there are no data to present in this section.

#### **5.1.3 VDC**

The primary purpose of VDC was to verify the status of eligible housing units identified during NRFU as either non-seasonally vacant or nonexistent on Census Day. However, the operation also included housing units that had been added to the MAF Extract too late to be included in NRFU so had not yet been enumerated in the census.

The following sections will report on results of the VDC operation:

- Section 5.1.3.1 discusses the formation of the analysis universe.
- Section 5.1.3.2 discusses the origins of the VDC workload.
- Section 5.1.3.3 discusses the housing unit status of all cases worked in VDC.
- Section 5.1.3.4 discusses cases that were initially worked in NRFU and then sent to VDC.
- Section 5.1.3.5 discusses cases that were sent to VDC as part of the Supplemental Universe.
- Section 5.1.3.6 discusses cases that were added in VDC.
- Section 5.1.3.7 discusses the VDC RI component.
- Section 5.1.3.8 discusses the timing when VDC interviews were completed and when they were checked-in.
- Section 5.1.3.9 discusses characteristics of VDC interviews, notably key paradata results.
- Section 5.1.3.10 discusses characteristics of occupied housing units.
- Section 5.1.3.11 presents the standard demographic tables for VDC.
- Section 5.1.3.12 discusses characteristics of housing units that were added during VDC.

### 5.1.3.1 Formation of Analysis Universe

The top row in Table 79 is the total number of VDC EQs on the DRF, including multiple copies of the same questionnaire and added questionnaires that were not able to be associated with an address. The second row removes the multiple copies of the same questionnaire. The third row removes all questionnaires that were for an added housing unit which were not associated with an address. There were 28,575<sup>75</sup> of those from the NRFU VDC universe. The last row in the table removes duplicated questionnaires generated for an address due to rework<sup>76</sup>. The universe to analyze the results of the VDC operation from the DRF in this assessment is 8,685,928 unique housing units.

**Table 79: VDC Universe Characteristics**

<b>VDC Universe Characteristics</b>	<b>Number of Questionnaires</b>
All Questionnaires on the DRF (including Adds not geocoded and assigned to an address)	8,996,365
Unique Questionnaires on the DRF (including Adds not geocoded and assigned to an address)	8,995,336
Unique Questionnaires on the DRF (only including Adds geocoded and assigned to an address)	8,966,761
Unique Housing Units on the DRF (only including Adds geocoded and assigned to an address)	8,685,928

Source: DRF

### 5.1.3.2 Origins of the VDC Workload

The VDC workload originated from four different universe sources. The four universe sources are:

1. Cases worked in NRFU that were classified as Vacant or Nonexistent (Delete) and met the requirements to be followed up on in VDC. The requirements for vacant and delete housing units to be eligible for VDC were:
  - a. Determined to be either
    - i. Vacant-Regular,
    - ii. Demolished/Burned Out/Cannot Locate,
    - iii. Nonresidential, or
    - iv. Uninhabitable
  - b. Not on a military base (TEA = 6),

<sup>75</sup> This number includes 4,093 cases added in NRFU that were selected for followup in VDC and were not able to be associated with a state. The remaining 24,482 will be discussed in Section 5.1.3.12.

<sup>76</sup> Rework was initiated if an enumerator discovered they originally interviewed the wrong housing unit. The enumerator used a new questionnaire to interview the correct unit.

- c. Did not have an associated complete Late Mail Return (LMR),
  - d. Did not have a mail return flagged as Undeliverable as Addressed (UAA) from the United States Postal Service, and
  - e. Were not deleted in the Update/Leave operation.
2. Supplemental Cases - Geography Division (GEO) included housing units in the VDC universe from a variety of sources. Most of these cases had never received a questionnaire at their address; some had received a late mailing but had not returned that questionnaire. There were seven different Supplemental universe sources that all contributed to updating the MAF/TIGER Database (MTDB) between December 2009 and April 2010:
- a. The Spring 2010 Delivery Sequence File (DSF) Refresh from the Post Office,
  - b. Housing units that were identified by local governments as recently completed housing units and submitted in the New Construction operation,
  - c. Housing units that were identified by local governments as being omitted from the census universe submitted through the LUCA appeals process,
  - d. Non-responding housing units added from the Update/Leave operation,
  - e. Cases from the Ungeocoded Operation, which was an operation where Field Office staff assigned block-level geocodes for ungeocoded but otherwise good housing units found in the MTDB,
  - f. Cases from the Info-Comm Operation, which was a component of the Address Canvassing Quality Control operation that aimed to identify cases missing from Address Canvassing,
  - g. Count Review, which also aimed to identify missing housing units.
3. Blank mail returns (also known as Reverse Check-ins) – These are housing units that were sent and returned a mail questionnaire, but the returned questionnaire was found to be blank during data capture and it was too late for it to be included in NRFU.
4. Cases added by VDC enumerators.

Table 80 shows the number of cases from each source.

**Table 80: Distribution of VDC Workload by Origin**

<b>Origin of VDC case</b>	<b>Number of VDC cases</b>	<b>Percent</b>
Vacant/Delete Cases worked in NRFU	5,625,001	64.8%
Supplemental Cases	2,218,973	25.5%
Blank Mail Returns	627,749	7.2%
Cases added by VDC enumerators	214,205	2.5%
Cases that had also been added independently in NRFU (and not selected for VDC)	13,701	0.2%
Cases only added in VDC	200,504	2.3%
<b>Total Housing Units</b>	<b>8,685,928</b>	<b>100.0%</b>

Source: DRF

The majority of cases (64.9 percent) were vacant or delete cases that had been worked in the NRFU operation, either as added housing units or as assigned housing units. An additional 25.5

percent of the VDC universe came from the Supplemental universe. There were two types of Added cases in VDC. There were cases that VDC enumerators added that were not found in NRFU and then cases that NRFU enumerators also added independently. The housing units that had also been added by a NRFU enumerator did not have to be added in VDC and most likely resulted from the use of paper listing pages. The pages in the AA binder with information on added housing units were separated from the primary address pages so VDC enumerators might not have seen the NRFU enumerator's work.

### 5.1.3.3 Housing Unit Status – All VDC cases

Table 81 shows what the reported housing unit status was for the 8,685,928 housing units in VDC.

**Table 81: VDC Housing Unit Status**

<b>Housing Unit Status</b>	<b>Number of Housing units</b>	<b>Percent</b>
Occupied	2,265,090	26.1%
Vacant	4,301,933	49.5%
Delete	2,078,287	23.9%
Unresolved	40,618	0.5%
<b>Total Housing Units</b>	<b>8,685,928</b>	<b>100.0%</b>

Source: DRF

Table 81 shows that of the 8,685,928 housing units contacted during VDC, 26.1 percent were found to be occupied, 49.5 percent were found to be vacant, and 23.9 percent were deletes. There is more information on the sources and details of these statuses in the tables below.

Table 82 reports how many VDC cases were reported to be refusals, by housing unit status.

**Table 82: NRFU VDC Refusals**

<b>Housing Unit Status</b>	<b>Number of Housing Units</b>	<b>Number of Refusals</b>	<b>Refusal Percentage</b>
Occupied	2,265,090	11,975	0.5%
Vacant	4,301,933	3,056	0.1%
Delete	2,078,287	1,718	0.1%
Unresolved	40,618	174	0.4%
<b>Total Housing Units</b>	<b>8,685,928</b>	<b>16,923</b>	<b>0.2%</b>

Source: DRF

Of the 8,685,928 housing units in NRFU VDC, there were 16,923 (0.2 percent) that were marked as a refusal on the questionnaire.

#### 5.1.3.3.1 Occupied Housing Units

The reported population count of an occupied housing unit (as captured in Item C from Figure 2) was considered valid if it was from one to 49, inclusive. A population count for an occupied

housing unit was considered invalid if it was either blank, zero, or ranged from 50 to 98. A value of 99 indicated the population count was unknown to the enumerator. Table 83 shows how often each of these three situations was recorded in conjunction with a reported refusal.

**Table 83: Types of Refusals for VDC Occupied Housing Units**

Type of Population Count	Number of Housing Units	Percent
Valid population count	6,311	52.7%
Invalid population count	22	0.2%
Unknown population count	5,642	47.1%
<b>Refusals</b>	<b>11,975</b>	<b>100.0%</b>

Source: DRF

Table 83 shows that just over half of the refusals had a valid population count (52.7 percent), while just under half had an unknown population count (47.1 percent).

#### 5.1.3.3.2 Vacant Housing Units

Table 81 showed that 4,301,933 housing units were determined to be vacant during VDC. Table 84 describes the distribution of those vacant housing units. There are two primary types of vacant housing units, as listed in Item A from the Interview Summary in Figure 2; vacant-regular and vacant-UHE.

**Table 84: Types of VDC Vacant Statuses**

Vacant Type	Number of Housing units	Percent <sup>77</sup>
Regular	3,659,590	85.1%
Usual Home Elsewhere	639,589	14.9%
Unknown	2,754	0.1%
<b>Total Vacant Housing Units</b>	<b>4,301,933</b>	<b>100.0%</b>

Source: DRF

The majority (85.1 percent) of vacant housing units in VDC were classified as regular vacant while 14.9 percent were UHEs. Only 0.1 percent were unclassified.

#### 5.1.3.3.3 Delete Housing Units

Table 81 showed that 2,078,287 housing units were marked to be deleted during VDC. There are five classes of deletes and Table 85 shows the distribution among those classes in VDC.

<sup>77</sup> This column does not total 100.0% due to rounding.



**Table 85: Types of VDC Deletes Statuses**

<b>Delete Type</b>	<b>Number of Housing units</b>	<b>Percent</b>
Demolished/Burned Out/Cannot Locate	1,048,726	50.5%
Nonresidential	443,073	21.3%
Empty Mobile Home/Trailer Site	56,309	2.7%
Uninhabitable	271,747	13.1%
Duplicate	247,995	11.9%
Delete Unknown	10,437	0.5%
<b>Total Deleted Housing Units</b>	<b>2,078,287</b>	<b>100.0%</b>

Source: DRF

Just over half of all deletes (50.5 percent) were marked as “demolished/burned out/cannot locate.” An additional 21.3 percent were nonresidential, 13.1 percent were uninhabitable, and 11.9 percent were duplicates of another housing unit. Only 2.7 percent of VDC deletes were Empty Mobile Home/Trailer Sites, while 0.5 percent were an unknown class of delete housing unit.

The previous tables can be expanded by crossing the five sources of the VDC workload (NRFU cases, Supplemental cases, Blank Mail Return cases, VDC Adds, VDC and NRFU Adds) by the resulting housing unit status found during VDC. This is shown in Table 86.

**Table 86: VDC Status By Source of Case<sup>78</sup>**

<b>Resulting VDC Housing Unit Status</b>	<b>Cases Worked In NRFU</b>		<b>Supplemental Universe</b>		<b>Blank Mail Returns</b>		<b>VDC and NRFU Add</b>		<b>VDC-Only Add</b>	
	<b>Count</b>	<b>Percent</b>	<b>Count</b>	<b>Percent</b>	<b>Count</b>	<b>Percent</b>	<b>Count</b>	<b>Percent</b>	<b>Count</b>	<b>Percent</b>
Occupied	1,062,440	18.9%	775,609	35.0%	262,500	41.8%	8,600	62.8%	155,941	77.8%
Vacant-Regular	3,088,479	54.9%	334,010	15.1%	200,994	32.0%	3,400	24.8%	32,707	16.3%
Vacant-UHE	408,952	7.3%	110,342	5.0%	110,440	17.6%	774	5.6%	9,081	4.5%
Vacant-Unknown	2,294	<0.1%	223	<0.1%	213	<0.1%	1	<0.1%	23	<0.1%
Demolished/Burned										
Out/Cannot Locate	462,299	8.2%	569,770	25.7%	15,359	2.4%	507	3.7%	791	0.4%
Nonresidential	282,222	5.0%	133,855	6.0%	26,647	4.2%	61	0.4%	288	0.1%
Empty Mobile	31,921	0.6%	22,922	1.0%	1,374	0.2%	7	0.1%	85	<0.1%
Home/Trailer Site										
Uninhabitable	203,428	3.6%	62,754	2.8%	5,104	0.8%	35	0.3%	426	0.2%
Duplicate	53,730	1.0%	190,027	8.6%	3,192	0.5%	274	2.0%	772	0.4%
Delete Unknown	2,607	<0.1%	7,684	0.3%	112	<0.1%	8	0.1%	26	<0.1%
Unresolved Status	26,629	0.5%	11,777	0.5%	1,814	0.3%	34	0.2%	364	0.2%
<b>Total Housing Units</b>	<b>5,625,001</b>	<b>100.0%</b>	<b>2,218,973</b>	<b>100.0%</b>	<b>627,749</b>	<b>100.0%</b>	<b>13,701</b>	<b>100.0%</b>	<b>200,504</b>	<b>100.0%</b>

Source: DRF

The cases that had been enumerated initially in NRFU and were now in VDC for verification had the highest vacancy rate. Blank Mail Return cases also had a high percentage of vacant housing units. Twenty percent of the Supplemental universe was determined to be vacant housing units and 44.5 percent of the housing units were classified as deletes. There was a high percentage of housing units classified as Demolished/Burned Out/Cannot Locate from the Supplemental Universe, which will be discussed in greater detail in the Supplemental Universe section (Section 5.1.3.5) below. Of the Blank Mail Returns sent to VDC: 41.8 percent were occupied, 49.6 percent were vacant, and 8.2 percent were deletes.

<sup>78</sup> These columns do not total 100.0% due to rounding.

#### **5.1.3.4 NRFU Cases Sent to VDC for Verification**

There were 5,625,001 housing units worked in NRFU that were sent to VDC for verification. The Census Bureau mandates that a housing unit cannot be deleted from the Master Address File (MAF) unless it is marked as a delete by two different operations or two different enumerators in the same operation. Since the Census is required to count every person in the country, vacant housing units are revisited to ensure that no one was erroneously missed and excluded from the count.

According to the VDC Universe Specification (Jackson, 2009b), only certain statuses should have been eligible for VDC. However, the selection of NRFU cases for VDC was done by PBOCS; not from the data-captured questionnaire. In every LCO, a clerk manually keyed the status code and population count for every NRFU questionnaire into PBOCS during check-in. PBOCS would then select the NRFU case for VDC if the case met the VDC eligibility criteria. However, if the LCO clerk keyed a status incorrectly into PBOCS, a case could have been selected for VDC that should not have been selected. This analysis shows the actual data-captured status of the NRFU cases that were selected for VDC. Thus, it includes NRFU statuses that were not eligible for VDC (Occupied, Vacant-UHE, Empty Mobile Home /Trailer Site and Duplicate) but apparently were sent due to keying error.

Using the data-captured NRFU status, Table 87 reports how many housing units were visited in VDC, by eligibility.

**Table 87: Distribution of NRFU Housing Unit Statuses selected for VDC**

<b>NRFU Housing Unit Status</b>	<b>Number of VDC cases</b>	<b>Percent</b>
Status Codes Eligible for VDC	5,417,308	96.3%
Vacant – Regular	4,284,003	76.2%
Demolished/Burned Out/ Cannot Locate	533,473	9.5%
Nonresidential	361,368	6.4%
Uninhabitable	238,464	4.2%
Status Codes Ineligible for VDC <sup>79</sup>	148,611	2.6%
Occupied	40,789	0.7%
Vacant – UHE	91,873	1.6%
Empty Mobile Home/Trailer Site	1,680	<0.1%
Duplicate	14,269	0.3%
Cases with Unknown Status	59,082	1.1%
Vacant Unknown	3,316	0.1%
Delete Unknown	6,454	0.1%
Unresolved	49,312	0.9%
<b>Total Housing Units</b>	<b>5,625,001</b>	<b>100.0%</b>

Source: DRF

There were 148,611 Nonresponse Followup cases that should not have been eligible for Vacant Delete Check but were selected due to keying error in the LCO. An additional 59,082 Nonresponse Followup cases were selected, but the eligibility cannot be determined due to contradictory data on the questionnaire.

As described in Section 5.1.3.2, not all cases with a VDC-eligible housing unit status were sent to VDC, as there were other criteria involved in selecting cases for VDC. Table 88 shows the percentage of NRFU statuses that met all the criteria and were selected for VDC.

<sup>79</sup> Not eligible for VDC, according to the specification. (Jackson, 2009b)

**Table 88: Percentage of NRFU Housing Units in VDC by Housing Unit Status**

<b>NRFU Housing Unit Status</b>	<b>Number of NRFU cases</b>	<b>Number of VDC cases</b>	<b>Percent</b>
Status Codes Eligible for VDC	13,730,142	5,417,308	39.5%
Vacant – Regular	10,713,658	4,284,003	40.0%
Demolished/Burned Out/ Cannot Locate	1,550,941	533,473	34.4%
Nonresidential	658,485	361,368	54.9%
Uninhabitable	807,058	238,464	29.5%
Status Codes Ineligible for VDC <sup>80</sup>	33,178,003	148,611	0.4%
Occupied	28,756,540	40,789	0.1%
Vacant – UHE	3,449,235	91,873	2.7%
Empty Mobile Home/Trailer Site	413,205	1,680	0.4%
Duplicate	559,023	14,269	2.6%
Cases with Unknown Status	289,260	59,082	20.4
Vacant Unknown	12,811	3,316	25.9%
Delete Unknown	21,675	6,454	29.8%
Unresolved	254,774	49,312	19.4%
<b>Total</b>	<b>47,197,405</b>	<b>5,625,001</b>	<b>11.9%</b>

Source: DRF

Forty percent of the cases identified in NRFU as regular vacant housing units were selected for VDC. Nonresidential was the only classification that had over fifty percent of the cases selected for VDC.

For the cases that were worked in NRFU and sent to VDC for a second visit, Table 89 shows how many of the cases reported the exact same housing unit status in VDC as was reported in NRFU.

<sup>80</sup> Not eligible for VDC, according to the specification. (Jackson, 2009b)

**Table 89: NRFU to VDC: Resulting Housing Unit Status Exact Matches in VDC**

<b>NRFU Housing Unit Status</b>	<b>Number of VDC cases</b>	<b>Percent with a VDC Status That Matched NRFU Exactly</b>	<b>Percent that Did Not Match Exactly</b>	<b>Total Percent</b>
<b>Eligible for VDC</b>				
Vacant – Regular	4,284,003	65.0%	35.0%	<b>100.0%</b>
Demolished/Burned Out/ Cannot Locate	533,473	45.0%	55.0%	<b>100.0%</b>
Nonresidential	361,368	42.2%	57.8%	<b>100.0%</b>
Uninhabitable	238,464	31.9%	68.1%	<b>100.0%</b>
<b>Ineligible for VDC<sup>81</sup></b>				
Occupied	40,789	52.3%	47.7%	<b>100.0%</b>
Vacant – UHE	91,873	45.9%	54.1%	<b>100.0%</b>
Empty Mobile Home/Trailer Site	1,680	30.8%	69.2%	<b>100.0%</b>
Duplicate	14,269	9.0%	91.0%	<b>100.0%</b>
<b>Unknown Status</b>				
Vacant Unknown	3,316	0.1%	99.9%	<b>100.0%</b>
Delete Unknown	6,454	0.6%	99.4%	<b>100.0%</b>
Unresolved	49,312	1.0%	99.0%	<b>100.0%</b>
<b>Total</b>	<b>5,625,001</b>	<b>59.0%</b>	<b>41.0%</b>	<b>100.0%</b>

Source: DRF

Housing units marked as vacant-regular in NRFU were also found to be vacant-regular 65.0 percent of the time in VDC. Vacant-Regular cases had the most consistent status among the two operations. There were 40,789 housing units that were found to be occupied in NRFU and incorrectly sent to VDC, but only 52.3 percent were found to be occupied again in VDC.

Table 89 shows that there were 41.0 percent of VDC cases that did not have the same exact status as their NRFU case, but Table 90 shows that a majority of the time the VDC case had a status in the same basic category (occupied, vacant, or delete) as the NRFU status.

<sup>81</sup> Not eligible for VDC, according to the specification. (Jackson, 2009b)

**Table 90: NRFU to VDC: Resulting Housing Unit Status Basic Matches in VDC**

<b>NRFU Housing Unit Status</b>	<b>VDC Occupied</b>		<b>VDC Vacant</b>		<b>VDC Delete</b>		<b>VDC Totals<sup>82</sup></b>	
	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>
<b>Eligible for VDC</b>								
Vacant - Regular	827,274	19.3%	3,106,703	72.5%	331,402	7.7%	<b>4,284,003</b>	<b>100.0%</b>
Demolished / Burned Out/ Cannot Locate	110,566	20.7%	93,704	17.6%	326,593	61.2%	<b>533,473</b>	<b>100.0%</b>
Nonresidential	49,796	13.8%	85,488	23.7%	224,046	62.0%	<b>361,368</b>	<b>100.0%</b>
Uninhabitable	20,989	8.8%	94,153	39.5%	121,122	50.8%	<b>238,464</b>	<b>100.0%</b>
<b>Ineligible for VDC</b>								
Occupied	21,316	52.3%	15,673	38.4%	3,664	9.0%	<b>40,789</b>	<b>100.0%</b>
Vacant – UHE	14,253	15.5%	71,844	78.2%	5,372	5.8%	<b>91,873</b>	<b>100.0%</b>
Empty Mobile Home/Trailer Site	194	11.5%	562	33.5%	888	52.9%	<b>1,680</b>	<b>100.0%</b>
Duplicate	5,982	41.9%	3,244	22.7%	4,987	34.9%	<b>14,269</b>	<b>100.0%</b>
<b>Unknown Status</b>								
Vacant Unknown	613	18.5%	2,410	72.7%	277	8.4%	<b>3,316</b>	<b>100.0%</b>
Delete Unknown	1,404	21.8%	1,024	15.9%	3,992	61.9%	<b>6,454</b>	<b>100.0%</b>
Unresolved	10,053	20.4%	24,920	50.5%	13,864	28.1%	<b>49,312</b>	<b>100.0%</b>
<b>Total Cases</b>	<b>1,062,440</b>	<b>18.9%</b>	<b>3,499,725</b>	<b>62.2%</b>	<b>1,036,207</b>	<b>18.4%</b>	<b>5,625,001</b>	<b>100.0%</b>

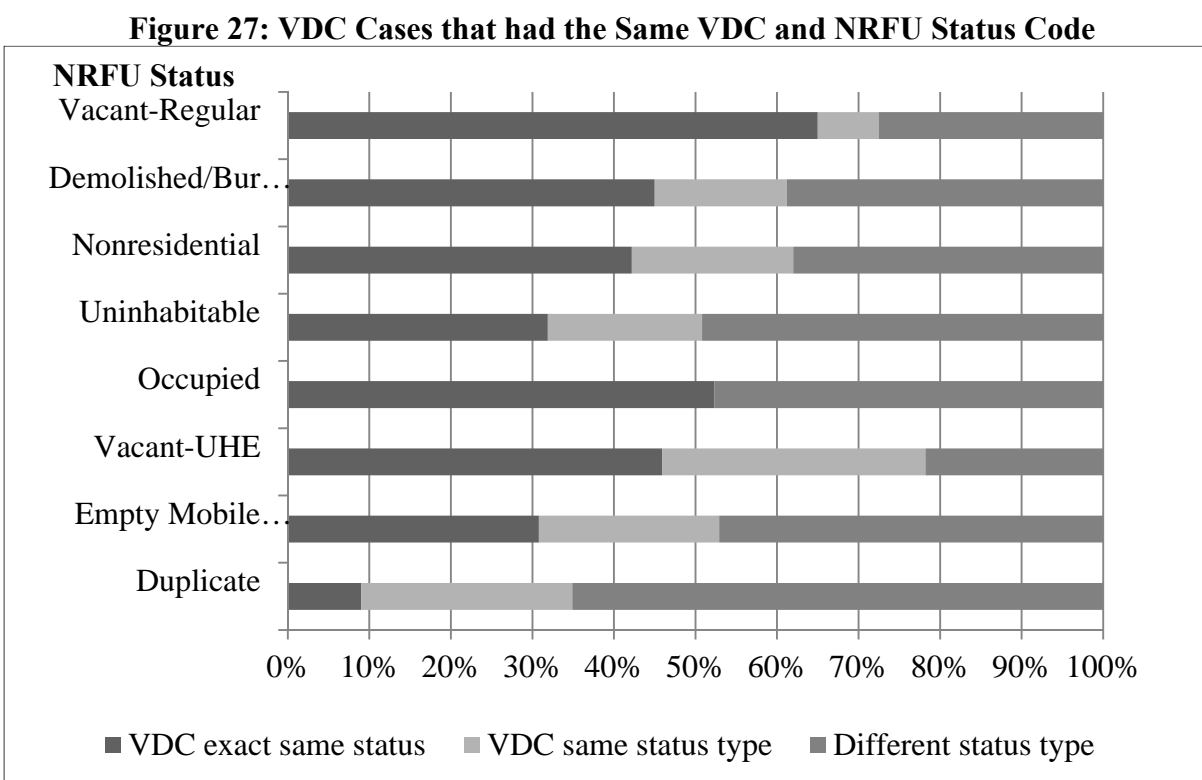
Source: DRF

<sup>82</sup> Percentages added across the rows do not sum to 100.0 because the table does not include cases that had a final status of ‘unresolved’ in VDC.

Housing units that were identified as a vacant-regular in NRFU were found to be occupied 19.3 percent of the time in VDC.

Approximately 38 percent of NRFU demolished/burned out/cannot locate housing units were found to be existing housing units (either vacant or occupied) in VDC. Approximately 42 percent of the cases identified as duplicate housing units in NRFU were found to be occupied housing units in VDC. Additionally, approximately 40 percent of the Uninhabitable NRFU housing units were marked as Vacant in VDC.

The information from Table 89 and Table 90 is portrayed graphically in Figure 27.



Source: DRF

The darkest bar on the left side of the graph represents the proportion of cases that were classified with the exact same status by the VDC enumerator as the NRFU enumerator (for instance, Table 89 showed that 42.2 percent of cases classified as Nonresidential in NRFU were also classified as Nonresidential in VDC). The light bar in the middle of the graph represents the cases that were in the same general status (for instance, about twenty percent of the cases classified as Nonresidential in NRFU were then classified as a different kind of delete by the VDC enumerator). The bar on the right of the graph represents the cases that were classified as an entirely different primary status between the NRFU and VDC enumerators (for instance, Table 89 showed that 37.5 percent of cases classified as Nonresidential in NRFU were classified as either vacant or occupied in VDC).



As shown in the tables above, it is common for a NRFU housing status to not agree with a VDC housing status. As mentioned in Section 2.3.3, the initial VDC plans included an adjudication component for housing units that were classified differently in VDC than they had been in NRFU. The adjudication process involved PBOCS notifying the LCO that the case needed to be investigated to determine a final housing unit status. However, this functionality was not implemented. Without the ability to adjudicate, we were unable to resolve housing unit discrepancies in the field. The final housing unit status of the case was decided during processing after the end of field data collection based on pre-defined decennial rules. The final housing unit status was selected based on the rules in Table 91. (Pennington 2010)

**Table 91: Final Status based on NRFU and VDC Statuses**

<b>NRFU Status</b>	<b>VDC Status</b>	<b>Final Status</b>
Vacant	Occupied	Occupied
Vacant	Vacant	Vacant
Vacant	Delete	Vacant
Delete	Occupied	Occupied
Delete	Vacant	Vacant
Delete	Delete	Delete

#### **5.1.3.5 Supplemental Cases in VDC**

Table 80 showed that there were 2,218,973 housing units identified as supplemental cases for the VDC operation. The next few tables will focus solely on those cases. Since these housing units had not been enumerated in NRFU, there is no previous housing unit status to compare to, as there was for the tables in Section 5.1.3.4.

Section 2.3.3 discussed the Late Mailing operation, which reduced the Supplemental case workload for VDC. Table 92 shows the number of housing units receiving a late mailing from each of the three eligible sources.

**Table 92: Addresses in the Late Mailing**

<b>Address Source</b>	<b>Number of Housing Units</b>	<b>Percentage<sup>83</sup></b>
LUCA Appeals	1,353,108	66.2%
Ungeocoded	516,475	25.3%
DSF Refresh	174,868	8.6%
<b>Total Housing Units</b>	<b>2,044,451</b>	<b>100.0%</b>

Source: 2010 Census Operational Plan

The final workload for the Late Add Mailing operation was 2,044,451 addresses. Addresses from the LUCA Appeals operation constituted 66.2 percent of the Late Mailing workload. Table 93 shows the percent from each source that returned the questionnaire in the late mailing.

**Table 93: Late Add Mailing Success Rates<sup>84</sup>**

<b>Address Source</b>	<b>Housing Units in the Late Mailing</b>	<b>Housing Units That Returned the Mailing</b>	
	Number	Number	Percent
LUCA Appeals	1,353,108	310,381	22.9%
Ungeocoded	516,475	273,826	53.0%
DSF Refresh	174,868	71,913	41.1%
<b>Total Housing Units</b>	<b>2,044,451</b>	<b>656,120</b>	<b>32.1%</b>

Source: Census Op Plan & DRF

Of the addresses receiving a late mailing, 656,120 (32.1 percent) returned the questionnaire. Addresses from the ungeocoded operation were the most likely to return the questionnaire (53.0 percent of the time). Of the LUCA appeals addresses, 22.9 percent returned the questionnaire.

The Late Mailing reduced the workload of cases that were sent to VDC as part of the Supplemental Universe. Table 94 shows the workload that would have existed in VDC without the Late Mailing.

<sup>83</sup> This column does not total 100.0% due to rounding.

<sup>84</sup> The data on the number of housing units that received a late mailing come from the 2010 Census Operational Plan, while the number that returned the mailing comes from the DRF. Given the discrepancies seen between other data universes and described in the limitations, we assume these percents would be similar but slightly different if the numbers came from the same source.

**Table 94: Hypothetical VDC Workload from Supplemental Universe**

<b>Universe</b>	<b>Number of Housing Units</b>
Actual VDC Workload from Supplemental Universe	2,218,973
Addresses Successfully Omitted from VDC due to Late Mailing	656,120
<b>Hypothetical Supplemental VDC Workload without Late Mailing</b>	<b>2,875,093</b>

Source: DRF and 2010 Census Operational Plan

The final VDC workload from Supplemental sources (2,218,973 cases) was 77.2% of what it would have been if the Late Mailing operation had not happened (2,875,093 cases).

The next few tables will focus on the 2,218,973 housing units that were enumerated in VDC as part of the Supplemental Universe. Table 95 shows the distribution of sources that contributed to the Supplemental workload. These sources were briefly defined in Section 5.1.3.2.

**Table 95: Sources of the Supplemental VDC Workload**

<b>Source</b>	<b>Number of cases</b>	<b>Percent</b>
Spring DSF	118,419	5.3%
New Construction	332,603	15.0%
U/L Add	276,596	12.5%
LUCA Appeals	1,151,544	51.9%
Count Review	63,311	2.9%
Info Comm Operation	25,242	1.1%
Ungeocoded	251,258	11.3%
<b>Total Supplemental Housing Units</b>	<b>2,218,973</b>	<b>100.0%</b>

Source: DRF

The majority of Supplemental cases (51.9 percent) were identified during the LUCA Appeals process. However, a housing unit might have been identified by more than one of these sources, in which case a hierarchy was established to identify a single supplemental universe source for that housing unit. The hierarchy is reflected in the order shown in Table 95, so a housing unit identified through both the LUCA appeals process and the Count Review process would be labeled as a LUCA Appeals case in Table 95.

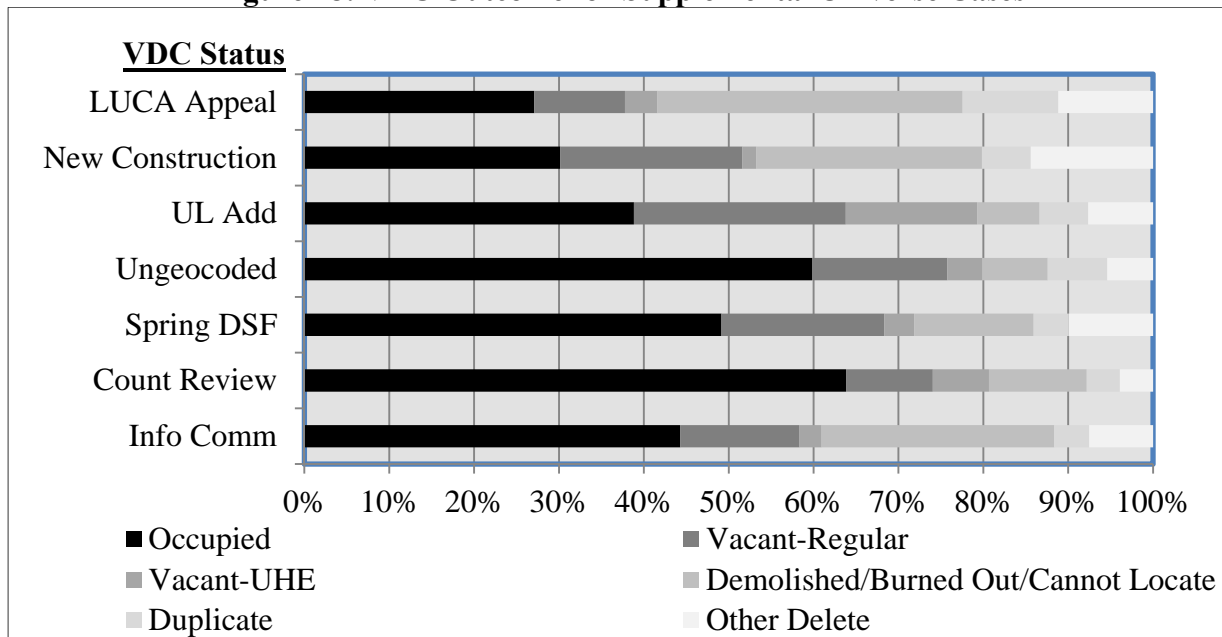
The information in Table 96 is copied directly from Table 86. This information is presented again here for easier comparison with the subsequent tables.

**Table 96: VDC Status for Supplemental Cases**

<b>VDC Housing Unit Status</b>	<b>Housing Units</b>	<b>Percent</b>
Occupied	775,609	35.0%
Vacant-Regular	334,010	15.1%
Vacant-UHE	110,342	5.0%
Vacant-Unknown	223	<0.1%
Demolished/Burned Out/Cannot Locate	569,770	25.7%
Nonresidential	133,855	6.0%
Empty Mobile Home/Trailer Site	22,922	1.0%
Uninhabitable	62,754	2.8%
Duplicate	190,027	8.6%
Delete Unknown	7,684	0.3%
Unresolved Status	11,777	0.5%
<b>Total Housing Units</b>	<b>2,218,973</b>	<b>100.0%</b>

Source: DRF

For cases enumerated in VDC that came from the Supplemental Universe, 35.0 percent were classified as occupied. However, the distribution of housing unit status varies for each of the seven different sources that contributed to the VDC workload. For each of the seven supplemental universe sources in Table 95, Figure 28 shows how often certain housing unit statuses were assigned to cases that originated from each supplemental universe source.

**Figure 28: VDC Outcome for Supplemental Universe Cases**

Source: DRF

Figure 28 shows that about 27 percent of cases identified from the LUCA Appeals process were classified as occupied in VDC. The largest segment of LUCA Appeals cases were classified as Demolished/Burned Out/Cannot Locate. Cases from Count Review were the most likely to be classified as occupied while UL Adds had a substantial number of regular vacants. Table 97 shows the specific counts for the detailed VDC housing status outcome by universe source, and Table 98 shows the results as percentages.

**Table 97: VDC Status for Cases coming from the Supplemental Universe - Counts**

<b>VDC Housing Unit Status</b>	<b>Count Review</b>	<b>Info Comm</b>	<b>LUCA Appeals</b>	<b>New Construction</b>	<b>Spring DSF</b>	<b>U/L Add</b>	<b>Ungeocoded</b>
Occupied	40,346	11,135	309,747	99,538	57,935	106,823	150,085
Vacant – Regular	6,434	3,535	122,090	70,893	22,572	68,645	39,841
Vacant – UHE	4,180	665	43,212	5,210	4,175	42,497	10,403
Vacant – Unknown	9	3	93	19	11	68	20
Demolished / Burned Out / Cannot Locate	7,292	6,887	411,608	87,907	16,610	20,188	19,278
Nonresidential	1,716	1,271	86,632	17,721	6,955	12,372	7,188
Empty Mobile Home/Trailer Site	231	78	13,938	3,374	1,365	2,262	1,674
Uninhabitable	419	537	23,388	25,477	3,211	5,912	3,810
Duplicate	2,480	1,040	129,219	19,079	4,816	15,857	17,536
Delete Unknown	59	25	5,104	1,050	155	603	688
Unresolved	145	66	6,513	2,335	614	1,369	735
<b>Total</b>	<b>63,311</b>	<b>25,242</b>	<b>1,151,544</b>	<b>332,603</b>	<b>118,419</b>	<b>276,596</b>	<b>251,258</b>

Source: DRF

**Table 98: VDC Status for Cases coming from the Supplemental Universe - Percents<sup>85</sup>**

<b>VDC Housing Unit Status</b>	<b>Count Review</b>	<b>Info Comm</b>	<b>LUCA Appeals</b>	<b>New Construction</b>	<b>Spring DSF</b>	<b>U/L Add</b>	<b>Ungeocoded</b>
Occupied	63.7%	44.1%	26.9%	29.9%	48.9%	38.6%	59.7%
Vacant – Regular	10.2%	14.0%	10.6%	21.3%	19.1%	24.8%	15.9%
Vacant – UHE	6.6%	2.6%	3.8%	1.6%	3.5%	15.4%	4.1%
Vacant – Unknown	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%
Demolished / Burned Out / /Cannot Locate	11.5%	27.3%	35.7%	26.4%	14.0%	7.3%	7.7%
Nonresidential	2.7%	5.0%	7.5%	5.3%	5.9%	4.5%	2.9%
Empty Mobile Home/Trailer Site	0.4%	0.3%	1.2%	1.0%	1.2%	0.8%	0.7%
Uninhabitable	0.7%	2.1%	2.0%	7.7%	2.7%	2.1%	1.5%
Duplicate	3.9%	4.1%	11.2%	5.7%	4.1%	5.7%	7.0%
Delete							
Unknown	0.1%	0.1%	0.4%	0.3%	0.1%	0.2%	0.3%
Unresolved	0.2%	0.3%	0.6%	0.7%	0.5%	0.5%	0.3%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

Source: DRF

For every source besides LUCA Appeals, the most common status was ‘occupied’. LUCA Appeals cases were most likely to be marked as ‘Demolished/Burned Out/Cannot Locate’ in VDC. Over a quarter of cases sent to VDC from LUCA Appeals, New Construction, and the Info Comm Operation were marked as ‘Demolished/Burned Out/Cannot Locate’ in VDC. Nearly 60 percent of the Ungeocoded cases and 63 percent of Count Review cases were found to be occupied in VDC. U/L add cases had the highest percentage of vacant-UHE cases.

#### **5.1.3.6 VDC Added Cases that were also Added in NRFU**

There were 13,701 cases that were added by VDC enumerators that had also been added by NRFU enumerators. Table 99 shows the percentage of VDC added cases that had the same outcome as the NRFU added case.

<sup>85</sup> These columns do not total 100.0% due to rounding.

**Table 99: NRFU to VDC: Resulting Housing Unit Status Matches for Added Cases**

<b>NRFU Housing Unit Status</b>	<b>Number of VDC cases</b>	<b>Percent That Match Exactly</b>	<b>Percent that Do Not match Exactly</b>	<b>Total Percent</b>
Occupied	8,600	83.3%	16.7%	<b>100.0%</b>
Vacant - Regular	3,400	55.1%	44.9%	<b>100.0%</b>
Vacant – UHE	774	62.7%	37.3%	<b>100.0%</b>
Vacant – Unknown	1	<0.1%	100.0%	<b>100.0%</b>
Demolished/Burned Out / Cannot Locate	507	20.7%	79.3%	<b>100.0%</b>
Nonresidential	61	6.6%	93.4%	<b>100.0%</b>
Empty Mobile Home/Trailer Site	7	28.6%	71.4%	<b>100.0%</b>
Uninhabitable	35	22.9%	77.1%	<b>100.0%</b>
Duplicate	274	0.7%	99.3%	<b>100.0%</b>
Delete Unknown	8	<0.1%	100.0%	<b>100.0%</b>
Unresolved	34	<0.1%	100.0%	<b>100.0%</b>
<b>Total</b>	<b>13,701</b>	<b>70.4%</b>	<b>29.6%</b>	<b>100.0%</b>

Source: DRF

There were 8,600 housing units added in NRFU and designated as occupied units, which were then also added in the VDC operation. 83.3 percent of those were again designated as occupied in VDC.

Sections 5.1.3.4, 5.1.3.5, and 5.1.3.6 have discussed three of the five universes that contributed cases to the VDC workload. The additional two universes (Blank Mail Returns and VDC adds not added in NRFU) do not have as many characteristics to report on, so the basic information on those universes was shown alongside the other three universes in Table 86.

### 5.1.3.7 VDC RI

VDC was the first enumeration for all cases in the supplemental universe, so any vacant units or deletes from this universe required a follow-up to verify the unit status. This was the purpose of the VDC RI program.

All cases from the supplemental universe that received a unit status of Vacant or Delete were sent to telephone clerks in the LCO for VDC RI. If the clerks were able to contact the original respondent and determined that the original VDC unit status was not correct, they completed a new VDC EQ with the correct status. If the original respondent confirmed the original VDC status or the clerks were unable to contact the original respondent by telephone, then no new VDC EQ was created and the original status was retained. Per the original requirement, the PBOCS displayed a message at VDC check-in for all cases selected for VDC RI, but all tracking beyond that was done in Excel spreadsheets.

Please refer to Table 100 for the results of the VDC RI. We see that the LCO telephone clerks had a relatively high contact rate with 72.3 percent, and 95.3 percent of those contacts confirmed that the original VDC status was correct. All VDC RI cases with no contact made or original VDC status confirmed retained the original VDC status. All VDC RI cases with contact made and where the original VDC status was incorrect should have had a new EQ created with the correct VDC status. However, the LCOs failed to complete a new EQ for 4.2 percent of the cases where the VDC status was incorrect. The reasons for this are unknown but the data come directly from the VDC RI tracking spreadsheets, which are subject to error.

**Table 100: VDC RI Results**

<b>Description</b>	<b>Cases</b>	<b>Percent</b>
VDC RI Cases	1,657,011	-
No Contact Made	459,116	27.7% of RI Cases
Contact Made	1,197,895	72.3% of RI Cases
VDC status correct	1,141,018	95.3% of RI cases with contact made
VDC status incorrect	56,877	4.7% of RI cases with contact made
New EQs created	54,488	95.8% of Incorrect VDC status cases
No new EQs created	2,389	4.2% of Incorrect VDC status cases



### **5.1.3.8 Interview Completion and Case Check-in**

The rest of the VDC tables will look at the entire universe of 8,685,928 VDC returns and will not show the distribution by universe sources.

Section 5.1.3.8 presents information about when NRFU RI cases were completed in the field and when they were checked-in by the office. These results answer the research questions regarding how the planned start and finish dates for the RI operation compared to the actual start and finish dates, and how the accumulation of outcomes changed over time.

#### **5.1.3.8.1 Interview Completion**

LCOs were allowed to start working VDC cases when they finished NRFU cases and the VDC workloads were prepared. This was usually within ten days after completing NRFU. Most LCOs finished NRFU ahead of schedule so they started VDC ahead of schedule, as reflected in Table 101. The baseline schedule dates for VDC were from July 24 to August 25. The operation started early in all but one LCO and finished two days before the baseline finish.

**Table 101: VDC Housing Units Completed By Week**

<b>Week</b>	<b>Total for that Time Period</b>	<b>Percent for that Time Period<sup>86</sup></b>	<b>Cumulative Percent</b>
6/01 - 6/05	981	<0.1%	<0.1%
6/06 - 6/12	2,998	<0.1%	<0.1%
6/13 - 6/19	3,479	<0.1%	0.1%
6/20 - 6/26	8,202	0.1%	0.2%
6/27 - 7/03	175,220	2.0%	2.2%
7/04 - 7/10	1,944,112	22.4%	24.6%
7/11 - 7/17	3,176,878	36.6%	61.2%
7/18 - 7/23	1,871,815	21.5%	82.7%
7/24 - 7/31    Official Start of VDC	1,059,353	12.2%	94.9%
8/01 - 8/07	315,301	3.6%	98.5%
8/08 - 8/14	67,162	0.8%	99.3%
8/15 - 8/21	16,787	0.2%	99.5%
8/22 - 8/26    Official End of VDC	1,966	<0.1%	99.5%
8/27 - 8/28	106	<0.1%	99.5%
8/29 - 9/04	831	<0.1%	99.5%
9/05 - 9/11	4,277	<0.1%	99.6%
9/12 - 9/18	3,950	<0.1%	99.6%
9/19 - 9/25	2,801	<0.1%	99.7%
9/26 - 9/30	915	<0.1%	99.7%
Missing/Out of Range	28,794	0.3%	100.0%
<b>Total Housing Units</b>	<b>8,685,928</b>	<b>100.0%</b>	<b>100.0%</b>

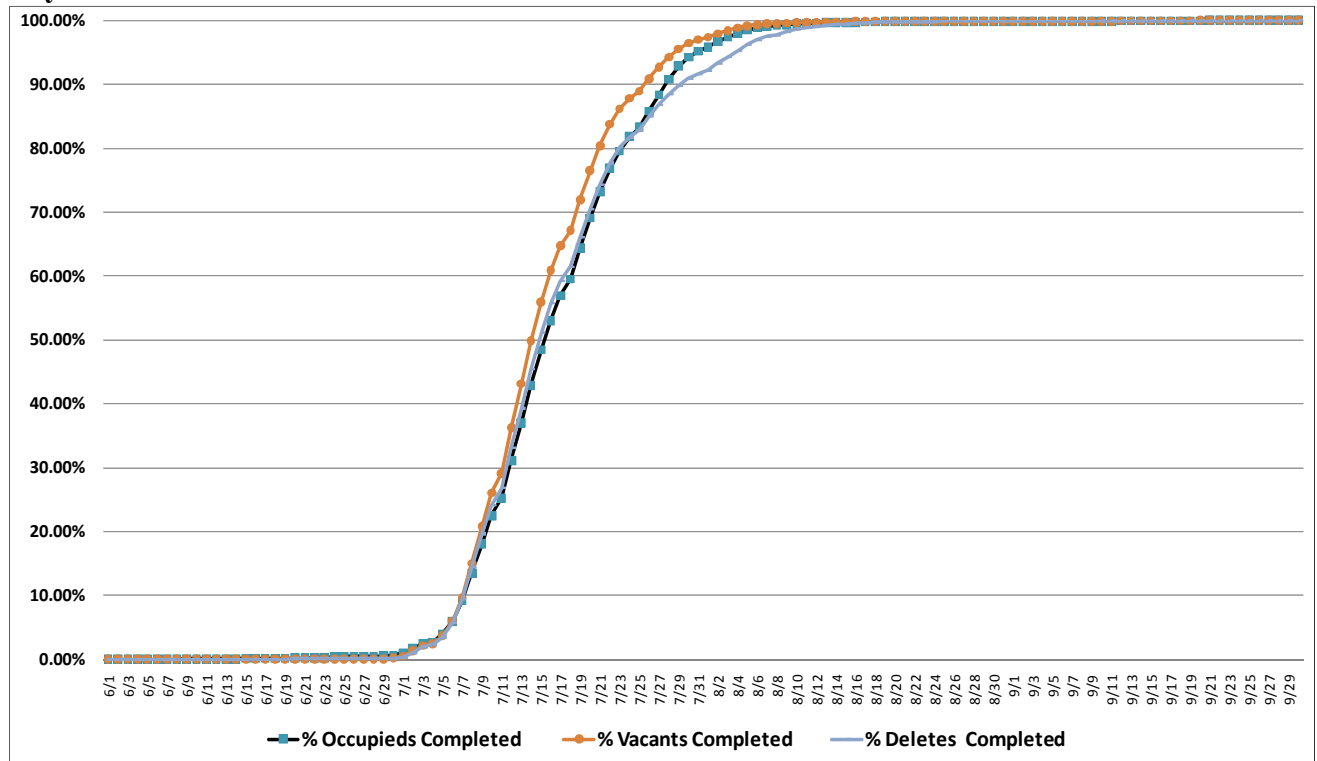
Source: DRF and AUX

About 83 percent of the VDC workload was completed before the official start date for VDC, July 24<sup>th</sup>. Of the entire VDC universe, 0.3 percent of cases were either missing a date in the Certification section, the date written was before June 1, or the date was after September 30<sup>th</sup>. There is an inexplicable increase in cases supposedly completed in September. All data collection activities had to be completed by August 25<sup>th</sup>, so questionnaires could arrive in time to be data captured. No cases could have been worked in September and data captured, so these dates are likely the result of poor handwriting on the EQ or data capture errors.

Figure 29, Table 102, Table 103, and Table 104 show the number of VDC occupied, vacant, and deleted cases completed by week.

<sup>86</sup> This column does not total 100.0% due to rounding.

**Figure 29: Cumulative Percent Occupied, Vacant, and Delete Completed VDC Cases by Day**



Source:DRF and AUX

Nearly 99 percent of all of the occupied and vacant interviews were completed by August 7. The deleted housing units took slightly longer to complete. Approximately 99 percent of the deleted housing unit interviews were completed by August 21.

**Table 102: VDC Occupied Housing Units Completed By Week**

<b>Week</b>	<b>Total for that Time Period</b>	<b>Percent for that Time Period</b>	<b>Cumulative Percent</b>
6/01 - 6/05	533	<0.1%	<0.1%
6/06 - 6/12	1,396	0.1%	0.1%
6/13 - 6/19	2,045	0.1%	0.2%
6/20 - 6/26	6,788	0.3%	0.5%
6/27 - 7/03	45,155	2.0%	2.5%
7/04 - 7/10	453,086	20.0%	22.5%
7/11 - 7/17	778,719	34.4%	56.9%
7/18 - 7/23	511,099	22.6%	79.4%
7/24 - 7/31      Official Start of VDC	353,259	15.6%	95.0%
8/01 - 8/07	87,744	3.9%	98.9%
8/08 - 8/14	13,762	0.6%	99.5%
8/15 - 8/21	3,455	0.2%	99.6%
8/22 - 8/26      Official End of VDC	700	<0.1%	99.7%
8/27 - 8/28	50	<0.1%	99.7%
8/29 - 9/04	252	<0.1%	99.7%
9/05 - 9/11	1,043	<0.1%	99.7%
9/12 - 9/18	992	<0.1%	99.8%
9/19 - 9/25	748	<0.1%	99.8%
9/26 - 9/30	297	<0.1%	99.8%
Missing/Out of Range	3,967	0.2%	100.0%
<b>Total Occupied Housing Units</b>	<b>2,265,090</b>	<b>100.0%</b>	<b>100.0%</b>

Source: DRF and Aux

**Table 103: VDC Vacant Housing Units Completed By Week**

<b>Week</b>	<b>Total for that Time Period</b>	<b>Percent for that Time Period<sup>87</sup></b>	<b>Cumulative Percent</b>
6/01 - 6/05	282	<0.1%	<0.1%
6/06 - 6/12	1,065	<0.1%	<0.1%
6/13 - 6/19	1,039	<0.1%	0.1%
6/20 - 6/26	1,290	<0.1%	0.1%
6/27 - 7/03	90,108	2.1%	2.2%
7/04 - 7/10	1,025,360	23.8%	26.0%
7/11 - 7/17	1,662,013	38.6%	64.6%
7/18 - 7/23	921,604	21.4%	86.1%
7/24 - 7/31      Official Start of VDC	466,553	10.8%	96.9%
8/01 - 8/07	105,399	2.5%	99.4%
8/08 - 8/14	14,386	0.3%	99.7%
8/15 - 8/21	3,079	0.1%	99.8%
8/22 - 8/26      Official End of VDC	518	<0.1%	99.8%
8/27 - 8/28	30	<0.1%	99.8%
8/29 - 9/04	350	<0.1%	99.8%
9/05 - 9/11	2,266	0.1%	99.8%
9/12 - 9/18	2,039	<0.1%	99.9%
9/19 - 9/25	1,388	<0.1%	99.9%
9/26 - 9/30	422	<0.1%	99.9%
Missing/Out of Range	2,742	0.1%	100.0%
<b>Total Vacant Housing Units</b>	<b>4,301,933</b>	<b>100.0%</b>	<b>100.0%</b>

Source: DRF and Aux

<sup>87</sup> This column does not total 100.0% due to rounding.

**Table 104: VDC Delete Housing Units Completed By Week**

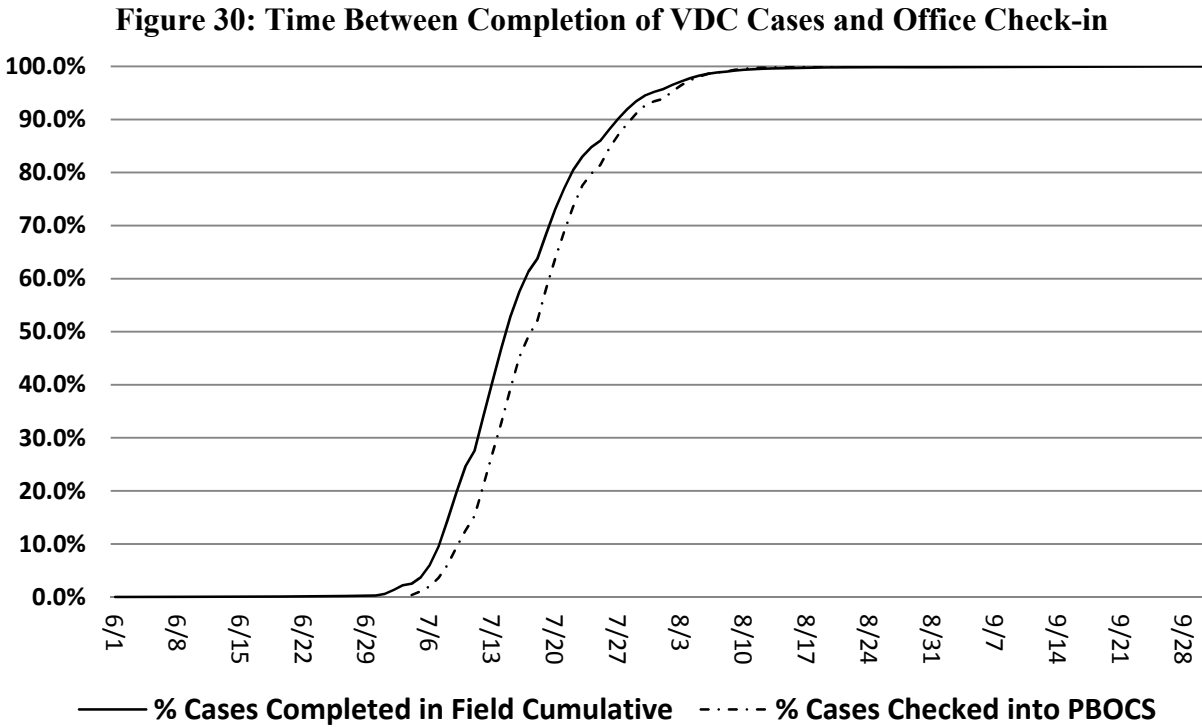
<b>Week</b>	<b>Total for that Time Period</b>	<b>Percent for that Time Period<sup>88</sup></b>	<b>Cumulative Percent</b>
6/01 - 6/05	162	<0.1%	<0.1%
6/06 - 6/12	525	<0.1%	<0.1%
6/13 - 6/19	388	<0.1%	0.1%
6/20 - 6/26	107	<0.1%	0.1%
6/27 - 7/03	39,200	1.9%	1.9%
7/04 - 7/10	455,605	21.9%	23.9%
7/11 - 7/17	722,367	34.8%	58.6%
7/18 - 7/23	431,274	20.8%	79.4%
7/24 - 7/31 Official Start of VDC	235,157	11.3%	90.7%
8/01 - 8/07	120,868	5.8%	96.5%
8/08 - 8/14	38,682	1.9%	98.4%
8/15 - 8/21	9,801	0.5%	98.8%
8/22 - 8/26 Official End of VDC	729	<0.1%	98.9%
8/27 - 8/28	25	<0.1%	98.9%
8/29 - 9/04	222	<0.1%	98.9%
9/05 - 9/11	942	<0.1%	98.9%
9/12 - 9/18	892	<0.1%	99.0%
9/19 - 9/25	648	<0.1%	99.0%
9/26 - 9/30	190	<0.1%	99.0%
Missing/Out of Range	20,503	1.0%	100.0%
<b>Total Delete Housing Units</b>	<b>2,078,287</b>	<b>100.0%</b>	<b>100.0%</b>

Source: DRF and Aux

**5.1.3.8.2 Check-in**Completion Dates Compared to PBOCS Check-in Data

As with NRFU, completed questionnaires had to be checked in to PBOCS by office staff. Figure 30 shows the difference between when a percentage of cases was completed in the field and when the same percentage was checked into PBOCS.

<sup>88</sup> This column does not total 100.0% due to rounding.

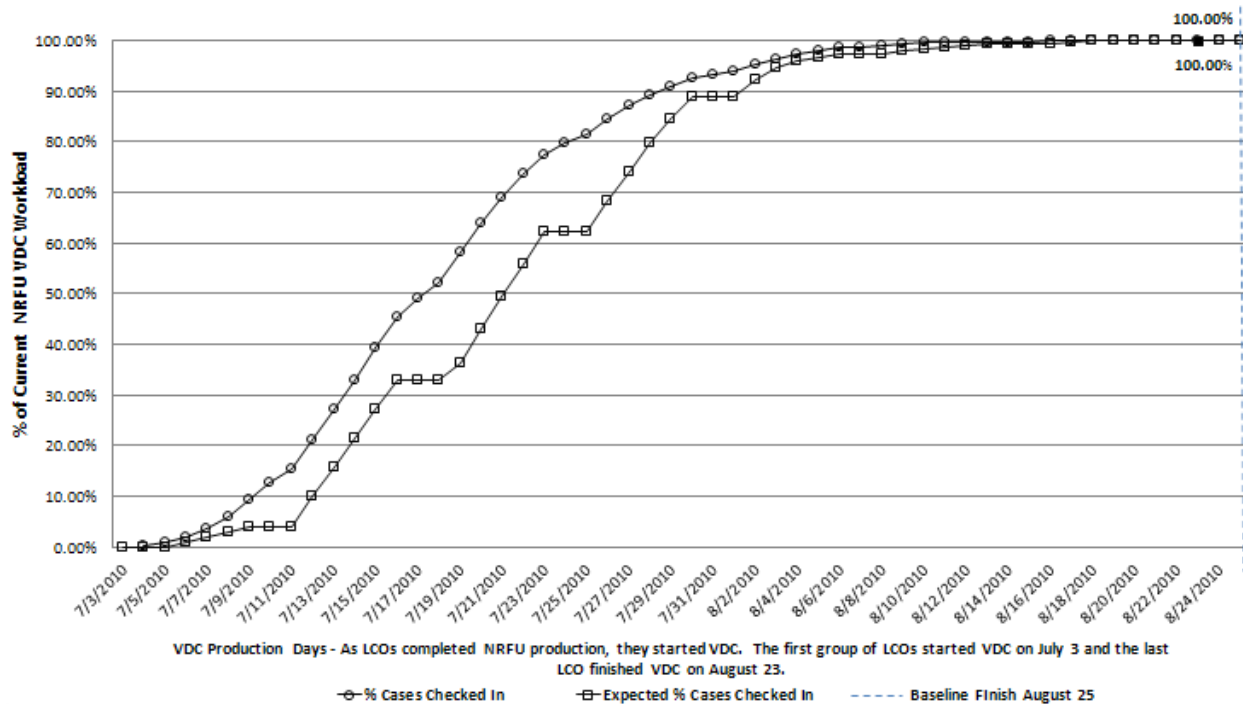


Source: DRF, AUX, and DMD C&P

The largest period of backlog was between July 9<sup>th</sup> and July 19<sup>th</sup>. During this period, the daily check-in backlog was between 10 percent and 14 percent.

Figure 31 depicts the cumulative percent of VDC questionnaires checked in daily compared to the expected check-in rates at the national level.

**Figure 31: Actual Percent of VDC Cases Checked-in Compared to the Expected Percent**



Source: DMD C&P

Figure 31 shows that cases were checked in to the office sooner than was expected for the VDC operation. The corresponding numbers, by week, are presented in Table 105.

**Table 105: Distribution of VDC Questionnaires Checked-in by Week**

Week	Date	Cumulative Number of EQs Checked-in	Cumulative Percent of EQs Checked-in	Expected Percent of EQs Checked-in
--	July 3 - July 9	800,742	9.4%	4.1%
--	July 10 - July 16	3,856,610	45.3%	32.8%
--	July 17 - July 23	6,645,831	77.6%	62.2%
1	July 24 - July 30	8,043,549	92.7%	88.9%
2	July 31 - August 6	8,607,636	98.6%	97.5%
3	August 7 - August 13	8,712,880	99.8%	99.3%
4	August 14 - August 20	8,728,160	100.0%	100.0%
4 ½	August 21 - August 23	8,730,457	100.0%	100.0%

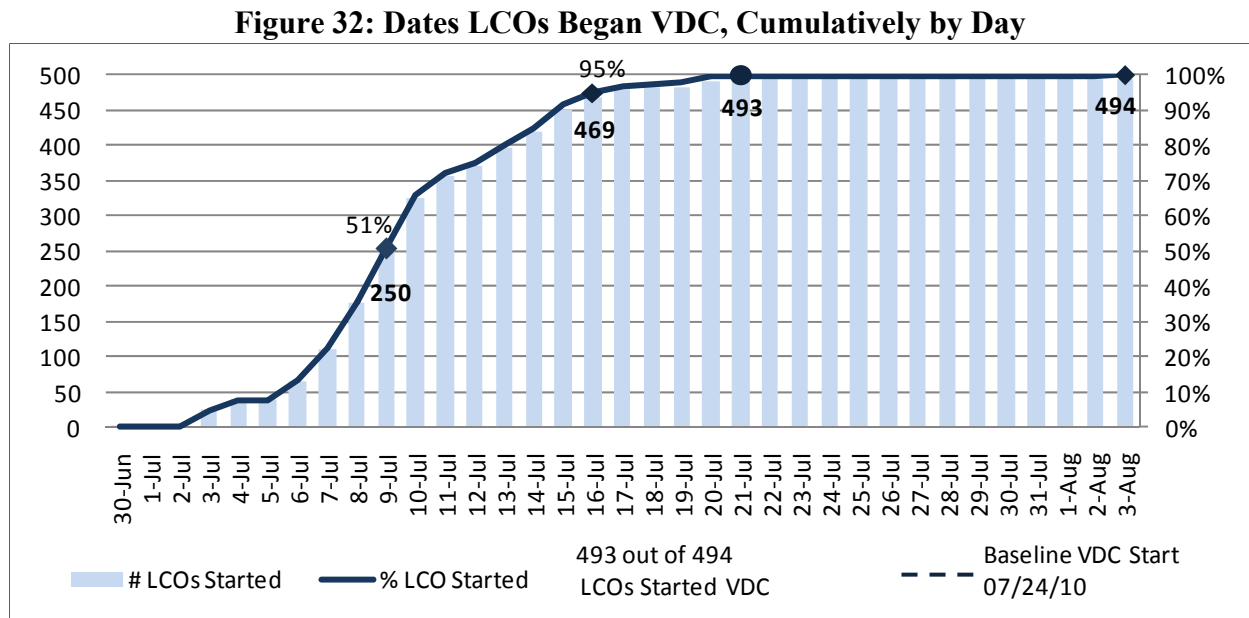
Source: DMD C&P



By July 23<sup>rd</sup>, a day before the baseline start date of the operation, over 77 percent of the workload was already complete at the national level based on check-in data. By the end of the official second week of the operation, on August 6<sup>th</sup>, close to 99 percent of the work was complete. The VDC operation reached 100 percent completion on August 23<sup>rd</sup>, two days before the planned finish.

#### 5.1.3.8.3 LCO Completion

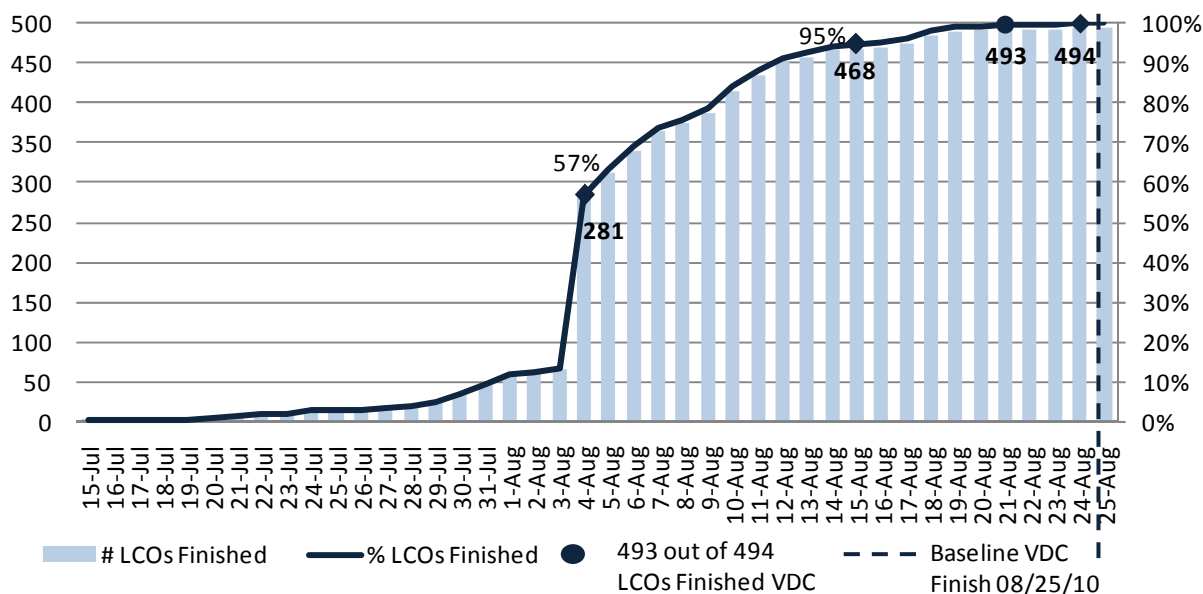
LCOs were able to start VDC once they were finished with NRFU and the VDC workloads were prepared. The first LCOs started VDC on July 1<sup>st</sup>. Figure 32 shows when the LCOs started VDC.



Source: DMD C&P

Since the majority of LCOs started VDC early, they were also able to finish the operation ahead of schedule. Figure 33 shows when the LCOs finished VDC.

**Figure 33: Dates LCOs Finished VDC, Cumulatively by Day**

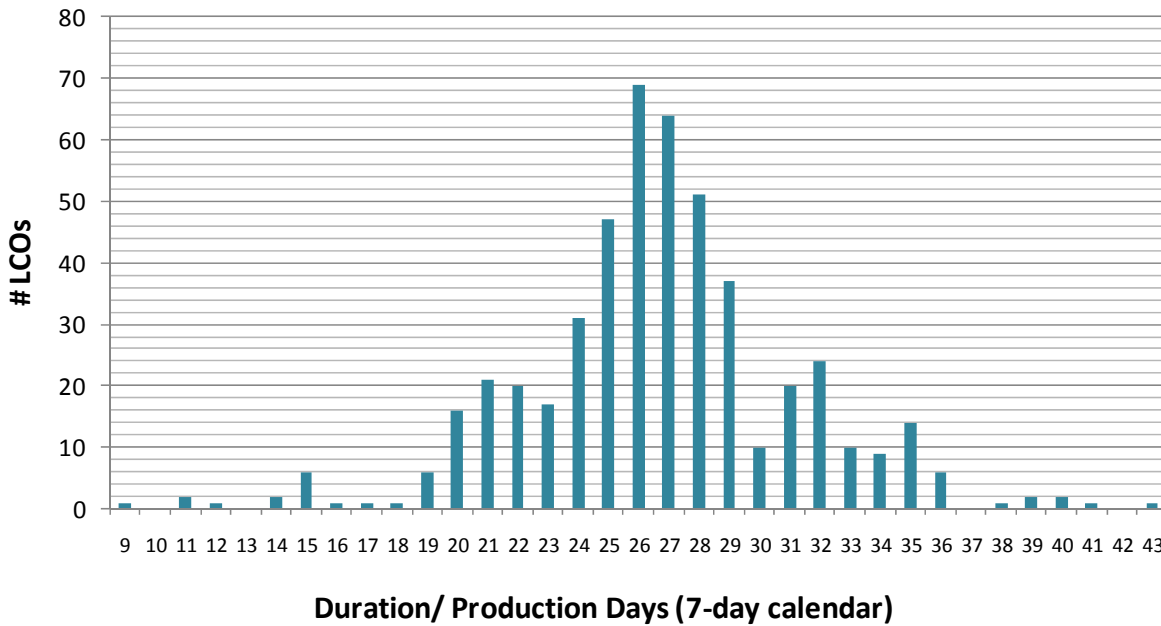


Source: DMD C&P

Another contributing factor to the LCOs finishing VDC early, other than the fact that they started early, is that the majority of LCOs tended to take slightly less time to conduct the operation than planned. The baseline schedule for conducting VDC was July 24<sup>th</sup> through August 25<sup>th</sup> (33 days on a 7-day calendar). However, the average LCO was able to complete the operation in 27 days. Approximately 93 percent of the LCOs completed VDC within the baseline duration or in fewer days.

Figure 34 shows a distribution of the durations that the LCOs took to complete the operation.

**Figure 34: Duration of VDC (in Days), by LCOs**



Source: DMD C&P

In the figure above, we calculated durations by subtracting the first date that cases were checked in to PBOCS for an LCO from the date the LCO reached 100 percent check-in. In actuality, LCOs would have started VDC a couple days prior to their first checked-in case. Therefore, the chart above slightly understates the production days.

### **5.1.3.9 Interview Characteristics**

The following section presents some paradata about the interviews with VDC respondents, including the language that interviews were conducted in, the number of contacts that enumerators made to enumerate a housing unit, and the type of respondents who completed VDC interviews.

#### **5.1.3.9.1 Language**

Table 106 shows the top five languages in which VDC interviews were conducted.

**Table 106: Top Five Languages in which VDC Interviews were Conducted**

<b>Total Number of Names</b>	<b>Total</b>	<b>Percent</b>
English	7,960,820	91.7%
Spanish	401,964	4.6%
Chinese	6,285	<0.1%
Korean	1,043	<0.1%
Russian	996	<0.1%
All other languages	4,028	0.1%
Multiple languages indicated	6,596	0.1%
Unknown language	304,196	3.5%
<b>Total Housing Units</b>	<b>8,685,928</b>	<b>100.0%</b>

Source: DRF and AUX

The vast majority (91.7 percent) were conducted in English, with an additional 4.6 percent in Spanish. Of the 401,964 VDC interviews conducted in Spanish, 246,078 (61.2 percent) of those were interviews conducted in Puerto Rico. There were 3.5 percent of VDC interviews conducted in an unknown language; this could be either that the language was not recorded by the enumerator, or that the flashcard with language options was not extensive enough to provide a numeric code to identify the language of the interview.

The full distribution of languages used to conduct the VDC operation is in Appendix D.

#### **5.1.3.9.2 Record of Contact**

Table 107 shows the distribution of the number of contacts made to an address in order to obtain a completed interview. The first column contains all 8,685,928 housing units in VDC. Subsequent columns look strictly at housing units by their final occupancy status. The occupied, vacant, and delete columns do not add up to the total of 8,685,928 housing units because some housing units had unresolved occupancy statuses, as shown in Table 81.

**Table 107: Number of Contact Attempts Made to VDC Housing Units<sup>89</sup>**

<b>Number of Contact Attempts</b>	<b>Overall Contact Attempts</b>	<b>Overall Percent</b>	<b>Occupied Count Attempts</b>	<b>Occupied Percent</b>	<b>Vacant Count Attempts</b>	<b>Vacant Percent</b>	<b>Delete Count Attempts</b>	<b>Delete Percent</b>
0 <sup>90</sup>	107,817	1.2%	4,989	0.2%	4,511	0.1%	94,902	4.6%
1	3,311,032	38.1%	798,331	35.2%	1,421,425	33.0%	1,075,181	51.7%
2	2,325,835	26.8%	503,015	22.2%	1,309,115	30.4%	503,289	24.2%
3	1,444,786	16.6%	399,879	17.7%	808,944	18.8%	230,518	11.1%
4	892,548	10.3%	281,892	12.4%	494,125	11.5%	113,366	5.5%
5	267,333	3.1%	109,820	4.8%	126,086	2.9%	30,558	1.5%
6	335,006	3.9%	166,627	7.4%	136,693	3.2%	30,473	1.5%
Unknown	1,571	<0.1%	537	<0.1%	1,034	<0.1%	0	0.0%
<b>Total Housing Units</b>	<b>8,685,928</b>	<b>100.0%</b>	<b>2,265,090</b>	<b>100.0%</b>	<b>4,301,933</b>	<b>100.0%</b>	<b>2,078,287</b>	<b>100.0%</b>

Source: DRF and AUX

Of the 8,685,928 housing units in VDC, 38.1 percent of them were contacted only one time. The frequency of contacts decreases except for a slight increase in the number of housing units that received six contacts, which is in line with what was reported for the distribution of contacts in both the NRFU and NRFU RI operations.

Comparing the columns in Table 107 that contain the universes of occupied, vacant, and deleted housing units, the deleted housing units were much more likely to only require one contact (51.7 percent of the time). They also had the highest percentage of cases that supposedly received zero contacts. Occupied housing units had the highest percentage of cases requiring six contacts (7.4 percent).

Table 108 shows the distribution of contacts made on the telephone. The first record of contact row was pre-filled as a personal visit so it was not possible to record six telephone contacts.

<sup>89</sup> These columns do not total 100.0% due to rounding.

<sup>90</sup> Cases with zero contacts reflect the number of cases that did not meet our criteria for documenting a valid record of contact.

**Table 108: Number of Telephone Contact Attempts Made to VDC Housing Units<sup>91</sup>**

<b>Number of Telephone Contact Attempts</b>	<b>Overall Contact Attempts</b>	<b>Overall Percent</b>	<b>Occupied Count Attempts</b>	<b>Occupied Percent</b>	<b>Vacant Count Attempts</b>	<b>Vacant Percent</b>	<b>Delete Count Attempts</b>	<b>Delete Percent</b>
0	7,640,505	88.0%	1,976,035	87.2%	3,720,678	86.5%	1,906,501	91.7%
1	849,272	9.8%	228,630	10.1%	473,937	11.0%	143,984	6.9%
2	145,209	1.7%	43,241	1.9%	80,295	1.9%	21,234	1.0%
3	40,510	0.5%	13,551	0.6%	21,298	0.5%	5,517	0.3%
4	7,695	0.1%	2,687	0.1%	4,078	0.1%	908	<0.1%
5	1,166	<0.1%	409	<0.1%	613	<0.1%	143	<0.1%
Unknown	1,571	<0.1%	537	<0.1%	1,034	<0.1%	0	0.0%
<b>Total Housing Units</b>	<b>8,685,928</b>	<b>100.0%</b>	<b>2,265,090</b>	<b>100.0%</b>	<b>4,301,933</b>	<b>100.0%</b>	<b>2,078,287</b>	<b>100.0%</b>

Source: DRF and AUX

The first column of Table 108 shows that 9.8 percent of the VDC universe was contacted exactly once by telephone. Housing units that were found to be vacant and those found to be occupied had similar rates of telephone contacts.

Table 109 presents the percentage of personal contacts made during VDC.

<sup>91</sup> These columns do not total 100.0% due to rounding.

**Table 109: Number of Personal Visit Contact Attempts Made to VDC Housing Units<sup>92</sup>**

<b>Number of Personal Contact Attempts</b>	<b>Overall Contact Attempts</b>	<b>Overall Percent</b>	<b>Occupied Count Attempts</b>	<b>Occupied Percent</b>	<b>Vacant Count Attempts</b>	<b>Vacant Percent</b>	<b>Delete Count Attempts</b>	<b>Delete Percent</b>
0	122,531	1.4%	13,451	0.6%	7,148	0.2%	98,435	4.7%
1	3,933,989	45.3%	929,718	41.0%	1,781,159	41.4%	1,204,320	57.9%
2	2,170,446	25.0%	497,085	21.9%	1,216,538	28.3%	447,396	21.5%
3	1,338,327	15.4%	391,012	17.3%	740,729	17.2%	201,621	9.7%
4	696,994	8.0%	232,686	10.3%	377,046	8.8%	84,817	4.1%
5	216,202	2.5%	97,685	4.3%	95,289	2.2%	22,510	1.1%
6	205,868	2.4%	102,916	4.5%	82,990	1.9%	19,188	0.9%
Unknown	1,571	<0.1%	537	<0.1%	1,034	<0.1%	0	0.0%
<b>Total Housing Units</b>	<b>8,685,928</b>	<b>100.0%</b>	<b>2,265,090</b>	<b>100.0%</b>	<b>4,301,933</b>	<b>100.0%</b>	<b>2,078,287</b>	<b>100.0%</b>

Source: DRF and AUX

Table 110 shows what mode the presumed last contact was with a housing unit. Cases with an unknown mode either had zero contacts identified, were dummy returns, or did not mark the checkbox to distinguish if it was a personal visit or a telephone visit for the last box utilized in the record of contact section.

<sup>92</sup> These columns do not total 100.0% due to rounding.



**Table 110: Type of Final Contact for Housing Units in VDC**

<b>Final Contact</b>	<b>Total Cases</b>		<b>Occupied</b>		<b>Vacant</b>		<b>Delete</b>	
	<b>Totals</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>
Personal Visit	7,386,723	85.0%	1,937,325	85.5%	3,638,971	84.6%	1,777,874	85.6%
Telephone	875,272	10.1%	223,291	9.9%	498,652	11.6%	150,496	7.2%
Unknown	423,933	4.9%	104,474	4.6%	164,310	3.8%	149,917	7.2%
<b>Total Housing Units</b>	<b>8,685,928</b>	<b>100.0%</b>	<b>2,265,090</b>	<b>100.0%</b>	<b>4,301,933</b>	<b>100.0%</b>	<b>2,078,287</b>	<b>100.0%</b>

Source: DRF and AUX

There is a much higher rate of unknown final contact type for those housing units marked for deletion (7.2 percent), than for either vacant housing units (3.8 percent) or occupied ones (4.6 percent). The last contact made to a vacant housing unit was a telephone call 11.6 percent of the time.

#### **5.1.3.9.3 Type of Respondent**

Table 111 reports the distribution of respondent type for all VDC interviews.

**Table 111: Type of Respondent for VDC Interviews, by Housing Unit Status**

<b>Respondent Type</b>	<b>Total Cases</b>		<b>Occupied</b>		<b>Vacant</b>		<b>Delete</b>	
	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>
Household Member	1,457,714	16.8%	1,309,151	57.8%	50,840	1.2%	96,394	4.6%
Unknown Type	62,447	0.7%	6,361	0.3%	10,150	0.2%	41,255	2.0%
All Proxy	7,165,767	82.5%	949,578	41.9%	4,240,943	98.6%	1,940,638	93.4%
Proxy Types								
In-mover	535,092	6.2%	46,550	2.1%	476,132	11.1%	10,224	0.5%
Neighbor or other	6,629,799	76.3%	902,873	39.9%	3,764,177	87.5%	1,930,337	92.9%
Both marked	876	<0.1%	155	<0.1%	634	<0.1%	77	<0.1%
<b>Total Housing Units</b>	<b>8,685,928</b>	<b>100.0%</b>	<b>2,265,090</b>	<b>100.0%</b>	<b>4,301,933</b>	<b>100.0%</b>	<b>2,078,287</b>	<b>100.0%</b>

Source: DRF and AUX

Table 111 shows that neighbors or other proxies accounted for 76.3 percent of all respondents while in-mover proxies were 6.2 percent of all respondents. Actual April 1 household members were 16.8 percent of all respondents. There were an additional 0.7 percent of respondents who could not be categorized.

Given that almost three-fourths of the VDC universe was determined to be either a vacant or deleted housing unit (shown in Table 81), the high number of proxy respondents makes sense.

For occupied housing units, the percent of respondents who were household members was 57.8 percent while neighbors or other proxies were interviewed in 39.9 percent of interviews, a higher proxy rate than was seen for interviews with occupied units in NRFU.

For vacant housing units, the percent of respondents who were in-movers was 11.1 percent in VDC, a higher percentage than the 7.0 percent seen in NRFU interviews with vacant housing units. Again, interviews were reported to have been conducted in VDC with household members of both vacant (1.2 percent) and delete (4.6 percent) housing units.

### 5.1.3.10 Characteristics of Occupied Housing Units

The tables in this section will discuss characteristics of the occupied housing units that were interviewed during VDC. This section will include results on occupied housing units' reported population count, answers to the undercount question, and answers to the overcount question.

#### 5.1.3.10.1 Population Count for Occupied Housing Units

Table 112 shows the distribution of population count within occupied housing units in VDC using both the enumerator-reported population count and the number of data-defined people.

**Table 112: Population Count of Housing Units Found to be Occupied During VDC**

Population Count	Enumerator-Reported		Data-defined People	
	Number of Housing Units	Percent	Number of Housing Units	Percent
0	637	<0.1%	346,795	15.3%
1	754,339	33.3%	688,036	30.4%
2	654,600	28.9%	570,226	25.2%
3	314,005	13.9%	272,224	12.0%
4	256,063	11.3%	217,310	9.6%
5	124,251	5.5%	109,536	4.8%
6	43,354	1.9%	35,448	1.6%
7	20,510	0.9%	13,851	0.6%
8	8,458	0.4%	5,947	0.3%
9	3,573	0.2%	2,554	0.1%
10	1,942	0.1%	1,562	0.1%
11 – 15	2,212	0.1%	1,336	<0.1%
16 – 20	257	<0.1%	136	<0.1%
21 – 30	147	<0.1%	53	<0.1%
31 – 40	52	<0.1%	37	<0.1%
41 – 49	109	<0.1%	32	<0.1%
50 – 97	173	<0.1%	7	<0.1%
98 (Delete)	58	<0.1%	N/A <sup>93</sup>	N/A
99 (Unknown)	79,761	3.5%	N/A	N/A
Missing	589	<0.1%	N/A	N/A
<b>Total Occupied Housing Units</b>	<b>2,265,090</b>	<b>100.0%</b>	<b>2,265,090</b>	<b>100.0%</b>

Source: DRF

<sup>93</sup> Not Applicable

Of the 2,265,090 occupied housing units enumerated in VDC, the enumerator reported that 33.3 percent had one person living in them, and 28.9 percent had two people. However, the distribution of number of data-defined people reported per housing unit is lower than the enumerator reported population count. There were 15.3 percent of the occupied housing units with zero data-defined people. That is nearly double the rate of occupied housing units with zero data-defined people in NRFU. After the interview, a population count was still unknown for 3.5 percent of VDC occupied units, roughly twice the rate as for NRFU interviews. The increase in the number of zero data-defined people in VDC could be the result of more proxy respondents in VDC. Proxy respondents could be less likely to know detailed demographic information about the people living at the VDC housing unit.

Table 113 reports how many cases with an unknown enumerator-reported population count were also marked as refusals.

**Table 113: Unknown Population Counts for VDC Occupied Housing Units**

<b>Refusal Status</b>	<b>Number of Housing Units</b>	<b>Percent</b>
Refusals	5,642	7.1%
Not a Refusal	74,119	92.9%
<b>Unknown Population Counts</b>	<b>79,761</b>	<b>100.0%</b>

Source: DRF

The vast majority of the occupied housing units in VDC that had an unknown population count were not marked as a refusal (92.9 percent).

The parent EQ only had space to roster five people in a household. If more than five people lived at an address, then enumerators had to use a continuation form. Continuation forms did not have any of the beginning or concluding questions printed on them; they only collected person-level data for up to five persons on each continuation form. Table 114 shows the number of continuation forms used to enumerate people at each address in VDC.

**Table 114: Number of Continuation Forms used at an Address During VDC**

<b>Number of Continuation Forms</b>	<b>Number of Housing Units</b>	<b>Percent</b>
0	2,197,570	97.0%
1	65,577	2.9%
2	1,607	0.1%
3	179	<0.1%
4	38	<0.1%
5	27	<0.1%
6	22	<0.1%
7	20	<0.1%
8	12	<0.1%
9	34	<0.1%
10	1	<0.1%
11	1	<0.1%
12	0	0.0%
13	1	<0.1%
14	0	0.0%
15	0	0.0%
16	1	<0.1%
<b>Total Occupied Housing Units</b>	<b>2,265,090</b>	<b>100.0%</b>

Source: DRF

Table 114 shows that the majority of housing units enumerated in VDC did not utilize a continuation form. Of the occupied housing units, 2.9 percent required one continuation form and 97.0 percent had five or less people listed as residents at the housing unit.

#### **5.1.3.10.2 Undercount Question**

After the household roster and demographic characteristics were collected during the VDC interview, the enumerator asked a series of questions that probed if anyone else might have been staying at the address. Table 115 shows the frequency that each probe was marked with an affirmative answer and the number that answered affirmatively for multiple categories.

**Table 115: Distribution of Answers to the Undercount Probes at Occupied VDC Housing Units**

<b>Undercount Category</b>	<b>Total</b>	<b>Percent<sup>94</sup></b>
Only 'No' category marked	1,662,582	73.4%
At least one category marked	16,497	0.7%
Babies only	1,618	0.1%
Foster children only	352	<0.1%
Any other relatives only	8,366	0.4%
Roommates only	1,804	0.1%
Any other nonrelatives only	1,998	0.1%
Anyone else staying on April 1 who had no permanent place to live only	1,474	0.1%
Multiple categories marked	885	<0.1%
Missing (All boxes blank)	586,011	25.9%
<b>Total Occupied Housing Units</b>	<b>2,265,090</b>	<b>100.0%</b>

Source: DRF

At least one undercount category was marked for 0.7 percent of the occupied VDC housing units. The most common VDC undercount category selected was “any other relatives,” similar to NRFU and NRFU RI. Over a quarter of the questionnaires (25.9 percent) had no checkboxes marked on the form, to indicate either a ‘no’ or a ‘yes’ reply.

If the respondent answered ‘yes’ to any of the probes, the VDC enumerator was to collect a maximum of two names for the people who were possibly undercounted. Table 116 shows the number of undercount names reported when any undercount category was marked.

**Table 116: Number of Undercount Names Reported when Any Undercount Category was marked in VDC Occupied Housing Units**

<b>Total Number of Names</b>	<b>Total</b>	<b>Percent<sup>95</sup></b>
Zero Names	2,166	13.1%
One Name	11,770	71.3%
Two Names	2,561	15.5%
<b>Total Occupied Housing Units with Category Selected</b>	<b>16,497</b>	<b>100.0%</b>

Source: DRF and AUX

Table 116 shows the number of undercount names reported when any undercount category was marked.

<sup>94</sup> This column does not total 100.0% due to rounding.

<sup>95</sup> This column does not total 100.0% due to rounding.

Table 116 shows that 13.1 percent of questionnaires did not have a name in the boxes even though an undercount category had been marked. There were 15.5 percent of questionnaires with an undercount category that provided two names.

Table 117 shows how often a name was provided to the enumerator when a respondent had replied affirmatively to a specific undercount category.

**Table 117: Number of Undercount Names Reported with the Specific Undercount Category in VDC Occupied Housing Units**

<b>Undercount Category with Number of Names</b>	<b>Total</b>	<b>Percent<sup>96</sup></b>
<b>Babies only</b>		
Zero Names	362	22.4%
One Name	1,095	67.7%
Two Names	161	10.0%
<b>Total</b>	<b>1,618</b>	<b>100.0%</b>
<b>Foster children only</b>		
Zero Names	70	19.9%
One Name	195	55.4%
Two Names	87	24.7%
<b>Total</b>	<b>352</b>	<b>100.0%</b>
<b>Any other relatives only</b>		
Zero Names	607	7.3%
One Name	6,374	76.2%
Two Names	1,385	16.6%
<b>Total</b>	<b>8,366</b>	<b>100.0%</b>
<b>Roommates only</b>		
Zero Names	316	17.5%
One Name	1,326	73.5%
Two Names	162	9.0%
<b>Total</b>	<b>1,804</b>	<b>100.0%</b>
<b>Any other nonrelatives only</b>		
Zero Names	266	13.3%
One Name	1,551	77.6%
Two Names	181	9.1%
<b>Total</b>	<b>1,998</b>	<b>100.0%</b>
<b>Anyone else only</b>		
Zero Names	183	12.4%
One Name	1,112	75.4%
Two Names	179	12.1%
<b>Total</b>	<b>1,474</b>	<b>100.0%</b>
<b>Multiple</b>		
Zero Names	362	40.9%
One Name	117	13.2%
Two Names	406	45.9%
<b>Total</b>	<b>885</b>	<b>100.0%</b>
<b>None<sup>97</sup></b>		
Zero Names	2,247,872	100.0%
One Name	590	<0.1%
Two Names	131	<0.1%
<b>Total</b>	<b>2,248,593</b>	<b>100.0%</b>

Source: DRF and AUX

<sup>96</sup> This column may not total 100.0% due to rounding.

<sup>97</sup> These numbers include both rows “Missing” and “Only ‘No’ category marked” from Table 115.



Table 115 showed that the category “other relatives” was the most commonly utilized undercount category, and Table 117 shows that the “other relatives” category was the category most likely to successfully elicit at least one name. Only 7.3 percent of people who answered the “other relatives” category did not provide a name, the smallest of any category.

Respondents who indicated multiple undercount categories applied to their household were the most likely to not provide a name, 40.9 percent of the time, but were also the most likely to provide two names (45.9 percent of the time).

### 5.1.3.10.3 Overcount Question

There were 4,480,956 people data-defined on the EQs from occupied housing units in VDC. Table 118 describes the outcome of the overcount question.

**Table 118: Overcount Category for Data-defined People in VDC Occupied Housing units**

<b>Overcount Category</b>	<b>Number of People</b>	<b>Percent</b>
None	4,334,390	96.7%
At least one category marked	146,566	3.3%
College Housing only	12,529	0.3%
Military only	15,055	0.3%
Seasonal/Second Home only	54,317	1.2%
Child Custody only	21,228	0.5%
Jail or Prison only	2,285	0.1%
Nursing Home only	3,201	0.1%
Another Reason only	33,343	0.7%
Multiple	4,608	0.1%
<b>Total People in Occupied Housing units</b>	<b>4,480,956</b>	<b>100.0%</b>

Source: DRF

The vast majority of people (96.7 percent) did not indicate they lived or stayed anywhere else besides the VDC address. The most common positive reply to the overcount question was for a seasonal or second home, which described 1.2 percent of people. An additional 0.7 percent stayed elsewhere for an undefined reason and 0.5 percent of people indicated they stayed elsewhere for child custody. Both military reasons and college reasons were cited by 0.3 percent of people.

### 5.1.3.11 Standard Demographic Tables

There were 4,480,956 data-defined persons included on 2,265,090 occupied VDC forms in the 2010 Census. This section will present the demographic characteristics for these persons on the VDC form. Table 119 through Table 123 give VDC person demographic characteristics: age, Hispanic origin, race, relationship to person 1, and sex. Age was calculated based on the date of birth provided; if no date of birth was provided then the write-in age was used. Age was calculated only if the date of birth fell within valid date ranges. Similarly, the calculated age or write-in age was used only if it fell within valid age ranges; otherwise it was considered missing. Table 124 also gives the distribution of tenure responses for housing units included in the VDC operation.

Because the demographic data used in this assessment are unedited, direct comparisons with published 2010 Census results are not possible. These tables include a row for people with missing values for the specific characteristic. The data in published Census reports have undergone editing and imputation, and therefore will have no missing values.

**Table 119: Standard Assessment Demographic Table for Age in VDC Interviews**

<b>Age</b>	<b>Number of People</b>	<b>Percent<sup>98</sup></b>
Under 5 years	229,302	5.1%
5 to 9 years	209,513	4.7%
10 to 14 years	195,049	4.4%
15 to 19 years	192,771	4.3%
20 to 24 years	211,595	4.7%
25 to 29 years	232,635	5.2%
30 to 34 years	213,702	4.8%
35 to 39 years	199,142	4.4%
40 to 44 years	184,489	4.1%
45 to 49 years	183,646	4.1%
50 to 54 years	166,123	3.7%
55 to 59 years	140,277	3.1%
60 to 64 years	117,745	2.6%
65+ years	278,506	6.2%
Missing	1,726,461	38.5%
<b>Total</b>	<b>4,480,956</b>	<b>100.0%</b>

Source: DRF

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<sup>98</sup> This column does not total 100.0% due to rounding.

**Table 120: Standard Assessment Demographic Table for Hispanic Origin in VDC Interviews**

<b>Hispanic Origin</b>	<b>Number of People</b>	<b>Percent</b>
Not Hispanic or Latino checkbox only	3,296,416	73.6%
Mexican checkbox only	457,317	10.2%
Puerto Rican checkbox only	161,883	3.6%
Cuban checkbox only	20,929	0.5%
Another Hispanic checkbox only	25,939	0.6%
Multiple checkboxes	3,852	0.1%
Both Checkbox and Write-in	149,264	3.3%
Write-in Only	9,090	0.2%
Missing	356,266	8.0%
<b>Total</b>	<b>4,480,956</b>	<b>100.0%</b>

Source: DRF

**Table 121: Standard Assessment Demographic Table for Race in VDC Interviews**

<b>Race</b>	<b>Number of People</b>	<b>Percent</b>
White checkbox alone	2,757,072	61.5%
Black or African American checkbox alone	670,193	15.0%
American Indian and Alaska Native checkbox alone	10,055	0.2%
Asian Indian checkbox alone	48,402	1.1%
Chinese checkbox alone	32,632	0.7%
Filipino checkbox alone	25,577	0.6%
Japanese checkbox alone	6,309	0.1%
Korean checkbox alone	15,731	0.4%
Vietnamese checkbox alone	15,011	0.3%
Other Asian checkbox alone	890	<0.1%
Native Hawaiian checkbox alone	3,256	0.1%
Guamanian or Chamorro checkbox alone	1,677	<0.1%
Samoan checkbox alone	1,401	<0.1%
Other Pacific Islander checkbox alone	201	<0.1%
Some Other Race checkbox alone	11,292	0.3%
Multiple checkboxes	56,082	1.3%
Both Checkbox and Write-in	463,109	10.3%
Write-in Only	21,264	0.5%
Missing	340,802	7.6%
<b>Total</b>	<b>4,480,956</b>	<b>100.0%</b>

Source: DRF

**Table 122: Standard Assessment Demographic Table for Relationship Status in VDC Interviews**

<b>Relationship Status</b>	<b>Number of People</b>	<b>Percent</b>
Householder	1,902,255	42.5%
Husband or Wife of Householder	707,658	15.8%
Biological Son or Daughter of Householder	1,124,916	25.1%
Adopted Son or Daughter of Householder	18,991	0.4%
Stepson or Stepdaughter of Householder	47,858	1.1%
Brother or Sister of Householder	54,887	1.2%
Father or Mother of Householder	52,670	1.2%
Grandchild of Householder	64,164	1.4%
Parent-in-law of Householder	8,474	0.2%
Son-in-law or Daughter-in-law of Householder	10,991	0.3%
Other Relative	57,047	1.3%
Roomer or Boarder	19,110	0.4%
Housemate or Roommate	108,780	2.4%
Unmarried Partner	101,214	2.3%
Other Nonrelative	51,289	1.1%
Two or more relationships	3,327	0.1%
Missing	147,325	3.3%
<b>Total</b>	<b>4,480,956</b>	<b>100.0%</b>

Source: DRF

**Table 123: Standard Assessment Demographic Table for Sex in VDC Interviews**

<b>Sex</b>	<b>Number of People</b>	<b>Percent</b>
Male	2,208,144	49.3%
Female	2,178,333	48.6%
Both	1,087	<0.1%
Missing	93,392	2.1%
<b>Total</b>	<b>4,480,956</b>	<b>100.0%</b>

Source: DRF

**Table 124: Standard Assessment Demographic Table for Tenure in VDC Interviews**

<b>Tenure</b>	<b>Number of Housing Units</b>	<b>Percent</b>
Owned with a mortgage or a loan	524,487	23.2%
Owned without a mortgage or a loan	259,422	11.5%
Rented	902,665	39.9%
Occupied without payment of rent	43,139	1.9%
Multiple	1,142	0.1%
Missing	534,235	23.6%
<b>Total</b>	<b>2,265,090</b>	<b>100.0%</b>

Source: DRF

These distributions may vary across different 2010 Census operations due to differences in corresponding populations and census procedures.

### **5.1.3.12 Added Housing Units**

The following section discusses housing units that were not part of a VDC enumerators' assigned work but were either visited or discussed during the course of an interview. In Table 5, we noted that 28,575 cases were removed from the universe that was the basis for all previous VDC analysis. Those cases were added housing units that did not have enough address information to be successfully geocoded and assigned a MAFID so were not eligible for inclusion in the census. Of those, 4,093 cases were actually added in NRFU and visited a second time in VDC so they will not be discussed in this section about VDC adds. The other 24,482 however were added during VDC. While they were not successfully geocoded, they do represent work done by enumerators and are discussed in this section.

#### **5.1.3.12.1 Characteristics of Added Housing Units**

As stated earlier in section 5.1.1.7, there are two types of added housing units that are relevant to this field operation: Type A and Type C cases. Type A cases consist of a cases where the respondent at a NRFU address might have reported the NRFU address as a vacation home and claimed that they really lived or stayed at another address where they should have been counted by the Census (called a Usual Home Elsewhere (UHE)). Adds that were Type A cases were to only be processed if at least one person was listed on the questionnaire (i.e., one person had a value of one for the variable PNC). However, some Type A cases without a person record were incorrectly included for processing. Type C cases occurred when an enumerator observed a housing unit that was missing from their address binder and completed an EQ for the housing unit. Type C cases were processed regardless of how many people were listed. Table 125 shows the number of adds in VDC for each type.

**Table 125: Type of Potential Added Housing Units in VDC**

<b>Type</b>	<b>Number of Housing Units</b>	<b>Percent</b>
Type A (PNC=1) Total	976	0.4%
Type A (PNC=0) Total	521	0.2%
Type C	242,059	99.4%
<b>Total</b>	<b>243,556</b>	<b>100.0%</b>

Source: DRF

The majority of the added housing units in VDC were Type C cases (99.4 percent).

Since the collected address information differed between Puerto Rico and stateside adds, Table 126 presents the distribution of types of potential Adds in stateside and Puerto Rico separately.

**Table 126: Frequency of Added Housing Units in VDC, Stateside or Puerto Rico**

<b>Type</b>	<b>Stateside</b>		<b>Puerto Rico</b>	
	<b>Number of Housing Units</b>	<b>Percent</b>	<b>Number of Housing Units</b>	<b>Percent</b>
Type A (PNC=1)	974	0.4%	2	<0.1%
Type A (PNC=0)	519	0.2%	2	<0.1%
Type C	237,415	99.4%	4,644	99.9%
<b>Total</b>	<b>238,908</b>	<b>100.0%</b>	<b>4,648</b>	<b>100.0%</b>

Source: DRF

Puerto Rico only had four Type A cases, and two did not have adequate person information to be an actual Type A add.

Type A Adds can also be further grouped into two living situations, as described earlier in section 5.1.1.7. Table 127 shows the number of Type A cases that fit each description.

**Table 127: Frequency of Living Situations Identified for Type A Adds in VDC**

<b>Type A Living Situations</b>	<b>Type A with PNC=1</b>		<b>Type A with PNC=0</b>	
	<b>Number</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>
UHE	131	13.4%	308	59.1%
Movers	843	86.4%	210	40.3%
Both UHE and Movers	2	0.2%	3	0.6%
<b>Total Type A Cases</b>	<b>976</b>	<b>100.0%</b>	<b>521</b>	<b>100.0%</b>

Source: DRF

For Type A cases with a person enumerated at the address, 86.4 percent were classified as movers. However, for Type A cases that did not have a person enumerated on the questionnaire, more cases were classified as UHEs (59.1 percent) than movers (40.3 percent).

All added housing units went through a process by the Geography Division that attempted to geocode and then assign a MAFID to the address. GEO needs to discern the state, county, and census block that an address is in to successfully geocode it. Table 128 shows the frequency with which GEO was able to successfully geocode and assign MAFIDs to added housing units and thus allocate them to a state for apportionment.

**Table 128: Frequency of Added Housing Units from VDC Associated with a State**

<b>Type</b>	<b>Number of Housing Units</b>	<b>Percent</b>
In a State and coded to a Block	219,074	89.9%
Not associated with a State	24,482	10.1%
<b>Total</b>	<b>243,556</b>	<b>100.0%</b>

Source: DRF

Table 128 reports that 89.9 percent of housing units added during VDC were able to be geocoded to a block in a state.

Table 129 shows how many of each type of added housing units were successfully geocoded.

**Table 129: Frequency of Added Housing Units from VDC Associated with a State, by Type**

<b>Type</b>	<b>Type A with PNC=1</b>		<b>Type A with PNC=0</b>		<b>Type C</b>	
	<b>Number</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>
In a State and coded to a Block	690	70.7%	470	90.2%	217,914	90.0%
Not associated with a State	286	29.3%	51	9.8%	24,145	10.0%
<b>Total</b>	<b>976</b>	<b>100.0%</b>	<b>521</b>	<b>100.0%</b>	<b>242,059</b>	<b>100.0%</b>

Source: DRF

Ninety percent of the Type C cases were successfully geocoded, as were 90.2 percent of the Type A adds without a valid person record. Only 70.7 percent of the Type A cases with a valid person record were successfully geocoded however. The records not associated with a state are records that GEO was unable to geocode and not assigned a MAFID. Therefore they are not associated with a state on the DRF file.

#### **5.1.3.12.2 Geography of Added Housing Units**

Because of the differences in when enumerators collected address information and the availability of it (described in Section 5.1.1.7.2), there were two places on the EQ where enumerators could record geographic and address information about an added housing unit. Section 5.1.1.7 on Adds includes images of the areas where this information was collected on the questionnaire.

Subsequent tables show the completeness of address information collected on the stateside and Puerto Rico EQs during VDC. To assess if the adds can be found on the ground by a Census enumerator in the future, the information collected in the address fields is extremely important.

#### 5.1.3.12.2.1 Address Information of Type A Adds

As first described in section 5.1.1.7.2.1 for Type A cases from stateside questionnaires, the address fields necessary for a complete record came only from the H3 question and were:

- House Number,
- Street Name,
- And ZIP Code.

For Type A cases in Puerto Rico, there are two combinations of address fields that could comprise a complete record, again using only address information collected in question H3. An address needs to meet one of these two combinations to be complete:

Combination 1.

- Numero de casa,
- Nombre de calle o direccion estilo rural or Urbanizacion/Condominio/Residencial, and
- Codigo postal

Combination 2:

- Designacion de Unidad,
- Urbanizacion/Condominio/Residencial,
- Codigo postal or State

The analysis on address information confirms only that the necessary fields were filled, but not that the data in the fields are valid and correct.

Table 130 shows the address combinations for all stateside Type A cases.

<b>Table 130: Content of Address Fields for All Stateside Type A Adds from VDC</b>				
<b>House Number, Street Name, and ZIP Code</b>	<b>Type A with PNC=1</b>		<b>Type A with PNC=0</b>	
	<b>Number</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>
All Filled	878	90.1%	449	86.5%
All Blank	45	4.6%	9	1.7%
At least 1 field filled	51	5.2%	61	11.8%
<b>Total Stateside Type A Cases</b>	<b>974</b>	<b>100.0%</b>	<b>519</b>	<b>100.0%</b>

Source: DRF

The Type A cases with a valid person record were more likely to have complete information provided than cases without a valid person record. The Adds with a person record had no information written in to the three key address fields (house number, street name and zip code)



4.6 percent of the time as compared to only 1.7 percent of the time when a valid person record was not present.

Since there were only four Type A cases with Puerto Rico addresses, we do not present a table on the address information provided in those cases.

#### **5.1.3.12.2.2 Address Information of Type C Adds**

Type C cases were the added housing units that the enumerator visibly saw in front of them. For an enumerator to find a Type C case in the future, a combination of address fields from question H3 and geographic fields near the label on the front of the EQ are needed. The necessary fields of stateside Type C addresses are:

- House Number (H3),
- Street Name (H3),
- Block (EQ front),
- County (EQ front), and
- State (EQ front)

The necessary address fields for Type C Puerto Rico addresses, and the section of the EQ they come from, are:

Combination 1:

- Numero de casa (H3),
- Nombre de calle o direccion estilo rural or Urbanizacion/Condominio/Residencia (H3),
- Block (EQ Front),
- Municipio (EQ Front), and
- State (EQ Front).

Combination 2:

- Designacion de Unidad (H3),
- Urbanizacion/Condominio/Residencial (H3),
- Block (EQ Front),
- Municipio (EQ Front), and
- State (EQ front).

The next two tables show the number of Type C cases with these address fields filled. Table 131 reports the completeness of address information collected on all stateside Type C adds.

**Table 131: Content of Address Fields for All Stateside Type C Adds from VDC**

<b>House Number, Street Name, Block, County, and State</b>	<b>Number</b>	<b>Percent</b>
All Filled	161,846	68.2%
All Blank	72,751	30.6%
At least 1 field filled	2,818	1.2%
<b>Total Stateside Type C Cases</b>	<b>237,415</b>	<b>100.0%</b>

Source: DRF

Table 131 reports that 68.2 percent of Type C cases from VDC stateside enumerators had complete information for all five of the address fields investigated for this table. Of Type C stateside cases, 30.6 percent had all five address fields blank.

Table 132 shows the completeness of address information collected on all Puerto Rico Type C cases.

**Table 132: Content of Address Fields for All Puerto Rico Type C Adds from VDC**

<b>Address Field Groupings</b>	<b>Number</b>	<b>Percent</b>
Address Combination 1		
All filled	669	14.4%
All blank	0	0.0%
Address Combination 2		
All filled	1,537	33.1%
All blank	0	0.0%
At least 1 field filled, but not all, of the following fields (Numero de casa, Designacion de Unidad, Nombre de calle o direccion estilo rural, Urbanizacion/Condominio/Residencial, Block, Municipio, State)	2,438	52.5%
<b>Total Puerto Rico Type C Cases</b>	<b>4,644</b>	<b>100.0%</b>

Source: DRF

Table 132 reports that all Type C cases from Puerto Rico enumerators had at least one piece of address information. The state codes pre-printed on all the Puerto Rico questionnaires account for the high percentage of completed address fields. Only 14.4 percent had all address fields filled from Combination 1, while over one-half of the NRFU Type C Puerto Rico adds had all five address fields filled for Combination 1.

### 5.1.4 NRFU Residual

NRFU Residual was an ad hoc operation developed when Census Headquarters processing found that there were housing units where more information was needed to avoid imputation. This included cases that were LMRs and blank returns and not previously worked, as well as cases worked in NRFU where the enumerator identified the housing unit as being occupied but had not determined a population count. There was no Reinterview component to the NRFU Residual operation.

The following sections will report on results of the Residual operation:

- Section 5.1.4.1 discusses the formation of the analysis universe.
- Section 5.1.4.2 discusses the origins of the Residual workload.
- Section 5.1.4.3 discusses the housing unit status of cases worked in Residual.
- Section 5.1.4.4 discusses the timing when Residual interviews were completed and when they were checked-in.
- Section 5.1.4.5 discusses characteristics of Residual interviews, notably key paradata results.
- Section 5.1.4.6 discusses characteristics of occupied housing units.
- Section 5.1.4.7 presents the standard demographic tables for Residual.

#### 5.1.4.1 Formation of the Analysis Universe

The top row in Table 133 is the total number of EQs on the DRF from the NRFU RES operation, including multiple copies of the same questionnaire. Table 133 only has three rows, unlike the corresponding table for the other three NRO operations, because there were no added questionnaires in NRFU RES. Enumerators in NRFU RES were not allowed to add housing units.

In Table 133, the second row removes multiple copies of the same questionnaire. The third row in the table removes duplicated questionnaires generated for an address due to rework. There were 4,483 additional questionnaires completed for housing units in the NRFU RES universe due to rework. The universe to analyze the results of the NRFU RES operation from the DRF in this assessment is 728,823 unique housing units.

**Table 133: NRFU RES Universe Characteristics**

<b>NRFU RES Universe Characteristics</b>	<b>Number of Questionnaires</b>
Questionnaires on the DRF	733,748
Unique questionnaires on the DRF associated with an address	733,306
Unique housing units on the DRF associated with a state	728,823

Source: DRF

#### 5.1.4.2 Origins of the NRFU Residual Workload

The NRFU RES workload originated from two different sources. The first source consisted of blank mail returns that were not included in the VDC workload. The second source was occupied housing units from NRFU where the number of people living at the address was unknown.<sup>99</sup>

Table 134 presents the distribution of workload by these two sources, as could be identified on the DRF.

**Table 134: Sources of the NRFU RES workload**

<b>Source</b>	<b>Number of cases</b>	<b>Percent<sup>100</sup></b>
Blank Mail Returns	417,185	57.2%
Occupied Housing Units from NRFU, Unknown Population count	310,604	42.6%
Unknown	1,034	0.1%
<b>Total</b>	<b>728,823</b>	<b>100.0%</b>

Source: DRF

For this analysis, these universes were identified by matching the NRFU RES workload to the NRFU workload. Of the 728,823 cases in NRFU RES, 310,604 had a corresponding NRFU case that was enumerated as occupied with an unknown population count, as shown in Table 134. There were 417,185 NRFU RES cases that did not have a corresponding NRFU case. These cases are considered the Blank Mail Return portion of the NRFU Residual workload. Additionally, there were 1,034 cases that had a corresponding NRFU case but that case was not enumerated as an occupied housing unit with an unknown population count. These last cases are categorized as an unknown universe source since they do not meet the definitions of either of the known universe sources.

#### 5.1.4.3 NRFU Residual Housing Unit Status

Table 135 reports the distribution of housing unit status for the cases worked in RES.

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<sup>99</sup> The interview also could not be a respondent refusal.

<sup>100</sup> This column does not total 100.0% due to rounding.

**Table 135: NRFU RES Housing Unit Status**

<b>Housing Unit Status</b>	<b>Number of Housing Units</b>	<b>Percent</b>
Occupied	373,207	51.2%
Vacant	296,809	40.7%
Delete	56,663	7.8%
Unresolved	2,144	0.3%
<b>Total</b>	<b>728,823</b>	<b>100.0%</b>

Source: DRF

Of the entire NRFU RES workload, Table 135 shows that 51.2 percent of housing units were found to be occupied, 40.7 percent were found to be vacant, and 7.8 percent were to be deleted. More information on the final housing unit status by universe source is in Table 140.

Table 136 shows the number of housing units marked as refusals during the NRFU RES operation, by housing unit status.

**Table 136: NRFU RES Refusals**

<b>Housing Unit Status</b>	<b>Number of Housing Units</b>	<b>Number of Refusals</b>	<b>Refusal Percentage</b>
Occupied	373,207	3,147	0.8%
Vacant	296,809	259	0.1%
Delete	56,663	57	0.1%
Unresolved	2,144	66	3.1%
<b>Total Housing Units</b>	<b>728,823</b>	<b>3,529</b>	<b>0.5%</b>

Source: DRF

Of the 728,823 housing units in NRFU RES, there were 3,529 (0.5 percent) that were marked as a refusal on the questionnaire. Of the housing units that had an unresolved status, 3.1 percent were flagged as refusals.

The following tables look at occupied, vacant and delete housing units in more depth.

The reported population count of an occupied housing unit (as captured in Item C from Figure 2) was considered valid if it was from 1 to 49, inclusive. A population count for an occupied housing unit was considered invalid if it was either blank, zero, or ranged from 50 to 98. A value of 99 indicated the population count was unknown to the enumerator. Table 137 shows how often each of these three types of population counts was recorded in conjunction with a reported refusal.

**Table 137: Types of Refusals for NRFU RES Occupied Housing Units**

<b>Type of Population Count</b>	<b>Number of Housing Units</b>	<b>Percent</b>
Valid population count	1,372	43.6%
Invalid population count	18	0.6%
Unknown population count	1,757	55.8%
<b>Refusals</b>	<b>3,147</b>	<b>100.0%</b>

Source: DRF

Table 137 shows that just over half of the refusals from occupied housing units (55.8 percent) had an unknown population count, while just under half (43.6 percent) had a valid population count.

Table 135 showed that 296,809 housing units were determined to be vacant during NRFU RES. Table 138 describes the distribution of those vacant housing units.

**Table 138: Types of NRFU RES Vacant Statuses**

<b>Vacant Type</b>	<b>Number of Housing units</b>	<b>Percent<sup>101</sup></b>
Regular	176,568	59.5%
Usual Home Elsewhere	120,146	40.5%
Unknown	95	<0.1%
<b>Total Vacant Housing Units</b>	<b>296,809</b>	<b>100.0%</b>

Source: DRF

Table 138 shows that the majority (59.5 percent) of vacant housing units from the Residual operation were classified as vacant-regular while 40.5 percent were UHEs.

Table 135 showed that 56,663 housing units were marked to be deleted during NRFU RES. There are five classes of deletes and Table 139 shows their distribution in NRFU RES. If an enumerator indicated two or more delete classifications for an address, then it was coded as a Delete-Unknown. Table 139 shows the distribution of deletes in NRFU.

<sup>101</sup> This column does not total 100.0% due to rounding.

**Table 139: Types of NRFU RES Deletes Statuses**

<b>Delete Type</b>	<b>Number of Housing Units</b>	<b>Percent<sup>102</sup></b>
Demolished/Burned Out/Cannot Locate	27,472	48.5%
Nonresidential	16,997	30.0%
Empty Mobile Home/Trailer Site	2,993	5.3%
Uninhabitable	5,599	9.9%
Duplicate	3,491	6.2%
Delete-Unknown	111	0.2%
<b>Total Deleted Housing Units</b>	<b>56,663</b>	<b>100.0%</b>

Source: DRF

Almost half of all deletes (48.5 percent) were marked as “demolished/burned out/cannot locate.” An additional 30.0 percent were classified as nonresidential and 9.9 percent were uninhabitable.

Table 140 looks at the housing unit status by universe source.

**Table 140: NRFU RES Housing Unit Status By Universe Source**

<b>NRFU RES Housing Unit Status</b>	<b>Blank Mail Returns</b>		<b>NRFU Occupied, Unknown Population Count</b>		<b>Unknown Source</b>	
	<b>Count</b>	<b>Percent</b>	<b>Count</b>	<b>Percent</b>	<b>Count</b>	<b>Percent<sup>103</sup></b>
Occupied	145,721	34.9%	226,934	73.1%	552	53.4%
Vacant-Regular	121,715	29.2%	54,666	17.6%	187	18.1%
Vacant-UHE	105,959	25.4%	14,010	4.5%	177	17.1%
Vacant-Unknown	72	<0.1%	23	<0.1%	0	0.0%
Demolished/Burned Out/Cannot Locate	18,701	4.5%	8,702	2.8%	69	6.7%
Nonresidential	14,162	3.4%	2,820	0.9%	15	1.5%
Empty Mobile Home/Trailer Site	2,420	0.6%	570	0.2%	3	0.3%
Uninhabitable	4,263	1.0%	1,322	0.4%	14	1.4%
Duplicate	2,809	0.7%	669	0.2%	13	1.3%
Delete Unknown	71	<0.1%	39	<0.1%	1	0.1%
Unresolved Status	1,292	0.3%	849	0.3%	3	0.3%
<b>Total</b>	<b>417,185</b>	<b>100.0%</b>	<b>310,604</b>	<b>100.0%</b>	<b>1,034</b>	<b>100.0%</b>

Source: DRF

The cases identified as Blank Mail Returns had the highest percentage of vacant statuses after NRFU RES. This is expected if the mail questionnaire was returned without any information

<sup>102</sup> This column does not total 100.0% due to rounding.

<sup>103</sup> This column does not total 100.0% due to rounding.

about people living at the address. Of the cases enumerated in NRFU as occupied with an unknown population count, 73.1 percent of them were found to be occupied again in NRFU RES.

Of the cases classified as occupied in NRFU, with an unknown population count, Table 140 shows that 226,934 were again classified as occupied in NRFU RES. For those 226,934 cases, 93.1 percent had a known population count after NRFU RES.

#### **5.1.4.4 Interview Completion Dates and Case Check-in**

Section 5.1.4.4 presents information about when NRFU RES cases were completed in the field and when they were checked-in by the office. These results answer the research questions regarding how the planned start and finish dates for the operation compared to the actual start and finish dates, and how the accumulation of outcomes changed over time.

##### **5.1.4.4.1 Interview Completion**

Since NRFU RES was an ad-hoc operation, there were no baseline schedule dates associated with the operation. Census instructed the LCOs to start prepping for the operation on August 9<sup>th</sup> and close out by August 25<sup>th</sup> so that LCOs could ship questionnaires to DRIS in time to be included in the Census. Enumerators finished NRFU RES on August 24<sup>th</sup> so the binders could be shipped to the data capture centers in time.

Table 141 shows the distribution of cases completed by week.



**Table 141: NRFU RES Housing Units Completed By Week**

<b>Week</b>	<b>Total for that Time Period</b>	<b>Percent for that Time Period<sup>104</sup></b>	<b>Cumulative Percent</b>
8/01 - 8/07	952	0.1%	0.1%
8/08 - 8/14	326,574	44.8%	44.9%
8/15 - 8/21	395,857	54.3%	99.3%
8/22 - 8/24 Official End of NRFU RES	3,438	0.5%	99.7%
8/25 - 8/28	229	<0.1%	99.8%
8/29 - 9/04	37	<0.1%	99.8%
9/05 - 9/11	32	<0.1%	99.8%
9/12 - 9/18	824	0.1%	99.9%
9/19 - 9/25	197	<0.1%	99.9%
Missing/Out of Range	683	0.1%	100.0%
<b>Total Housing Units</b>	<b>728,823</b>	<b>100.0%</b>	<b>100.0%</b>

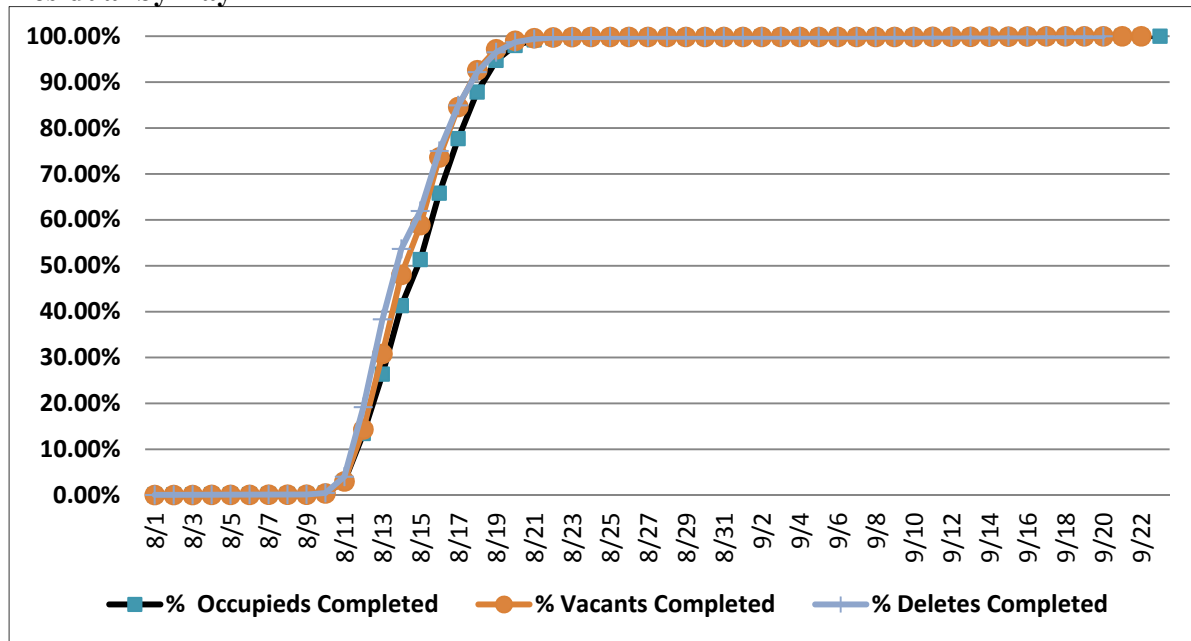
Source: DRF and AUX

Approximately 99 percent of the cases were completed within two weeks between August 8<sup>th</sup> and August 21<sup>st</sup>. Just under 100 percent of the cases were reported to be completed by August 25<sup>th</sup>. No cases could have been worked in September and data captured, so these dates are likely the result of poor handwriting on the EQ or data capture errors.

Figure 35, Table 142, Table 143, Table 144 show the number of housing units completed by week for housing units found to be occupied, vacant, or marked for deletion.

<sup>104</sup> This column does not total 100.0% due to rounding.

**Figure 35: Cumulative Percent Occupied, Vacant, and Delete Cases Completed in NRFU Residual by Day**



Source: DRF and AUX

Table 142 shows the week in which cases were completed when found to be occupied during NRFU RES.

**Table 142: NRFU RES Occupied Housing Units Completed By Week**

<b>Week</b>	<b>Total for that Time Period</b>	<b>Percent for that Time Period<sup>105</sup></b>	<b>Cumulative Percent</b>
8/01 - 8/07	546	0.1%	0.1%
8/08 - 8/14	153,322	41.1%	41.2%
8/15 - 8/21	215,825	57.8%	99.1%
8/22 - 8/24 Official End of NRFU RES	2,349	0.6%	99.7%
8/25 - 8/28	141	<0.1%	99.7%
8/29 - 9/04	21	<0.1%	99.7%
9/05 - 9/11	14	<0.1%	99.7%
9/12 - 9/18	414	0.1%	99.8%
9/19 - 9/25	128	<0.1%	99.9%
Missing/Out of Range	447	0.1%	100.0%
<b>Total Occupied Housing Units</b>	<b>373,207</b>	<b>100.0%</b>	<b>100.0%</b>

Source: DRF and AUX

Table 142 shows that after the first week that NRFU RES was worked (August 8<sup>th</sup> to 14<sup>th</sup>), 41.2 percent of all housing units eventually identified as occupied had been completed by an enumerator. Table 143 shows that 48.0 percent of vacants had been completed after the first week and Table 144 shows that 53.6 percent of deletes were completed after the first week.

**Table 143: NRFU RES Vacant Housing Units Completed By Week**

<b>Week</b>	<b>Total for that Time Period</b>	<b>Percent for that Time Period</b>	<b>Cumulative Percent</b>
8/01 - 8/07	329	0.1%	0.1%
8/08 - 8/14	142,132	47.9%	48.0%
8/15 - 8/21	152,886	51.5%	99.5%
8/22 - 8/24 Official End of NRFU RES	795	0.3%	99.8%
8/25 - 8/28	71	<0.1%	99.8%
8/29 - 9/04	11	<0.1%	99.8%
9/05 - 9/11	15	<0.1%	99.8%
9/12 - 9/18	333	0.1%	99.9%
9/19 - 9/25	66	<0.1%	99.9%
Missing/Out of Range	171	0.1%	100.0%
<b>Total Vacant Housing units</b>	<b>296,809</b>	<b>100.0%</b>	<b>100.0%</b>

Source: DRF and AUX

<sup>105</sup> This column does not total 100.0% due to rounding.

**Table 144: NRFU RES Delete Housing Units Completed By Week**

<b>Week</b>	<b>Total for that Time Period</b>	<b>Percent for that Time Period<sup>106</sup></b>	<b>Cumulative Percent</b>
8/01 - 8/07	73	0.1%	0.1%
8/08 - 8/14	30,315	53.5%	53.6%
8/15 - 8/21	25,893	45.7%	99.3%
8/22 - 8/24 Official End of NRFU RES	237	0.4%	99.8%
8/25 - 8/28	15	<0.1%	99.8%
8/29 - 9/04	5	<0.1%	99.8%
9/05 - 9/11	3	<0.1%	99.8%
9/12 - 9/18	74	0.1%	99.9%
9/19 - 9/25	3	<0.1%	99.9%
Missing/Out of Range	45	0.1%	100.0%
<b>Total Delete Housing units</b>	<b>56,663</b>	<b>100.0%</b>	<b>100.0%</b>

Source: DRF and AUX

#### **5.1.4.4.2 Check-in**

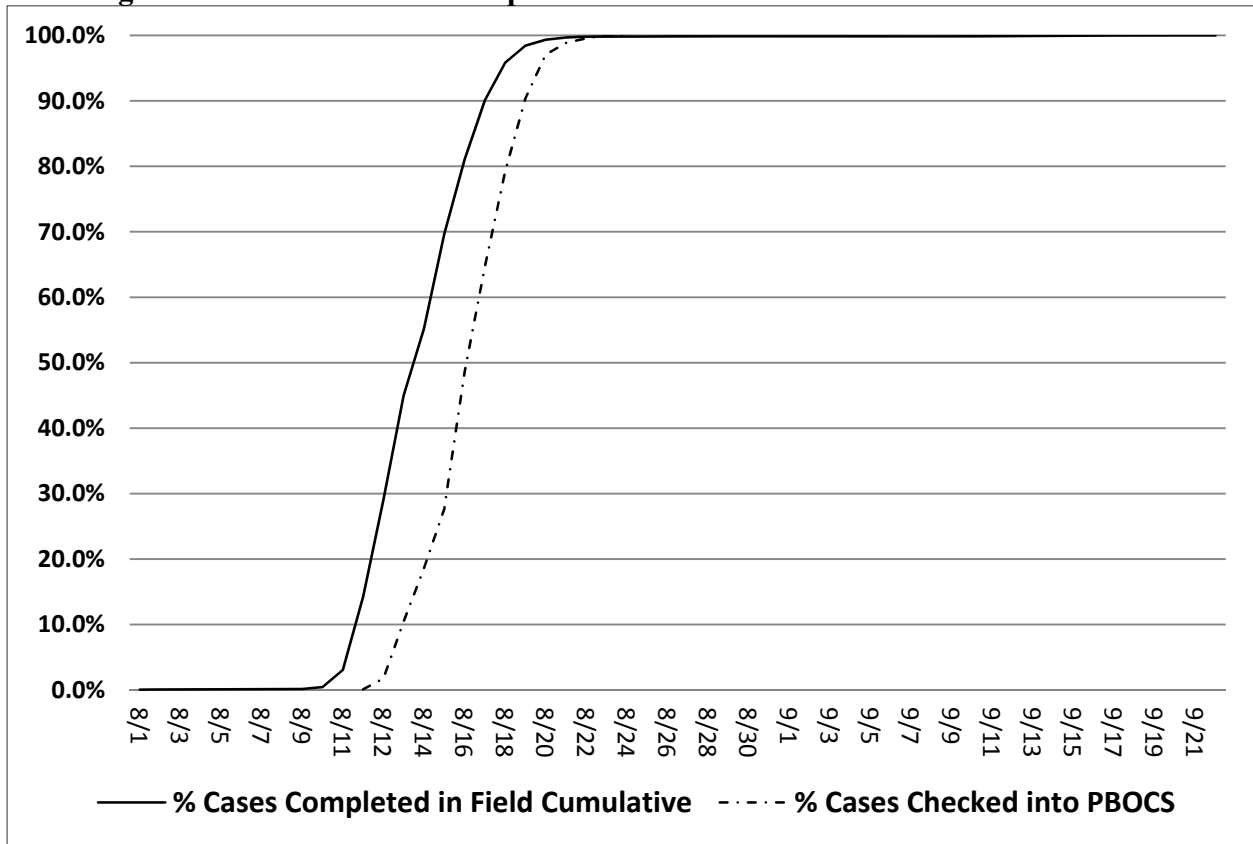
##### Completion Dates Compared to PBOCS Check-in Data

Once the NRFU RES cases were completed, they were then checked in to PBOCS. There was not a large check-in backlog in PBOCS, which can be attributed to nearly all of the NRFU RES workload being completed in two weeks.

See Figure 36 for the difference between when a percentage of cases was completed in the field and when the percentage was checked in to PBOCS.

<sup>106</sup> This column does not total 100.0% due to rounding.

**Figure 36: Time Between Completion of NRFU RES Cases and Office Check-in**



Source: DRF, AUX, and DMD C&P

The largest lag between completion and check-in was on August 15<sup>th</sup>. On August 15<sup>th</sup>, 42 percent of the NRFU RES workload was not yet checked in.

Table 145 shows the number and percent of NRFU RES cases checked in by day.

**Table 145: Distribution of NRFU RES Questionnaires Checked-in by Day**

<b>Progress As Of Date</b>	<b>Cumulative Number of EQs Checked-in</b>	<b>Cumulative Percent of EQs Checked-in</b>
08/11/10	829	0.1%
08/12/10	12,996	1.8%
08/13/10	76,403	10.5%
08/14/10	135,533	18.6%
08/15/10	201,506	27.6%
08/16/10	354,221	48.6%
08/17/10	471,654	64.7%
08/18/10	577,891	79.3%
08/19/10	659,009	90.4%
08/20/10	707,872	97.1%
08/21/10	720,753	98.9%
08/22/10	725,877	99.6%
08/23/10	729,136	100.0%
08/24/10	729,143	100.0%

Source: DMD C&P

Check-in for NRFU RES reached over 64 percent of the workload by August 17<sup>th</sup>, midway through the operational schedule. We did not use expected check-in rates to monitor NRFU RES progress due to the short duration of the operation.

#### **5.1.4.5 Interview Characteristics**

The following section presents some paradata about the interviews with NRFU RES respondents, including the language that interviews were conducted in, the number of contacts that enumerators made to enumerate a housing unit, and the type of respondents who completed NRFU RES interviews.

##### **5.1.4.5.1 Language**

Table 146 shows the top five languages in which NRFU RES interviews were conducted.

**Table 146: Top Five Languages in which NRFU RES Interviews were Conducted**

<b>Total Number of Names</b>	<b>Total</b>	<b>Percent<sup>107</sup></b>
English	698,313	95.8%
Spanish	13,328	1.8%
Chinese	507	0.1%
Vietnamese	53	<0.1%
Korean	45	<0.1%
All other languages	222	<0.1%
Multiple languages indicated	755	0.1%
Unknown language	15,600	2.1%
<b>Total Housing Units</b>	<b>728,823</b>	<b>100.0%</b>

Source: DRF and AUX

The vast majority of NRFU RES interviews (95.8 percent) were conducted in English, with an additional 1.8 percent in Spanish. Of the 13,328 NRFU RES interviews conducted in Spanish, 1,654 (12.4 percent) of those were interviews conducted in Puerto Rico.

For 2.1 percent of the NRFU RES interviews, the language in which the interview was conducted is unknown. Appendix D shows the distribution of all languages in which NRFU RES interviews were conducted.

<sup>107</sup> This column does not total 100.0% due to rounding.

#### 5.1.4.5.2 Record of Contact

The following tables document how many times an enumerator had to contact an address before a completed interview was obtained. Enumerators were told not to attempt to contact an address more than six times and there was only space to record six contact attempts on the EQ, but that does not guarantee an enumerator did not make more than six contact attempts.

Table 147 shows the distribution of the number of attempts made to an address in order to obtain a completed interview. The first column contains all 728,823 housing units in NRFU RES. Subsequent columns look strictly at housing units by their final housing unit status.

**Table 147: Number of Contact Attempts Made to NRFU RES Housing Units <sup>108</sup>**

<b>Number of Contact Attempts</b>	<b>Overall Contact Attempts</b>	<b>Overall Percent</b>	<b>Occupied Count Attempts</b>	<b>Occupied Percent</b>	<b>Vacant Count Attempts</b>	<b>Vacant Percent</b>	<b>Delete Count Attempts</b>	<b>Delete Percent</b>
0	554	0.1%	218	0.1%	118	<0.1%	202	0.4%
1	185,326	25.4%	91,905	24.6%	69,229	23.3%	23,626	41.7%
2	165,677	22.7%	71,925	19.3%	78,306	26.4%	14,981	26.4%
3	145,713	20.0%	72,476	19.4%	63,987	21.6%	8,837	15.6%
4	123,853	17.0%	66,741	17.9%	51,415	17.3%	5,381	9.5%
5	47,325	6.5%	29,317	7.9%	16,046	5.4%	1,818	3.2%
6	60,375	8.3%	40,625	10.9%	17,708	6.0%	1,818	3.2%
<b>Total Housing Units</b>	<b>728,823</b>	<b>100.0%</b>	<b>373,207</b>	<b>100.0%</b>	<b>296,809</b>	<b>100.0%</b>	<b>56,663</b>	<b>100.0%</b>

Source: DRF and AUX

As shown in Table 147, of the 728,823 housing units in NRFU RES, 25.4 percent of them required only one attempted contact by an enumerator. The frequency of contact attempts decreases except for a slight increase in the number of housing units that received six

<sup>108</sup> These columns do not total 100.0% due to rounding.



contact attempts. Overall, 8.3 percent of housing units recorded six contact attempts. That rate increased to nearly 11 percent for the occupied housing units. Both those numbers are higher than the rates seen from NRFU cases, where 4.6 percent of all cases recorded six contact attempts and 5.9 percent of occupied housing units had six contact attempts. Given that cases in NRFU RES were expected to be difficult to enumerate, this increase makes sense.

Comparing the columns in Table 147 that contain the universes of occupied, vacant, and deleted housing units, the deleted housing units were much more likely to only require one contact attempt (41.7 percent of the time). They also had the highest percentage of cases that supposedly received zero contact attempts.

Table 148 and Table 149 show the distribution of contact attempts made in person and on the telephone. The first row on the EQ for the Record of Contact Section was pre-filled as a personal visit so it was not possible to record six telephone contact attempts.

**Table 148: Number of Telephone Contacts Attempts Made to NRFU RES Housing Units<sup>109</sup>**

<b>Number of Telephone Contact Attempts</b>	<b>Overall Contact Attempts</b>	<b>Overall Percent</b>	<b>Occupied Count Attempts</b>	<b>Occupied Percent</b>	<b>Vacant Count Attempts</b>	<b>Vacant Percent</b>	<b>Delete Count Attempts</b>	<b>Delete Percent</b>
0	624,517	85.7%	327,450	87.7%	245,203	82.6%	49,991	88.2%
1	84,271	11.6%	36,364	9.7%	41,938	14.1%	5,754	10.2%
2	15,159	2.1%	6,957	1.9%	7,420	2.5%	740	1.3%
3	4,022	0.6%	1,982	0.5%	1,868	0.6%	160	0.3%
4	747	0.1%	389	0.1%	340	0.1%	17	<0.1%
5	107	<0.1%	65	<0.1%	40	<0.1%	1	<0.1%
<b>Total Housing Units</b>	<b>728,823</b>	<b>100.0%</b>	<b>373,207</b>	<b>100.0%</b>	<b>296,809</b>	<b>100.0%</b>	<b>56,663</b>	<b>100.0%</b>

Source: DRF and AUX

<sup>109</sup> These columns do not total 100.0% due to rounding.

The rate of telephone usage to contact cases in NRFU RES was higher than in NRFU. NRFU RES enumerators did not make any telephone contact with 85.7 percent of the total cases in NRFU RES, but that number was 88.1 percent from NRFU.

**Table 149: Number of Personal Visit Contact Attempts Made to NRFU RES Housing Units<sup>110</sup>**

<b>Number of Personal Contact Attempts</b>	<b>Overall Contact Attempts</b>	<b>Overall Percent</b>	<b>Occupied Count Attempts</b>	<b>Occupied Percent</b>	<b>Vacant Count Attempts</b>	<b>Vacant Percent</b>	<b>Delete Count Attempts</b>	<b>Delete Percent</b>
0	718	0.1%	302	0.1%	191	0.1%	209	0.4%
1	233,927	32.1%	111,266	29.8%	94,058	31.7%	27,868	49.2%
2	165,934	22.8%	74,826	20.0%	76,873	25.9%	13,798	24.4%
3	144,887	19.9%	74,570	20.0%	61,762	20.8%	8,128	14.3%
4	103,096	14.1%	58,249	15.6%	40,545	13.7%	4,050	7.1%
5	41,865	5.7%	27,443	7.4%	12,820	4.3%	1,461	2.6%
6	38,396	5.3%	26,551	7.1%	10,560	3.6%	1,149	2.0%
<b>Total Housing Units</b>	<b>728,823</b>	<b>100.0%</b>	<b>373,207</b>	<b>100.0%</b>	<b>296,809</b>	<b>100.0%</b>	<b>56,663</b>	<b>100.0%</b>

Source: DRF and AUX

<sup>110</sup> These columns may not total 100.0% due to rounding.

Table 149 shows the number of personal visit contact attempts made to housing units in RES. Housing units with zero reported personal visit contacts did not meet the criteria for a valid record of contact. Unlike previous NROs, there was not an increased number of cases requiring six personal visits, as compared to those requiring five contact attempts, even though some of the housing units in this universe were expected to be challenging cases.

Table 150 shows what mode the presumed last contact was with a housing unit. Cases with an unknown mode had either zero contacts identified or did not mark the checkbox to distinguish if it was a personal visit or a telephone visit for the last box utilized in the record of contact section.

**Table 150: Type of Final Contact for Housing Units in NRFU RES, by Housing Unit Status<sup>111</sup>**

	Total Cases		Occupied		Vacant		Delete	
Final Contact	Totals	Percent	Total	Percent	Total	Percent	Total	Percent
Personal Visit	609,002	83.6%	319,082	85.5%	239,663	80.7%	48,513	85.6%
Telephone	84,884	11.7%	34,457	9.2%	44,347	14.9%	5,860	10.3%
Unknown	34,937	4.8%	19,668	5.3%	12,799	4.3%	2,290	4.0%
<b>Total Housing Units</b>	<b>728,823</b>	<b>100.0%</b>	<b>373,207</b>	<b>100.0%</b>	<b>296,809</b>	<b>100.0%</b>	<b>56,663</b>	<b>100.0%</b>

Source: DRF and AUX

Table 150 reports that 11.7 percent of the last visits to housing units in NRFU RES were telephone contacts. The rate of final contact by telephone was higher for all NRFU RES cases, whether occupied, vacant, or delete, than it had been in NRFU.

#### 5.1.4.5.3 Type of Respondent

Table 151 shows the type of respondents for housing units interviewed during the NRFU RES operation, by housing unit status. Housing units with an unresolved status are not given their own column in this table but are included in the total.

<sup>111</sup> These columns do not total 100.0% due to rounding.

**Table 151: Type of Respondent for NRFU RES Interviews, by Housing Unit Status**

<b>Respondent Type</b>	<b>Total Cases</b>		<b>Occupied</b>		<b>Vacant</b>		<b>Delete</b>	
	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent</b>	<b>Total</b>	<b>Percent<sup>112</sup></b>	<b>Total</b>	<b>Percent</b>
Household Member	212,176	29.1%	199,624	53.5%	7,845	2.6%	4,620	8.2%
Unknown Type	3,087	0.4%	1,422	0.4%	699	0.2%	650	1.1%
All Proxy	513,560	70.5%	172,161	46.1%	288,265	97.1%	51,393	90.7%
Proxy Types								
In-mover	41,728	5.7%	7,426	2.0%	33,695	11.4%	457	0.8%
Neighbor or other	471,783	64.7%	164,724	44.1%	254,532	85.8%	50,936	89.9%
Both marked	49	<0.1%	11	<0.1%	38	<0.1%	0	0.0%
<b>Total Housing Units</b>	<b>728,823</b>	<b>100.0%</b>	<b>373,207</b>	<b>100.0%</b>	<b>296,809</b>	<b>100.0%</b>	<b>56,663</b>	<b>100.0%</b>

Source: DRF and AUX

Neighbors or other proxies accounted for 64.7 percent of all respondents in NRFU RES while in-mover proxies were 5.7 percent of all respondents. There was a much lower percentage of household-member respondents in NRFU RES than in NRFU. Actual April 1 household members were only 29.1 percent of all RES respondents while NRFU reported 47.2 percent of their interviews conducted with April 1 household members.

Just over half of all RES cases were reported as being occupied (51.2 percent) but these were often cases that were the most difficult to interview. The percent of occupied housing units from interviews conducted with a household member (53.5 percent) was lower than seen in any of the other three NROs.

For deleted housing units, the percent of respondents who were identified as being household members was 8.2 percent. Again, this result is incongruous with our expectations for deleted housing units.

<sup>112</sup> This column does not total 100.0% due to rounding.

#### 5.1.4.6 Characteristics of Occupied Housing Units

The following tables will discuss characteristics of the occupied housing units that were interviewed during NRFU RES.

##### 5.1.4.6.1 Household Population Count

Table 152 shows the distribution of data-defined people and the population count within occupied housing units in NRFU RES as reported in Item C of the Interview Summary section of the EQ.

**Table 152: Population Count of Housing Units Found to be Occupied During NRFU RES<sup>113</sup>**

Enumerator Reported Population Count	Enumerator-Reported		Data-defined People	
	Number of Housing units	Percent	Number of Housing Units	Percent
0	68	<0.1%	66,842	17.9%
1	122,184	32.7%	110,896	29.7%
2	106,707	28.6%	92,121	24.7%
3	51,261	13.7%	43,503	11.7%
4	41,070	11.0%	33,992	9.1%
5	19,677	5.3%	16,654	4.5%
6	6,795	1.8%	5,383	1.4%
7	3,184	0.9%	2,090	0.6%
8	1,303	0.3%	897	0.2%
9	555	0.1%	389	0.1%
10	303	0.1%	212	0.1%
11 – 15	293	0.1%	206	0.1%
16 – 20	30	<0.1%	17	<0.1%
21 – 30	9	<0.1%	2	<0.1%
31 – 40	3	<0.1%	0	0.0%
41 – 49	12	<0.1%	2	<0.1%
50 – 97	28	<0.1%	1	<0.1%
98	1	<0.1%	N/A <sup>114</sup>	N/A
99	19,626	5.3%	N/A	N/A
Missing	98	<0.1%	N/A	N/A
<b>Total Occupied Housing Units</b>	<b>373,207</b>	<b>100.0%</b>	<b>373,207</b>	<b>100.0%</b>

Source: DRF

<sup>113</sup> These columns do not total 100.0% due to rounding.

<sup>114</sup> Not Applicable

Of the 373,207 occupied housing units enumerated in NRFU RES, the enumerator reported that 32.7 percent had one person living in them, and 28.6 percent had two people. The number of cases with a certain number of data-defined people is always smaller than the number of cases that have that number as the enumerator-reported population count because of our definition of a data-defined person and the respondents' inability to provide demographic characteristics for all household members. For instance, compared to the 32.7 percent of cases with an enumerator-reported population count of one person, 29.7 percent of cases had one data-defined person.

There were 66,842 housing units found to be occupied in RES but with no data-defined people enumerated, which was 17.9 percent of the universe. Enumerators used the population count number 99 to describe an unknown population count in 5.3 percent of cases. Table 153 reports how many of those cases were also marked as refusals.

**Table 153: Unknown Population Counts for NRFU RES Occupied Housing Units**

<b>Refusal Status</b>	<b>Number of Housing Units</b>	<b>Percent</b>
Refusal	1,757	9.0%
Not a Refusal	17,869	91.0%
<b>Unknown Population Counts</b>	<b>19,626</b>	<b>100.0%</b>

Source: DRF

Some cases were worked in Residual because they had an unknown population count from NRFU, but 17,869 cases still existed after Residual with an unknown population count that were not marked as refusals.

The parent EQ only had space to roster five people in a household. If more than five people lived at an address, then enumerators had to use a continuation form. Continuation forms did not have any of the beginning or concluding questions printed on them; they only collected person-level data for up to five persons on each continuation form.

Table 154 shows the number of continuation forms used to enumerate people at each address found to be occupied in NRFU RES.

**Table 154: Number of Continuation Forms used at an Address During  
NRFU RES**

<b>Number of Continuation Forms</b>	<b>Number of Housing Units</b>	<b>Percent<sup>115</sup></b>
0	362,618	97.2%
1	10,309	2.8%
2	253	0.1%
3	21	<0.1%
4	2	<0.1%
5	0	0.0%
6	1	<0.1%
7	0	0.0%
8	1	<0.1%
9	1	<0.1%
10	0	0.0%
11	1	<0.1%
<b>Total Occupied Housing Units</b>	<b>373,207</b>	<b>100.0%</b>

Source: DRF

Table 154 shows that the majority of housing units enumerated in NRFU RES did not utilize a continuation form (97.2 percent). Of the occupied housing units, 2.8 percent required one continuation form.

#### **5.1.4.6.2 Undercount Question**

After the household roster and demographic characteristics were collected during the NRFU RES interview, the enumerator asked a series of questions that probed if anyone else might have been staying at the address. Table 155 shows the frequency that each probe was marked with an affirmative answer, including one row for housing units that said ‘yes’ to more than one of the probes.

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<sup>115</sup> This column does not total 100.0% due to rounding.

**Table 155: Distribution of Answers to the Undercount Probes at Occupied NRFU RES Housing Units**

<b>Undercount Category</b>	<b>Total</b>	<b>Percent</b>
Only 'No' category marked	258,712	69.3%
At least one category marked	2,307	0.6% <sup>116</sup>
Babies only	216	0.1%
Foster children only	62	<0.1%
Any other relatives only	1,163	0.3%
Roommates only	266	0.1%
Any other nonrelatives only	270	0.1%
Anyone else staying on April 1 who had no permanent place to live only	197	0.1%
Multiple categories marked	133	<0.1%
Missing (All boxes blank)	112,188	30.1%
<b>Total Occupied Housing Units</b>	<b>373,207</b>	<b>100.0%</b>

Source: DRF

Table 155 shows that at least one undercount category was marked in 0.6 percent of NRFU RES interviews with occupied housing units. The most common category when one was marked was “any other relatives.” Over thirty percent of the questionnaires (30.1 percent) had no boxes checked to indicate either a ‘yes’ or a ‘no’ reply to the undercount probes.

If the respondent answered ‘yes’ to any of the probes, the enumerator was to collect a maximum of two names for the people who were possibly undercounted. Table 156 shows how many names were collected when any undercount category was marked.

**Table 156: Undercount Names Reported when any Undercount Category was Marked in NRFU RES Occupied Housing Units**

<b>Total Number of Names</b>	<b>Total</b>	<b>Percent</b>
Zero Names	372	16.1%
One Name	1,607	69.7%
Two Names	328	14.2%
<b>Total Occupied Housing Units with Category Selected</b>	<b>2,307</b>	<b>100.0%</b>

Source: DRF and AUX

Of the questionnaires that positively marked at least one undercount category, Table 156 shows that 16.1 percent did not write a name into the boxes provided. There were 14.2 percent that provided two names however. Table 157 shows how often a name was provided to the enumerator when a respondent had replied affirmatively to each specific undercount category.

<sup>116</sup> This column does not sum to 0.6% due to rounding.



**Table 157: Number of Undercount Names Reported for Specific Undercount Category Marked in NRFU RES Occupied Housing Units<sup>117</sup>**

<b>Undercount Category with Number of Names</b>	<b>Total</b>	<b>Percent</b>
<b>Babies only</b>		
Zero Names	56	25.9%
One Name	142	65.7%
Two Names	18	8.3%
<b>Total</b>	<b>216</b>	<b>100.0%</b>
<b>Foster children only</b>		
Zero Names	23	37.1%
One Name	25	40.3%
Two Names	14	22.6%
<b>Total</b>	<b>62</b>	<b>100.0%</b>
<b>Any other relatives only</b>		
Zero Names	99	8.5%
One Name	889	76.4%
Two Names	175	15.0%
<b>Total</b>	<b>1,163</b>	<b>100.0%</b>
<b>Roommates only</b>		
Zero Names	57	21.4%
One Name	189	71.1%
Two Names	20	7.5%
<b>Total</b>	<b>266</b>	<b>100.0%</b>
<b>Any other nonrelatives only</b>		
Zero Names	58	21.5%
One Name	180	66.7%
Two Names	32	11.9%
<b>Total</b>	<b>270</b>	<b>100.0%</b>
<b>Anyone else only</b>		
Zero Names	21	10.7%
One Name	157	79.7%
Two Names	19	9.6%
<b>Total</b>	<b>197</b>	<b>100.0%</b>
<b>Multiple</b>		
Zero Names	58	43.6%
One Name	25	18.8%
Two Names	50	37.6%
<b>Total</b>	<b>133</b>	<b>100.0%</b>
<b>None<sup>118</sup></b>		
Zero Names	370,809	100.0%
One Name	71	<0.1%
Two Names	20	<0.1%
<b>Total</b>	<b>370,900</b>	<b>100.0%</b>

Source: DRF and AUX

<sup>117</sup> This column may not total 100.0% due to rounding.

<sup>118</sup> These numbers include both rows “Missing” and “Only ‘No’ category marked” from Table 155.

The “other relatives” category was the category most likely to successfully elicit at least one name. Only 8.5 percent of people who answered the “other relatives” category did not provide a name, the smallest of any category.

Respondents who indicated multiple undercount categories applied to their household were the most likely to not provide a name, 43.6 percent of the time, but were also the most likely to provide two names (37.6 percent of the time).

#### 5.1.4.6.3 Overcount Question

Table 158 describes the outcome of the overcount question. There were 707,600 data-defined people from housing units found to be occupied in NRFU RES.

**Table 158: Overcount Category of Data-defined People in NRFU RES Occupied Housing Units**

<b>Overcount Category</b>	<b>Number of People</b>	<b>Percent</b>
None	685,052	96.8%
At least one category marked	22,548	3.2%
College Housing only	2,137	0.3%
Military only	2,074	0.3%
Seasonal/Second Home only	8,975	1.3%
Child Custody only	2,933	0.4%
Jail or Prison only	225	<0.1%
Nursing Home only	354	0.1%
Another Reason only	5,158	0.7%
Multiple	692	0.1%
<b>Total People in Occupied Housing Units</b>	<b>707,600</b>	<b>100.0%</b>

Source: DRF

The vast majority of people (96.8 percent) did not indicate they lived or stayed anywhere else besides the NRFU RES address. The most common positive reply to the overcount question was for a seasonal or second home, which described 1.3 percent of people. An additional 0.7 percent stayed elsewhere for an undefined reason and 0.4 percent of people were indicated as staying elsewhere for child custody. Both military reasons and college reasons were cited for 0.3 percent of people.

#### **5.1.4.7 Standard Demographic Tables**

There were 707,600 data-defined persons included on 373,207 occupied NRFU RES forms in the 2010 Census. This section will present the demographic characteristics for these persons on the NRFU RES form. Table 159 through Table 163 give NRFU RES person demographic characteristics: age, Hispanic origin, race, relationship to person 1, and sex. Age was calculated based on the date of birth provided; if no date of birth was provided then the write-in age was used. Age was calculated only if the date of birth fell within valid date ranges. Similarly, the calculated age or write-in age was used only if it fell within valid age ranges; otherwise it was considered missing.

Table 164 gives the distribution of tenure responses for housing units included in the NRFU RES operation.

Because the demographic data used in this assessment are unedited, direct comparisons with published 2010 Census results are not possible. These tables include a row for people with missing values for the specific characteristic. The data in published 2010 Census reports have undergone editing and imputation, and therefore will have no missing values.

**Table 159: Standard Assessment Demographic Table for Age in RES Interviews**

<b>Age</b>	<b>Number of People</b>	<b>Percent<sup>119</sup></b>
Under 5 years	27,832	3.9%
5 to 9 years	28,096	4.0%
10 to 14 years	27,584	3.9%
15 to 19 years	26,351	3.7%
20 to 24 years	26,779	3.8%
25 to 29 years	29,169	4.1%
30 to 34 years	27,849	3.9%
35 to 39 years	27,166	3.8%
40 to 44 years	25,945	3.7%
45 to 49 years	26,334	3.7%
50 to 54 years	24,045	3.4%
55 to 59 years	19,571	2.8%
60 to 64 years	15,037	2.1%
65+ years	29,651	4.2%
Missing	346,191	48.9%
<b>Total</b>	<b>707,600</b>	<b>100.0%</b>

Source: DRF

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<sup>119</sup> This column does not total 100.0% due to rounding.

**Table 160: Standard Assessment Demographic Table for Hispanic Origin in RES Interviews**

<b>Hispanic Origin</b>	<b>Number of People</b>	<b>Percent</b>
Not Hispanic or Latino checkbox only	541,296	76.5%
Mexican checkbox only	59,903	8.5%
Puerto Rican checkbox only	10,132	1.4%
Cuban checkbox only	2,569	0.4%
Another Hispanic checkbox only	4,532	0.6%
Multiple checkboxes	400	0.1%
Both Checkbox and Write-in	22,060	3.1%
Write-in Only	1,382	0.2%
Missing	65,326	9.2%
<b>Total</b>	<b>707,600</b>	<b>100.0%</b>

Source: DRF

**Table 161: Standard Assessment Demographic Table for Race in RES Interviews**

<b>Race</b>	<b>Number of People</b>	<b>Percent</b>
White checkbox alone	417,730	59.0%
Black or African American checkbox alone	133,815	18.9%
American Indian and Alaska Native checkbox alone	1,534	0.2%
Asian Indian checkbox alone	4,074	0.6%
Chinese checkbox alone	4,919	0.7%
Filipino checkbox alone	2,825	0.4%
Japanese checkbox alone	908	0.1%
Korean checkbox alone	1,821	0.3%
Vietnamese checkbox alone	2,273	0.3%
Other Asian checkbox alone	166	<0.1%
Native Hawaiian checkbox alone	346	0.1%
Guamanian or Chamorro checkbox alone	246	<0.1%
Samoan checkbox alone	142	<0.1%
Other Pacific Islander checkbox alone	41	<0.1%
Some Other Race checkbox alone	1,577	0.2%
Multiple checkboxes	6,723	1.0%
Both Checkbox and Write-in	63,871	9.0%
Write-in Only	3,304	0.5%
Missing	61,285	8.7%
<b>Total</b>	<b>707,600</b>	<b>100.0%</b>

Source: DRF

**Table 162: Standard Assessment Demographic Table for Relationship Status in RES Interviews**

<b>Relationship Status</b>	<b>Number of People</b>	<b>Percent</b>
Householder	302,866	42.8%
Husband or Wife of Householder	112,123	15.9%
Biological Son or Daughter of Householder	176,965	25.0%
Adopted Son or Daughter of Householder	3,042	0.4%
Stepson or Stepdaughter of Householder	6,293	0.9%
Brother or Sister of Householder	8,596	1.2%
Father or Mother of Householder	8,010	1.1%
Grandchild of Householder	9,208	1.3%
Parent-in-law of Householder	1,127	0.2%
Son-in-law or Daughter-in-law of Householder	1,571	0.2%
Other Relative	8,580	1.2%
Roomer or Boarder	2,886	0.4%
Housemate or Roommate	16,442	2.3%
Unmarried Partner	13,036	1.8%
Other Nonrelative	7,168	1.0%
Two or more relationships	428	0.1%
Missing	29,259	4.1%
<b>Total</b>	<b>707,600</b>	<b>100.0%</b>

Source: DRF

**Table 163: Standard Assessment Demographic Table for Sex in RES Interviews**

<b>Sex</b>	<b>Number of People</b>	<b>Percent</b>
Male	347,971	49.2%
Female	341,181	48.2%
Both	135	<0.1%
Missing	18,313	2.6%
<b>Total</b>	<b>707,600</b>	<b>100.0%</b>

Source: DRF

**Table 164: Standard Assessment Demographic Table for Tenure in RES Interviews**

<b>Tenure</b>	<b>Number of Housing Units</b>	<b>Percent</b>
Owned with a mortgage or a loan	85,621	22.9%
Owned without a mortgage or a loan	35,598	9.5%
Rented	135,436	36.3%
Occupied without payment of rent	4,823	1.3%
Multiple	114	<0.1%
Missing	111,615	29.9%
<b>Total</b>	<b>373,207</b>	<b>100.0%</b>

Source: DRF

These distributions may vary across different census operations due to differences in corresponding populations and census procedures.

## 5.2 Cost, Staffing and Production Rates

Program office staff generated the cost results in this assessment. The methods used predate 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.

The budget for NRFU was based on cost estimates using a number of components that were developed early in the decade or were revisited when the decision was made to go back to paper operations. These components included staff productivity, the number of cases requiring followup, and cost drivers such as salary and miles. The original budgeted cost for NRFU was \$2.74 billion.

As we approached the start of the operation, our knowledge of the components improved based on experience and data. The experience came from similar operations such as Address Canvassing and Group Quarters Validation, as well as revisiting Census 2000 observations and Census Test experiences. We also looked at current external challenges and opportunities and worked with panels of experts in Census Headquarters and field operations to determine the impact of this information on cost drivers. These working sessions identified components of the original estimate that should remain the same and those that should be updated. The components of greatest concern due to the high uncertainty and high impact on cost were workload and productivity. Working with subject matter experts, we developed alternative scenarios for these components, and developed over 1000 likely cost estimates based on all scenario combinations. Due to the uncertainties, the costs varied greatly but the analysis showed that NRFU operations could be completed within the original budget.

The cost estimate validation, completed in January 2010, showed the profile of NRFU costs, based on all combinations of workload and productivity scenarios was a distribution of costs. Costs ranged from a low of \$1.94 billion to a high of \$2.83 billion. Based on these results, as well as a concurrent review of likely costs at each of the 494 LCOs, we believed that a NRFU (including RI) cost estimate of \$2.33 billion was reasonable. The NRFU portion of this cost estimate was \$2.245 billion.

In April, when the workloads for the LCOs stabilized, FLD identified a few LCOs where the mail return rate was much lower than expected. FLD requested additional field staff to complete the higher workload in these LCOs and so we added \$1.95 million to the NRFU budget. This addition raised the NRFU budget to \$2.247 billion and represents the final budget loaded into the DMD C&P system.

The above analysis was a collaborative effort among DMD, FLD, and DSSD staff, and represented the final budget (see Budget Cost for NRFU in Table 165) that was loaded into the DMD C&P, which DMD and FLD used to manage the field operations during production. For



this assessment we also used the DMD C&P System to analyze the budgeted and actual costs for the NRO.

At the aggregate level the NRO costs were 23.2 percent lower than budgeted. With the exception of NRFU, all other NROs exceeded their field budget. Table 165 shows the operations that comprise the NRO, the budgeted and actual workloads and costs, and the dollar variance associated with each NRO. Total field costs include production and training salary, mileage, other costs, Federal Insurance Contribution Act (FICA), and Medicare.

**Table 165: 2010 NRO Budgeted and Actual Costs**

	<b>Budget Workload</b>	<b>Budget Cost</b>	<b>Actual Workload</b>	<b>Actual Cost</b>	<b>Variance</b>	<b>Percent under/over budget</b>
NRFU	48,609,413	\$2,247,884,384	47,235,198	\$1,589,397,886	\$658,486,498	29.3%
NRFU RI	1,579,806	\$94,036,946	900,329	\$95,271,468	(\$1,234,522)	(1.3%)
VDC	8,566,741	\$244,284,616	8,730,803	\$281,727,536	(\$37,442,920)	(15.3%)
NRFU RES <sup>120</sup>	729,143	\$31,287,851	729,143	\$42,595,299	(\$11,307,448)	(36.1%)
<b>Total NRO</b>	<b>59,485,103</b>	<b>\$2,617,493,797</b>	<b>57,595,473</b>	<b>\$2,008,992,189</b>	<b>\$608,501,608</b>	<b>23.2%</b>

Source: DMD C&P

In the following cost sections, we will review each of the four NROs independently and address the following cost factors, as appropriate, that impacted the cost variances:

- Summary of the field operations cost
- Cost per case
- Cases per hour and miles per case
- Variance by position type
- Variance by cost factor and position type
- Production staff

Detailed NRO cost information is included in Appendices 16 through 19.

<sup>120</sup> NRFU Residual was an ad hoc operation. The cost budget was determined while NRO was already in production. The budgeted workload reflects the known number of cases that required re-enumeration.

## **5.2.1 NRFU**

### **5.2.1.1 Summary of the NRFU Field Operation Cost**

Total field costs for NRFU were \$1,589,397,886 (29.3 percent under budget). This section of the assessment addresses the following areas that we believe caused NRFU to run under budget:

- Lower than expected workload,
- Higher than expected production rate,
- Lower than expected mileage per case,
- Lower CLA cost than budgeted, and
- Lower training costs than budgeted.

#### **Lower than Expected Workload**

The final NRFU workload in DMD C&P was 47,235,198, which was less than the budgeted workload of 48,609,413. The NRFU workload was less than budgeted primarily because the mail response rate was higher than projected. We speculate that the higher response rate may have been impacted by replacement mailing, targeting mailout strategies, publicity, Census partnerships, the Take 10 Program and the advertising program encouraging respondents to mailback their census questionnaires. Additionally, the systems and procedures in place to implement an automated LMR removal and several clerical removals help reduce the NRFU workload.

#### **Higher Than Expected Production Rate**

The budgeted production rate was 0.89 cases per hour; however, we achieved a production rate of 1.05 cases per hour.<sup>121</sup> Improved targeted recruiting and work assignment delineation may have led to increased enumerator productivity.

#### **Lower Than Expected Mileage per Case for Enumerators**

With respect to the mileage, we budgeted 8.46 miles per case; however, on average, enumerators only traveled 5.05 miles per case. Just as with the production rate, we believe that the lower miles per case may have been in part because of improved targeted recruiting and work assignment delineation. We believe we were able to hire more local enumerators who may not have had to travel as far to complete their assigned work.

#### **Lower CLA Costs than Budgeted**

The actual CLA fieldwork cost was only 50 percent of its budget (see Table 168). We attribute part of the surplus to the operation finishing ahead of schedule, resulting in CLAs working fewer total hours than budgeted. Additionally, the surplus may also be a result of having fewer CLAs working than budgeted.

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<sup>121</sup> The production rate reflects the average number of cases completed per hour. It is the total workload divided by the total enumerator production hours worked.

### Lower Training Costs than Budgeted

Cost savings realized in training also contributed to the budget surplus. We budgeted \$319,199,979 for enumerator/CLA training. However, the actual training costs were \$236,082,472 (see Table 166). We believe that training costs may have been lower in part because of fewer replacement training sessions.

Table 166 depicts the budgeted and actual NRFU workload and costs broken out by four cost factors: production salary, training salary, cost of mileage, and miscellaneous cost. The miscellaneous cost includes the cost of lodging, per diem, and telephone calls. The table also shows the percent of budget used for each cost factor. The percent of budget used is the actual cost divided by the budgeted cost for each individual cost factor. Additionally, the table shows each individual cost factor as a percentage of the actual total NRFU cost of \$1,589,397,886.

**Table 166: Summary of NRFU Field Operation Costs**

	<b>Budget</b>	<b>Actual</b>	<b>Percent of Budget Used</b>	<b>Percent of Actual Total Cost</b>
Workload	48,609,413	47,235,198	--	--
Production Salary	\$1,556,153,490	\$1,135,212,586	72.9%	71.4%
Training Salary	\$349,829,969	\$266,904,486	76.3%	16.8%
Mileage Cost	\$331,511,139	\$181,816,018	54.8%	11.4%
Miscellaneous <sup>122</sup>	\$10,389,786	\$5,464,795	52.6%	0.3%
<b>Total</b>	<b>\$2,247,884,384</b>	<b>\$1,589,397,886<sup>123</sup></b>	<b>70.7%</b>	<b>100.0%<sup>124</sup></b>

Source: DMD C&P

All of the NRFU cost factors were under budget. The largest difference between budgeted and actual costs occurs in the production salary, where we spent 72.9 percent of the production salary budget. Mileage cost was the next largest difference between budgeted and actual costs, with over fifty percent of the mileage cost budget going unused. Training salary was also under budget, although to a lesser degree, with 76.3 percent of the budget spent.

Production salary was the largest category of spending, making up 71.4 percent of the total costs. Training and mileage costs made up 16.8 percent and 11.4 percent of total costs, respectively.

<sup>122</sup> Miscellaneous cost includes lodging, per diem and telephone calls.

<sup>123</sup> Due to rounding, total actual costs are approximately \$1 more than the sum of the individual cost factors depicted in Table 166.

<sup>124</sup> Due to rounding, the sum of the individual cost factor percentages is 99.9%.

#### 5.2.1.2 NRFU Cost per Case

Overall, the actual cost per case was less than planned. The total cost per case was budgeted at \$46.20; however, the actual was \$33.60. This includes total field costs for the operation including training, production salary and mileage costs for all field staff positions.

#### 5.2.1.3 NRFU Cases per Hour and Miles per Case

Table 167 displays the average number of cases worked per hour and average miles driven per case. The percent change in the following tables is the difference between the budgeted and actual variables divided by the budget.

<b>Table 167: NRFU Cases per Hour and Miles per Case</b>		
	<b>Budgeted</b>	<b>Actual</b>
<b>Cases Per Hour</b>	<b>0.89</b>	<b>1.05</b>
<b>Miles Per Case</b>	<b>8.46</b>	<b>5.05</b>

Source: DMD C&P

The original budget had enumerators working 0.89 cases per hour; however, the actual cases per hour were higher at 1.05. The miles per case budgeted was 8.46, while the actual was only 5.05 miles per case.

#### 5.2.1.4 NRFU Variance by Position Type

In analyzing the cost variance, we reviewed the variance by position type, including enumerators, CLA, CL, FOS, and a separate category for miscellaneous charges not associated with the four field positions (See Figure 1 in Section 2.3.1 for the hierarchy of field staff.). Table 168 depicts the dollar and percent variance by position type. It also shows the variance by position type as a percentage of the Total NRFU variance.

**Table 168: NRFU Variance by Position Type**

<b>Position Type</b>	<b>Variance</b>	<b>Percent Variance of Position Type Budget</b>	<b>Percent of Total Variance</b>
Enumerator	\$379,987,260	26.0%	57.7%
CLA	\$202,250,613	51.3%	30.7%
CL	\$70,555,074	21.5%	10.7%
FOS	\$768,560	1.4%	0.1%
Miscellaneous	\$4,924,991	47.4%	0.7%
<b>Total</b>	<b>\$658,486,498</b>	<b>29.3%</b>	<b>100.0%</b> <sup>125</sup>

Source: DMD C&P

The total NRFU cost variance is \$658,486,498 or 29.3 percent of the total NRFU budget. The largest variances in terms of dollars and percent are in the enumerator and CLA costs. The enumerator cost variance is \$379,987,260 (57.7 percent of the total variance for NRFU), which is 26.0 percent of the enumerator budget. The CLA cost variance is \$202,250,613 (30.7 percent of the total variance for NRFU), which is 51.3 percent of the CLA budget.

There is more information on the cost factors by position type in the following sections.

#### **5.2.1.5 NRFU Variance by Cost Factor**

Several cost factors contribute to the total variance. Those factors include the money allocated for training, salary, and mileage. Four different position types categorize the amount of money budgeted and spent: enumerator, CLA, CL, and FOS. Table 169 shows the dollar and percent variances by cost factor and by employee type. It also shows each variance as a percent of the total variance.

<sup>125</sup> Due to rounding, the sum of the individual cost factor percentages is 99.9%.

**Table 169: NRFU Variance by Cost Factor and Position Type**

<b>Cost Factor</b>	<b>Variance</b>	<b>Percent Variance of Cost Factor Budget</b>	<b>Percent of Total Variance</b>
<b>Production Salary</b>			
Enumerator	\$197,639,362	21.4%	30.0%
CLA	\$161,800,654	49.8%	24.6%
CL	\$60,864,528	23.0%	9.2%
FOS	\$636,359	1.4%	0.1%
<b>Total</b>	<b>\$420,940,904</b>	<b>27.1%</b>	<b>63.9%</b>
<b>Training Salary</b>			
Enumerator	\$83,117,507	26.0%	12.6%
CLA	\$652,028	16.4%	0.1%
CL	(\$1,462,571)	(6.3%)	(0.2%)
FOS	\$618,519	17.8%	0.1%
<b>Total</b>	<b>\$82,925,483</b>	<b>23.7%</b>	<b>12.6%</b>
<b>Mileage Cost</b>			
Enumerator	\$99,230,392	45.4%	15.1%
CLA	\$39,797,931	61.5%	6.0%
CL	\$11,153,117	27.4%	1.7%
FOS	(\$486,318)	(6.4%)	(0.1%)
<b>Total</b>	<b>\$149,695,121</b>	<b>45.2%</b>	<b>22.7%</b>
<b>Miscellaneous</b>	<b>\$4,924,991</b>	<b>47.4%</b>	<b>0.7%</b>
<b>Total</b>	<b>\$658,486,498<sup>126</sup></b>	<b>29.3%</b>	<b>100.0%<sup>127</sup></b>

Source: DMD C&amp;P

Production salary cost and mileage cost make up 63.9 percent and 22.7 percent of the total variance, respectively. The enumerator production salary cost variance was the largest contributing factor to the overall variance, accounting for 30.0 percent of the total NRFU cost variance. The second largest factor was the CLA production salary. The cost variance for the CLA production salary accounted for 24.6 percent of the total NRFU variance. The variance in enumerator mileage cost accounted for 15.1 percent of the total NRFU variance.

<sup>126</sup> Due to rounding, total actual costs are approximately \$1 less than the sum of the individual cost factors depicted in Table 169.

<sup>127</sup> Due to rounding, the sum of the individual cost factor percentages is 99.9%.

### 5.2.1.6 NRFU Production Staffing

Table 170 depicts the budgeted and actual number of field positions along with the frontloading<sup>128</sup> rate and the percent variance.

<b>Table 170: NRFU Production Staffing</b>			
<b>Position</b>	<b>Frontloading Rate</b>	<b>Number of Positions Budgeted</b>	<b>Number of Positions Actual</b>
Enumerator	50%	524,919	516,709
CLA	0%	65,266	48,973
CL	0%	40,781	39,559
FOS	0%	4,568	5,575
<b>Total</b>	<b>--</b>	<b>635,534</b>	<b>610,816</b>

For NRFU, 635,534 total field staff positions were budgeted. However, we only filled 610,816 field positions. The FOS position was the only position type where actual positions were higher than budgeted. The budget called for 4,568 FOS positions, however, 5,575 FOS worked on NRFU. A late program change, which was successfully implemented, included adding an AMFO Assistant position in the LCO office. Most AMFO Assistants (listed as a FOS in DAPPS) charged to the LCO office project; however, some AMFO Assistants mistakenly charged to the NRFU project. It is not possible to distinguish FOS from AMFO Assistant staff who charged to the NRFU task code. As a result, the number of actual NRFU FOS staff is slightly inflated by these AMFO Assistants.

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<sup>128</sup> Frontloading is a staffing strategy of over-selecting enumerators for specific field operations to compensate for the risk of dropouts (attrition). Frontloading allows the LCO to meet or exceed established operational deadlines by ensuring that a pool of trained field staff is available as needed.

## 5.2.2 NRFU RI

### 5.2.2.1 Summary of the NRFU RI Field Operations Cost

The total cost of NRFU RI was \$95,271,468 or 101.3 percent of the \$94,036,946 NRFU RI field budget. These costs only reflect RI cases completed by field enumerators. Both office clerks and field staff performed NRFU RI enumeration; however, office reinterview was included in a separate budget. In analyzing the NRFU RI budget and cost, we separated out the workload completed by field enumerators from the workload completed by office staff so our cost analysis would be consistent.

The final NRFU workload estimate was 48,609,413 cases and we planned to select 5.5 percent of these cases for RI. Additionally, we estimated that the 5.5 percent would be split such that 3.25 percent would be conducted in the field and 2.25 percent in the office. Table 171 shows the budgeted RI workload by personal visit and telephone followup.

**Table 171: Budgeted NRFU RI Workload by Personal Visit and Telephone Followup**

	<b>Budgeted Cases</b>	<b>Percent of NRFU Cases</b>	<b>Percent of NRFU RI Cases</b>
NRFU	48,609,413	100.00%	--
NRFU RI Personal Visit	1,579,806	3.25% <sup>129</sup>	60%
NRFU RI Telephone Followup	1,093,711	2.25% <sup>130</sup>	40%
<b>Total RI workload</b>	<b>2,673,517</b>	<b>5.50%</b>	<b>100%</b>

Source: DMD C&P

Based on the NRFU workload, we estimated that 1,579,806 cases would be completed by NRFU RI field enumerators. However, the actual RI personal visit workload was lower than the budgeted 1,579,806 partly because the budgeted workload was based on all NRFU cases rather than on those that were RI eligible.<sup>131</sup> In addition, the NRFU workload was lower than expected at 47,367,647 cases.

<sup>129</sup> The estimated RI sample was 5.5% of the eligible NRFU workload. FLD HQs estimated that 60% of the RI sample would be completed by personal visit and the remainder would be done by telephone.

<sup>130</sup> FLD HQs estimated that 40% of the RI sample would be completed by telephone.

<sup>131</sup> For a NRFU case to have been eligible for RI it must have had either an Occupied, Vacant-Usual Home Elsewhere, or Empty Mobile Home/Trailer Site status. Close out cases, in-mover adds, and UHE were not eligible for RI. Additionally, cases for which the population count was equal to 99, or if earlier version of the case was selected for RI, were not eligible.



The \$94 million NRFU RI budget referenced in this assessment reflects the RI personal visit budget and only corresponds to the 1,579,806 budgeted cases.

**Table 172: Actual NRFU RI Workload by Personal Visit and Telephone Followup**

	Actual Cases	Percent of NRFU Cases	Percent of NRFU RI Cases
NRFU	47,367,647	100.0%	--
NRFU RI Eligible	31,991,588	67.5%	--
NRFU RI Personal Visit	900,329	2.8%	47.7%
NRFU RI Telephone Followup	948,505	3.0%	50.2%
Unknown	39,314	0.1%	2.1%
<b>Total RI workload</b>	<b>1,888,148</b>	<b>5.9%</b>	<b>100%</b>

Sources: Census MaRCS, DRF

Table 172 shows that only 31,991,588 or 67.5% of NRFU cases were eligible for NRFU RI. The table also shows that only 900,329 RI cases were completed by personal visit, which is 2.8% of the NRFU eligible cases and 47.7% of the total RI cases.

The NRFU RI costs of \$95,271,468 came in slightly over the budgeted cost of \$94,036,946. Though the personal visit workload was significantly less than budgeted, we only exceeded the budget minimally because of the following factors:

- Lower cases per hour completed
- Higher miles per case

#### **Lower Cases per Hour Completed**

We budgeted 0.89 cases per hour; however, on average, NRFU RI enumerators only completed 0.42 cases per hour.

#### **Higher Miles per Case**

We budgeted 8.78 miles per case; however, on average, enumerators travelled 32.04 miles per case. RI enumerators travelled longer distances to reach their assignments since RI households were more geographically dispersed.

Table 173 depicts the budgeted and actual NRFU RI workload as well as the NRFU RI budgeted and actual costs by four cost factors: production salary, training salary, cost of mileage, and miscellaneous cost. The miscellaneous cost includes the cost of lodging, per diem, and telephone calls. The table also shows the percent of budget used for each cost factor. The percent of budget used is the actual cost divided by the budgeted cost for each individual cost factor. Additionally, the table shows each individual cost factor as a percentage of the actual total NRFU RI cost of \$95,271,468.

**Table 173: NRFU RI Summary of Field Operation Costs**

	<b>Budget</b>	<b>Actual</b>	<b>Percent of Budget Used</b>	<b>Percent of Actual Total Cost</b>
Workload	1,579,806	900,329 <sup>132</sup>	--	--
Production Salary	\$64,612,378	\$61,851,809	95.7%	64.9%
Training Salary	\$15,219,276	\$9,904,196	65.1%	10.4%
Mileage Cost	\$13,777,744	\$22,880,974	166.1%	24.0%
Miscellaneous	\$427,548	\$634,489	148.4%	0.7%
<b>Total</b>	<b>\$94,036,946</b>	<b>\$95,271,468</b>	<b>101.3%</b>	<b>100.0%</b>

Source: DMD C&P

The production salary and training salary costs ran slightly under budget. Production salary costs were 95.7 percent of the \$64,612,378 production salary budget. Training salary costs were 65.1 percent of the \$15,219,276 training salary budget. However, the mileage costs and miscellaneous costs ran over budget, resulting in an overall cost overrun for NRFU RI. The largest contributing factor to the budget overrun was the mileage costs. We spent \$22,880,974 or 166.1 percent of the mileage cost budget. Additionally, the miscellaneous costs ran over budget. We spent 148.4 percent of the \$427,548 miscellaneous budget. However, despite the large discrepancy between the miscellaneous budget and cost, the miscellaneous cost category was too small to have a significant impact on the budget overrun.

Production salary was the largest category of spending accounting for 64.9 percent of the total costs. Mileage costs (24.0 percent of the total cost) were a larger percentage of the NRFU RI budget than the NRFU budget. The actual cost of the mileage was the largest contributing factor to the NRFU RI operation not finishing under budget.

<sup>132</sup> The actual workload is lower than the budgeted workload for the reasons cited earlier in section 5.2.2.1.

#### 5.2.2.2 NRFU RI Cost per Case

Overall, the actual cost per case was greater than planned. The total cost per case was budgeted at \$59.50; however, the actual was higher at \$105.80. This includes total field costs for the operation including training, production salary and mileage costs for all field staff positions.

#### 5.2.2.3 NRFU RI Cases per Hour and Miles per Case

Table 174 displays the average number of cases worked per hour and average miles driven per case. The variance in the following tables is the difference between the budgeted and actual variables. The percent variance is the difference between the actual and budget divided by the budget.

<b>Table 174: NRFU RI Cases per Hour and Miles per Case</b>		
	<b>Budgeted</b>	<b>Actual</b>
<b>Cases Per Hour</b>	<b>0.89</b>	<b>0.42</b>
<b>Miles Per Case</b>	<b>8.78</b>	<b>32.04</b>

Source: DMD C&P

The number of cases completed per hour was lower than the number that was budgeted. We budgeted 0.89 cases per hour; however, the actual cases per hour were lower at 0.42. There was a large difference in the number of miles driven by enumerators and the number of miles budgeted for the enumerators. The miles per case budgeted was 8.78 while the actual was 32.04.

#### 5.2.2.4 NRFU RI Production Staffing

Table 175 depicts the budgeted and actual number of field positions and the percent difference.

<b>Table 175: NRFU RI Staffing</b>		
<b>Position</b>	<b>Number of Positions Budgeted</b>	<b>Number of Positions Actual</b>
Enumerator	20,273	27,092
CLA	2,770	4,101
CL	1,880	2,564
FOS	494	748
<b>Total</b>	<b>25,417</b>	<b>34,505</b>

Sources: DMD Cost Model and DAPPS

For NRFU RI, we budgeted for 25,417 total field staff positions. The actual total field positions filled was 34,505, yielding a difference of 35.8 percent. Based on anecdotal feedback, we believe the regions were concerned that they may need more RI enumerators in the field than originally

budgeted because of problems with PBOCS resulting in bottlenecks with RI selection. Consequently, the regions felt the LCO staff would not be able to handle the RI cases so they overhired RI field staff as a way to mitigate the risk.

### 5.2.3 VDC

#### 5.2.3.1 Summary of VDC Field Operation Costs

The total cost of VDC was \$281,727,536, or 115.3 percent of the \$244,284,616 VDC field budget. We believe the \$37,442,920 overspending is due to lower than expected production rates and higher than expected mileage costs. The following factors contributed to lower productivity rate and higher miles:

- VDC cases were more dispersed than NRFU resulting in more miles and travel time per case.
- Enumerators were selected and sometimes trained before the locations of the workloads were known; therefore, the distribution of the trained staff was not in line with the distribution of the workload.

Table 176 depicts the budgeted and actual VDC workload as well as the VDC budgeted and actual costs by four cost factors: production salary, training salary, cost of mileage, and miscellaneous cost. As is the case for NRFU, the miscellaneous cost includes the cost of lodging, per diem, and telephone calls. The table also shows the percent of budget used for each cost factor. The percent of budget used is the actual cost divided by the budgeted cost for each individual cost factor. Additionally, the table shows each individual cost factor as a percentage of the actual total VDC cost of \$281,727,536.

**Table 176: VDC Summary of Field Operation Costs**

	<b>Budget</b>	<b>Actual</b>	<b>Percent of Budget Used</b>	<b>Percent of Actual Total Cost</b>
Workload	8,566,741	8,730,803	--	--
Production Salary	\$174,333,078	\$211,385,263	121.3%	75.0%
Training Salary	\$24,771,825	\$14,991,153	60.5%	5.3%
Mileage Cost	\$44,112,745	\$54,060,202	122.6%	19.2%
Miscellaneous	\$1,066,968	\$1,290,918	121.0%	0.5%
<b>Total</b>	<b>\$244,284,616</b>	<b>\$281,727,536</b>	<b>115.3%</b>	<b>100.0%</b>

Source: DMD C&P

The actual workload was slightly higher than expected at 8.7 million cases, compared with the budgeted 8.6 million. Production salary, mileage cost, and miscellaneous costs ran over budget by 21.3 percent, 22.6 percent, and 21.0 percent, respectively. However, training salary actually ran under budget by 39.5 percent.

### 5.2.3.2 VDC Cost per Case

Actual cost per case was higher than budgeted for each unit-level cost. The total cost per case was budgeted at \$28.50; however, the actual was \$32.30. We calculate this unit cost by dividing the total cost of \$281,727,536 by the workload of 8,730,803. This includes total field costs for the operation including training, production salary and mileage costs for all field staff positions.

### 5.2.3.3 VDC Cases per Hour and Miles per Case

The cost overruns in enumerator production hours and miles cost, indicate that enumerators worked more hours and travelled more miles than budgeted per case. Table 177 displays the average number of cases worked per hour and average miles driven per case. The variance in the following tables is the difference between the budgeted and actual variables. The percent variance is the difference between the actual and budget divided by the budget.

<b>Table 177: VDC Cases per Hour and Miles per Case</b>		
	<b>Budgeted</b>	<b>Actual</b>
<b>Cases Per Hour</b>	<b>1.31</b>	<b>0.97</b>
<b>Miles Per Case</b>	<b>7.44</b>	<b>8.69</b>

Source: DMD C&P

We budgeted 1.31 cases per hour; however, the actual cases per hour were lower at 0.97, a variance of 25.8 percent. The miles per case budgeted was 7.44 while the actual was higher at 8.69, a variance of 16.7 percent.

### 5.2.3.4 VDC Variance by Position Type

In analyzing the cost variance, we reviewed the variance by position type, including enumerator, CLA, CL, FOS, and a separate category for miscellaneous charges not associated with the four field positions (See Figure 1 in Section 2.3.1 for the hierarchy of field staff). Table 178 depicts the dollar variance and percent variance by position type. It also shows the variance by position type as a percentage of the total VDC variance.

**Table 178: VDC Variance by Position Type**

<b>Position Type</b>	<b>Variance</b>	<b>Percent Variance of Position Type Budget</b>	<b>Percent of Total Variance</b>
Enumerator	(\$32,725,038)	(20.7%)	87.4%
CLA	(\$4,962,521)	(15.8%)	13.3%
CL	\$1,657,577	3.7%	(4.4%)
FOS	(\$1,188,988)	(13.8%)	3.2%
Miscellaneous	(\$223,950)	(21.0%)	0.6%
<b>Total</b>	<b>(\$37,442,920)</b>	<b>(15.3%)</b>	<b>100.0%</b> <sup>133</sup>

Source: DMD C&P

The total VDC cost variance is \$37,442,920, or 15.3 percent over the total VDC budget. The largest variances in terms of dollars and percent of total variance occur in the enumerator and CLA costs. The enumerator cost variance is \$32,725,038, or 20.7 percent over the enumerator budget; and the CLA cost variance is \$4,962,521, or 15.8 percent over the CLA budget.

The enumerator and CLA positions make up for 87.4 percent and 13.3 percent of the total variance, respectively. There is more information on the cost factors by position type in the following sections.

#### **5.2.3.5 VDC Variance by Cost Factor**

Several cost factors contribute to the total variance. Those factors include the money allocated for training, salary, and mileage. Four different position types categorize the amount of money budgeted and spent: enumerator, CLA, CL, and FOS. Table 179 shows the variances by cost factor and by employee type. It also shows each variance as a percent of the total variance.

<sup>133</sup> Due to rounding, the sum of the individual cost factor percentages is 100.1%.

**Table 179: VDC Variance by Cost Factor and Position Type**

<b>Cost Factor</b>	<b>Variance</b>	<b>Percent Variance of Cost Factor Budget</b>	<b>Percent of Total Variance</b>
<b>Production Salary</b>			
Enumerator	(\$37,881,469)	(36.5%)	101.2%
CLA	(\$1,696,139)	(6.5%)	4.5%
CL	\$3,997,850	10.5%	(10.7%)
FOS	(\$1,472,427)	(23.3%)	3.9%
<b>Total</b>	<b>(\$37,052,185)</b>	<b>(21.3%)</b>	<b>99.0%</b>
<b>Training Salary</b>			
Enumerator	\$10,775,663	48.7%	(28.8%)
CLA	(\$1,612,133)	100.0%	4.3%
CL	(\$203,344)	(13.2%)	0.5%
FOS	\$820,486	75.3%	(2.2%)
<b>Total</b>	<b>\$9,780,672</b>	<b>39.5%</b>	<b>(26.1%)</b>
<b>Mileage Cost</b>			
Enumerator	(\$5,619,232)	(17.4%)	15.0%
CLA	(\$1,654,249)	(30.9%)	4.4%
CL	(\$2,136,929)	(40.6%)	5.7%
FOS	(\$537,047)	(44.8%)	1.4%
<b>Total</b>	<b>(\$9,947,457)</b>	<b>(22.6%)</b>	<b>26.6%</b>
<b>Miscellaneous</b>	<b>(\$223,950)</b>	<b>(21.0%)</b>	<b>0.6%</b>
<b>Total</b>	<b>(\$37,442,920)</b>	<b>(15.3%)</b>	<b>100.0%<sup>134</sup></b>

Source: DMD C&amp;P

The largest variances in terms of dollar amount and percent of total variance are the production salary and mileage cost. The production salary cost variance is \$37,052,185, or 21.3 percent over the production salary cost budget and the mileage cost variance is \$9,947,457, or 22.6 percent over the mileage cost budget. Production salary cost and mileage cost account for 99.0 percent and 26.6 percent of the total variance, respectively. However, the training salary cost variance of \$9,780,672 offsets the mileage cost variance of \$9,947,457 almost entirely.

Specifically, the most significant cost variances are in the enumerator production salary and enumerator mileage costs. These two factors together account for 116.2 percent of the total VDC

<sup>134</sup> Due to rounding, the sum of the individual cost factor percentages is 100.1%.

cost variance. The enumerator production salary cost variance was \$37,881,469, or 36.5 percent over the enumerator production salary budget.

The enumerator production salary cost variance was the largest contributing factor to the overall variance, accounting for 101.2 percent of the total VDC cost variance. The variance in enumerator miles cost made up 15.0 percent of the total VDC variance - offset by enumerator training costs which account for 28.8 percent of the total VDC variance.

#### **5.2.3.6 VDC Production Staffing**

Table 180 depicts the budgeted and actual number of field positions along with the frontloading rate and the percent variance.

<b>Table 180: VDC Staffing</b>		
<b>Position</b>	<b>Number of Positions Budgeted</b>	<b>Number of Positions Actual</b>
Enumerator	160,364	146,129
CLA	10,785	17,671
CL	12,232	13,897
FOS	1,958	2,300
<b>Total</b>	<b>185,339</b>	<b>179,997</b>

Source: DMD Cost Model and DAPPS

For VDC, we budgeted for 185,339 total field staff positions. The actual total field positions filled was 179,997, or 2.9 percent less than planned. The enumerator position was the only position where more positions were budgeted than needed. The budget called for 160,364 enumerator positions, but we only filled 146,129 positions for VDC.

#### **5.2.4 NRFU Residual**

##### **5.2.4.1 Summary of the NRFU Residual Field Operation Costs**

The NRFU Residual operation was planned late in the Census production schedule. The goal of the operation was to reconcile and closeout NRFU. We modeled the NRFU Residual after the VDC operation with the exception of a training budget because we hired only experienced NRFU or VDC staff to work on the NRFU Residual and no training was necessary. However, the NRFU Residual enumerators traveled more miles and achieved a lower than expected production rate, resulting in overspending in the operation.

The total cost of NRFU Residual was \$42,595,299, or 136.1 percent of the \$31,287,851 NRFU Residual field budget. The operation ran over budget by \$11,307,448.



Table 181 depicts the NRFU Residual workload, the total NRFU Residual budget and actual costs, as well as a distribution of the budget and actual cost, by cost factor. The table also shows each cost factor as a percentage of the total operational cost.

**Table 181: NRFU Residual Summary of Field Operation Costs**

	<b>Budget</b>	<b>Actual</b>	<b>Percent of Budget Used</b>	<b>Percent of Actual Total Cost</b>
Workload	729,143	729,143	--	--
Production Salary	\$23,627,881	\$30,927,547	130.9%	72.6%
Training Salary	--	\$1,519,926	--	3.6%
Mileage Cost	\$7,659,970	\$9,920,952	129.5%	23.3%
Miscellaneous	--	\$226,874	--	0.5%
<b>Total</b>	<b>\$31,287,851</b>	<b>\$42,595,299</b>	<b>136.1%</b>	<b>100.0%</b>

Source: DMD C&P

The budgeted and actual workloads are the same since the NRFU Residual operation was a late operation implemented specifically to re-enumerate a known number of housing units.

Production salary and mileage costs were both over budget. We spent \$30,927,547, or 130.9 percent of the production salary budget; and we spent \$9,920,952, or 129.5 percent of the mileage cost budget.

There were no training or miscellaneous budgets for NRFU Residual. The operation utilized staff that had previously worked on NRFU or VDC and did not require official training. However, some staff incorrectly charged to the training code for NRFU Residual instead of the field work code for NRFU Residual.

Production salary was the largest category of spending accounting for 72.6 percent of the total costs. The second largest spending category was mileage costs, which were \$9,920,952, or 23.3 percent of total spending. Training costs and miscellaneous costs were \$1,519,926, or 3.6 percent of total spending, and \$226,874, or 0.5 percent of total spending, respectively.

#### 5.2.4.2 NRFU Residual Cost per Case

NRFU Residual cost per case was higher than budgeted. The total cost per case was budgeted at \$42.90; however, the actual was \$58.40. This includes total field costs for the operation including training, production salary and mileage costs for all field staff positions.

#### 5.2.4.3 NRFU Residual Cases per Hour and Miles per Case

The modeled production rate for NRFU Residual was 0.8 cases per hour per enumerator. This production rate estimate was based on what happened in VDC, taking into consideration that NRFU Residual may have a lower productivity than VDC due to the geographically dispersed workload. Table 182 displays the budgeted cases per hour and miles per case compared to the actual and the corresponding variances.

**Table 182: NRFU Residual Cases per Hour and Miles per Case**

	<b>Budgeted</b>	<b>Actual</b>
<b>Cases Per Hour</b>	<b>0.80</b>	<b>0.53</b>
<b>Miles Per Case</b>	<b>14.30</b>	<b>20.24</b>

Source: DMD C&P

On average NRFU Residual enumerators worked more hours and traveled more miles per case than budgeted. Although we budgeted 0.80 cases per hour, the actual cases per hour were lower at 0.53, a variance of 33.8 percent. The miles per case budgeted was 14.30 while the actual was higher at 20.24, a difference of 41.5 percent over the budgeted miles.

#### 5.2.4.4 NRFU Residual Production Staffing

Table 183 depicts the budgeted and actual number of field positions along with the frontloading rate and the percent variance.

**Table 183: NRFU Residual Staffing**

<b>Position</b>	<b>Number of Positions Budgeted</b>	<b>Number of Positions Actual</b>
Enumerators	31,188	34,402
CLA	4,810	4,167
CL	2,398	3,751
FOS	261	735
<b>Total</b>	<b>38,657</b>	<b>43,055</b>

Source: DMD Cost Model and DAPPS

For NRFU Residual, we budgeted for 38,657 total field staff positions. The actual total field positions filled was 43,055, 11.4 percent over plan. For all positions except for the CLAs, more field staff worked than budgeted. Because of the limited time we had to conduct the operation, more staff was required than planned.

## 5.3 Training

### 5.3.1 NRFU

#### 5.3.1.1 FOS and CL Training

FOSs were trained for the NRFU operation from March 29 to April 2, on schedule according to baseline dates. There was no specific questionnaire or debriefing to capture feedback from FOSs after their training.

During the week of April 12, 2010, CLs were trained in approximately 4,900 sites throughout the United States and Puerto Rico. The CL training, conducted by the FOSs, included four days of classroom training and a self-study to be completed at home the following week. This self-study was intended to further prepare them to perform their CL duties, which included training and supervising enumerators, and monitoring the performance and quality of enumerators' work to ensure the timely completion of NRFU in their CL District.

On the last day of CL training, the trainees were asked to complete a training evaluation form. The completed forms were forwarded to NPC and data captured. We received 19,227 completed evaluation forms. Some results from those forms are listed below.

- Approximately 75.0 percent of respondents felt the amount of information covered in training was *just right*, and 64.4 percent thought the length of training was *just right* given the amount of information to be covered. Approximately 30.7 percent, however, thought the training was *too short* given the amount of information to be covered.
- Almost 31 percent thought *more time* should be spent on using CL reports. Additional topics CLs thought *more time* should be spent on were: Assigning AAs, viewing assigned AAs, and reassigning cases; the Overview of CL duties; UHE, in-movers and adding HUS; and the outline of the duties that must be performed before enumerator training.
- While 67.7 percent thought the number of practice interviews was the *right amount*, approximately 27.5 percent thought there were *too few* practice interviews to help them train their enumerators to conduct successful interviews.
- The majority (55.2 percent) said there were the *right amount* of complex interviews such as proxies, vacants, deletes, no one home, refusals, added units, in-movers, and WHUHEs. However, 41.4 percent said there were *too few* of these complex interviews to help them train their enumerators to handle the more difficult interviewing situations.
- The majority of the survey respondents felt they were *totally prepared* to train their enumerators to perform NRFU tasks, but about one-fourth felt only *somewhat prepared* to teach enumerators to organize and manage their work (24.6 percent), convince reluctant respondents to cooperate (27.8 percent), and handle refusals and irate respondents (26.8). One-fifth (or 20.1 percent) also felt they were only *somewhat prepared* to handle difficult or potentially dangerous situations.
- Approximately 30.4 percent felt they were only *somewhat prepared* to teach their enumerator trainees how to resolve mix-ups in multi-unit buildings and mobile home

parks; another 28.9 percent were only *somewhat prepared* to teach trainees how to address locked and gated communities. A little more than 20 percent were only *somewhat prepared* to resolve duplicate housing units (22.1 percent) and address households where all occupants speak a language other than English (21.5 percent).

- When trainees were asked their overall assessment of their CL training, almost 60 percent of respondents said they were *totally prepared* to perform the job of a NRFU CL. About 36 percent said they were *somewhat prepared* to perform the job.

### 5.3.1.2 Enumerator Training

The week of April 26, 2010, NRFU enumerators were simultaneously trained in approximately 32,000 NRFU training sessions throughout the United States and Puerto Rico. The training lasted 4 days and included 3 and ½ days of classroom training with approximately ½ day of field work using “live” NRFU cases. Training was conducted on schedule according to the baseline dates.

On the last day of enumerator training, the trainees were asked to complete a training evaluation form. The completed forms were forwarded to NPC and data captured. We received completed questionnaires from 313,295 of the trainees. The following bullets describe some of the primary findings.

- Approximately 85.2 percent of the respondents to the survey thought the amount of information covered in training was *just right*, almost three-fourths thought the length of training was *just right* for the amount of information covered, and more than 77 percent of trainees thought the pace of their classroom training was *just right*.
- Approximately 48.4 percent thought *more time* should be allocated to field work, 31.4 percent felt that *more time* should be allocated to practice interviews, and 25.1 percent wanted *more time* allocated to group discussions. Almost 32 percent of the trainees recommended *less time* be spent on lectures (i.e., reading from the manuals).
- More than 62 percent felt the field work portion of training was *very useful*. Almost 15 percent did not have the opportunity to work real cases in the field as part of their training.
- Approximately 90 percent rated their enumerator training on NRFU tasks as *good*, *very good*, or *outstanding*. Handling questionnaire misdeliveries and apartment mixups in multi-unit buildings or mobile home parks were the tasks that received the greatest number of enumerators who rated the training as either *fair* or *poor*.
- Overall, 73.7 percent said they were *totally prepared* to perform effectively in the job of NRFU enumerator. Approximately 20.3 percent said they were *somewhat prepared* to effectively perform the job.

The LCO training procedures required supervisors to observe all enumerators on the job within the first week after training and mark observations on an observation checklist and provide feedback to the enumerator. After the NRFU operation was completed, these checklists were shipped to NPC for data capture. However, observation forms were received for only 51.9 percent of all NRFU enumerators. There was no tracking of observation forms, so we do not

know if this is because the actual observations were not done or because the observation checklists were lost or not filled out.

If an enumerator struggled with properly implementing census procedures or if they were unable to interview any respondents during their first observation, the supervisor was supposed to make a second observation. Table 184 shows that 14.0 percent of observed NRFU enumerators had two observations and 0.6 percent had more than two observations. It is not possible to determine how many repeat observations were due to improper implementation of procedures and how many were needed because the first observation did not capture any completed interviews. For Table 184 and Table 185, there were 17,824 observation forms not used for this analysis due to missing Applicant ID, unknown operation, or late form shipment.

<b>Table 184: Number of NRFU Crew Leader Observations of Enumerators</b>		
<b>Number of Observations</b>	<b>Number of Enumerators</b>	<b>Percentage of Enumerators</b>
0 Observations <sup>135</sup>	745	0.3%
1 Observation	233,854	85.2%
2 Observations	38,334	14.0%
More than 2 Observations	1,610	0.6%
<b>Total Enumerators with Observation Forms</b>	<b>274,543<sup>136</sup></b>	<b>100.0%</b>

Table 185 below shows that 86.5 percent of all observed enumerators received a final observation outcome of pass while 0.8 percent of all observed enumerators failed. The remaining enumerators either had observation outcomes of ‘other’ or did not have an outcome marked. Outcomes of ‘other’ were applied either when an enumerator quit or was moved to another CLD before they could be observed.

<sup>135</sup> These are enumerators that had an observation form data-captured and attributed to them but all observation fields (including observer name, observation date, number of cases observed, and all task outcomes) were blank. Based on the results of most of these forms, it appears it was because they left the operation or the CLD before an observation was completed.

<sup>136</sup> There were 528,960 enumerators total but only 274,543 were observed.

**Table 185: Results of NRFU Crew Leader Observations of Enumerators**

<b>Final Observation Outcome</b>	<b>Number of Enumerators</b>	<b>Percentage of Enumerators</b>
Pass	237,499	86.5%
Fail	2,149	0.8%
Other	3,035	1.1%
None marked	31,860	11.6%
<b>Total Enumerators with Observation Forms</b>	<b>274,543</b>	<b>100.0%</b>

\* Note: 17,818 observation forms were not used for this analysis due to missing Applicant ID, unknown operation, or late form shipment.

Of 273,798 first observations of enumerators' work by a CL, 9.2 percent had at least one error observed by the CL. Of the last observations made (when more than one was required), 8.6 percent had at least one error observed. Table 186 shows what tasks were the most likely for a CL to observe an enumerator performing incorrectly.

**Table 186: Error Rate of Specific Tasks During NRFU Crew Leader Observations**

<b>Observed Error Actions</b>	<b>Number of First Observations with This Error</b>	<b>Percentage of First Observations with This Error</b>	<b>Number of Last Observations with This Error</b>	<b>Percentage of Last Observations with This Error</b>
1 – Introduction/show badge	2,421	0.9%	327	0.8%
2 – Provide Information Sheet	6,055	2.2%	835	2.1%
3 – Plan efficient route	4,887	1.8%	784	2.0%
4 – Use Census maps	6,533	2.4%	1,031	2.6%
5 – Interview eligible respondent	942	0.3%	223	0.6%
6 – Read questions as worded	9,256	3.4%	1,352	3.4%
7 – Fill out questionnaire	6,880	2.5%	1,182	3.0%
8 – Use various forms	3,810	1.4%	723	1.8%
9 – Protect confidentiality	1,665	0.6%	349	0.9%
10 – Wear seatbelt when driving	1,754	0.6%	237	0.6%
<b>Total Observations done</b>	<b>273,798</b>	<b>-----</b>	<b>39,989</b>	<b>-----</b>

Table 186 shows that the most common error enumerators made was not reading questions as worded. The checklists were unable to capture which questions or how many questions an enumerator was not reading as worded. A promising result is that incidences of not interviewing an eligible respondent or not protecting confidential data were rare.

While the overall error rate went down between the first and last observations, we see that the specific error rates went up on using census maps, interviewing eligible respondents, filling out the questionnaire, using various forms, and protecting confidentiality. This is likely due to the limited abilities of the enumerators who required a second observation rather than a decrease in overall proficiency. However, this may also indicate an area where re-trainings could be improved.

## 5.3.2 NRFU RI

### 5.3.2.1 Field Staff Training

All RI field staff training was conducted on schedule according to baseline dates. There were no training evaluation forms given to NRFU RI enumerators so there is no information available to assess their immediate reaction to the week of training.

As with the NRFU enumerators though, RI supervisors were to observe all RI enumerators on the job within the first week after training and mark observations on an observation checklist. After the RI operation was completed, these checklists were shipped to NPC for data capture. However, observation forms were received for only 48.5 percent of all RI enumerators.

Table 187 shows that 14.0 percent of observed NRFU RI enumerators had two observations and 1.0 percent had more than two observations.

<b>Table 187: Number of NRFU RI Crew Leader Observations of Enumerators</b>		
<b>Number of Observations</b>	<b>Number of Enumerators</b>	<b>Percentage of Enumerators</b>
0 Observations	12	0.1%
1 Observation	11,223	84.9%
2 Observations	1,855	14.0%
More than 2 Observations	134	1.0%
<b>Total Enumerators with Observation Forms</b>	<b>13,224<sup>137</sup></b>	<b>100.0%</b>

Source: NPC Observation Forms Keying

Table 188 shows that 87.3 percent of all observed RI enumerators received a final observation outcome of pass while 0.7 percent of all observed RI enumerators failed.

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<sup>137</sup> There were 27,276 RI enumerators total but only 13,224 were observed.

\*Note: 17,824 observation forms were not used for this analysis due to missing Applicant ID, unknown operation, or late form shipment.



**Table 188: Results of NRFU RI Crew Leader Observations of Enumerators**

<b>Final Observation Outcome</b>	<b>Number of Enumerators</b>	<b>Percentage of Enumerators</b>
Pass	11,538	87.3%
Fail	87	0.7%
Other	86	0.7%
None marked	1,513	11.4%
<b>Total Enumerators with Observation Forms</b>	<b>13,224</b>	<b>100.0%</b>

Source: NPC ObservationForms Keying

These distributions in Table 187 and Table 188 are similar to those seen for the NRFU enumerators, although RI had fewer enumerators with zero observations and fewer observation results of other, which may indicate a lower turnover rate than NRFU.

Of 13,212 first observations made by a RI CL to observe an RI enumerator, 9.5 percent of the first observations and 10.0 percent of the last observations had at least one error observed. Table 189 shows what tasks were the most likely for a CL to observe an RI enumerator performing incorrectly.

**Table 189: Error Rate of Specific Tasks During NRFU RI Crew Leader Observations**

<b>Observed Error Actions</b>	<b>Number of First Observations with This Error</b>	<b>Percentage of First Observations with This Error</b>	<b>Number of Last Observations with This Error</b>	<b>Percentage of Last Observations with This Error</b>
1 – Introduction/show badge	116	0.9%	16	0.8%
2 – Provide Information Sheet	463	3.5%	70	3.5%
3 – Plan efficient route	138	1.0%	18	0.9%
4 – Use Census maps	303	2.3%	55	2.8%
5 – Interview eligible respondent	47	0.4%	11	0.6%
6 – Read questions as worded	416	3.1%	65	3.3%
7 – Fill out questionnaire	246	1.9%	55	2.8%
8 – Use various forms	164	1.2%	35	1.8%
9 – Protect confidentiality	48	0.4%	12	0.6%
10 – Wear seatbelt when driving	47	0.4%	7	0.4%
<b>Total Observations done</b>	<b>13,212</b>	<b>-----</b>	<b>1,989</b>	<b>-----</b>

Source: NPC ObservationForms Keying

Table 189 shows that the most common error enumerators made in both the first and last observation was not providing an Information Sheet, followed by not reading questions as worded. A promising result is that incidences of not interviewing an eligible respondent or not protecting confidential data were rare.

Just as with NRFU enumerators, while the overall error rate went down between the first and last observations, the specific error rates went up on using census maps, interviewing eligible

respondents, filling out the questionnaire, using various forms, and protecting confidentiality. This is likely due to the limited abilities of the RI enumerators who required a second observation, rather than a decrease in overall proficiency. However, this may also indicate an area where re-trainings could be improved.

### 5.3.2.2 NPC and LCO MaRCS Training

Table 190 shows the scheduled and actual completion dates for Census MaRCS training for LCO and NPC staff. For NPC MaRCS clerks, we conducted three rounds of training.

**Table 190: MaRCS Training Scheduled and Actual Completion Dates**

<b>Training</b>	<b>Completion Dates</b>	
	<b>Scheduled</b>	<b>Actual</b>
NPC MaRCS 1	5/19/10	5/19/10
NPC MaRCS 2	6/09/10	6/09/10
NPC MaRCS 3	6/10/10	6/03/10
LCO MaRCS	5/21/10	5/21/10

Source: Master Activities Schedule

NPC round three was actually completed earlier than scheduled. This round was training the Update Enumerate (UE) clerks to work on NRFU. The UE clerks did not have enough cases to work in the UE operation and NRFU clerks had more than they could keep up with, so we trained the UE clerks on NRFU early so they could work on NRFU cases once they were done with their UE workload for the day.

The NPC MaRCS training was designed to prepare NPC clerks for their job conducting clerical matching on the NRFU MaRCS application. They learned how to navigate the software to investigate cases, view reports, and assign RI matching outcomes to their cases. Once they began working on NRFU cases, however, they encountered many situations that had not been covered during the training. Some examples are the following situations:

1. Either the NRFU case or the RI case was not occupied,
2. The RI enumerator incorrectly listed the household members at the proxy address and not the NRFU address, and
3. Data capture errors resulted in inconsistent data (i.e. population count was seven but only one household member was listed).

Three weeks after conducting the NPC MaRCS training, we held a debriefing with a sample of NRFU MaRCS NPC clerks. When asked if the training prepared them for their jobs, the majority of the clerks said yes but with the following suggestions:

1. Make the training longer to allow for more examples,
2. Include better training on the field enumerator procedures for both NRFU and RI so they have a better understanding of the resulting data,

3. Include more instruction on what exactly to put into their notes when deferring a case, and
4. Schedule question and answer sessions one week into production so clerks can have questions resolved in a setting that would share the knowledge with all clerks.

All of these suggestions would improve the NPC training and should be considered for future enumerations.

In a questionnaire sent to LCO staff that used MaRCS, the majority of respondents provided a positive response to the LCO Clerk MaRCS training. LCO clerks were trained on how to navigate the software and on tools and procedures on how to investigate and assign a final code to a case. The training was conducted over 2 1/2 days the week after RI enumerator training was completed. The first two days were dedicated to MaRCS training and the last 1/2 day was dedicated to practice cases on their own. LCO clerks assigned to work in MaRCS should have attended RI enumerator training prior to attending MaRCS training. The RI enumerator training gave the LCO clerks the proper background to code cases in MaRCS.

The training used different training scenarios to illustrate possible situations the clerks would encounter when working the cases in MaRCS. The majority of respondents liked this format of MaRCS training and using the actual MaRCS system during training. The respondents recommended that LCO Clerk MaRCS training needs to be expanded with more specific case scenarios. Participants also said to prepare several training packages directed to different audiences, such as a training package for the AMQA and another for the clerks.

### **5.3.3 VDC**

We did not conduct field staff debriefings for VDC and do not have sufficient information to address the success of VDC training.

### **5.3.4 NRFU Residual**

Because NRFU Residual was a late operation - added when NRFU was already in production - there was no planned training for the operation. Staff that worked on previous operations worked on NRFU Residual with FLD-provided job aids to assist them with their tasks.

## **5.4 Schedule**

### **5.4.1 NRFU and NRFU RI Schedule Activities**

Census used the 2010 DMD Master Activities Schedule (MAS) to monitor and track the 2010 Census. The MAS - created and maintained by the Decennial Census staff through a web-based version of Primavera scheduling software - included 10,875 activity lines. Of the overall 10,875 lines, NRFU and RI accounted for 602 activities (5.5 percent of total activities). Of the 602

activities, 82 were under the NRFU Work Breakdown Structure (WBS), and the remaining 520 activities spanned all functional areas related to NRFU (e.g. FDCA, UCM.)

As shown in Table 191, 366 activities (64.4 percent) started and finished on time or ahead of schedule according to baseline dates.

**Table 191: NRFU and RI Activities that Started and Finished On Time**

	<b>Number of Activities</b>	<b>Percent of Activities</b>
Activities that Started and Finished on Time or Ahead of Schedule	366	64.4%
Activities that Started or Finished Late	202	35.6%
<b>Completed Activities</b>	<b>568<sup>138</sup></b>	<b>100.0%</b>

Source: Master Activities Schedule

Table 192 shows the counts and percentages of activities that started and finished on time, disaggregating the counts into groupings of all activities, milestone starts, milestone finishes, and task dependent activities. There were 416 (73.2 percent) activities that started on time or early and 399 (70.3 percent) activities that finished on time or ahead of schedule. Overall, the milestone activities, particularly the milestone finishes, were less frequently on schedule than task dependent activities.

<sup>138</sup> There are 602 total NRFU and NRFU RI schedule activities. The schedule lines that are not finished are all related to the NRO assessment and are not included here.

**Table 192: NRFU and RI Activities that Started or Finished on Time, by Activity Type**

	All Activities		Milestone Starts		Milestone Finishes		Task Dependent Activities <sup>139</sup>	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Activities Started on Time or Early	416	73.2%	20	62.5%	--	--	367	76.6%
Activities Finished on Time or Early	399	70.2%	--	--	29	50.9%	350	73.1%
<b>Completed Activities</b>	<b>568</b>		<b>32</b>		<b>57</b>		<b>479</b>	

Source: Master Activities Schedule

To generate the count of all activities that started on time or early, we added the milestone starts that started on time or early, the milestone finishes that finished on time or early, and the task dependent activities that started on time or early. Similarly, to calculate the count of all activities that finished on time or early, we added the milestone starts that started on time or early, the milestone finishes that finished on time or early, and the task dependent activities that finished on time or early.

#### 5.4.2 VDC Schedule Activities

The VDC schedule lines comprised 117 of the 10,875 lines in the schedule. This count is slightly understated in that there were additional activities outside of the 117 also related to VDC (e.g. Assessment activities) that were not linked to the VDC schedule, but were linked to the NRFU schedule only. Twenty-eight of the 117 activities were under the VDC Work Breakdown Structure (WBS), and the remaining 89 activities spanned all functional areas related to VDC (e.g. FDCA, UCM).

<sup>139</sup> Task dependent activities are activities that have defined predecessor and successor activities linked to them in the schedule.

As shown in Table 193, of the finished activities, 70 activities (60.3 percent) both started and finished on time or ahead of schedule according to baseline dates.

**Table 193: VDC Activities that Started and Finished On Time**

	<b>Number of Activities</b>	<b>Percent of Activities</b>
Activities that Started and Finished on Time or Ahead of Schedule	70	60.3%
Activities that Started or Finished Late	47	40.5%
<b>Completed VDC Activities</b>	<b>116<sup>140</sup></b>	<b>100.0%</b>

Source: Master Activities Schedule

Table 194 shows the counts and percentages of activities that started and finished on time, disaggregating the counts into groupings of all activities, milestone starts, milestone finishes, and task dependent activities. There were 90 (77.6 percent) activities that started on time or early and 80 (69.0 percent) activities that finished on time or ahead of schedule. Overall, the milestone activities, particularly the milestone finishes were less frequently on schedule than task dependent activities.

**Table 194: VDC Activities that Started or Finished on Time, by Activity Type**

	<b>All Activities</b>		<b>Milestone Starts</b>		<b>Milestone Finishes</b>		<b>Task Dependent Activities</b>	
	<b>Number</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>
Activities Started on Time or Early	90	77.6%	4	50.0%	--	--	82	81.2%
Activities Finished on Time or Early	80	69.0%	--	--	4	57.1%	72	71.3%
<b>Completed Activities</b>	<b>116</b>		<b>8</b>		<b>7</b>		<b>101</b>	

Source: Master Activities Schedule

### 5.4.3 NRFU Residual Schedule Activities

NRFU Residual was a late operation added while VDC was in the field. As a result, we did not develop an official NRFU Residual schedule in the MAS. We instructed the LCOs to conduct the operation from August 9<sup>th</sup> to August 25<sup>th</sup> so they would be able to ship questionnaires to DRIS in

<sup>140</sup> There are 117 total VDC schedule activities. The schedule line that is not finished relates to the NRO assessment and is not reported here.

time for inclusion in the Census. NRFU Residual cases were checked in to PBOCS from August 11<sup>th</sup> to August 24<sup>th</sup>.

## **5.5 Change Control**

Change control was the process of identifying, documenting, approving or rejecting, and controlling changes to the NRO baseline. The NRO baseline reflected the original project plan, including requirements, schedule, and budget documentation. The HUE OIT - and if necessary, the Census Intergration Group (CIG) - carefully reviewed proposed changes before incorporating changes to a revised baseline. The change control process successfully facilitated the implementation of changes throughout the lifecycle of the NRO.

Following a decision made by CIG on December 17, 2008, many changes only required approval at the HUE OIT level. The CIG approved a revision to the Change Control Management Plan that empowered teams, such as the HUE OIT, to make changes to the schedule when appropriate, without direct involvement from the CIG. The purpose of the Change Control Management Plan revision was to accomplish the following:

- Create a more effective and efficient change control process
- Improve integration of schedule changes
- Define the roles and expectations of stakeholders
- Define the change control documentation and communication process

The new process allowed integration teams to make their own changes except in the following instances:

- Increase in costs to the baseline budget
- Impact to other key activities on the alert report<sup>141</sup> (for example, a change to a planned start or finish date)
- Owners of impacted activities did not agree on a change
- Change to operation scope
- At the discretion of the initiator

In general, the change control process was user friendly. Most divisions submitted change requests for their schedule activities in a timely manner. However, at times, Decennial Management Division (DMD) staff had to prepare change requests for other areas to get the requests submitted in a timely manner. These situations occurred during the most demanding time of the operations and created additional work for the DMD staff, which was already short staffed.

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<sup>141</sup> The alert report is a weekly report that lists key activities in the 2010 Census and indicates whether the activities are running on time, a few days late, or more than five days later than baseline dates. During production, staff participated in weekly schedule meetings and addressed any late key activities, either by statusing the activity or by creating change requests if necessary.

The ability of the team to make decisions on operational changes as long as scope creep, budget, and operation impacts were contained was a big advantage. It allowed quick implementation of changes that enabled the operation to continue on a reasonably uninterrupted course.

### **5.5.1 2010 Schedule Changes**

The 2010 MAS contained 10,875 schedule lines. Of the 10,875 activities, 602 were associated with NRFU or NRFU RI and 117 pertained to VDC. The MAS did not contain any NRFU Residual activities. The rapid development of NRFU Residual, towards the end of VDC, did not allow time to develop a baseline schedule for this operation.

The 2010 Census schedule was baselined on May 22, 2008. Subsequent to the baseline schedule, we approved and implemented 25 NRO related change requests. Twelve of these changes related to NRFU, six were specific to NRFU RI and seven were specific to VDC. NRO schedule changes affected many areas including - but not limited to - the following:

- Field staff training and operation start and finish dates
- Cost and progress
- Address extract and the universe
- Assignment preparation
- MaRCS development
- Late mail returns
- Observation forms
- Assessments

The changes included revisions to lags, durations, baseline dates, predecessor and successors, and responsible divisions. Some changes also added or deleted activities from the schedule.

### **5.5.2 2010 Requirement Changes**

Three requirement changes were specific to NRO. The most significant requirement change - implemented in spring 2008 - changed the NRO from an automated to a paper-based data collection operation. The second change - implemented in fall 2009 - redefined the VDC universe eligibility criteria to be in line with the 2000 Coverage Improvement Followup operation baseline. The third change - implemented in March 2010 - added an RI component to VDC for late adds (i.e. cases from the supplemental NRFU universe) identified as vacant or delete during VDC.

## **5.6 Risk Management**

The NRO team identified and monitored project risks using the NRO Risk Register. The team started to identify risks in 2008 and continued to revise and refine the risk register through March 2010. There were 34 NRO project risks initially. Throughout the review process that happened prior to the operation starting in the field, six risks were removed from the Risk Register, leaving 28 open risks. During NRO production, there were no additional updates (e.g. closing out risks



that already occurred, reevaluating ratings of existing risks, and adding additional risks) to the NRO risk register due to conflicting priorities and limited time. Of the 28 open risks, 13 risks were realized to some degree.

## **5.7 Automation**

The NROs used four Integral Systems and eight Support Systems to prepare, conduct, and complete back-end activities. Those systems were described in Section 2.3.5.

The sections that follow will detail both how the systems worked in production and any issues documented for each system during NRO.

### **5.7.1 Integral Systems**

#### **5.7.1.1 Decennial Applicant, Personnel and Payroll System (DAPPS)**

DAPPS experienced performance issues in the spring/summer of 2009 during the Address Canvassing operation. By March 2010 a new architecture for the DAPPS environment was successfully deployed. DAPPS stability and performance improved tremendously, enabling DAPPS to meet the NRFU and subsequent operations' peak demands on the system. For example, at peak processing on May 4, 2010, DAPPS supported over 8,000 concurrent users who performed the necessary administrative functions to facilitate the hiring, training, and paying of the temporary workforce needed to conduct the critical 2010 Census NRFU operation.

#### ***Alternate Shipping Solution***

The frequent outages of the PBOCS and the slow performance during the first two months of critical 2010 Census field operations prevented over 10 million questionnaires from being processed at the three Data Capture Centers and caused a large backlog in LCO processing capabilities. To mitigate this, we implemented the Alternate Shipping Solution for EQs and Binders, and the PBOCS shipping functionality was disabled.

In the original plan, PBOCS was to track shipping and send notification to DRIS that contained the Fed Ex ID, PBOCS box ID, and Census ID of all forms within the shipped box. DRIS was to provide feedback to PBOCS through a form-level notification or acknowledgement of receipt. However, PBOCS performance issues resulted in the shipping of questionnaires outside of PBOCS.

Administrative and Management Systems Division (AMSD) developed a contingency shipping solution that was used to ship the majority of the NRO questionnaires. The contingency shipping system was not integrated with DRIS, however, the system provided information to DRIS through the DMD C&P. DMD C&P received the data via Oracle database link and forwarded these data to DRIS. The LCOs and HQ still faced some challenges in monitoring and tracking shipping due to the descope of shipping from the PBOCS. This is further discussed in section 5.7.2.4.

The contingency shipping application was released on May 22, 2010. For the first two days, it was released to 24 LCOs across the 12 regions, resulting in the scanning and tracking of over 322,000 questionnaires and the shipment of 1,120 boxes.

On the fourth day, May 25, 2010, the application was released to all 494 LCOs across all 12 regions, resulting in the scanning and tracking of 2,519,790 questionnaires and the shipment of over 8,533 boxes.

Throughout the rest of the 2010 Census paper-based operations, we expanded the capabilities of the shipping application to incorporate additional functionality for the Field Verification operation to generate barcode labels, and print Listing Pages and Cover Logs. We also added functionality to scan, track, and ship Assignment Listings to NPC to mitigate the potential loss of Title 13 data.

By the time the critical 2010 Census field operations were completed, the shipping application handled the workload of about 7,000 concurrent users; scanned and tracked 51,334,953 questionnaires; shipped 179,036 boxes; and the field operations shipping activities completed on schedule.

#### **5.7.1.2 Paper-Based Operations Control System (PBOCS)**

In fall 2008, the decision<sup>142</sup> was made to implement a contingency plan to descope the operational control system development for all paper-based operations from the Field Data Collection Automation (FDCA) contract. The PBOCS was established as the contingency application to manage and control the work conducted by field enumerator staff and to provide status reporting to management staff within the Local Census Offices, the Regional Census Centers, and at Census Bureau Headquarters. As a direct result of the contingency nature of the PBOCS, reduced testing time affected the performance of the application throughout operations. The paragraphs below highlight the most prominent issues dealt with during NRO.

PBOCS was the first web-based operations control solution used at Census. Using PBOCS, we were able to manage most of the field operations from one centralized location while still maintaining a regional and local office control model. This design led to some major gaps in executing, monitoring, and tracking operations not only from HQ, but also from Regional Census Centers and LCOs. Given the limitation of users prescribed on the system, the regions implemented administrative controls to ensure adherence to directives from HQ. However, the west coast was most impacted by the daily maintenance windows 12:01AM – 7AM EST. As a result, offices on the west coast would often begin work at 4AM local time in order to maximize system use while available. The lesson learned from this experience is to separate regional data, even though it may be physically located in the same location.

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<sup>142</sup> This decision is discussed more thoroughly in section 2.2.3 of this document.

This centralized regional design scenario and reduced testing cycle time, coupled with an incompatibility between operating system software (Redhat), the hardware (Egenera) and the Oracle database created a scenario such that no more than three users (prescribed, but four or five actual) could be on the system at one time performing functions within the application at each site. This problem had significant impact during the early days of NRFU while office staff was trying to make assignments and check work in and out of the office. A backup plan was initiated to create the capability within PBOCS to generate the listing pages in batch mode. The number of pages required for printing was approximately 35 million pages. To minimize the impact on performance and in order to meet the schedule for the operation, a sophisticated batch process was developed to generate about 8 million PDF files within a 24-hour period. Eliminating the time for report generation at the LCO level allowed for printing to occur immediately, which triggered an unexpected performance impact. Immediate delivery of one-half of the assignment area listings and related materials led to the check-out of assignment binders at a rate which was not a documented performance benchmark. This “immediate checkout” usage scenario was not considered and therefore was neither documented nor tested during the limited performance testing cycles. The design was for the checkout to be more evenly distributed; when an AA was checked-out, all the corresponding cases within that AA were also updated to reflect a checked-out state. This was important for controlling check-in at a case-level by ensuring it was checked-out first. This design, coupled with expediting the delivery of the listing PDF files and the database contention and blocking problems created significant negative performance and escalated regional concern that the system could not perform to complete the Census.

Once the work started flowing back into the LCOs, the check-in functionality also experienced performance issues due to the physical database configuration. This issue affected the cases flagged for RI, and therefore, users in the field worked around this by checking in questionnaires for vacant housing units, while the PBOCS team fixed the problem. However, many questionnaires were accumulating in the LCOs to the point that the DRIS data capture centers did not have enough work to keep staff busy. In addition, FLD did not design the LCOs to store and accumulate all these forms and this raised significant concern related to data loss. FLD HQs turned off the shipping component within PBOCS and made changes in the workflow to support the change, and AMSD developed an alternative shipping application for this purpose. In order to provide consistency for the Field staff, we used the AMSD alternative shipping application for all operations throughout the end of the Census.

Cost and progress monitoring at all levels during the Census was another tremendously visible issue within the PBOCS. As a result of the challenges noted above, the stability of the database caused an unrecoverable impact to the design of the reports solution, which utilized Oracle Streams to synchronize data to a reporting database. The backlog of transactions to synchronize became so great that over time, we could not catch up. This resulted in eliminating the Performance Report (D-341) and changing the architecture for the critical Progress Report (D-948). Modifications were also made to the DMD C&P interface to ensure progress numbers were matching the field reports.

Additional ancillary, yet significant problems that occurred throughout NRO were related to PBOCS duplicating processing IDs/Census IDs across operations. There were also issues with DRIS returning the same version number for a case despite multiple versions having been shipped, and PBOCS and MaRCS' experience with an Oracle defect that affected the performance of the messaging queue.

The MAF Extract and the Universe were ingested successfully. In addition, the automated removal of LMRs was successful; however, the continuous removal of LMRs was suspended at one point. When it resumed, there were instances where UAAs were mixed in with LMRs and some cases were removed from the NRFU workload in error. This issue was corrected and cases that were removed in error were enumerated in NRFU Residual.

Despite all of the above, due to the dedication and commitment of contractor and government staff, the NRO work was completed on time.

### **5.7.1.3 Field Data Collection Automation – Office Computing Environment (FDCA-OCE)**

#### **5.7.1.3.1 Small Format Map Printing**

The design decision to retain small-format map file metadata in a central database but to cache small-format map files to the LCOs worked well. Metadata could be updated easily without worry of synchronization issues, and maps, once cached, could be printed without impact on network performance.

Using generic small-format block maps across multiple operations eliminated the need to create and distribute electronic copies of the small-format block maps to the LCOs for the NRO. Since generic block maps in PDF format had already been created and distributed to the LCOs for earlier operations, systems were freed up to perform other activities during a critical time.

Maps were only printed as needed, which was more efficient than printing a fixed number of copies as was done in Census 2000. There were two phases of map printing.

- Phase 1 – Printed one copy of each block map.
- Phase 2 (between the time of NRFU creation and deployment) – Printed extra maps when there were multiple AAs in a block. The NRFU operation required 6.5 million block maps.

The FDCA system was not designed to print multiple copies of small format maps at the same time, which extended the time to prepare field materials in the office.

The FDCA system was not designed to track Phase 2 map printing. The requirement was in the initial design but was removed during the re-plan of NRFU. Therefore, manual reporting was implemented for Phase 2.

The communication hierarchy presented a challenge for manual reporting of Phase 2 map printing. FLD Geographic Programs could not communicate directly with LCOs, but had to send information to GEO staff in the RCCs, who then sent the information to the Area Managers and

LCO managers. Because of this communication hierarchy, the appropriate information was not always communicated properly to the LCOs.

The need for FLD reports was emphasized during the design of the map printing control system. However, there was not sufficient emphasis placed on the needs of the FLD Geographic Support Branch for reports to monitor the ingest of maps and the printing of maps. As a result, daily, weekly, and monthly ad hoc reporting was developed and refined during production operations. While FLD reports are essential, reports to monitor the ingest of maps and the printing of maps across all LCOs and across all operations for the FLD Geographic Support Branch are also essential.

The D-1189, Map Printing Report for LCO, listed AAs in the LCO with state/county code and information on (1) when the maps in the AA were available for printing, (2) when they were printed, and (3) when they were placed on hold and taken off hold. However, the report, as originally designed, did not list the FOS District (FOSD) and CLD in which the AAs were located, only the state/county code. FDCA office staff often had to access specific maps within an AA for printing, reprinting, or placing maps on hold. To locate specific maps easily within an AA, the office staff needed to know the FOSD/CLD in which the AA was located, otherwise they had to manually search for the AA by looking at the contents of each FOSD/CLD combination in the LCO until they found the AA that they were seeking. Thus, the D-1189, because it did not contain a FOSD/CLD column, did not provide the FDCA office staff the basic information they needed to eliminate this search time. Just prior to the start of NRFU, the D-1189 was redesigned to include a four-digit FOSD/CLD column (and any CLD range data appended to the four-digit FOSD/CLD in those cases where CLDs had been divided into ranges of AAs).

The map printing control system was designed on the assumption that address delineation for each operation would result in Crew Leader Districts (CLDs) with a limited number of Assignment Areas (AAs) in each CLD (i.e., less than 150) and AAs with a limited number of blocks in each AA (i.e., less than 150). This assumption proved to be wrong. It was discovered that address delineation produced some CLDs for some operations in which there were thousands of AAs and some AAs for some operations in which there were thousands of blocks. As a result, prior to the start of the Group Quarters Enumeration operation, the map printing control system user interface had to be redesigned to display in drop-down lists these 'large' CLDs as ranges of AAs within the CLD and these 'large' AAs as ranges of blocks within the AA.

#### **5.7.1.3.2 Passwords**

A lack of understanding of how the OCE related to PBOCS and other applications made it challenging for staff to understand how passwords and access rights worked (e.g., a user might have a PBOCS account, but could not access the system if they did not also have a FDCA account). If a staff member without an email address forgot their password, then a new password could not be sent through email, increasing the number of remedy tickets.

#### 5.7.1.3.3 Enumerators moving between LCOs

The system could not accommodate enumerators moving between LCOs, and so if an enumerator was moved to another LCO, it required manual intervention from DAPPS in order for transferred enumerators to show up in the control system under the correct LCO.

#### 5.7.1.3.4 MaRCS Access

Access to external sites through the FDCA Portal<sup>143</sup> was set up early and so DSSD had to create a workaround to allow MaRCS access through this structure.

#### 5.7.1.4 Census MaRCS

During the Update Enumerate and NRFU operations, there were 487 problem tickets related to MaRCS issues that were resolved by the software developers or Field Quality Assurance. There were many more routine requests resolved by the 2010 Decennial Operations Technical Support (DOTS) staff. Please refer to Table 195 for the count of tickets by problem category.

**Table 195: Census MaRCS Remedy Tickets by Category**

<b>Problem description</b>	<b>Tickets</b>
MaRCS Performance Issues	98
User misunderstandings	70
Out of disk space error	52
MaRCS System Issues	51
Data discrepancies	38
Invalid Applicant IDs	37
Training database – reset data, add data, not working as expected	37
DRIS data not available in MaRCS	26
Partially Worked locks	23
Reports	21
RI problems in other systems – PBOCS, Shipping	15
Unusual MaRCS access issues	12
Other	7
<b>Total</b>	<b>487</b>

Source: 2010 Decennial Operations Technical Support Staff

We see that the most tickets were submitted due to periods of poor performance, which was caused by various factors that were exacerbated by the MaRCS contingency to not rely on

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<sup>143</sup> The FDCA portal was a web-based Access Point that provided users with centralized access to systems such as the PBOCS, the FDCA-OCE map printing, and Census MaRCS.

PBOCS data. Using contingency processing, data capture errors in the applicant ID caused the creation of 5.3 million different enumerators in the MaRCS system. This slowed down processing significantly because we designed the system for only around 630,000 enumerators. Other factors that affected MaRCS performance were:

- More concurrent users than the system was designed to handle, because LCOs used MaRCS to resolve shipping issues
- Original server configuration and size was not adequate to handle the workloads

The second most common type of ticket was user misunderstandings. Some examples of these are users who wanted to reset cases more than once (which the system does not allow), did not understand the content of reports, or were looking for a database that was not yet released. These tickets were usually resolved by explaining how to do something or why it must not be done at all. In the future, we should try to prevent these types of tickets with better MaRCS training and better knowledge-based articles in the remedy system.

Of all tickets, we see that at least 173 of them (performance issues, data discrepancies, and invalid applicant IDs) could have been avoided if we had not needed to abandon the PBOCS interface. In addition, the 26 issues of DRIS data not being available would be avoided with an automated interviewing instrument. Hopefully more testing and automation will prevent all of these tickets for future enumerations.

Of the tickets listed in Table 195, some were opened for major incidents that required immediate MaRCS changes implemented during brief MaRCS shutdowns during the workday. Some other incidents required a MaRCS shutdown but did not have remedy tickets because they were initiated by Headquarters and the LCOs were given advance notice. All such incidents, and how they were resolved, are described in Table 196.

**Table 196: Census MaRCS Incidents**

<b>Incident</b>	<b>Resolution</b>	<b>Occurrences</b>
Out of disk space error	Deleted unnecessary back-up logs and set up system to notify developers when memory was low	1
Performance issues	Limited number of users and improved enumerator search efficiency	2
System Crash	The MaRCS website was inadvertently restarted while Census Coverage Measurement Personal Interview RI MaRCS was installed onto the same server. MaRCS was back on-line within a few minutes.	1
MaRCS down-time to resolve urgent issues	MaRCS was restored after fix within 30 minutes.	2
Widespread MaRCS Access Denied	Fixed the authentication username search to return FDCA users missed in original query.	1

Source: 2010 Decennial Operations Technical Support Staff

## **5.7.2 Support Systems**

### **5.7.2.1 Master Address File/Topologically Integrated Geographic Encoding and Referencing System (MAF/TIGER)**

The MAF/TIGER automation components for the NRO operations were the Geographic Reference File - Codes (GRF-C), Address List, FOSD/CLD Delineation Software, Large Format Map Software, and Small Format Map Software. There were no issues reported with the GRF-C, Address List, Large Format Maps Software, and Small Format Maps Software. The maps and address list were printed without any problems.

### **5.7.2.2 Universe Control and Management System (UCM)**

There were four automation components that made up UCM. Those components were AA Delineation, the Initial NRFU Universe, Non-IDs, and the Supplemental Universe.

AA delineation was originally planned to be performed in PBOCS. However, due to the workload burden with PBOCS development, Headquarters Processing (HQP) developed the software to conduct AA delineation.

HQP delivered the Initial NRFU Universe with the AA Delineation and Supplemental Universe as designed.

There were issues with the Census IDs. Due to a defect within PBOCS, resulting in the duplication of processing identifications (PIDs) across operations, HQP successfully performed unplanned programming to replace and track PIDs.

### **5.7.2.3 Response Processing System (RPS)**

There were no specific issues with the Response Processing System.

### **5.7.2.4 Decennial Response Integration System (DRIS)**

Due to the de-scope of the shipping functionality from PBOCS, the defined interface between PBOCS and DRIS was unsuccessful in completely satisfying all of the required functions to achieve comprehensive inventory control. In the original interface design, there was supposed to be an acknowledgement sent for every file transmission sent or received. The following describes each of the interfaces between DRIS and PBO and the operational deviations that were actually performed during production:

- **Linkage of enumerator continuation forms to parent forms**  
As a result of job scheduling decisions, delays, and users shipping without checking into PBOCS, many continuation forms were received from the LCOs before the linkage information was received electronically. A special linking application was created by



DRIS to periodically search for the linking data necessary to associate continuation forms that were previously unlinked.

Through additional effort during production, the DRIS team worked closely with the PBOCS team and additional Census Bureau stakeholders, generating tools, scripts, and queries that drove unlinked enumerator continuation form counts from the hundreds of thousands to a few thousand.

- **Questionnaire Version Number**

The primary issue with the DRIS-PBOCS interface was related to DRIS tracking/sending the version number for the case. All the forms from DRIS were coming with the same version number even though multiple versions were shipped from the LCO. Despite the version number conflict, all cases were reconciled by the end of DRIS operations. Field Division was provided with custom reports and data queries for this additional reconciliation. In many instances, forms encountered by DRIS did not contain a proper version number. DRIS was instructed to capture the handwritten version number (if one existed) if the labeled version number was missing. The handwritten number was subject to legibility issues and data capture error. DRIS was instructed to default to the same version number if no version could be ascertained from either the label or handwritten information on the form.

In some instances, PBOCS printed labels that contained multiple case ID barcodes and multiple versions on one label. DRIS instituted a manual workaround, but if the true version number could not be determined, DRIS was instructed to use the default version number.

- **DRIS to PBO Notification of box receipt**

DRIS transmitted receipt notifications to PBOCS of all boxes received. However, once shipping was discontinued from PBOCS, the DRIS interface did not send box confirmations to PBOCS. However, DRIS continued to send PBOCS all form notifications of receipt. PBOCS underwent some changes to account for the lack of shipping functionality so that these form receipt notifications could be used to track and reconcile cases. However, DRIS received very few acknowledgments from PBOCS in response to these notifications.

- **Notification of form receipt**

DRIS transmitted receipt notifications to PBOCS for all forms received from the field. However, as a result of the shipping descope, during most of the production period, DRIS received no acknowledgements from PBOCS in response to their notifications of receipt. DSPO worked extensively with UCM to ensure accountability of every form.

- **Late mail return (LMR) notification**

This interface was executed by DRIS, as planned. There was confusion regarding when it should be initiated. DRIS had assumed that it should commence at NRFU cut-off.

However, it was ultimately tied to some other event or activity that was not clearly communicated to DRIS. Very few acknowledgements were received (37,000 messages were sent and only 8 positive Acknowledgements and 1 Negative Acknowledgement were received) which made it difficult to monitor the interface. The interface was run from April 11 to July 12.

- **Reverse check-in notification**

This interface was executed by DRIS, as planned, in the same manner as LMRs described above. However, the efficacy of the data was severely limited by the absence of hand-held computers to schedule enumerator activities. Rather than electronically updating the households assigned to enumerators, reverse check-in cases fell into VDC as planned in a paper-based system.

#### **5.7.2.5 DMD Cost and Progress System**

Due to a compressed PBOCS development and testing schedule, PBOCS had to limit the number of variables that they would provide to DMD C&P, which resulted in the need for DMD operational staff to modify and eliminate several reports. Because of these late changes, there were inaccuracies in the initial progress data that PBOCS provided DMD C&P that were later corrected. There were many days in which no file was transmitted to DMD C&P because the processing was taking so long. This resulted in time-consuming workarounds and occasionally required that DMD operational staff use Microsoft Excel spreadsheets to report on NRFU and NRFU RI, increasing the chance of human error. As a workaround, PBOCS started sending DMD C&P the data from alternate tables within the PBOCS schema. These alternate tables were refreshed within the timeframe needed to pass the data to DMD C&P.

DMD C&P experienced only occasional automation problems with the other source systems for NRFU. Other problems included database links that were not operational because the source database was down at the time the scheduled jobs ran.

#### **5.7.2.6 Census Evaluation and Experiments System (CEE)**

CEE was the interface that transferred data from DRIS directly to DSSD. The auxiliary (AUX) data from paper questionnaires data capture was transferred through CEE. The AUX data were not part of the core data that DRIS transferred to DSPO. The core data created the DRF and CUF. The auxiliary data arrived daily to DSSD starting on February 25, 2010, and ending on October 5, 2010. There were several days during this period that DRIS was unable to transfer the data to DSSD. This was due to the interface being down or not working. It happened infrequently and when it did happen, it was fixed the next day. There were no negative repercussions for DSSD for receiving the data a day later. DRIS would then transfer the data on the following day when the interface was working.

#### **5.7.2.7 National Processing Center – Automated Tracking and Control System (NPC-ATAC)**

There were no automation problems with the Automated Tracking and Control System.

#### **5.7.2.8 Visual Basic Key from Paper (VB-KFP)**

There were no automation problems with the VB-KFP for the data capture of the NRFU observations forms.

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

The following assessments, evaluations, and experiments are related to the NRO assessment.

- 2010 Census Postal Tracking Assessment
- Behavior Coding of 2010 NRFU Evaluation
- Content and Forms Design Assessment
- Cost and Progress System Assessment
- Count Review Program Assessment
- DRIS Data Capture Assessment
- Field Office Administration and Payroll Assessment
- Forms and Printing Assessment
- Language Assessment
- Late Mail Add Assessment
- LUCA Assessment
- Mail Response/Return Rates Assessment
- New Construction Assessment
- Non-ID Processing Assessment
- NRFU Contact Strategy Experiment
- Observing Census Enumeration of Non-English Speaking Households Evaluation
- Recruiting and Hiring Field Staff Assessment
- Response Processing System/Universe Control and Management Assessment
- TEA Delineation Assessment

## **7 KEY LESSONS LEARNED, CONCLUSIONS, AND RECOMMENDATIONS**

Following the completion of the NRO, DMD conducted a series of Lessons Learned sessions, which included stakeholders from the NRO subteam and the HUE OIT. The group used a modified nominal group technique to gather information from all participants on a range of topics related to the NRO. Section 7.1 of this assessment highlights the key successes, challenges, and recommendations identified by the group. The detailed Lessons Learned document is appended to this document.

## **7.1 Lessons Learned**

### **7.1.1 Successes**

- The NRO team prepared a well-documented Detailed Operations System Plan during the planning phase of the operation. Stakeholders successfully used the document as a resource throughout the project lifecycle.
- We successfully implemented an automated LMR removal followed and three phases of clerical LMR removals that yielded an overall workload reduction of 19 percent. The second clerical removal occurred during the first week of the operation and allowed us to remove LMRs received after the first set of assignments went to the field. Unlike during Census 2000, the PBOCS tracked the clerical removal of LMRs, which allowed us to know how many cases were in the field.
- We printed half a million NRFU maps on schedule and under budget. The map printing strategy to re-use NRFU maps for VDC and NRFU Residual was successful and efficient. Using NRFU maps across all NROs reduced map print time.
- The MaRCS was a success and enabled us to automate matching. The automated matching performed by MaRCS reduced the volume of cases that went to clerical review by approximately 63 percent. The automated matching may have yielded better data quality because the system applied consistent rules.
- A separate office staff and AMQA managed the NRFU RI, allowing staff to focus all attention on RI activities. This resulted in an effective and efficient reinterview program.
- Communication between the HQ and RCCs and the RCCs to LCOs was effective. Video teleconferencing proved to be a successful method of communication between HQ and the regions. Operational logs sent from HQ that provided updates to field procedures were successful.

### **7.1.2 Challenges**

- Early College Enumeration was a challenge. The late policy decision to implement Early NRFU allowed little time to develop procedures, identify the workload, and disseminate materials. As a result, we do not know the results of Early NRFU since there were no address lists and no accurate data indicating its success.
- Using MaRCS in a paper environment was a challenge because we designed it to work with automated systems. The paper operation introduced problems that would not have occurred in an automated environment. For example, there was a lag in the transmission of data from DRIS to MaRCS. In addition, MaRCS received DRIS data before it was quality checked; therefore, the data contained errors.

- Although not a requirement, report functionality in PBOCS was not flexible and did not allow users to produce custom reports to address specific requests that concerned operational issues and progress.
- Although not a requirement, PBOCS reports were not available in real time, which limited some users who needed data more current than daily.
- NPC only received half of the expected observation forms. The remaining half were either not completed or lost in shipping. If we had automated the observation checklists and tracking of the form, we would have been able to determine why we did not receive the forms.
- A significant number of the VDC workload was comprised of supplemental cases not previously visited by a census enumerator. Field staff often assumed that the VDC mostly included vacant and delete cases - as the name of the operation implies - and were not always prepared to handle these occupied units.
- The late change from an automated to a paper operation resulted in a tight development and testing schedule. Consequently, there was no Dress Rehearsal or fully integrated operational test.

### **7.1.3 Recommendations**

- Automate the NRO and develop a data warehouse to create a consolidated repository of operational data that all systems can access. In addition, create a data dictionary to standardize Census Bureau terms.
- Streamline the NRO and conduct VDC and NRFU Residual concurrently with NRFU as a quality check along with NRFU RI.
- Avoid having to add late operations and procedures by reviewing, for example, the enumeration of colleges and universities and incorporating how to enumerate this group in the larger enumeration process. Also, implement planning for the re-enumeration of POP 99s.
- Conduct training and initial observations through an automated instrument.
- Improve communication among stakeholders by ensuring teams meet regularly during production and use a shared portal site or drive to communicate information.
- Develop report functionality that produces real-time reporting for fieldwork and cost data.
- Design and develop the contingency plans and systems in parallel with the production development in order to ensure contingencies are fully tested and ready when/if the need arises.

## 7.2 Conclusions

The 2010 NRO was an enormous undertaking. Approximately 600,000 enumerators, CLs, and FOSs were trained to conduct the field work. They contacted over 50 million unique housing units in less than five months. The 2010 NRO cost was 23% under budget. It was not always smooth and there were some large burdens placed especially on the LCO staff in order to successfully manage and conduct the 2010 NRO on paper instead of with automation, but ultimately the goal of the NROs was achieved.

We could do better however.

The primary lesson learned from the 2010 NRO is to take advantage of technology and automate the operations. This does not mean only an automated survey instrument, but all features such as automated payroll functionality, automated training features, and automated quality control capabilities. Automation of the NRO would be beneficial to everyone involved: Headquarters staff, RCC and LCO staff, field staff, respondents, and ultimately the data users.

An automated instrument would, among other things,

- Improve the quality of data captured in an individual interview,
- Facilitate more timely and informed followup interviews when needed,
- Facilitate more accurate real-time monitoring,
- Easily manage workloads,
- Record CL observations of enumerators in the field,
- Identify problem areas,
- Identify data issues, and
- Model predictions to test for quality, using census data and ACS data. This would allow the Census Bureau to compare the progress, workload, and data to an expected outcome.

An automated instrument would be valuable to the creation of a data warehouse, another recommendation from the 2010 Census. A data warehouse would be a huge asset to understanding a housing unit's entire census experience. In conjunction with the data warehouse, we recommend storing or examining the data from an address-level approach in addition to an operation-level approach. The current data files are structured so each row is a result of a data-captured questionnaire. In order to get a picture of the entire census experience for one address, the data have to be merged and restructured, sometimes with incompatible data files such as between the DRF and MaRCS and can only be done months after a census has ended. The data are structured to report what happened in one interview, and the primary analysis is to report what happened in all interviews within a specific operation, instead of what happened across the census lifecycle at one housing unit. Further research should be conducted to investigate what happened across the census lifecycle at individual housing units.

A second recommendation is to conduct followup contacts (such as were conducted in VDC and NRFU RES during 2010) during the same time period as NRFU. Conducting all followup operations concurrently with NRFU would:

- Improve data quality by having the interviews take place closer to Census Day instead of three or four months after,
- Reduce cost by reducing the amount of time enumerators are in the field, and
- Decrease redundancy. For instance, since VDC was a separate operation that happened several weeks after NRFU, VDC enumerators added some housing units that had previously been added by a NRFU enumerator. This created unnecessary cost and enumerator and respondent burden, as well as additional post-processing and occasional discrepancies between the redundant questionnaires.

While a concurrent approach was tried in the 2006 Census Test using handheld computers, and found to be difficult to manage and staff due to the changing workload (Moul 2007), we believe the Census Bureau should reconsider the possibilities and benefits of a concurrent approach.

An additional recommendation is to avoid adding late operations and procedures, notably Early NRFU, Early NRFU, and NRFU RES. The universe of housing units in NRFU RES has now been enumerated as a late operation in two consecutive censuses and should be planned for in advance of future censuses. The universe of cases that need to be enumerated in April should also be given much more attention in the planning process for future censuses.

One notable result from this assessment illustrates how improvements could be made in a number of areas to attain more reliable and efficient enumerations. We showed in Table 89 the number of cases in VDC that were also worked in NRFU, and the percent of those cases that had the exact same status code in VDC as they had in NRFU. The VDC enumerator indicated the housing unit had the exact same status as the NRFU enumerator in only 59.0 percent of the cases and the highest match rate for a particular NRFU status was only 65.0 percent, for units identified in NRFU as vacant-regular. These percentages are discouragingly low; at this point, the data cannot tell us the full story to explain the discrepancies. However, there are a number of ways we could work to minimize these discrepancies and improve all enumeration efforts in the future.

One way would be to pay more attention in training to the nuances of classifying a housing unit as occupied, vacant, or as deleted. The time and money available for training is limited, but having a variety of examples online would allow enumerators and CLs to refer to them at any point as needed, while the primary training could focus on the most common situations. The importance of collecting the housing unit status as of April 1 should also be emphasized with enumerators, especially as more time passes between the enumeration and April 1.

A second way to minimize discrepancies and improve enumeration is to reconsider the categories and implications of the numerous housing unit status designations. The housing unit status designation, including the subcategories within vacant and deleted housing units, is incredibly important and has implications for the processing that HQ performs on the collected data, but the importance is not relayed to the enumerators. For instance, one enumerator might have considered a case to be 'Demolished/Burned Out/Cannot Locate' while another might have considered it an 'Empty Mobile Home/Trailer Site'; only the first of those two designations would have qualified for VDC in 2010. While there is merit in emphasizing the importance of



housing unit statuses for enumerators, Headquarters should also reconsider both the subcategories that are presented to enumerators and the processing implications attached to them.

The initial plan for the 2010 Census included an adjudication component that would have addressed these situations where two enumerators used different housing unit statuses to describe the same address. The adjudication component was not implemented.

We believe that the changes mentioned above, coupled with further research, are essential to improving the accuracy of our data while reducing the expense of fieldwork in the 2020 Census.

## **8 ACKNOWLEDGEMENTS**

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The vast majority of field and office staff who worked on NRO in 2010 did an outstanding job. They were almost all temporary employees, often with no former census or interviewing experience, and we are grateful for their work.

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## APPENDIX A. SAMPLE ADDRESS LISTING PAGE FROM AA BINDERS

The image on this page shows an example of an Address Listing Page for NRFU. These pages listed every address within an AA. Rows that were blank in Column 2 (Status) were to be visited by the NRFU enumerator.

This report contains information protected by the Privacy Act of 1974 (Title 5, U.S.C., Section 552a). The Privacy Act requires appropriate safeguards be taken to ensure the security and confidentiality of this information. The information is restricted to authorized uses by individuals with a need-to-know. This listing contains confidential information, the release of which is prohibited by Title 13 U.S.C., OMB NO. 0607-0919-C. Approval Expires 12/31/2011

D-103.1 (NRFU)

Address List

Operation: Nonresponse Followup

2010 Census

U.S. Department of Commerce

Economics and Statistics Administration

U.S. Census Bureau

Create Date/Time: 04/25/2010 04:17:37 AM

Print Date/Time: 04/25/2010 04:17:37 AM

Page 1 of 8

ST/COU: 06/037 California, Los Angeles

TRACT: 481800 AA: 32-1001

Line No. (1)	Status (2)	Date (3)	Case ID (4)	Block Number (5)	Map Spot (6)	House No (7)	Address/Physical Location/ Description (8)	Unit Designation (9)	Zip (10)	Mailing address (11)	Occupant Name (12)
1	XXXXX	XXXXXX	10271 5299 401 29	45108	1	2233					
2	XXXXX	XXXXXX	10271 2701 941 05	45108	2	2237					
3	XXXXX	XXXXXX	10270 8810 551 83	45108	3	2241					
4	XXXXX	XXXXXX	10268 4131 561 06	45108	4	2245					
5	XXXXX	XXXXXX	10271 7890 011 93	45108	5	2249					
6	XXXXX	XXXXXX	10269 4520 231 79	45108	6	2301					
7	XXXXX	XXXXXX	10270 7511 801 18	45108	7	2305					
8	XXXXX	XXXXXX	10270 6218 111 67	45108	8	2309					
9	XXXXX	XXXXXX	10269 4520 241 12	45108	9	2315					
10	XXXXX	XXXXXX	10269 7117 941 88	45108	10	2317					
11	XXXXX	XXXXXX	10270 6218 121 00	45108	11	2321					
12	XXXXX	XXXXXX	10269 3221 431 40	45108	12	2401					
13	XXXXX	XXXXXX	10269 1921 521 77	45108	13	2405					
14	XXXXX	XXXXXX	10269 9717 091 55	45108	14	2409					
15	XXXXX	XXXXXX	10271 1405 241 19	45108	15	2415					
16	XXXXX	XXXXXX	10271 2701 931 72	45108	16	2417					
17	XXXXX	XXXXXX	10270 6218 131 30	45108	17	2421					
18	XXXXX	XXXXXX	10268 5429 721 95	45108	18	2408					
19			10270 7510 361 29	45108	19	2404					
20	XXXXX	XXXXXX	10269 1920 371 42	45108	20	2400					
21			10271 5298 291 17	45108	21	2328					
22	XXXXX	XXXXXX	10271 9382 741 52	45108	22	2322					

## APPENDIX B. SAMPLE ADD PAGE FROM AA BINDERS

The image on this page shows an example of an Add Page for NRFU. If a housing unit was not included on an enumerator's Address Listing Page, then they were to write address information for the housing unit on this blank page.

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**D-103.A(NRFU)**

**Add Page For Housing Units**  
Operation: Nonresponse Followup  
2010 Census

U.S. Department of Commerce  
Economics and Statistics Administration  
U.S. Census Bureau

RCC: 2699/Kansas City  
LCO: 2614/Pine Bluff, AR


Create Date/Time: 07/14/2011 02:49 PM CT  
Print Date/Time: 07/14/2011 02:49 PM CT  
Page \_\_\_ of \_\_\_

ST/COU: 05/027 Arkansas, Columbia  
TRACT: 950100 AA: 32-1001

Line No.	Status	Date	Office Use Only	Block Number	Map Spot No.	House No.	Street Name/Physical Location	Unit Designation	Zip	Mailing address	Occupant Name
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)

## APPENDIX C. LANGUAGE FLASHCARD

If an enumerator encountered a language barrier when addressing a respondent, they were to use the Language Identification Flashcard to determine which language the respondent spoke. There were 51 languages identified on the Language Identification Flashcard (including Traditional Chinese and Simplified Chinese).

	U.S. DEPARTMENT OF COMMERCE Economics and Statistics Administration U.S. CENSUS BUREAU	<b>LANGUAGE IDENTIFICATION FLASHCARD</b>	
Hello, I'm from the U.S. Census Bureau. Is someone here now who speaks English and can help us? If not, please write your phone number and someone will contact you in English.	01. English		
Buenos días (Buenas tardes), soy de la Oficina del Censo de los Estados Unidos. ¿Se encuentra alguien que hable inglés y pueda ayudarnos? Si no, por favor, anote su número de teléfono y alguien se comunicará con usted en español.	02. Español/ Spanish		
Përshëndetje, unë vij nga Zyra e Regjistrimit të Popullsisë së Sh.B.A-së. A ndodhet dikush tani këtu që flet anglisht dhe mund të na ndihmojë? Nëse jo, ju lutem shkruani numrin e telefonit tuaj dhe dikush do t'ju kontaktojë në gjuhën shqipe.	03. Shqip/ Albanian		
አንደኞቻችን ፡ ከእሳራን የሕዝብ ቁጠራ ቢር ነኝ ። እሁን እንግሊዝኛ ቋንቋ የሚናገር እና ሊረዳን የሚችል ሰው አለ? ከሌለ እባክዎን የሰልክ ቁጥርን ይጻፉልንና በእሳራን የሚያናግርን ይጻፉልን።	04. ቋንቋ አማርኛ/ Amharic		
مرحبًا، أنا من مكتب الإحصاء الأمريكي. هل يوجد هنا الآن شخص يتحدث الإنجليزية ويمكنه مساعدتنا؟ إذا كان لا يوجد، فلارجاء أتلية رقم هاتفكم وسيتصل بكم أحد الأشخاص بلغة العربية.	05. العربية / Arabic		
Բարև Ձեզ, ես ԱՄՆ-ի Մարդահամարի Բյուրոյից եմ: Ներկա՞ ե արդյոք մեզը, որը խոսում է Ամերիկայի և կարող է մեզ օգնել: Եթե ոչ, մերեք Ձեր հեռախոսի համարը և Ձեզ հետ կկապվեն Քայրենյանը:	06. Հայերեն/ Armenian		
হ্যালো, আমি ইউ.এস. সেন্সাস বিউরো থেকে এসেছি। এখানে এখন এমন কেউ আছে কি যিনি ইংরেজি বলতে পারেন এবং আমাদের সাহায্য করতে পারেন যদি তেমন কেউ না থাকে, আপনার ফোন নম্বর লিখে দিন এবং আপনার সঙ্গে একজন বাংলায় যোগাযোগ করবো।	07. বাংলা/ Bengali		
Разрешете да ви се представя, аз съм служител на Бюрото по преброяване на населението на САЩ. Има ли тук някой, който говори английски и би могъл да ни помогне? Ако няма, моля, напишете своя телефонен номер, за да може някой от нашите служители да ви се обади на български.	08. Български/ Bulgarian		





سلام. من یک کارمند اداره سرشماری ایالات متحده هستم. آیا کسی حالا اینجا هست که به زبان انگلیسی صحبت میکند و میتواند به ما کمک کند؟ اگر کسی نیست، لطفاً شماره تلفنشان را بنویسید، و یک نفر به زبان فارسی با شما تماس خواهد گرفت.	18. فارسی/ Farsi
Bonjour, je travaille pour le Bureau de Recensement des États-Unis. Y a-t-il quelqu'un ici qui parle anglais et puisse nous aider ? Sinon, notez votre numéro de téléphone pour que quelqu'un puisse vous contacter en Français.	19. Français/ French
Guten Tag, ich komme im Auftrag des Bundesbüro zu Durchführung von Vollezzählungen. Kann ich mit jemandem sprechen, der Englisch spricht und der uns helfen kann? Wenn nicht, schreiben Sie bitte Ihre Telefonnummer auf und es wird sich jemand in deutscher Sprache mit Ihnen in Verbindung setzen.	20. Deutsch/ German
Γεια σας, Είμαστε από την Υπηρεσία Απογραφής των ΗΠΑ. Είναι κανείς εδώ αυτή τη στιγμή που μιλάει Αγγλικά να μας εξυπηρετήσει; Αν όχι, παρακαλώ σημειώστε το τηλέφωνό σας και θα επικοινωνήσει κάποιος μαζί σας στα ΕΛΛΗΝΙΚΑ.	21. Ελληνικά/ Greek
Bonjou, mwen se anplwaye biwo resanisman ameriken. Èske m ka pale ak yon moun nan kay la ki konn pale anglè ? Si pa gen moun nan kay la ki pale anglè, tanpri elni nimewo telefòn ou pou yon moun ki pale kreyòl ayisyen rele w.	22. kreyòl ayisyen/ Haitian Creole
שלום, אני ממשדר מפקד האוכלוסין של ארצות הברית. האם יש כאן מישהו ברגע זה שמדבר אנגלית ויכול לעזור לנו? במידה ולא, אנא כתבו את מספר הטלפון שלכם ומישהו ייצור קשר אתכם בשפה העברית.	23. עברית/ Hebrew
हेलो मैं दुःख, जनगणना बूरो से हूँ। क्या अभी यहाँ ऐसा कोई व्यक्ति है जो अंग्रेजी बोलता हो और हमारी मदद कर सकता हो? यदि नहीं, तो कृपया अपना फोन नंबर लिखें और कोई व्यक्ति आपसे हिन्दी में संपर्क करेगा।	24. हिन्दी/ Hindi
Nyob zoo. Kuv tuaj hauv Teb Chaws Asmeskas Chaw Suav Pej Xeem tuaj. Puas muaj loej twg nyob hauv tsev uas txawj lus Asláv thiab pab tau peb? Yog tsis muaj, thov sau koj tus xov tooj tseg, mam li muaj ib tug neeg hais lus Hmoob hu tuaj rau koj.	25. Hmoob/ Hmong
Jó napot kívánok, az Egyesült Államok Népszámlálási Hivatalától vagyok. Van a közelben valaki, aki beszél angolul, és segíteni tud nekünk? Ha nem, kérem, írja le a telefonszámát, és kapcsolatba fogunk lépni Önnel magyarul.	26. Magyar/ Hungarian

<p>Hello, taga Census Bureau ako ng U.S. Adda ladi kasalayo nga malapagsarita ti English ken mabalin nga tumulong kami? Nu awan pakli surat yo iti numero iti telepono yo ta adda iti tumawag karásyo nga ag Ilocano.</p>	<p>27. Ilocano/ Ilocano</p>
<p>Salve, chiamo da parte del Census Bureau degli Stati Uniti. C'è qualcuno che parla inglese ed è in grado di aiutarci? In caso negativo, scrivi il numero di telefono e sarà contattato da qualcuno che parla italiano.</p>	<p>28. Italiano/ Italian</p>
<p>こんにちは。私は米国勢調査局の係員です。こちらには英語を理解できる調査にご協力いただける方がいらっしゃいますか？もしない場合は、あなたのお電話番号をお書きいただければ、日本語を話す係員が連絡をいたします。</p>	<p>29. 日本語/ Japanese</p>
<p>안녕하세요. 저는 미국 인구조사국에서 일하고 있습니다. 영어를 사용하시는 분 중에 저희를 도와 주실 수 있는 분이 여기 계십니까? 없으신 경우, 전화번호를 적어주시면 한국어를 할 수 있는 직원이 연락을 드릴 것입니다.</p>	<p>30. 한국어/ Korean</p>
<p>ສະບາຍດີ, ຂ້າພະເຈົ້າ ມາຈາກສຳນັກງານສຳຫຼວດພົນລະເມືອງ ແຫ່ງສະຫະລັດອາເມລິກາ. ມີໃຜຢູ່ທີ່ນີ້ ສາມາດເຝົ້າພາສາອັງກິດ ແລະ ຊ່ວຍເຫຼືອພວກເຮົາໄດ້ບໍ່? ຖ້າບໍ່ມີ, ກະລຸນາຂຽນເລກ ໂທລະສັບຂອງທ່ານ ແລະ ພວກເຮົາ ຈະຕິດຕໍ່ຫາທ່ານ ເປັນພາສາລາວ.</p>	<p>31. ພາສາລາວ/ Laothian</p>
<p>Sveiki, aš esu iš JAV Gyventojų surašymo biuro. Ar čia dabar yra kas nors, kas kalba angliskai ir galėtų mums padėti? Jei ne, prašome užrašyti savo telefono numerį ir su jumis susisieks lietuvių kalba.</p>	<p>32. Lietuvių/ Lithuanian</p>
<p>ഹലോ, ഞാൻ യു.എസ്. സെൻസസ് ബ്യൂറോയിൽ നിന്നാണ്. ഇംഗ്ലീഷ് സംസാരിക്കുന്ന ആരെങ്കിലും ഇപ്പോൾ ഇവിടെയുണ്ടോ അവരെ സഹായിക്കാൻ ഇറക്കുമതി. നിങ്ങളുടെ ടെലിഫോൺ നമ്പർ എഴുതി നൽകുക. മലയാളത്തിൽ സംസാരിക്കുന്ന ആരെങ്കിലും താങ്കളെ ബന്ധപ്പെടുക.</p>	<p>33. മലയാളം/ Malayalam</p>
<p>Yá'át'ééh, Neeznáá nínááháágo Bila'ashdla'íi náóltah bit' haz' é bá naashnish. Háidanish kóó Bilagáanaa biq zaad yee yáht'i'igíí hóó? 'Ádingo 'éí nībēēsh bee hane' é nīhá 'ádlililí dóó t'áá háida t'áá Diné Bizaad yee yáht'i'igíí nich'í' náhodoolnih.</p>	<p>34. Diné Bizaad/ Navajo</p>
<p>नमस्ते, म अमेरिकाको जनगणना अफिसबाट आएको । यहाँ अंग्रेजी बोल्न जान्ने अन्त हामीलाई मदत गर्नसक्ने कोहि मान्छे छन ? नभए, तपाईंको फोन नम्बर लेखिदिनु अनि कसैले तपाईंसित नेपाली भाषामा कुरा गर्नेछन् ।</p>	<p>35. नेपाली/ Nepali</p>

ਹੇਠੋ, ਮੈਂ ਯੂ.ਐੱਸ. ਜਨਗਣਨਾ ਬਿਊਰੋ ਵਲੋਂ ਆਇਆ/ਆਈ ਹਾਂ। ਕੀ ਇਥੇ ਕੋਈ ਅੰਗਰੇਜ਼ੀ ਬੋਲ ਸਕਦਾ ਹੈ ਅਤੇ ਸਾਰੀ ਮਦਦ ਕਰ ਸਕਦਾ ਹੈ? ਜੇ ਨਹੀਂ, ਤਾਂ ਕਿਰਪਾ ਕਰਕੇ ਆਪਣਾ ਟੈਲੀਫੋਨ ਨੰਬਰ ਲਿਖ ਦਿਉ ਅਤੇ ਕੋਈ ਟਰਾਨਸਲੇਟਰ ਪੰਜਾਬੀ ਵਿੱਚ ਸੰਪਰਕ ਕਰੇਗਾ।	36. ਪੰਜਾਬੀ/ Punjabi
Dzień dobry. Jestem z Amerykańskiego Biura Spisu Ludności. Czy ktoś tutaj mówi po angielsku i mógłby nam pomóc? Jeżeli nie, proszę napisać swój numer telefonu, a ktoś skontaktuje się z Państwem po polsku.	37. Polish/ Polish
Olá, sou do Serviço de censo dos Estados Unidos. Alguém aqui fala inglês e pode nos ajudar? Caso contrário, escreva seu telefone e alguém vai entrar em contato com você em português.	38. Portuguese/ Portuguese
Bună ziua, sunt de la Biroul de Recensământ al S.U.A. Este cineva aici, în acest moment, care vorbeşte engleză şi ne poate ajuta? Dacă nu, vă rog scrieţi-vă numărul de telefon şi cineva vă va contacta telefonic în română.	39. Română/ Romanian
Здравствуйте! Я представляю Бюро переписи населения Соединённых Штатов. Присутствует здесь кто-нибудь, кто говорит по-английски и мог бы помочь нам? Если нет, то, пожалуйста, напишите свой телефонный номер, чтобы наши сотрудники могли пообщаться с вами по-русски.	40. русский/ Russian
Добар дан, ја сам из Америчког бироа за попис становништва. Да ли овде има некога ко говори енглески и може да нам помогне? Ако нема, молим Вас да напишете свој број телефона, па бемо контактирати с Вама на српском језику.	41. српски/ Serbian
Hallo, Waxaan arigay ka tirsanahay Xafiiska Tirakoobka Mareykanka. Halkan ciddi ma joogta hadda oo ku hadasha Ingiriisiga oo na caawin karta? Haddi kalese, fadlan qor lambarka talafoonkaaga markaanba qof ayaa kugulasoo xidhiidhi doona adiga Soomaaliga.	42. Soomaali/ Somali
Halo, nimetoka Shirika la Sensa la Merika Je, kuna mtu hapa sasa anayezunguriza Kikingereza na anaweza kutusaidia? Ikwia hakuna, tafadhali andika nambari yako ya simu na mtu atawasiliana na wewe kwa Kiswahili.	43. Kiswahili/ Swahili
Hello, Ako'y galing sa U.S. Census Bureau. Mayroon ba ditong marunong magsalita ng Ingles at makakatulong sa amin ngayon? Kung wala, pakisulat ang telepono ninyo at may tatagwag sa inyo sa Tagalog.	44. Tagalog/ Tagalog

<p>สวัสดีครับ/ค่ะ ผม/ดิฉันเป็นเจ้าหน้าที่จากสำนักงานสังคมในประเทศไทย มีใครพอจะพูดภาษาอังกฤษเพื่อช่วยแปลได้บ้างหรือเปล่า ครับ/ค่ะ ถ้าไม่ช่วยแจ้งเบอร์โทรศัพท์เพื่อที่เราจะสามารถติดต่อกลับมาใหม่ได้เป็นภาษาไทย</p>	45. ไทย/ Thai
<p>ሃሉው፡ ባለ ቤት ጽሕፈት ምክርብ ሕዝቧ አግረዋል እየ እነ። ሕጂ እንግሊዝኛ ምስራረብን እሕገዝን ምስሕሕገ ሰብ ኣሕዚ ኣሉዶ? እንተዘይነ። ብኸብረትኩም ቆጽሪ ቲሰርገኩም ጽሑፋዊ ኣይሰብ ብትገርኛ ከሃረብኩም እየ።</p>	46. ትግርኛ/ Tigrinya
<p>Merhaba, A.B.D. İstatistik Bürosu'ndanım. Orada İngilizce konuşan ve bize yardım edebilecek birisi var mı? Yoksa, lütfen telefon numaranızı yazın, sizinle Türkçe dilinde temasa geçilecek.</p>	47. TÜRKÇE/ Turkish
<p>Привіт, Ми з США. Сенсес Бюро. Тут є хтось, хто володіє англійською мовою і може допомогти нам? Якщо ні, будь ласка, запишіть ваш телефонний номер і з вами зв'яжуться на українській мові.</p>	48. українська мова/ Ukrainian
<p>ہیلو، میں امریکی مردم شماری بیورو سے ہوں۔ کیا یہاں کوئی ایسا شخص ہے جو انگریزی بولتا ہو اور ہماری مدد کر سکتا ہو؟ اگر نہیں، تو براہ کرم اپنا فون نمبر لکھوائیں اور کوئی شخص آپ سے اردو زبان میں رابطہ کرے گا۔</p>	49. اردو/ Urdu
<p>Xin chào, tôi là nhân viên của Cục Thống Kê Dân Số Hoa Kỳ. Ở đây hiện có ai biết nói tiếng Anh và có thể giúp chúng tôi không? Nếu không, xin vui lòng ghi lại số điện thoại của quý vị. Chúng tôi sẽ liên lạc lại với quý vị bằng tiếng Việt.</p>	50. Tiếng Việt/ Vietnamese
<p>האלוא, איך בין מן די יוניטעד סטעיטס צענזוס ביורא. איז פאראן דא איינער וואס רעדט ענגליש און קען אונז העלפן? אויב נישט, ביטע שרייבט אראפ אייער טעלעפאן נומער און איינער וועט דיך פארשטענדיגן מיט אייך איין אידיש.</p>	51. אידיש/ Yiddish

## APPENDIX D. COMPLETE LANGUAGE TABLES

The following tables were too large to be placed in the body of the report. They contain all languages that were reported to be used to interview respondents during NRO. Table D1 reports on NRFU interviews, Table D2 reports on NRFU RI interviews, Table D3 reports on VDC interviews, and Table D4 reports on NRFU RES interviews.

**Table D1: Languages in which NRFU Interviews were Conducted**

<b>Language</b>	<b>Total Number of Interviews</b>	<b>Percent<sup>144</sup></b>
English	43,656,556	92.5%
Spanish	1,970,493	4.2%
Chinese	40,137	0.1%
Russian	12,335	<0.1%
Korean	11,688	<0.1%
Vietnamese	8,345	<0.1%
Haitian Creole	6,864	<0.1%
Polish	6,730	<0.1%
Portuguese	6,445	<0.1%
Yiddish	4,893	<0.1%
Armenian	4,862	<0.1%
Arabic	4,507	<0.1%
Farsi	1,554	<0.1%
Somali	1,502	<0.1%
French	1,300	<0.1%
Bengali	1,151	<0.1%
Cambodian	1,138	<0.1%
Tagalog	1,098	<0.1%
Italian	1,080	<0.1%
Hindi	913	<0.1%
Panjabi	855	<0.1%
Hmong	808	<0.1%
Croatian	768	<0.1%
Amharic	678	<0.1%
Urdu	602	<0.1%
Greek	560	<0.1%
Ukrainian	535	<0.1%
Albanian	528	<0.1%
Japanese	501	<0.1%
Burmese	413	<0.1%
Laotian	298	<0.1%

<sup>144</sup> This column does not total 100.0% due to rounding.



**Table D1: Languages in which NRFU Interviews were Conducted**

<b>Language</b>	<b>Total Number of Interviews</b>	<b>Percent<sup>144</sup></b>
Hebrew	274	<0.1%
German	271	<0.1%
Serbian	271	<0.1%
Ilocano	243	<0.1%
Romanian	231	<0.1%
Thai	205	<0.1%
Bulgarian	177	<0.1%
Turkish	147	<0.1%
Nepali	112	<0.1%
Dari	108	<0.1%
Lithuanian	89	<0.1%
Hungarian	80	<0.1%
Tigrinya	80	<0.1%
Navajo	74	<0.1%
Swahili	71	<0.1%
Czech	70	<0.1%
Dutch	66	<0.1%
Malayalam	32	<0.1%
Dinka	7	<0.1%
Contradictory	68,487	0.1%
Unknown	1,376,173	2.9%
<b>Total Housing units</b>	<b>47,197,405</b>	<b>100.0%</b>

Source: DRF and AUX

**Table D2: Languages in which NRFU RI Interviews were Conducted**

<b>Language</b>	<b>Total Number of Interviews</b>	<b>Percent<sup>145</sup></b>
English	1,726,372	91.4%
Spanish	93,914	5.0%
Chinese	2,376	0.1%
Russian	1,024	0.1%
Korean	932	<0.1%
Vietnamese	674	<0.1%
Polish	576	<0.1%
Haitian	513	<0.1%
Portuguese	469	<0.1%
Armenian	389	<0.1%
Arabic	290	<0.1%
Somali	128	<0.1%
Hmong	101	<0.1%
Cambodian	93	<0.1%
Farsi	92	<0.1%
Italian	74	<0.1%
French	73	<0.1%
Amharic	67	<0.1%
Hindi	59	<0.1%
Tagalog	57	<0.1%
Yiddish	54	<0.1%
Japanese	52	<0.1%
Croatian	45	<0.1%
Panjabi	40	<0.1%
Urdu	39	<0.1%
Ukrainian	37	<0.1%
Albanian	32	<0.1%
German	31	<0.1%
Bengali	30	<0.1%
Ilocano	27	<0.1%
Laotian	24	<0.1%
Serbian	24	<0.1%
Greek	23	<0.1%
Burmese	16	<0.1%
Lithuanian	15	<0.1%
Romanian	14	<0.1%
Hebrew	11	<0.1%
Thai	11	<0.1%

<sup>145</sup> This column does not total 100.0% due to rounding.



**Table D2: Languages in which NRFU RI Interviews were Conducted**

<b>Language</b>	<b>Total Number of Interviews</b>	<b>Percent<sup>145</sup></b>
Dutch	9	<0.1%
Czech	8	<0.1%
Turkish	8	<0.1%
Bulgarian	7	<0.1%
Navajo	7	<0.1%
Swahili	6	<0.1%
Nepali	5	<0.1%
Hungarian	3	<0.1%
Tigrinya	3	<0.1%
Dinka	2	<0.1%
Malayalam	2	<0.1%
Dari	1	<0.1%
Contradictory	1,836	0.1%
Unknown	57,453	3.0%
<b>Total Housing units</b>	<b>1,888,148</b>	<b>100.0%</b>

Source: DRF and AUX

**Table D3: Languages in which VDC Interviews were Conducted**

<b>Language</b>	<b>Total Number of Interviews</b>	<b>Percent<sup>146</sup></b>
English	7,960,820	91.7%
Spanish	401,964	4.6%
Chinese	6,285	<0.1%
Korean	1,043	<0.1%
Russian	996	<0.1%
Yiddish	696	<0.1%
Polish	543	<0.1%
Vietnamese	525	<0.1%
Portuguese	493	<0.1%
Armenian	353	<0.1%
Haitian	304	<0.1%
Arabic	221	<0.1%
Italian	87	<0.1%
Tagalog	74	<0.1%
French	69	<0.1%
Bengali	68	<0.1%
Hindi	67	<0.1%
Greek	50	<0.1%
Farsi	49	<0.1%
Cambodian	48	<0.1%
Somali	42	<0.1%
Croatian	39	<0.1%
Hmong	26	<0.1%
Albanian	24	<0.1%
Japanese	23	<0.1%
Ukrainian	21	<0.1%
Urdu	20	<0.1%
Panjabi	17	<0.1%
Romanian	17	<0.1%
Laotian	15	<0.1%
Navajo	15	<0.1%
Amharic	14	<0.1%
German	13	<0.1%
Thai	12	<0.1%
Burmese	11	<0.1%
Dutch	11	<0.1%
Hebrew	10	<0.1%
Serbian	8	<0.1%

<sup>146</sup> This column does not total 100.0% due to rounding.

**Table D3: Languages in which VDC Interviews were Conducted**

<b>Language</b>	<b>Total Number of Interviews</b>	<b>Percent<sup>146</sup></b>
Hungarian	7	<0.1%
Ilocano	7	<0.1%
Nepali	6	<0.1%
Turkish	6	<0.1%
Czech	5	<0.1%
Lithuanian	4	<0.1%
Dari	3	<0.1%
Malayalam	3	<0.1%
Dinka	1	<0.1%
Tigrinya	1	<0.1%
Contradictory <sup>147</sup>	6,596	0.1%
Unknown	304,196	3.5%
<b>Total Housing units</b>	<b>8,685,928</b>	<b>100.0%</b>

Source: DRF and AUX

<sup>147</sup> Multiple languages were selected on the questionnaire by the enumerator.

**Table D4: Languages in which NRFU RES Interviews were Conducted**

<b>Language</b>	<b>Total Number of Interviews</b>	<b>Percent<sup>148</sup></b>
English	698,313	95.8%
Spanish	13,328	1.8%
Chinese	507	0.1%
Vietnamese	53	<0.1%
Korean	45	<0.1%
Portuguese	34	<0.1%
Russian	32	<0.1%
Yiddish	26	<0.1%
Polish	21	<0.1%
Haitian	20	<0.1%
Italian	17	<0.1%
Arabic	10	<0.1%
Armenian	10	<0.1%
Tagalog	8	<0.1%
French	7	<0.1%
Hmong	4	<0.1%
Amharic	3	<0.1%
Croatian	3	<0.1%
Greek	3	<0.1%
Hindi	3	<0.1%
Ukrainian	3	<0.1%
Albanian	2	<0.1%
Cambodian	2	<0.1%
Czech	2	<0.1%
German	2	<0.1%
Ilocano	2	<0.1%
Burmese	1	<0.1%
Hebrew	1	<0.1%
Hungarian	1	<0.1%
Lithuanian	1	<0.1%
Navajo	1	<0.1%
Panjabi	1	<0.1%
Somali	1	<0.1%
Turkish	1	<0.1%
Contradictory	755	0.1%
Unknown	15,600	2.1%
<b>Total Housing units</b>	<b>728,823</b>	<b>100.0%</b>

Source: DRF and AUX

<sup>148</sup> This column does not total 100.0% due to rounding.

## APPENDIX E. APPENDIX E. NOTICE OF VISIT

The image on this page shows the Notice of Visit. Enumerators were instructed to complete this form and leave it at a housing unit if a respondent was not available. Enumerators were also given Spanish translations of this form.

United States™  
**Census**  
**2010**

U.S. DEPARTMENT OF COMMERCE  
Economics and Statistics Administration  
U.S. CENSUS BUREAU

# NOTICE OF VISIT

Dear Resident:

**SORRY I MISSED YOU.**

The Census Bureau is conducting the 2010 Census. I stopped by today to complete a census interview for your household, but you were not home. Please telephone me to discuss when we can complete this interview – it generally takes about 10 minutes. Otherwise, I'll stop back in the next day or two.

Your answers are confidential. This means the Census Bureau cannot give out information that identifies you or your household. Federal law protects the confidentiality of your answers (Title 13, United States Code, Sections 9 and 214).

It's important to count everyone in the census.

Thank you.

My name is – (Print)

I can be reached at –

Area Code ( ) – –

The best time

to call is → From a.m. p.m. To a.m. p.m.

## CENSUS OFFICE INFORMATION

Office name and phone number

## ENUMERATOR USE ONLY

LCO No.

ID No.

OP Code

CLD No.

AA No.

Map Spot No.

Block No.

FORM **D-26**  
(4-18-2008)

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

## APPENDIX F. INFORMATION SHEET

The image on this page shows the front side of the information sheet. The left column presented the information about confidentiality that enumerators were required to convey to respondents. The right side presented the Residence Rules and examples of how the census counts people in various living situations.



### Your Answers Are Confidential

Your answers are confidential and protected by law. All U.S. Census Bureau employees have taken an oath and are subject to a jail term, a fine, or both if they disclose ANY information that could identify you or your household. Your answers will only be used for statistical purposes, and no other purpose. As allowed by law, your census data becomes public after 72 years. This information can be used for family history and other types of historical research.

You are required by law to provide the information requested. These federal laws are found in the United States Code, Title 13 (Sections 9, 141, 193, 214, and 221) and Title 44 (Section 2108). Please visit our Web site at <[www.census.gov/2010census](http://www.census.gov/2010census)> and click on "Protecting Your Answers" to learn more about our privacy policy and data protection.

Thank you for your cooperation. The U.S. Census Bureau appreciates your help.

If you have any comments concerning the time it takes to complete this form or any other aspect of the collection, send it to: Paperwork Reduction Project 0607-0919-C, U.S. Census Bureau, AMSD-3K138, 4600 Silver Hill Road, Washington, DC 20233. You may e-mail comments to <[Paperwork@census.gov](mailto:Paperwork@census.gov)>; use "Paperwork Project 0607-0919-C" as the subject.

Respondents are not required to respond to any information collection unless a valid approval number has been assigned by the Office of Management and Budget. The approval number for the 2010 Census is: OMB No. 0607-0919-C; Approval Expires 12/31/2011.

D-1(F) (3-20-2009)

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

### List A

### WHO TO COUNT ON APRIL 1<sup>st</sup>

We need to count people where they live and sleep most of the time.

#### Do NOT include:

- College students who live away from this address most of the year
- Armed Forces personnel who live away
- People in a nursing home, mental hospital, etc. on April 1, 2010
- People in jail, prison, detention facility, etc. on April 1, 2010

#### Do include:

- Babies and children living here, including foster children
- Roommates
- Boarders
- People staying here on April 1, 2010 who have no permanent place to live

The image on this page shows the back of the information sheet. These three lists were to help respondents answer person-level demographic questions. List B presented the fourteen relationship categories, List C presented answers to the Hispanic origin question, and List D presented answers to the race question. The categories printed on the Information Sheet were the same as the ones printed on the census questionnaire.

List B	List C	List D
<p><b>RELATIONSHIP</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Husband or wife</li> <li><input type="checkbox"/> Biological son or daughter</li> <li><input type="checkbox"/> Adopted son or daughter</li> <li><input type="checkbox"/> Stepson or stepdaughter</li> <li><input type="checkbox"/> Brother or sister</li> <li><input type="checkbox"/> Father or mother</li> <li><input type="checkbox"/> Grandchild</li> <li><input type="checkbox"/> Parent-in-law</li> <li><input type="checkbox"/> Son-in-law or daughter-in-law</li> <li><input type="checkbox"/> Other relative</li> <li><input type="checkbox"/> Roomer or boarder</li> <li><input type="checkbox"/> Housemate or roommate</li> <li><input type="checkbox"/> Unmarried partner</li> <li><input type="checkbox"/> Other nonrelative</li> </ul>	<p><b>HISPANIC, LATINO, OR SPANISH ORIGIN</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> <b>No</b>, not of Hispanic, Latino, or Spanish origin</li> <li><input type="checkbox"/> Yes, Mexican, Mexican American, or Chicano</li> <li><input type="checkbox"/> Yes, Puerto Rican</li> <li><input type="checkbox"/> Yes, Cuban</li> <li><input type="checkbox"/> Yes, another Hispanic, Latino, or Spanish origin – <i>For example, Argentinean, Colombian, Dominican, Nicaraguan, Salvadoran, Spaniard, and so on.</i></li> </ul>	<p><b>RACE</b> <i>(Choose one or more races.)</i></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> White</li> <li><input type="checkbox"/> Black, African American, or Negro</li> <li><input type="checkbox"/> American Indian or Alaska Native</li> <li><input type="checkbox"/> Asian Indian</li> <li><input type="checkbox"/> Chinese</li> <li><input type="checkbox"/> Filipino</li> <li><input type="checkbox"/> Japanese</li> <li><input type="checkbox"/> Korean</li> <li><input type="checkbox"/> Vietnamese</li> <li><input type="checkbox"/> Other Asian – <i>For example, Hmong, Laotian, Thai, Pakistani, Cambodian, and so on.</i></li> <li><input type="checkbox"/> Native Hawaiian</li> <li><input type="checkbox"/> Guamanian or Chamorro</li> <li><input type="checkbox"/> Samoan</li> <li><input type="checkbox"/> Other Pacific Islander – <i>For example, Fijian, Tongan, and so on.</i></li> <li><input type="checkbox"/> Some other race</li> </ul>

D-1(F) (3-20-2009)

## APPENDIX G. NRFU COST TABLE

Variable	Budget	Actual	Variance	% Variance of Budget	% of Total Variance by Category	% of Total NRFU Cost Variance
<b>Production Workload</b>	48,609,413	47,235,198	1,374,215	2.8%		
<b>Productivity</b>						
Cases per Hour (Enum.)	0.89	1.05	0.16	17.4%		
Miles per Case (Enum.)	8.46	5.05	3.42	40.4%		
<b>Total Staffing</b>	635,534	610,816	24,718	3.9%		
# of Enumerators	524,919	516,709	8,210	1.6%	33.2%	
# of Crew Leaders	40,781	39,559	1,222	3.0%	4.9%	
# of Crew Leader Assistants	65,266	48,973	16,293	25.0%	65.9%	
# of FOS	4,568	5,575	-1,007	-22.0%	-4.1%	
<b>Total Production Hours</b>	88,730,127	68,707,817	20,022,310	22.6%		
Enumerator	54,472,219	45,070,098	9,402,122	17.3%	47.0%	
Crew Leader	12,826,370	11,281,691	1,544,680	12.0%	7.7%	
Crew Leader Assistant	19,465,619	10,178,940	9,286,680	47.7%	46.4%	
Field Operation Supervisor	1,965,919	2,177,089	-211,170	-10.7%	-1.1%	
<b>Total Training Hours</b>	20,395,061	16,613,958	3,781,103	18.5%		
Enumerator	18,642,865	14,718,704	3,924,161	21.0%	103.8%	
Crew Leader	1,365,254	1,518,294	-153,040	-11.2%	-4.0%	
Crew Leader Assistant	199,617	218,171	-18,554	-9.3%	-0.5%	
Field Operation Supervisor	187,325	158,789	28,536	15.2%	0.8%	
<b>Total Number of Miles</b>	623,562,612	363,632,036	259,930,576	41.7%		
Enumerator	411,452,031	238,427,821	173,024,210	42.1%	66.6%	
Crew Leader	75,979,672	59,061,758	16,917,914	22.3%	6.5%	
Crew Leader Assistant	121,486,915	49,853,351	71,633,564	59.0%	27.6%	
Field Operation Supervisor	14,643,994	16,289,107	-1,645,113	-11.2%	-0.6%	
<b>Total Production Salary Cost</b>	\$1,556,153,490	\$1,135,212,586	\$420,940,904	27.1%		63.9%
Enumerator	\$921,406,971	\$723,767,609	\$197,639,362	21.4%	47.0%	30.0%
Crew Leader	\$264,890,196	\$204,025,668	\$60,864,528	23.0%	14.5%	9.2%
Crew Leader Assistant	\$325,196,219	\$163,395,565	\$161,800,654	49.8%	38.4%	24.6%
Field Operation Supervisor	\$44,660,104	\$44,023,745	\$636,359	1.4%	0.2%	0.1%
<b>Total Training Salary Cost</b>	\$349,829,969	\$266,904,486	\$82,925,483	23.7%		12.6%
Enumerator	\$319,199,979	\$236,082,472	\$83,117,507	26.0%	100.2%	12.6%
Crew Leader	\$23,179,272	\$24,641,843	-\$1,462,571	-6.3%	-1.8%	-0.2%
Crew Leader Assistant	\$3,982,541	\$3,330,513	\$652,028	16.4%	0.8%	0.1%
Field Operation Supervisor	\$3,468,177	\$2,849,658	\$618,519	17.8%	0.7%	0.1%
<b>Total Mileage Cost</b>	\$331,511,139	\$181,816,018	\$149,695,121	45.2%		22.7%



Enumerator	\$218,444,302	\$119,213,910	\$99,230,392	45.4%	66.3%	15.1%
Crew Leader	\$40,683,996	\$29,530,879	\$11,153,117	27.4%	7.5%	1.7%
Crew Leader Assistant	\$64,724,606	\$24,926,675	\$39,797,931	61.5%	26.6%	6.0%
Field Operation Supervisor	\$7,658,235	\$8,144,553	-\$486,318	-6.4%	-0.3%	-0.1%
<b>Total Other Cost</b>	\$10,389,786	\$5,464,795	\$4,924,991	47.4%		0.7%
Lodging/Per Diem	\$7,655,643		\$7,655,643	100.0%		1.2%
Telephone	\$2,734,143		\$2,734,143	100.0%		0.4%
Pre-approved Overtime						
Pay Rate Changes						
Additional Overtime						
Regional Flexibility						
Part Time Training Sessions						
CL to Conduct Enum Replacement Training						
<b>Total Cost</b>	<b>\$2,247,884,384</b>	<b>\$1,589,397,886</b>	<b>\$658,486,498</b>	<b>29.3%</b>		<b>100.0%</b>

Source: DMD C/P, DAPPS

## APPENDIX H. NRFU RI COST TABLE

Variable	Budget	Actual	Variance	% Variance of Budget	% of Total Variance by Category	% of Total NRFU RI Cost Variance
<b>Production Workload</b>	1,579,806	900,329	679,477	43.0%		
<b>Productivity</b>						
Cases per Hour (Enum.)	0.89	0.42	-0.48	-53.3%		
Miles per Case (Enum.)	8.78	32.04	-23.26	-265.1%		
<b>Total Staffing</b>	25,417	34,505	-9,088	-35.8%		
# of Enumerators	20,273	27,092	-6,819	-33.6%	75.0%	
# of Crew Leaders	1,880	2,564	-684	-36.4%	7.5%	
# of Crew Leader Assistants	2,770	4,101	-1,331	-48.1%	14.6%	
# of FOS	494	748	-254	-51.4%	2.8%	
<b>Total Production Hours</b>	3,379,959	3,724,083	-344,124	-10.2%		
Enumerator	1,770,348	2,161,765	-391,417	-22.1%	113.7%	
Crew Leader	544,559	665,204	-120,645	-22.2%	35.1%	
Crew Leader Assistant	826,750	629,651	197,100	23.8%	-57.3%	
Field Operation Supervisor	238,302	267,465	-29,163	-12.2%	8.5%	
<b>Total Training Hours</b>	834,245	632,664	201,581	24.2%		
Enumerator	727,513	536,990	190,524	26.2%	94.5%	
Crew Leader	62,735	63,824	-1,089	-1.7%	-0.5%	
Crew Leader Assistant	23,715	16,176	7,539	31.8%	3.7%	
Field Operation Supervisor	20,282	15,675	4,607	22.7%	2.3%	
<b>Total Number of Miles</b>	24,160,969	45,761,948	-21,600,979	-89.4%		
Enumerator	13,863,679	28,846,706	-14,983,027	-108.1%	69.4%	
Crew Leader	3,281,017	6,830,929	-3,549,912	-108.2%	16.4%	
Crew Leader Assistant	5,214,891	7,338,996	-2,124,105	-40.7%	9.8%	
Field Operation Supervisor	1,801,382	2,745,317	-943,935	-52.4%	4.4%	
<b>Total Production Salary Cost</b>	\$64,612,378	\$61,851,809	\$2,760,569	4.3%		-223.6%
Enumerator	\$31,909,501	\$34,646,337	-\$2,736,836	-8.6%	-99.1%	221.7%
Crew Leader	\$12,352,617	\$11,884,026	\$468,591	3.8%	17.0%	-38.0%
Crew Leader Assistant	\$14,622,147	\$10,075,090	\$4,547,057	31.1%	164.7%	-368.3%
Field Operation Supervisor	\$5,728,113	\$5,246,356	\$481,757	8.4%	17.5%	-39.0%
<b>Total Training Salary Cost</b>	\$15,219,276	\$9,904,196	\$5,315,080	34.9%		-430.5%
Enumerator	\$13,202,514	\$8,349,908	\$4,852,606	36.8%	91.3%	-393.1%
Crew Leader	\$1,126,105	\$1,025,970	\$100,135	8.9%	1.9%	-8.1%
Crew Leader Assistant	\$492,847	\$249,159	\$243,688	49.4%	4.6%	-19.7%
Field Operation Supervisor	\$397,810	\$279,159	\$118,651	29.8%	2.2%	-9.6%
<b>Total Mileage Cost</b>	\$13,777,744	\$22,880,974	-\$9,103,230	-66.1%		737.4%

Enumerator	\$7,840,927	\$14,423,353	-\$6,582,426	-83.9%	72.3%	533.2%
Crew Leader	\$1,937,569	\$3,415,465	-\$1,477,896	-76.3%	16.2%	119.7%
Crew Leader Assistant	\$2,998,701	\$3,669,498	-\$670,797	-22.4%	7.4%	54.3%
Field Operation Supervisor	\$1,000,547	\$1,372,658	-\$372,111	-37.2%	4.1%	30.1%
<b>Total Other Cost</b>	\$427,548	\$634,489	-\$206,941	-48.4%		16.8%
Lodging/Per Diem	\$315,022		\$315,022	100.0%		-25.5%
Telephone	\$112,526		\$112,526	100.0%		-9.1%
Pre-approved Overtime						
Pay Rate Changes						
Additional Overtime						
Regional Flexibility						
Part Time Training Sessions						
CL to Conduct Enum						
Replacement Training						
<b>Total Cost</b>	<b>\$94,036,946</b>	<b>\$95,271,468</b>	<b>-\$1,234,522</b>	<b>-1.3%</b>		<b>100%</b>

Source: DMD C/P, DAPPS

## APPENDIX I. VDC COST TABLE

Variable	Budget	Actual	Variance	% Variance of Budget	% of Total Variance by Category	% of Total NRFU VDC Cost Variance
<b>Production Workload</b>	8,566,741	8,730,803	-164,062	-1.9%		
<b>Productivity</b>						
Cases per Hour (Enum.)	1.31	0.97	-0.34	-25.8%		
Miles per Case (Enum.)	7.44	8.69	-1.24	-16.7%		
<b>Total Staffing</b>	185,339	179,997	5,342	2.9%		
# of Enumerators	160,364	146,129	14,235	8.9%	266.5%	
# of Crew Leaders	12,232	13,897	-1,665	-13.6%	-31.2%	
# of Crew Leader Assistants	10,785	17,671	-6,886	-63.8%	-128.9%	
# of FOS	1,958	2,300	-342	-17.5%	-6.4%	
<b>Total Production Hours</b>	10,203,341	13,055,429	-2,852,088	-28.0%		
Enumerator	6,557,362	9,001,482	-2,444,120	-37.3%	85.7%	
Crew Leader	1,683,677	1,907,591	-223,914	-13.3%	7.9%	
Crew Leader Assistant	1,669,547	1,753,027	-83,480	-5.0%	2.9%	
Field Operation Supervisor	292,755	393,329	-100,574	-34.4%	3.5%	
<b>Total Training Hours</b>	1,529,851	947,357	582,494	38.1%		
Enumerator	1,369,253	728,510	640,743	46.8%	110.0%	
Crew Leader	97,941	101,730	-3,789	-3.9%	-0.7%	
Crew Leader Assistant	0	102,854	-102,854	N/A	-17.7%	
Field Operation Supervisor	62,657	14,263	48,394	77.2%	8.3%	
<b>Total Number of Miles</b>	86,748,482	108,120,395	-21,371,913	-24.6%		
Enumerator	63,765,443	75,838,754	-12,073,311	-18.9%	56.5%	
Crew Leader	9,922,957	14,807,374	-4,884,417	-49.2%	22.9%	
Crew Leader Assistant	10,667,527	14,001,859	-3,334,332	-31.3%	15.6%	
Field Operation Supervisor	2,392,555	3,472,408	-1,079,853	-45.1%	5.1%	
<b>Total Production Salary Cost</b>	\$174,333,078	\$211,385,263	-\$37,052,185	-21.3%		99.0%
Enumerator	\$103,713,443	\$141,594,912	-\$37,881,469	-36.5%	102.2%	101.2%
Crew Leader	\$38,163,709	\$34,165,859	\$3,997,850	10.5%	-10.8%	-10.7%
Crew Leader Assistant	\$26,128,415	\$27,824,554	-\$1,696,139	-6.5%	4.6%	4.5%
Field Operation Supervisor	\$6,327,511	\$7,799,938	-\$1,472,427	-23.3%	4.0%	3.9%
<b>Total Training Salary Cost</b>	\$24,771,825	\$14,991,153	\$9,780,672	39.5%		-26.1%
Enumerator	\$22,145,335	\$11,369,672	\$10,775,663	48.7%	110.2%	-28.8%
Crew Leader	\$1,536,463	\$1,739,807	-\$203,344	-13.2%	-2.1%	0.5%
Crew Leader Assistant	\$0	\$1,612,133	-\$1,612,133	N/A	-16.5%	4.3%
Field Operation Supervisor	\$1,090,027	\$269,541	\$820,486	75.3%	8.4%	-2.2%
<b>Total Mileage Cost</b>	\$44,112,745	\$54,060,202	-\$9,947,457	-22.6%		26.6%

Enumerator	\$32,300,146	\$37,919,378	-\$5,619,232	-17.4%	56.5%	15.0%
Crew Leader	\$5,266,760	\$7,403,689	-\$2,136,929	-40.6%	21.5%	5.7%
Crew Leader Assistant	\$5,346,681	\$7,000,930	-\$1,654,249	-30.9%	16.6%	4.4%
Field Operation Supervisor	\$1,199,158	\$1,736,205	-\$537,047	-44.8%	5.4%	1.4%
<b>Total Other Cost</b>	\$1,066,968	\$1,290,918	-\$223,950	-21.0%		0.6%
Lodging/Per Diem	\$786,194		\$786,194	100.0%		-2.1%
Telephone	\$280,774		\$280,774	100.0%		-0.7%
Pre-approved Overtime						
Pay Rate Changes						
Additional Overtime						
Regional Flexibility						
Part Time Training Sessions						
CL to Conduct Enum						
Replacement Training						
<b>Total Cost</b>	<b>\$244,284,616</b>	<b>\$281,727,536</b>	<b>-\$37,442,920</b>	<b>-15.3%</b>		<b>100%</b>

Source: DMD C/P, DAPPS

## APPENDIX J. NRFU RESIDUAL COST TABLE

Variable	Budget	Actual	Variance	% Variance of Budget	% of Total Variance by Category	% of Total NRFU RES Cost Variance
<b>Production Workload</b>	729,143	729,143				
<b>Productivity</b>						
Cases per Hour (Enum.)	0.80	0.53	-0.27	-33.8%		
Miles per Case (Enum.)	14.30	20.24	-5.94	-41.5%		
<b>Total Staffing</b>	38,657	43,055	-4,398	-11.4%		
# of Enumerators	31,188	34,402	-3,214	-10.3%	73.1%	
# of Crew Leaders	2,398	3,751	-1,353	-56.4%	30.8%	
# of Crew Leader Assistants	4,810	4,167	643	13.4%	-14.6%	
# of FOS	261	735	-474	-181.6%	10.8%	
<b>Total Production Hours</b>	1,507,264	2,001,585	-494,321	-32.8%		
Enumerator	911,487	1,377,351	-465,864	-51.1%	94.2%	
Crew Leader	204,345	261,720	-57,375	-28.1%	11.6%	
Crew Leader Assistant	362,645	200,631	162,014	44.7%	-32.8%	
Field Operation Supervisor	28,787	161,883	-133,096	-462.3%	26.9%	
<b>Total Training Hours</b>	0	98,196	-98,196			
Enumerator	0	80,356	-80,356	N/A	81.8%	
Crew Leader	0	7,616	-7,616	N/A	7.8%	
Crew Leader Assistant	0	9,554	-9,554	N/A	9.7%	
Field Operation Supervisor	0	670	-670	N/A	0.7%	
<b>Total Number of Miles</b>	15,319,960	19,841,902	-4,521,942	-29.5%		
Enumerator	10,428,973	14,761,147	-4,332,174	-41.5%	95.8%	
Crew Leader	1,590,129	2,465,943	-875,814	-55.1%	19.4%	
Crew Leader Assistant	2,986,408	2,058,787	927,621	31.1%	-20.5%	
Field Operation Supervisor	314,450	556,025	-241,575	-76.8%	5.3%	
<b>Total Production Salary Cost</b>	\$23,627,881	\$30,927,547	-\$7,299,666	-30.9%		64.6%
Enumerator	\$14,032,258	\$20,474,242	-\$6,441,984	-45.9%	88.3%	57.0%
Crew Leader	\$3,476,173	\$4,547,321	-\$1,071,148	-30.8%	14.7%	9.5%
Crew Leader Assistant	\$5,583,371	\$3,022,233	\$2,561,138	45.9%	-35.1%	-22.7%
Field Operation Supervisor	\$536,079	\$2,883,751	-\$2,347,672	-437.9%	32.2%	20.8%
<b>Total Training Salary Cost</b>	\$0	\$1,519,926	-\$1,519,926			13.4%
Enumerator	\$0	\$1,231,858	-\$1,231,858	N/A	81.0%	10.9%
Crew Leader	\$0	\$129,983	-\$129,983	N/A	8.6%	1.1%
Crew Leader Assistant	\$0	\$145,786	-\$145,786	N/A	9.6%	1.3%
Field Operation Supervisor	\$0	\$12,299	-\$12,299	N/A	0.8%	0.1%
<b>Total Mileage Cost</b>	\$7,659,970	\$9,920,952	-\$2,260,982	-29.5%		20.0%

Enumerator	\$5,214,477	\$7,380,573	-\$2,166,096	-41.5%	95.8%	19.2%
Crew Leader	\$795,068	\$1,232,972	-\$437,904	-55.1%	19.4%	3.9%
Crew Leader Assistant	\$1,493,203	\$1,029,394	\$463,809	31.1%	-20.5%	-4.1%
Field Operation Supervisor	\$157,222	\$278,013	-\$120,791	-76.8%	5.3%	1.1%
<b>Total Other Cost</b>	\$0	\$226,874	-\$226,874			2.0%
Lodging/Per Diem	\$0	N/A	\$0	N/A		0.0%
Telephone	\$0	N/A	\$0	N/A		0.0%
<b>Total Cost</b>	<b>\$31,287,851</b>	<b>\$42,595,299</b>	<b>-\$11,307,448</b>	<b>-36.1%</b>		<b>100%</b>

Source: DMD C/P, DAPPS