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MEMORANDUM FOR The Distribution List

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

Subject: 2010 Census Nonresponse Followup Quality Profile

Attached is the 2010 Census Nonresponse Followup Quality Profile. 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 Jennifer Reichert at (301) 763-4298.

Attachment

2010 Census: Nonresponse Followup Quality Profile

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

FINAL

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Executive Summary

The Nonresponse Followup operation assigned enumerators to interview all addresses that had not yet provided information for the 2010 Census in the prior Mailout/Mailback and Update/Leave operations. These interviews were completed on paper questionnaires and collected such information as housing unit status, number of people living at the address, and demographic data about all residents of the household. All completed questionnaires were returned to the Local Census Office for check-in and then shipped to a data capture center.

The Nonresponse Followup quality assurance program ensured enumerators understood and followed interviewing procedures through enumerator observations, reviews of completed materials, and a separate reinterview operation. Crew Leaders completed enumerator observations just after training and reviewed completed materials as they were received. Office clerks also reviewed all forms for completeness before case check-in. Finally, the reinterview operation assigned a separate staff of enumerators to recontact a sample of respondents and verify select data from the original interview. The paper reinterview forms were shipped to data capture centers, and all Nonresponse Followup and reinterview data were electronically delivered to the Nonresponse Followup Matching, Review, and Coding System for comparison and final reinterview outcome coding.

Overall, the Nonresponse Followup Reinterview program was successful in deterring and identifying falsification by the enumerators. We selected 1,894,664 (or 5.9 percent) of the 31,991,588 Nonresponse Followup cases that were eligible for reinterview, with 1,525,297 of them (or 4.8 percent of the eligible universe) selected for the random reinterview type. The random reinterview selection rate was higher than the expected four percent because it was not a simple random sample but was instead a systematic sample stratified by enumerator and starting with one of the first three cases for each enumerator. This design was used in an effort to reinterview all enumerators at least once.

Of all reinterview cases selected, 1,632,798 (or 86.2 percent) received a final outcome of Pass, which means the Nonresponse Followup data were collected with no critical mistakes or intentional falsification. Another 68,043 reinterview cases (or 3.6 percent) found unintentional mistakes, and 12,912 (or 0.7 percent) found falsification. This falsification was found for 1,419 enumerators, which is 0.27 percent of all Nonresponse Followup enumerators. The targeted reinterview samples (Outlier, Supplemental, and Hard Fail) discovered higher rates of mistakes and falsification than the random sample, so we suggest further research on adjusting the reinterview sampling algorithm to more efficiently use reinterview resources.

We did not plan or implement Headquarters monitoring of Local Census Office reinterview coding trends during the operation, but this analysis shows some offices that appeared not to have implemented proper data collection or reinterview coding procedures. Future operations should implement tools to monitor and address these possible office-level issues during data collection.

The results of enumerator observations are incomplete because only half of the observation checklists were delivered in time for data capture. Of the forms received, we saw that 86.5

percent of enumerators passed the observation and 0.8 percent failed. The remaining enumerators had other or no outcomes marked, likely because they left the operation before an observation could be completed. An automated observation checklist would prevent these data issues and ensure all enumerators are observed in a timely manner.

I. Introduction

A. Scope

The purpose of the Nonresponse Followup (NRFU) Quality Profile is to document the results and major findings from the 2010 NRFU Quality Assurance (QA) program, including topics such as enumerator observations, NRFU Reinterview (RI), and NRFU Vacant Delete Check (VDC) RI.

B. Intended Audience

This document assumes that the reader has at least a basic understanding of the NRFU operations. The goal is to use this document to help research, planning, and development teams planning the 2020 Census. For a basic understanding of the NRFU, please refer to the "2010 Census Detailed Operational Plan for Nonresponse Followup Operations," Census 2010 Informational Memorandum No. 27.

II. Background

The NRFU was a field operation where enumerators visited all housing units in the Mailout/Mailback or Update/Leave universes that did not return their 2010 Census forms. Some forms received after the start of NRFU but before an enumerator could interview the address were removed from the operation as "Late Mail Returns." For all remaining cases, enumerators conducted NRFU interviews on paper questionnaires that were subsequently sent to one of three Decennial Response Integration System (DRIS) data capture centers.

The objective of the NRFU QA program was to ensure that NRFU enumerators understood and followed appropriate NRFU procedures. This objective was accomplished through enumerator observations, Crew Leader review of completed materials, office review of completed materials, and a NRFU RI operation. A brief description follows, but please refer to "2010 Census: Quality Control Plan for the Nonresponse Followup Operation" (Whitford, 2009) for a detailed description of the NRFU QA program.

Enumerator observations were conducted immediately after training in order to identify any procedures the enumerators did not understand. A Crew Leader or Crew Leader Assistant accompanied each enumerator as he/she conducted interviews, and kept track of all procedures done correctly and incorrectly on a NRFU observation checklist (illustrated in Appendix C). This was done for both production and RI enumerators.

After completing interviews, enumerators returned all completed NRFU and RI forms to their Local Census Office (LCO) for check-in. Before check-in, all NRFU and RI forms were subjected to an office review that ensured all critical data items were completed and consistent, including the record of contacts, interview summary, and enumerator

certification sections. There were no data collected on the results of these office reviews, so there is no analysis of it in this report.

The NRFU RI was a field operation conducted by separate QA staff and designed to detect and deter enumerator errors and data falsification. A NRFU case was ineligible for RI if any of the following were true:

- Unit Status was not Occupied, Vacant – Usual Home Elsewhere, or Empty Mobile Home/Trailer Site
- Population Count was Unknown
- Questionnaire Status was Closeout, Inmover add, or Usual Home Elsewhere add
- An earlier version of the case was already selected for RI

A sample of each enumerator's eligible NRFU cases was selected for NRFU RI. This sample had four components:

1. Random – The Paper-Based Operations Control System (PBOCS) selected a four-percent systematic sample stratified by enumerator and starting with one of the first three eligible cases checked in for each enumerator. This sample type was selected immediately at NRFU check-in and was designed to select at least one case for almost every enumerator who worked on NRFU.
2. Outlier – The NRFU Matching, Review, and Coding System (MaRCS) automatically selected one or two additional RI cases for enumerators whose work differed significantly from all work within their Crew Leader District for certain characteristics.
3. Supplemental – MaRCS users manually selected additional RI cases as needed. They could also select enumerators for future supplemental RI, which resulted in PBOCS selecting the next two cases checked in for that enumerator.
4. Hard Fail RI – when an enumerator received a Hard Fail outcome, **all** eligible NRFU cases completed by that enumerator were selected for Hard Fail RI.

For all selected cases, RI enumerators contacted the original NRFU respondents[1] to determine the following:

1. Whether the respondent was contacted by a NRFU enumerator
2. The housing unit status (Occupied, Vacant, Demolished, etc.) of the NRFU address on April 1, 2010
3. If occupied, how many people live at the NRFU address
4. If occupied, the names of everyone living at the NRFU address
5. If occupied and the original respondent was not contacted previously, full demographic data for everyone living at the NRFU address

All NRFU RI data were collected on NRFU RI paper questionnaires (illustrated in Appendix D) and subsequently delivered to DRIS for data capture. All NRFU and

[1] If the RI enumerator was unable to interview the original respondent, he/she was permitted to interview a different knowledgeable person (a neighbor, for example) who was at least 16 years old.

NRFU RI forms were scanned at DRIS, and the data were delivered electronically to NRFU MaRCS, for matching and assignment of final RI outcomes. Because a quick turnaround was critical for timely RI coding, the data delivered to MaRCS were not subject to any DRIS keying, keying quality control, or other quality control measures. The MaRCS used data captured only through optical mark recognition and optical character recognition engines. Therefore, we expected some data capture errors in MaRCS that were later corrected for use in the census tabulations.

We originally relied on PBOCS for critical data items used for RI, but abandoned that interface mid-operation due to unexpected delivery delays. Instead, the RI program depended completely on the data delivered from DRIS data capture. The data errors we then had for critical items adversely affected many aspects of the reinterview program.

Upon receipt of all NRFU and RI data, MaRCS began a three-stage matching process:

1. Computer Matching – MaRCS automatically compared the NRFU data to the NRFU RI data and assigned a final outcome of Pass to all cases that matched. At this time, MaRCS also assigned an outcome of RI Noninterview to any NRFU RI cases that lacked sufficient data for a meaningful comparison to NRFU data. Cases that did not receive either a Pass or RI Noninterview outcome were deferred to the National Processing Center (NPC) for clerical matching.
2. NPC Clerical Matching – NPC clerks reviewed all data in MaRCS and assigned a final outcome of Pass to all cases that matched. Cases that did not match were deferred to the LCOs.
3. LCO Final Coding – LCO clerks reviewed all data available to them in MaRCS and elsewhere (such as PBOCS or their own knowledge of the area) to assign a final RI outcome to all cases deferred to them.

The final RI matching outcomes are as follows:

1. Pass – The enumerator followed procedures without any critical mistakes. This outcome was assigned at all stages of matching – computer, NPC, and LCO.
2. Soft Fail – The enumerator made an unintentional mistake. This outcome was assigned by the LCOs only.
3. Hard Fail – The enumerator falsified data or intentionally did not follow procedures. This outcome was assigned by the LCOs only.
4. Don't Know/Suspect – The LCO MaRCS clerk was unable to determine a final RI outcome but suspected the enumerator falsified data or intentionally did not follow procedures. This outcome was assigned by the LCOs only.
5. Don't Know/No Suspect – The LCO MaRCS clerk was unable to determine a final RI outcome and did not suspect the enumerator of falsification. This outcome was assigned by the LCOs only.
6. LCO Relief – The case did not pass the Computer Matching, and the LCO did not have time to determine a final RI outcome for the case. This code was also automatically assigned at computer matching if the data were not received until after the MaRCS clerical coding effort ended.

7. RI Noninterview – The reinterviewer was unable to collect enough RI data for a valid comparison to the NRFU data. This code was automatically assigned at computer matching.

The NRFU RI was conducted concurrently with the NRFU production, beginning May 3, 2010 (two days after the start of NRFU) and ending July 31, 2010 (three weeks after the finish of NRFU). The MaRCS coding effort began May 19, 2010 and ended August 9, 2010. During the MaRCS coding effort, we identified many ways the MaRCS application could be improved for future enumerations. For a detailed list of these improvements, please refer to "Census MaRCS – Lessons Learned From the 2010 Census and Suggestions for Future Enumerations" (Reichert, 2010).

Following the completion of the NRFU and NRFU RI operations, a third operation – NRFU VDC – was conducted to verify all of the cases from NRFU that were flagged as Vacant or Delete. Due to the inherent processing delays of paper operations, there were cases that required enumeration but were not included in NRFU. These cases were added to the VDC universe as part of a supplemental universe. For the purposes of this report, the term "supplemental universe" describes **all** cases in VDC that were not enumerated during NRFU, including reverse check-ins – cases where a form was received (so the case was excluded from NRFU) but turned out to be blank (so it still required enumeration).

Most of the VDC universe had already been enumerated once during NRFU, so additional RI of these cases was not necessary. However, the supplemental universe was first enumerated during VDC and required some level of quality control. Therefore, we implemented a VDC RI that attempted to re-enumerate all supplemental universe cases with a VDC outcome of Vacant or Delete.

The VDC RI was limited in scope because it was developed late in the planning process. For all cases selected for VDC RI, the LCOs attempted to contact the original respondent by telephone to verify the VDC status. There was no field enumeration for VDC RI, so any cases that could not be completed by telephone were not verified at all. All VDC RI outcomes were tracked by each LCO in Excel spreadsheets.

III. Methodology

At the completion of the NRFU and NRFU RI operations, the MaRCS and PBOCS both produced final datasets containing one record for each case enumerated during NRFU and NRFU RI. Some cases were enumerated more than once, but only the last check-in record was included in the data from the PBOCS. The MaRCS matched each RI case only once (using the first RI case received and the production version selected for RI), and the MaRCS data included only the check-in records used for the matching.

We combined the MaRCS and PBOCS datasets with supplemental data from the Decennial Applicant, Payroll, and Processing System and the NRFU and NRFU RI observation checklists in order to create the following analysis datasets:

1. Production Cases – one record per completed NRFU production case (which excludes Late Mail Returns) with only fields used during production.
2. RI Cases – one record per NRFU RI selected case with all fields from production and RI.
3. Production Enumerators – one record per enumerator (identified by a unique applicant ID) with various NRFU and RI case counts, termination date, and observation results.
4. RI Enumerators – one record per RI enumerator (identified by a unique applicant ID) with RI case counts and observation results.

These datasets were used to create most of the tables presented in the results section. The exceptions are the VDC RI results, which are summaries of the Regional Census Center (RCC) level tracking spreadsheets, and the MaRCS issues section, which uses various external sources.

As mentioned earlier, MaRCS received raw data from DRIS in order to reduce the delivery time. In order to evaluate the impact of DRIS data capture errors, we recreated the MaRCS data using final DRIS data from the 2010 Decennial Response Files (DRF) and then re-ran the MaRCS computer matching and outlier RI selection algorithms. We also compared the raw data to the final DRIS data to determine how many items differed between the two, assuming that the final DRIS data are correct and any differences are due to raw data errors. This was done only for items that are relevant in the final dataset. For example, if the final DRIS data had no record-of-contact field populated for the sixth contact on a form, we assumed a sixth contact was not completed and did not evaluate any items for a sixth contact.

Three weeks after conducting the NPC NRFU MaRCS training, we held a debriefing with a sample of Update/Enumerate (UE) and NRFU MaRCS NPC clerks. We asked the clerks various questions about how the training was conducted and how well it prepared them to do their jobs. The Field Division (FLD) Quality Assurance Branch also distributed and tabulated the responses to LCO questionnaires on all aspects of the Quality Assurance operation, including specific questions about the MaRCS training and application. This report summarizes notable findings from these debriefings.

IV. Limitations

The MaRCS was initially designed for use with an automated interviewing instrument. This would have allowed MaRCS to electronically receive all NRFU and NRFU RI data within an hour of interview completion. As a result, MaRCS would have selected all RI cases and begun the RI matching process within hours of NRFU interview completion.

When NRFU became a paper operation, this immediate data delivery was no longer possible. The success of the RI operation depends on timely RI coding results, which relies on prompt delivery of interview data. Therefore, the Census Bureau and DRIS developed a solution for MaRCS to receive interview data within ten days of DRIS receiving the form. However, the only way to achieve this was for DRIS to deliver raw

data captured only through optical mark and character recognition scanners. We expected errors in these data because they had not yet gone through any DRIS keying or QA. We also expected the impacts of these errors to be minimal because all control data were coming from PBOCS and should not have these errors.

Once the operation began, unexpected delays in the PBOCS interface caused us to drastically change the MaRCS application to rely solely on DRIS data. This report will refer to this change as the "MaRCS contingency" because it was implemented in response to unexpected events. Some unfortunate consequences of this change were the MaRCS selection of ineligible cases for RI and data capture errors in control data such as case ID and applicant ID. The data capture errors complicated the final analyses presented here, and sometimes limited the types of analyses possible.

The final PBOCS dataset contains only the last Applicant ID to complete the case, and the MaRCS data contain invalid Applicant IDs due to data capture errors. As a result, we cannot determine which enumerator some RI cases were originally selected for when the NRFU case was completed and selected for RI for one enumerator and then later reworked by a different enumerator. Therefore, we are unable to analyze RI selections by enumerator or determine if the RI sampling plan was implemented correctly. This also prevents us from accurately analyzing the enumerators MaRCS should have selected for the "Excessive Soft Fail/Don't Know-Suspect" outlier test.

We originally planned to analyze how long it took LCOs to prepare the RI materials and make RI assignments, but this was not possible with the data available to us. The PBOCS was designed to automatically assign every RI case to the office for telephone RI, and this was done immediately after the NRFU case was selected for RI. Therefore, the assignment date was no longer a useful measure of how long it took the LCOs to prepare the RI materials.

V. Results

The results that follow are all presented at the national level. For RCC-specific results, please refer to Appendix A.

A. MaRCS Training

MaRCS Training at the LCOs

At the completion of the NRFU RI operation, all LCOs were sent an Excel spreadsheet with questions about their experiences with the MaRCS application, training, and all other materials used as part of the MaRCS coding effort. We received responses from 484 LCOs (out of 494 total), and their feedback on MaRCS training was somewhat positive. We found that 54 percent of the LCOs thought the amount of training information was just right, while 27 percent believed there was too little information, and 18 percent thought there was too much. We also found that 92 percent of all LCOs thought the training materials were useful or very useful. The

two training documents that were used most were the clerk's manual and the manager's manual.

Despite the overall positive feedback, 56 percent of all LCOs thought there were deficiencies in the training. According to these LCOs, the training could be improved as follows:

- Include more realistic examples
- Spend more time explaining Hard Fail procedures
- Spend more time working example cases

MaRCS Training at NPC

In order to minimize costs, the NRFU NPC MaRCS debriefing was held three weeks into the NRFU operation as part of a trip to train the last round of NRFU NPC MaRCS clerks. Unfortunately, the bulk of the NRFU MaRCS workload did not reach NPC until after this debriefing, so any complications from the increased workload were not captured during our debriefing. However, we were still able to gain some insight into the quality of the NPC training materials and possible improvements.

For the most part, the NPC MaRCS training did prepare NPC clerks for their job conducting clerical matching in 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 production cases, however, they encountered many situations that had not been covered during the training. Some examples of these situations are:

1. Either the production 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 for one case (i.e. population count was seven but only one household member was listed).

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 production and RI so they have a better understanding of the resulting data,
3. Include more instruction on what exactly to write in 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.

The LCOs had similar comments about the NPC coding. In the LCO MaRCS debriefing questionnaire, 45 percent of all LCOs said the NPC codes were not helpful. The main reasons given for this were that the NPC clerks did not have a good understanding of field procedures and wrote incomplete or confusing notes.

B. Initial Observations

Enumerator observations were conducted immediately after training in order to identify any procedures the enumerators did not understand. The observer spent two hours watching the enumerator work, recorded all observations on an observation checklist (illustrated in Appendix C), and assigned an overall observation result of Satisfactory, Unsatisfactory, or Other. If the first observation result was unsatisfactory, the enumerator was retrained and observed a second time. If the observation result remained unsatisfactory, the enumerator should have been removed from the operation. All observation checklists were shipped to NPC for keying, and data were delivered to the Decennial Statistical Studies Division (DSSD) Quality Assurance Branch for analysis.

We expected to receive one form for each of the 556,236 enumerators who worked on NRFU, but we only received a total of 314,201 forms. The observation forms we did receive were often incomplete, filled out incorrectly, or had duplicate forms for the same enumerator. In an effort to not count enumerators more than once, we combined multiple forms into one data record for the enumerator. We did this using applicant ID and enumerator name, so any forms with these items missing were discarded.

We also found that some observers wrote their own applicant ID on the form instead of the applicant ID of the enumerator they observed. We also discarded these records because they were essentially missing the correct applicant ID.

After cleaning the observation form data, we found that we received complete observation forms for 274,543 production enumerators and 13,224 RI enumerators, which is 51.9 percent and 48.5 percent of all production and RI enumerators who completed at least one case. There was no system designed to track observation forms, so we do not know if this is because the observations were not conducted or the observation forms were lost. Refer to Table 1 for a distribution of the enumerator observation results received.

We see that 14.6 percent of all enumerators had more than one observation, which indicates that they initially struggled with the procedures or were unable to locate any respondents during their first observation. We also see that 0.8 percent of all enumerators received a final observation result of unsatisfactory while 86.5 percent of all enumerators were satisfactory. The remaining 36,494 enumerators had observation results of other or none marked, and a brief review of the notes indicates that most were because the enumerator left the operation before an observation could be completed. These distributions are similar for the NRFU and RI enumerators,

although RI seems to have fewer enumerators with zero observations and fewer observation results of other, which may indicate a lower turnover rate than for production.

Table 1: Enumerator Observations Completed

	All Enumerators	NRFU	NRFU RI
Total Enumerators	556,236 [2]	528,960	27,276
Enumerators with Observation Forms	287,767 (100%)	274,543 (100%)	13,224 (100%)
Blank Observation Form	757 (0.3%)	745 (0.3%)	12 (0.1%)
1 Observation	245,077 (85.2%)	233,854 (85.2%)	11,223 (84.9%)
2 Observations	40,189 (14.0%)	38,334 (14.0%)	1,855 (14.0%)
More than 2 Observations	1,744 (0.6%)	1,610 (0.6%)	134 (1.0%)
Final Observation Outcome			
Satisfactory	249,037 (86.5%)	237,499 (86.5%)	11,538 (87.2%)
Unsatisfactory	2,236 (0.8%)	2,149 (0.8%)	87 (0.7%)
Other	3,121 (1.1%)	3,035 (1.1%)	86 (0.7%)
None marked	33,373 (11.6%)	31,860 (11.6%)	1,513 (11.4%)

Source: NPC Observation Form Keying

Table 2 examines the 2,236 enumerators who failed their observations. Enumerators with an unsatisfactory final observation result should have been removed from the operation, but we see that only 859 were terminated within two weeks of their last observation while 1,046 were allowed to continue working more than two weeks. The remaining 331 enumerators who failed observations either had no observation dates listed or could not be matched to the termination data. It appears that failing the observation did not always lead to enumerator termination.

Table 2: Termination Dates for Enumerators with Unsatisfactory Observation Results

		No Data	Enumerator was terminated within:			
Operation	Enumerators	Available	0-2 weeks	3-4 weeks	>4 weeks	Never
All	2,236	331	859	288	632	126
NRFU	2,149	305	830	283	612	119
RI	87	26	29	5	20	7

Source: NPC Observation Form Keying and DAPPS

We saw in Table 1 that 14.6 percent of observed production and RI enumerators had at least two observations done. Table 3 shows that 2.3 percent of these production enumerators had an unsatisfactory final observation result, compared to the overall

[2] 17,824 observation forms were not used for this analysis due to missing Applicant ID, unknown operation (NRFU or NRFU RI), or late form shipment.

unsatisfactory rate of 0.8 percent. This is expected because only enumerators who struggled in their first observations should have had a second observation done.

Table 3: Observation Results by Number of Observations Done

	Observations Done	Enumerators with Forms	Final Observation Outcome			
			Satisfactory	Unsatisfactory	Other	None
NRFU	Any	274,543 (100%)	237,499 (86.5%)	2,149 (0.8%)	3,035 (1.1%)	31,860 (11.6%)
	0[3]	745 (100%)	3 (0.4%)	1 (0.1%)	422 (56.6%)	319 (42.8%)
	1	233,854 (100%)	203,980 (87.2%)	1,243 (0.5%)	2,329 (1.0%)	26,302 (11.2%)
	2 or more	39,944 (100%)	33,516 (83.9%)	905 (2.3%)	284 (0.7%)	5,239 (13.1%)
RI	Any	13,224 (100%)	11,538 (87.3%)	87 (0.7%)	86 (0.7%)	1,513 (11.4%)
	03	12 (100%)	0 (0%)	0 (0%)	8 (66.7%)	4 (33.3%)
	1	11,223 (100%)	9,881 (88.0%)	40 (0.4%)	67 (0.6 %)	1,235 (11.0%)
	2 or more	1,989 (100%)	1,657 (83.3%)	47 (2.4%)	11 (0.6%)	274 (13.8%)

Source: NPC Observation Form Keying

We also see in Table 3 that the distribution of observation results by number of observations done is similar for NRFU and RI. Both show that most enumerators with zero observations had an outcome of Other or None, indicating that the enumerator left the operation or Crew Leader District before an observation could be done.

One unexpected result from Table 3 is that 1,243 observed NRFU enumerators received an unsatisfactory outcome after only one observation. Based on the procedures, we expected enumerators would receive re-training and a second observation before receiving that final outcome. It is possible these enumerators left the operation before that could happen, but it is also possible their supervisors did not have time to do a second observation or did not think a second observation would help.

Refer to Table 4 for the distribution of specific errors observed during observations. We see that production enumerators had a first observation error rate of 9.2 percent and most often failed to read the questions as worded. The RI enumerators had a first observation error rate of 9.5 percent and most often failed to provide the information sheet. A promising result is that incidences of not interviewing an eligible respondent or not protecting confidential data were rare for both production and RI enumerators.

[3] Observation forms had no fields filled in for either the first or second observation.

Table 4: Errors Discovered During Observations

	NRFU Observations		NRFU RI Observations	
	First	**Last**	**First**	**Last**
Enumerators Observed	273,798 (100%)	39,989 (100%)	13,212 (100%)	1,989 (100%)
Enumerators with Errors	25,096 (9.2%)	3,456 (8.6%)	1,257 (9.5%)	198 (10.0%)
1 – Introduction/show badge	2,421 (0.9%)	327 (0.8%)	116 (0.9%)	16 (0.8%)
2 – Provide Information Sheet	6,055 (2.2%)	835 (2.1%)	463 (3.5%)	70 (3.5%)
3 – Plan efficient route	4,887 (1.8%)	784 (2.0%)	138 (1.0%)	18 (0.9%)
4 – Use census maps	6,533 (2.4%)	1,031 (2.6%)	303 (2.3%)	55 (2.8%)
5 – Interview eligible respondent	942 (0.3%)	223 (0.6%)	47 (0.4%)	11 (0.6%)
6 – Read questions as worded	9,256 (3.4%)	1,352 (3.4%)	416 (3.2%)	65 (3.3%)
7 – Fill out questionnaire	6,880 (2.5%)	1,182 (3.0%)	246 (1.9%)	55 (2.8%)
8 – Use various forms	3,810 (1.4%)	723 (1.8%)	164 (1.2%)	35 (1.8%)
9 – Protect confidentiality	1,665 (0.6%)	349 (0.9%)	48 (0.4%)	12 (0.6%)
10 – Wear seatbelt when driving	1,754 (0.6%)	237 (0.6%)	47 (0.4%)	7 (0.4%)

Source: NPC Observation Form Keying

While the overall error rate went down between the first and last observations, we see that the specific error rates went up for the production and RI enumerators on using census maps, interviewing eligible respondents, filling out the questionnaire, using various forms, and protecting confidentiality. This is likely due to the abilities of the enumerators who require a second observation rather than a decrease in overall proficiency. However, this may also indicate an area where re-trainings could be improved.

C. Reinterview Workloads

Because this was a paper enumeration, PBOCS selected random RI cases and MaRCS selected most Outlier, Supplemental, and Hard Fail RI cases[4]. Under the MaRCS contingency, MaRCS assumed PBOCS selected a case for random RI upon receiving the RI data from DRIS. This method resulted in some RI cases where PBOCS and MaRCS had different RI types.

[4] The PBOCS selected a small percent of the Supplemental and Hard Fail RI cases once MaRCS identified enumerators for this selection.

These discrepancies were resolved with the following priority:

If…	Then the RI type is…
PBOCS RI type is random	Random
PBOCS or MaRCS RI type is Outlier	Outlier
PBOCS or MaRCS RI type is Supplemental	Supplemental
PBOCS or MaRCS RI type is Hard Fail	Hard Fail

After applying this algorithm, 649 RI cases did not have an RI type. Twenty-one of these cases had invalid case IDs and were removed from all analyses. The remaining 628 cases had RI data received in MaRCS even though neither PBOCS nor MaRCS selected them. We had no data to indicate which RI type these cases should be, so we assigned them the Random RI type for further analysis.

Refer to Table 5 for the distribution of cases selected for RI. We see that 67.5 percent of all NRFU cases were eligible for RI, which means they were complete interviews with housing unit status occupied, vacant – usual home elsewhere, or empty mobile home site. The random RI selection algorithm counted only eligible cases, so the number of eligible cases directly affected the RI workload. We failed to adjust for this during operation planning and had to adjust our estimated RI workload midway through the operation. In the future, we should consider altering the algorithm to count ineligible cases so we may better estimate the RI workload for budget planning.

The PBOCS was designed to select every 25th eligible case for each enumerator, which should have yielded a four percent Random RI sample. We see that PBOCS actually selected 4.8 percent of all eligible cases for random RI. This was most likely because the RI selection was done by enumerator, starting with one of his/her first three cases, to guarantee that almost all enumerators had at least one case selected. The result is that an enumerator who worked only five eligible cases, for example, would have a selection rate of 20 percent while an enumerator who worked 25 cases would have the expected selection rate of four percent.

Table 5: NRFU Reinterview Selections

	Cases
Total NRFU production	47,367,647
NRFU production eligible for RI	31,991,588 (67.5% of all production)
Selected for Reinterview	1,894,664 (5.9% of eligibles)
Random	1,525,297 (4.8% of eligibles)
Outlier	247,511 (0.8% of eligibles)
Supplemental	14,412 (0.1% of eligibles)
Hard Fail	107,444 (0.3% of eligibles)

Source: MaRCS and PBOCS

The MaRCS ran automatic outlier selections each week of the operation, and Table 6 shows the distribution of enumerators that failed each outlier test. We see that the most common outlier was enumerators with high proxy rates, and the least common outlier (excluding the excessive Soft Fail flag) was enumerators with a high percent of occupied households that had only one household member (identified with the population 1 rate test).

Table 6: Enumerators Flagged as Outliers

Outlier test	Enumerators flagged	Enumerators flagged more than once
All	106,562	22,885
Population 1 Rate	18,837	1,634
Missing Phone Rate	36,667	6,072
Proxy Rate	46,531	6,112
Seasonal Vacant Rate	29,448	4,263
Excessive Soft Fail/DK Suspect	276	0

Source: MaRCS

The final outcomes of these outlier RI cases are presented in Section IV.G below.

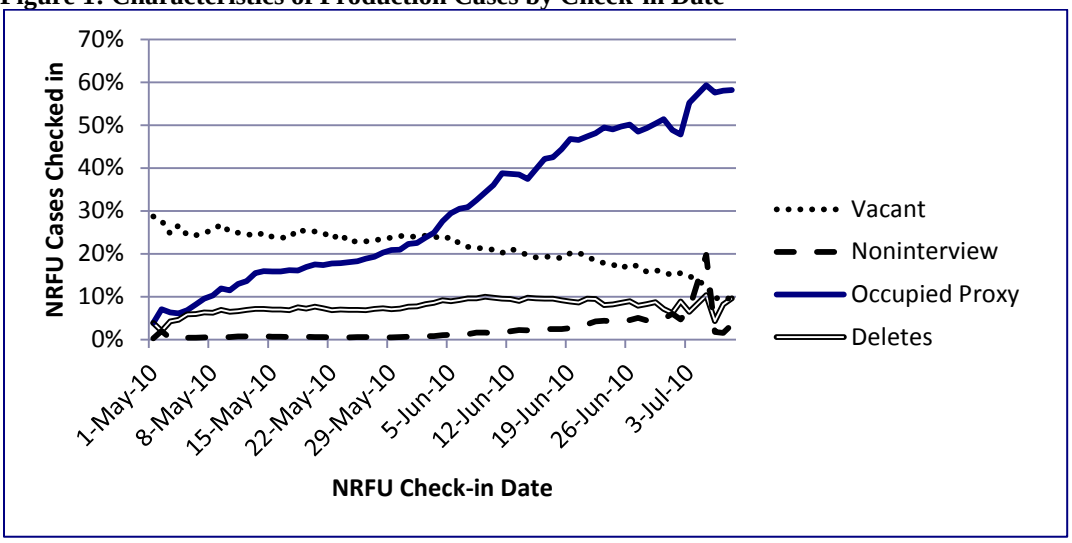
D. Production Data Collection

As mentioned earlier, the PBOCS dataset only contained one record per case with the last instance of check-in. Most results in this section are based on check-in date, but it should be noted that this is only the last check-in date. Instances of cases that were checked in multiple times should be relatively uncommon and therefore should not affect the national results.

On average, it took 23.3 days for a NRFU case to be completed and checked back into PBOCS after initial checkout. Figure 1 shows the characteristics of NRFU cases by check-in date. We see that the rate of regular vacant cases checked in goes down throughout the operation. We expect this because vacant cases should be easier to enumerate than occupied cases so they would be completed first.

The most striking change in characteristics is the increase in occupied cases completed with a proxy respondent from 21 percent on May 30, 2010 to 58 percent on July 8, 2010. Field procedures allow proxy interviews only after six failed attempts to interview a household member, and cases with more contact attempts should generally take longer to complete. We see a similar (although less extreme) increase in the percent of noninterviews for the same reason – noninterviews are a last resort only when you have exhausted all efforts and cannot complete an interview with anyone.

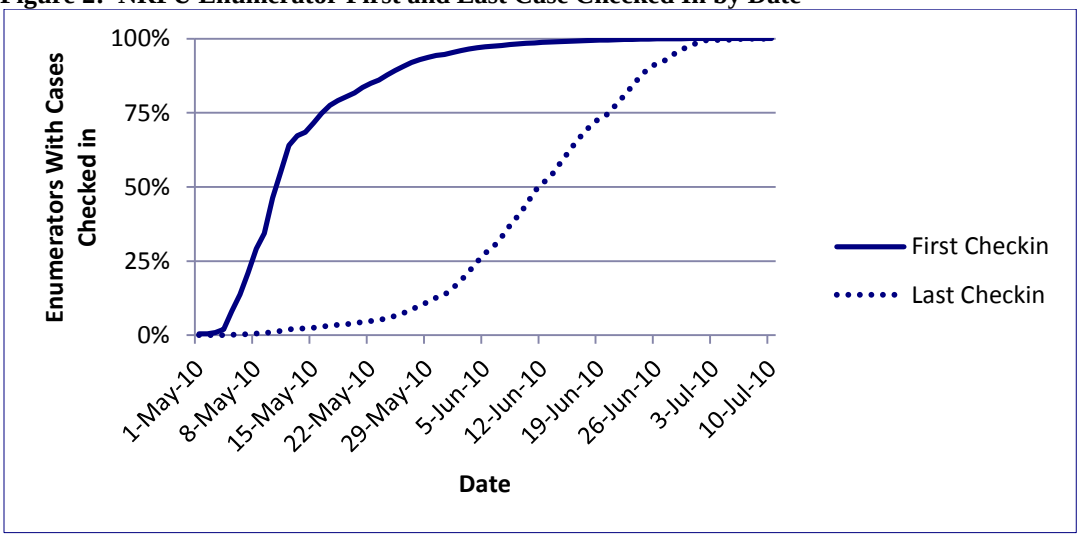
Figure 1: Characteristics of Production Cases by Check-in Date[5]



Source: PBOCS

Figure 2 shows the percent of all production enumerators with their first and last NRFU cases checked in by date.

Figure 2: NRFU Enumerator First and Last Case Checked In by Date[6]



Source: PBOCS

As expected, we see that 68 percent of all enumerators had their first case checked in during the first two weeks of the operation. The LCOs did not check-in most of these cases until the second week, which is likely due to the time needed to return the materials to the LCO, perform the office review, and check them in. There was also

[5] This analysis excludes the Brooklyn Northeast and Brooklyn Northwest LCOs due to cases checked in after the NRFU closeout date that do not represent the nation as a whole.

[6] This graph excludes 579 enumerators who had cases checked in after July 10 as part of the Brooklyn Northeast rework effort.

an unexpected delay in PBOCS for case check-in. For more information on this backlog, please see the NRFU Assessment (Walker et al., 2012).

An interesting observation from Figure 2 is that half of all enumerators had their last case checked in by June 12, which was almost a full month before the scheduled NRFU closeout date of July 10. While this was a positive result for the NRFU staff, it presented a challenge for the NRFU RI operation to determine final RI outcomes and provide feedback to enumerators before they completed all of their assignments.

E. Reinterview Data Collection

In order to reduce costs, all RI cases were initially attempted by telephone out of the LCOs. The RI cases were then deferred to the field RI enumerators once the LCO exhausted their three telephone attempts or determined a telephone contact would not be possible. Of the 1,888,148 completed RI cases on the final DRIS files, 948,505 (50 percent) were completed by telephone and 900,329 (48 percent) were completed in-person. The remaining two percent had unknown contact type because it was not marked on the form. (Walker et al., 2012)

The production and RI enumerators were instructed to write notes on the forms that might assist other field staff in follow-up efforts. FLD estimated that enumerators would write notes on 40 percent and 80 percent of the production and RI forms, respectively. We actually received notes from DRIS for 39.9 percent and 77.8 percent of the production and RI forms, respectively.

When conducting the RI, procedures instructed RI enumerators to ask the original NRFU respondent if they were contacted for the original interview (OI). If the answer to this question was ‘yes’ and the housing unit was occupied, the RI enumerator needed only collect the names of the household members. If the answer to this question was ‘no’ or ‘unknown,’ the RI enumerator needed to conduct a full NRFU interview. If the RI enumerator could not locate someone at the original respondent’s address, the RI enumerator should have skipped this question and conducted the full NRFU interview.

Overall, 18 percent of occupied RI cases were full interviews (collected full demographic data such as name, sex, relationship, age, race, and ethnicity) while the remaining 82 percent collected only names. Table 7 shows how many of each interview type were implemented correctly. We see that RI enumerators tended to err on the side of conducting the full interview. In fact, 32.4 percent of all complete occupied interviews should have collected names only. On the other hand, only 4.5 percent of name-only RI cases should have been full interviews.

Table 7: NRFU RI Cases by Interview Type

	All RI[7]	Occupied		Not Occupied
		Full Interview	Names Only	
All RI	1,742,011 (100%)	261,724 (100%)	1,236,853 (100%)	243,434 (100%)
Original Contact:				
Confirmed	1,427,979 (76.4%)	84,710 (32.4%)	1,182,284 (95.6%)	160,985 (66.1%)
Not Confirmed	262,991 (14.1%)	171,145 (65.4%)	36,499 (3.0%)	55,347 (22.7%)
Not Asked	51,041 (2.7%)	5,869 (2.2%)	18,070 (1.5%)	27,102 (11.1%)

Source: MaRCS

Another surprising result is that enumerators did not ask the OI contact question at all, which implies they did not interview the original respondent, for 1.6 percent of the occupied units and 11.1 percent of the unoccupied cases. The RI procedures require RI enumerators to make every attempt to contact the original respondent before interviewing someone else. This policy holds regardless of the unit status, so we did not expect the unoccupied units to skip this item seven times more than occupied units. One possible explanation is that unoccupied interviews are completed by proxy and the proxy respondents may be harder for the RI enumerator to locate a second time.

There was a check-box on the RI form where the enumerator could indicate that the RI respondent was the same person as the original respondent. Analysis of this check-box indicates that 66.6 percent of the 1,869,505 RI cases with DRIS data were completed with the same respondent as NRFU. Table 8 shows this by original NRFU respondent type and Housing Unit status.

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. We also see that 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. Most of these cases should have been verified through VDC, which does not require enumerators to locate the original respondent. If future operations verify these cases in RI, we should modify the RI enumerator procedures and training to improve these contact rates.

[7] 127,511 RI cases are excluded from this table because they were occupied but had no person records, presumably because the respondent refused to provide that information.

Table 8: Distribution of RI Cases with Original NRFU Respondent

	RI Cases Received[8]	RI Done with Original NRFU Respondent?			
		Yes		No	
All Cases	1,869,505	1,245,894	66.6%	623,611	33.4%
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

F. Reinterview Operation Delays

Success of the NRFU Reinterview program depended on our ability to quickly complete the RI and determine an outcome. We tried to complete the RI as soon as possible after the NRFU interview in order to improve respondent recall and reduce incidents of respondents moving before we could interview them again. We also wanted the RI outcomes determined quickly so we could provide feedback for mistakes or take other necessary action for intentional falsification.

Analysis of RI check-in dates has the same limitations as the NRFU check-in dates. A small percent of cases had the NRFU check-in date after the RI check-in date because the NRFU case was apparently reworked after the RI was completed. These cases were excluded from the following analysis.

Table 9 shows the average and quartiles for the number of days it took for a case to be completed at each stage of the RI operation. These delays are calculated as the number of days between completion of the current and previous stages. Quartiles are presented instead of the standard deviation because, as illustrated in Figure B9 in Appendix B, all distributions are skewed.

Table 9: Number of Days before Completion of RI Stages

Reinterview Stage	Average	1st Quartile	Median	3rd Quartile
NRFU Check-in	-	-	-	-
Reinterview Check-in	16	4	10	24
Computer Matching	15	8	13	19
NPC Clerical Matching	6	2	4	9
LCO Final Coding	4	1	3	6

Source: PBOCS and MaRCS

[8] The RI Cases Received within categories do not add up to the total cases because some cases were missing the category field.

The long delays for reinterview check-in and computer matching were both partially caused by aspects of a paper operation. The reinterview check-in delay includes the time it took before the case was selected as well as how long it took to conduct the reinterview. Targeted reinterview cases (which includes all RI types except random) were not selected until after the data were captured off the NRFU form, which could add up to ten days to the reinterview check-in time. The completion of the reinterview after selection was also likely affected by the transfer of paper materials to and from the LCOs. The computer matching delays were caused entirely by the data capture process and could be eliminated altogether with automated instruments and electronic data delivery to MaRCS.

The NPC delay was slightly higher than desired, due mostly to the fact that we did not have a large enough workforce to keep up with the clerical matching workload. We also found that a higher percent of RI cases failed to pass computer matching later in the operation, so NPC received the bulk of their workload later than expected.

The LCO clerks were expected to code all cases within five days of receipt. Table 9 shows that they coded half their cases within three days (less than the expected five days) but also coded 25 percent of their cases in six or more days (longer than expected) . It is possible that these cases required more research before a code could be assigned.

As mentioned earlier, we expect RI check-in delays to differ by RI type because PBOCS selected random RI at production check-in while the other RI Types were only selected after DRIS data capture. Table 10 shows how quickly RI was completed by RI type. These distributions are also illustrated in Figure B10 in Appendix B. As expected, the Random RI was done quicker than the other RI types, with 50 percent of cases done within 8 days of production check-in.

Table 10: RI Check-in Delays by RI Type

	Number of Days Between Production Check-in and …					
	RI Selection			RI Check-in		
	Mean	Median	Maximum	Mean	Median	Maximum
Random	0	0	0	10.5	8	91
Outlier	27.4	26	80	38.5	38	89
Supplemental	31.2	29	84	40.2	39	87
Hard Fail	40.8	41	84	47.5	48	90

Source: PBOCS and MaRCS

We expected MaRCS to receive production data within 11 or 12 days at most (one or two days for shipping and no more than ten days for DRIS data capture), but we never considered what the total delay might be for MaRCS RI selection. We found that MaRCS RI selection occurred an average of 31 days after production check-in, which explains most of the additional delay in RI check-in for these cases.

The reason for the unexpectedly high delay in RI selection is unknown, but it is likely a combination of the following factors:

- Unexpected delays in the LCOs shipping forms to DRIS after check-in
- Processing complications delayed MaRCS loading the data
- Cases were not selected for RI immediately upon loading

The third reason explains why the Hard Fail RI cases have such a higher average lag than the other RI Types. When an enumerator receives a Hard Fail, all of their cases are then selected for Hard Fail RI. Cases checked in during the first week of NRFU could be selected in the last week if that is when the enumerator receives their first Hard Fail outcome.

G. Reinterview Outcomes

Table 11 and Figure 3 show the distribution of final RI outcomes in MaRCS. We see that 86.2 percent of all RI cases received a final outcome of Pass, 3.6 percent of all RI cases found unintentional mistakes (Soft Fail), and 0.7 percent of all RI cases found intentional falsification (Hard Fail). Only 0.1 percent of all RI cases received the LCO Relief outcome code, and all but 11 of them were because the data were received after the MaRCS coding effort had ended. This means the LCOs were able to review and code almost all of the cases they received. On the other hand, 1.5 percent of all RI cases never received any RI matching outcome because the data were never received or loaded into MaRCS. This is an unfortunate consequence of a paper-based operation.

Table 11: Final RI Case Outcomes in MaRCS

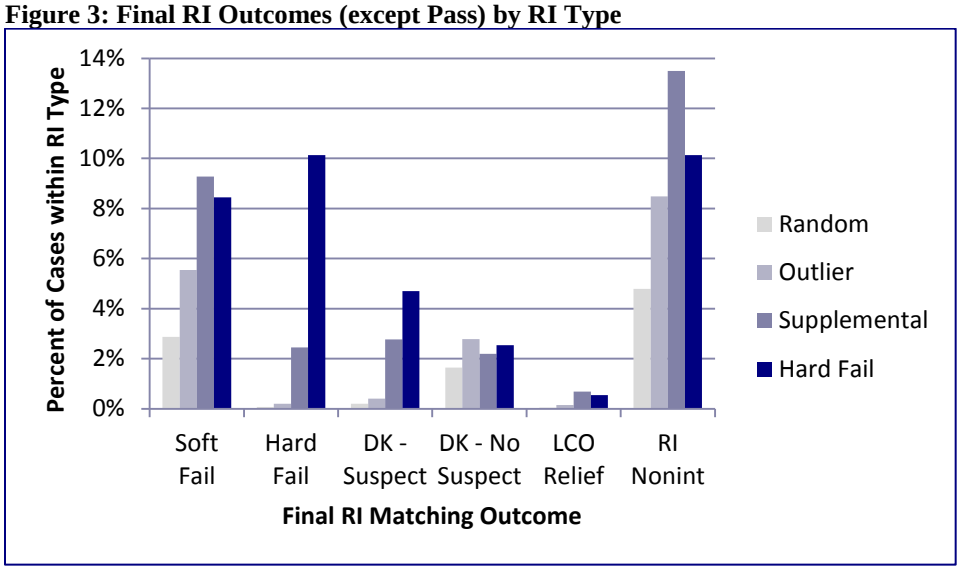
RI Type	Total	Pass	Soft Fail	Hard Fail	DK-Suspect	DK-No Suspect	LCO Relief	RI Nonint	None
All	1,894,664 (100%)	1,632,798 (86.2%)	68,043 (3.6%)	12,912 (0.7%)	9,586 (0.5%)	35,094 (1.9%)	1,797 (0.1%)	106,925 (5.6%)	27,509 (1.5%)
Random	1,525,297 (100%)	1,358,497 (89.1%)	43,914 (2.9%)	1,188 (0.1%)	3,123 (0.2%)	25,145 (1.7%)	744 (0.1%)	73,096 (4.8%)	19,590 (1.3%)
Outlier	247,511 (100%)	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%)
Supplemental	14,412 (100%)	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%)
Hard Fail	107,444 (100%)	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%)

Source: MaRCS

The MaRCS automatically coded 5.6 percent of all RI cases as noninterviews because they did not contain enough data for comparison to NRFU data. This noninterview rate is likely a combination of RI enumerators failing to collect enough data and data capture errors causing case misclassifications in MaRCS. An automated interviewing instrument would eliminate case misclassifications and improve the effectiveness of the NRFU RI operation.

Figure 3 illustrates these RI outcome rates by RI type. The Pass outcome is excluded so we may better examine the outcomes that found possible mistakes or falsification. We see that Random RI had the lowest percent of all outcomes in Figure 3 because it had the highest overall Pass rate of 89.1 percent. The Supplemental RI found the highest rate of unintentional mistakes (Soft Fail), while Outlier RI found the highest rate of Don't Know – No Suspect cases. The Hard Fail RI type had the highest rates of Hard Fail and Don't know/Suspect cases, which implies that enumerators who cheat will cheat more than once. Further analysis of these hard fail enumerators is presented in Section V.I.2.

Figure 3: Final RI Outcomes (except Pass) by RI Type



Source: MaRCS

An interesting observation in Figure 3 is that supplemental cases had the highest rate of LCO Relief and RI noninterviews. These cases were specifically selected by the LCOs, so we expected them to make every attempt to complete them. However, this also could be an indication that the types of cases selected for Supplemental RI were with difficult original respondents who would be even less likely to respond to yet another interview. It also could reflect over-eager LCOs who wanted to check more cases but simply did not have time.

As mentioned before, 1.5 percent of all RI cases did not receive any RI matching outcome. The various reasons for this are listed in Table 12 with a count of how many cases were affected by each circumstance. More than half of these cases 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. Twenty percent were not coded because the RI data were never received. 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 to not use PBOCS data. Except for the 11 LCO Relief cases that did not have enough time to be coded, all of these issues could be avoided with an automated instrument and rigorous software and interface testing.

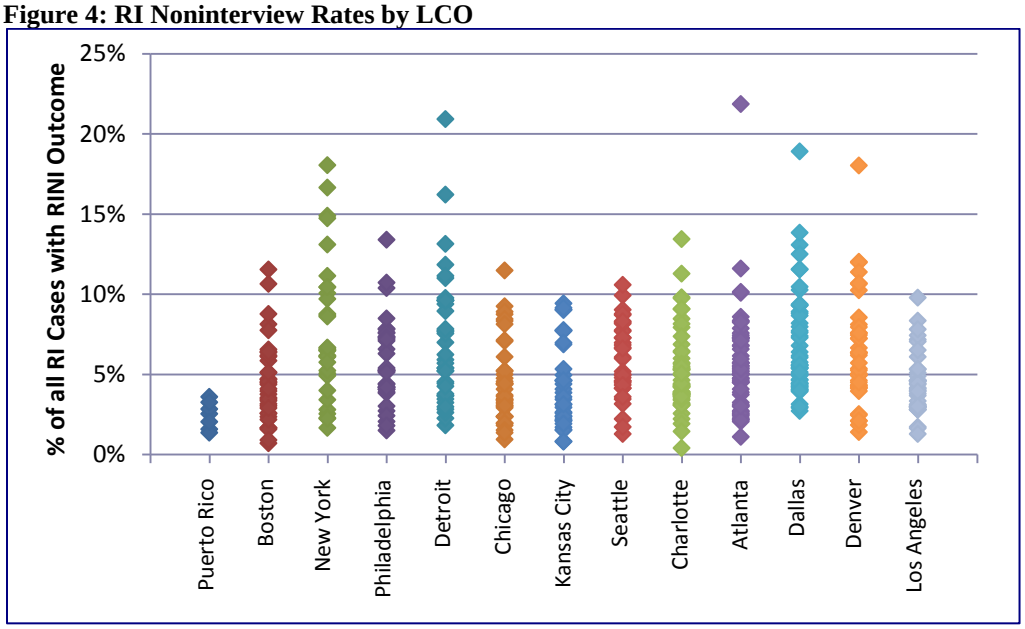
Table 12: RI Cases with No Final RI Matching Outcome

Reason for missing RI matching outcome	Cases (Number and %)	
Total RI cases with no MaRCS outcome	27,509	(100%)
MaRCS selected cases with invalid Case IDs	121	(0.4%)
MaRCS selected ineligible cases later removed	2,928	(10.6%)
MaRCS never received any data from DRIS	32	(0.1%)
MaRCS never received the RI case from DRIS	5,745	(20.9%)
MaRCS never received the production case from DRIS	2,523	(9.2%)
Unexpected data errors prevented any matching	16,152	(58.7%)
Undetected defects in MaRCS prevented matching	8	(0.0%)
Total RI cases with LCO Relief outcome	1,797	(100%)
MaRCS received all data after RI closeout – LCO Relief	1,786	(99.4%)
LCO did not have time before RI closeout – LCO Relief	11	(0.6%)

Source: MaRCS

Analysis of the RI Noninterview rates by LCO identifies some LCOs with much higher rates than the rest of the country. Figure 4 plots the RI Noninterview rates for each LCO within their RCC. Each diamond in the plot represents one LCO, and they are grouped by RCC.

Figure 4: RI Noninterview Rates by LCO



Source: MaRCS

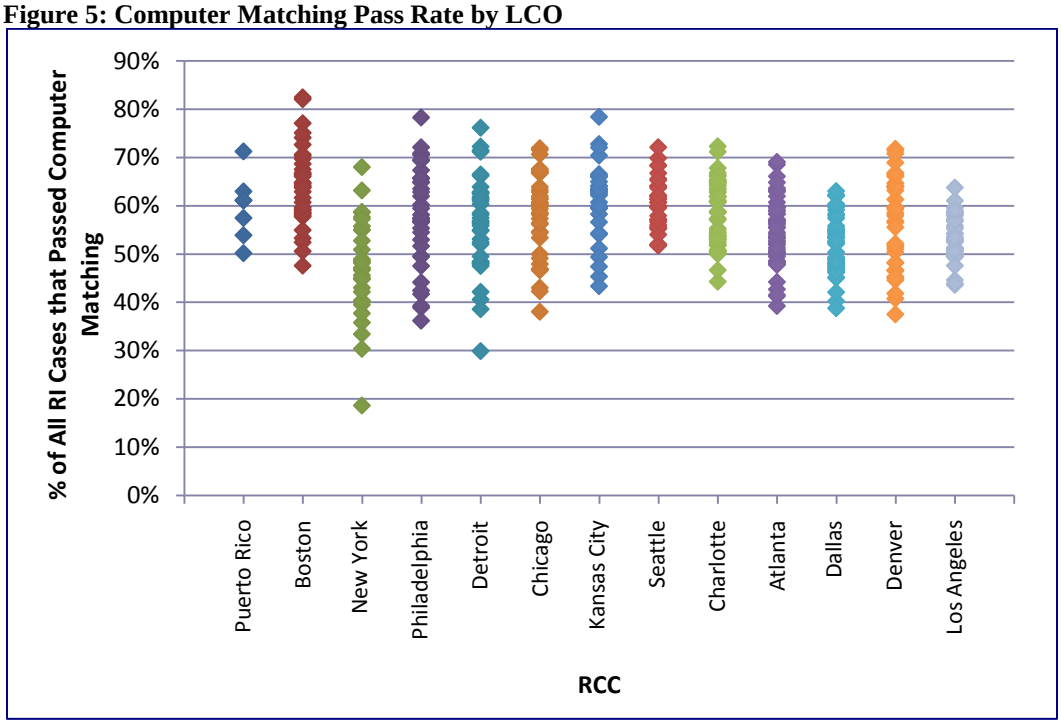
The plot in Figure 4 highlights a few LCOs that are outliers. LCO 2938 (Miami South, FL) in the Atlanta RCC had 22 percent of all RI cases receive a noninterview. Most of their noninterview cases were supplemental RI so this appears to be an over-eager LCO that did not have time to complete all selected cases. On the other hand, LCO 2413 (Detroit East, MI) in the Detroit RCC had a RI noninterview rate of 21 percent and most of those were random RI.

Another indicator of the quality of data collected during production and/or RI is the Computer Matching outcome. One obvious reason is that it identifies cases where the

data differed. Another reason is that all MaRCS data were received from questionnaire form scanning with no corrections by keyers. Therefore, the computer matching outcome could be affected by such things as the enumerator's handwriting, handling of the paper forms, and following interview skip patterns on the form.

Figure 5 shows the computer matching pass rate by LCO. Again, each point in this plot is the computer matching pass rate for one of our 494 LCOs, and the LCOs are grouped by their RCC.

Figure 5: Computer Matching Pass Rate by LCO



Source: MaRCS

The national computer matching pass rate was 58 percent, but we see in Figure 5 that some LCOs were much higher and others were much lower than this rate. The most striking observation in Figure 5 is LCO 2225 (Brooklyn Northeast) in the New York RCC, which had the lowest computer matching pass rate at 19 percent of all RI cases. This may be related to LCO-wide procedural violations discovered in this LCO. This discovery resulted in an extra effort to rework all of the NRFU cases in this LCO. If the plot in Figure 5 had been available to managers during the NRFU RI operation, we may have caught and corrected this issue sooner.

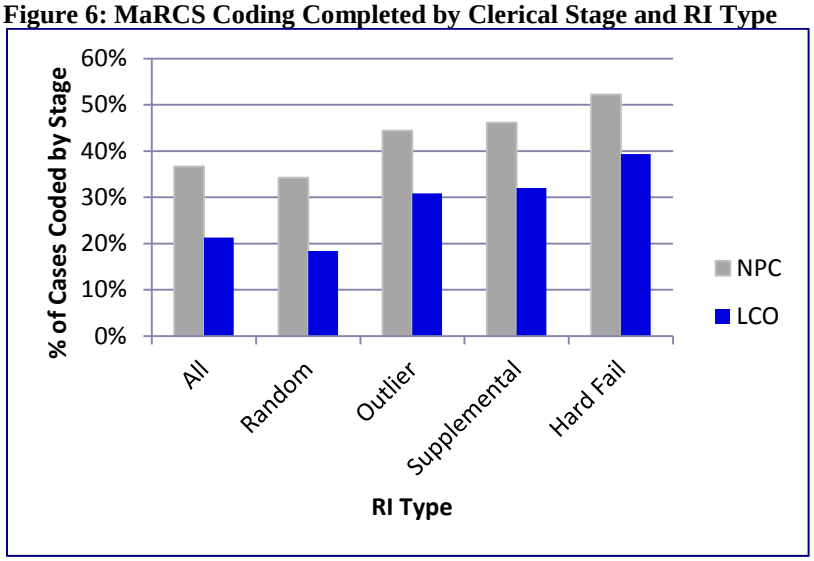
A positive observation from Figure 5 is that all LCOs in Seattle and Puerto Rico had at least half of their RI cases pass computer matching. This indicates consistently good data collection and clear writing on forms for both the production and RI staff in those offices.

H. MaRCS Coding

1. MaRCS Coding by Stage

Figure 6 shows the distribution of cases coded at each stage by RI type. As expected, the outlier, supplemental, and hard fail RI types all had higher rates of deferral than the random RI type. In other words, more of these cases did not pass the computer matching and NPC coding stages. Overall, only 37 percent of all cases were deferred to the NPC. The NPC passed 16 percent of all RI cases, so only 21 percent of all cases were deferred to the LCOs. This RI coding method is a great improvement over previous censuses where the RI enumerators assigned RI outcomes in the field based only on their assessment of each case (without access to all the enumerator's completed cases).

Figure 6: MaRCS Coding Completed by Clerical Stage and RI Type



Source: MaRCS

2. Computer Matching

Refer to Table 13 for a distribution of the Computer Matching outcomes for all RI cases.

Table 13: Computer Matching Outcomes

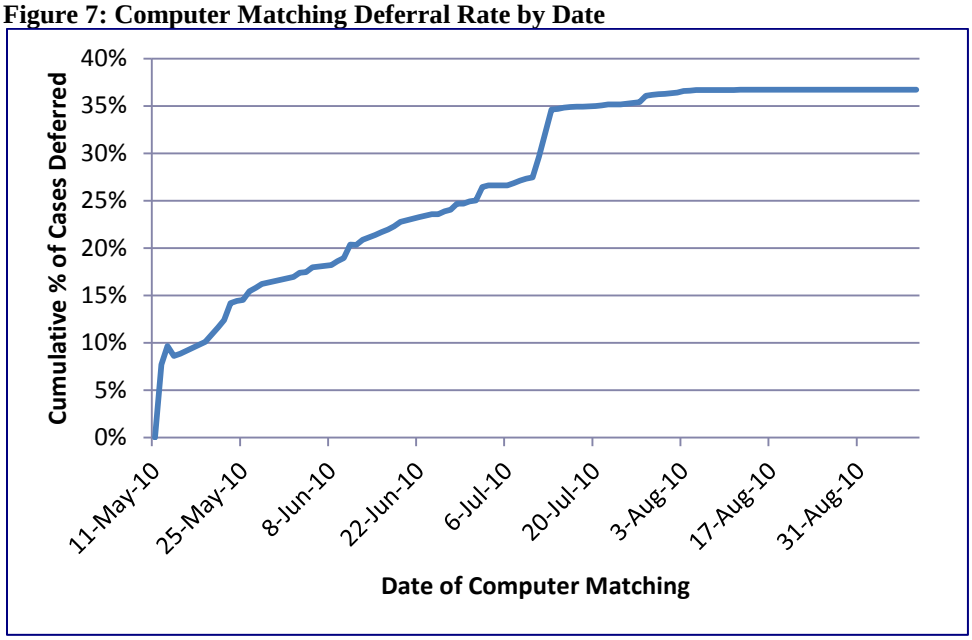
Computer Matching Outcome	Cases	Percent
All Cases	1,867,155	100%
Pass	1,074,776	57.6%
Defer	683,636	36.6%
RI Noninterview	106,957	5.7%
LCO Relief	1,786	0.1%

Source: MaRCS

The MaRCS automatically matched 57.6 percent of all RI cases, and only 36.6 percent were deferred to the NPC for clerical matching. These percents are based on all cases coded throughout the operation, but as illustrated in Figure 7, the

overall percent of cases that were deferred to NPC increased as the operation continued. This made it difficult to predict the NPC clerical matching workload and caused NPC to receive more of their workload later in the operation.

Figure 7: Computer Matching Deferral Rate by Date



Source: MaRCS

The trend shown in Figure 7 is partly due to data capture errors which can be seen with the sudden deferral rate increase on July 13 – the date of a special processing effort to load cases that were previously blocked by data issues. Another possible reason for this is that the characteristics of these cases changed throughout time. We saw in Figure 1 that more occupied proxy interviews were completed later in the operation. It is reasonable to expect more errors in these types of cases than in vacant addresses or household member respondent interviews.

3. NPC Coding

The NPC clerks coded a total of 683,636 cases, and Table 14 shows the NPC codes assigned and what their final outcome became if sent to the LCOs. The MaRCS allowed NPC clerks to select multiple deferral reasons, as necessary, so the number of individual reasons does not sum to the number of deferrals. The percents within each NPC reason code are illustrated in Figure 8.

The NPC clerks deferred 397,491 cases (58.1 percent of their workload) to the LCOs, and 68.4 percent of these cases received a Pass outcome at the LCOs. The NPC reason code "RI Data Questionable/Insufficient" had the highest rate of LCO Pass outcomes, which is expected because the error appears to be with the RI data and not the production data. A surprising observation is that 14.5 percent of all NPC cases were deferred for this reason, which may indicate a need for better RI Enumerator training.

Table 14: NPC MaRCS Codes by Final Matching Outcome

NPC Outcome	All Outcomes (% of cases coded at NPC)	LCO Outcome (and % of cases within NPC Outcome)				
		Pass	Soft Fail	Hard Fail	Don't Know – No Suspect	Don't Know – Suspect
Pass	286,408 (41.9%)	n/a[9]	n/a	n/a	n/a	n/a
Deferred to LCO[10]	397,491 (58.1%)	271,857 (68.4%)	68,043 (17.1%)	12,912 (3.2%)	35,093 (8.8%)	9,586 (2.4%)
Defer – No Suspect	293,995 (43.0%)	214,475 (73.0%)	40,429 (13.8%)	5,996 (2.0%)	28,030 (9.5%)	5,065 (1.7%)
Poor Respondent	102,948 (15.1%)	78,521 (76.3%)	12,711 (12.3%)	1,014 (1.0%)	9,471 (9.2%)	1,231 (1.2%)
RI Data Questionable/Insufficient	99,208 (14.5%)	77,488 (78.1%)	9,999 (10.1%)	1,605 (1.6%)	8,559 (8.6%)	1,557 (1.6%)
Insufficient Enumerator Cases	21,070 (3.1%)	15,116 (71.7%)	3,185 (15.1%)	173 (0.8%)	2,325 (11.0%)	271 (1.3%)
Differences with Reasonable Explanation	79,099 (11.6%)	50,821 (64.2%)	14,363 (18.2%)	2,950 (3.7%)	8,872 (11.2%)	2,093 (2.6%)
Other	108,382 (15.8%)	77,029 (71.1%)	16,406 (15.1%)	2,263 (2.1%)	10,800 (10.0%)	1,884 (1.7%)
Defer – Suspect	103,496 (15.1%)	57,382 (55.4%)	27,614 (26.7%)	6,916 (6.7%)	7,063 (6.8%)	4,521 (4.4%)
Suspicious Pattern	54,357 (7.9%)	27,998 (51.5%)	14,375 (26.4%)	5,547 (10.2%)	3,406 (6.3%)	3,031 (5.6%)
Differences with no Reasonable Explanation	21,276 (3.1%)	10,144 (47.7%)	4,693 (22.1%)	3,042 (14.3%)	1,790 (8.4%)	1,607 (7.6%)
Enumerator Performed Early Proxy Interview	49,356 (7.2%)	27,679 (56.1%)	16,488 (33.4%)	1,054 (2.1%)	2,949 (6.0%)	1,186 (2.4%)
Other	37,410 (5.5%)	22,273 (59.5%)	8,925 (23.9%)	1,914 (5.1%)	2,790 (7.5%)	1,508 (4.0%)

Source: MaRCS

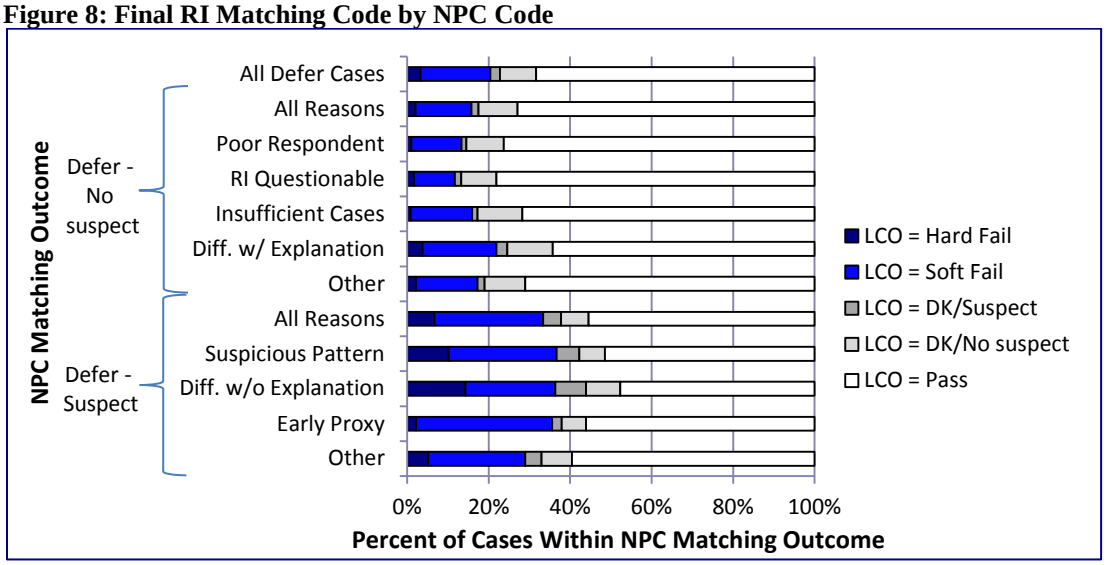
Only 15.1 percent of all NPC cases were deferred with suspicion of falsification, and 55.4 percent of these cases received a Pass outcome at the LCOs. The least common reason code for suspicious cases was "Differences without Reasonable Explanation," but these cases had the highest percent of cases that resulted in a Hard Fail outcome.

The reason code "Enumerator Performed Early Proxy Interview" had the lowest rate of Hard Fail outcomes and the highest rate of Soft Fail outcomes among the suspicious reason codes. Due to enumerator procedure flexibilities, there was confusion early in the operation regarding when to assign this code. It eventually was a good indicator of unintentional mistakes, but we should closely examine the detailed enumerator procedures when developing the NPC training for future enumerations.

[9] Not applicable

[10] Excludes 11 cases that NPC deferred but received a final code of LCO Relief.

Figure 8: Final RI Matching Code by NPC Code



Source: MaRCS

One major obstacle we had while planning for NRFU RI was determining how many staff the NPC needed for the NRFU MaRCS coding effort. We based our initial staffing estimate on 2006 Census Test results, but reduced it greatly after observing significantly lower than expected workloads for the similar UE operation. We also planned to start the NPC clerks in two different waves (one at the beginning of RI coding and the other three weeks later) because we expected the bulk of the coding workload to come later in the operation.

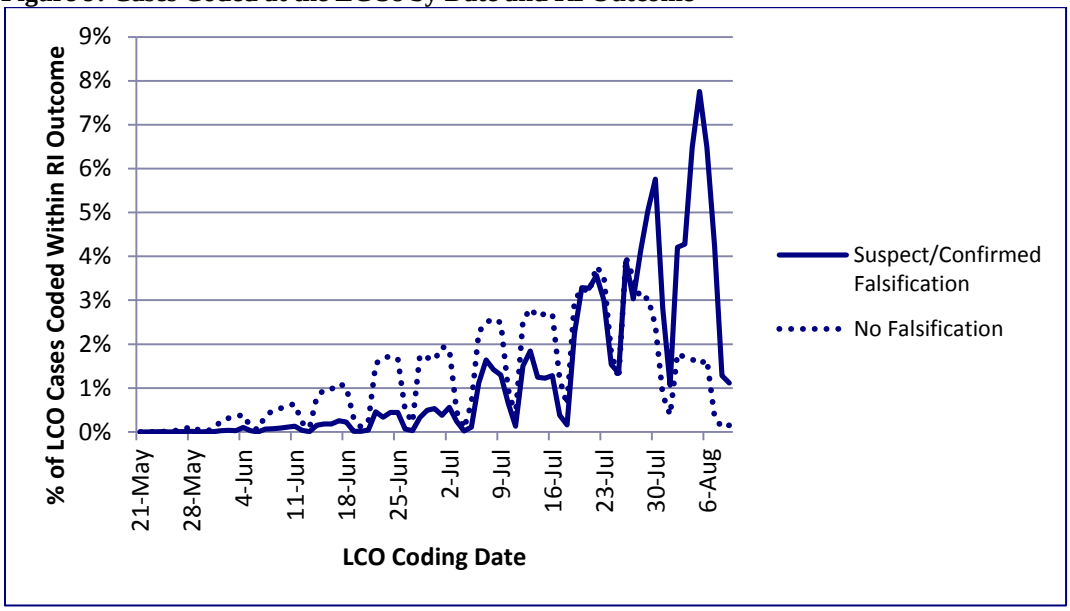
Data capture errors and other unforeseen issues complicated the NPC coding effort. At first, NPC clerks did not have enough cases to work due to interface issues. Once cases were loaded into MaRCS, the workloads were too great for the NRFU NPC clerks to code in a timely manner. In a late effort to code all cases in time, we added more NPC clerks, for a final total of 360, and had 56 headquarters staff code NPC cases. All these efforts resulted in the NPC coding adding an average six days to the total coding time for a case. A fully tested automated instrument should eliminate some of these issues, and we are researching other ways to improve this stage of coding.

4. LCO Coding

The LCO matching was the last stage of the RI coding process, where all cases that appeared to have some sort of issue received their final outcome. It was only after this stage that LCO managers could provide feedback to enumerators who made mistakes and terminate enumerators found falsifying data. Figure 9 illustrates the final RI outcomes assigned at the LCOs by date. The solid "Suspect/Confirmed Falsification" line includes the Hard Fail and Don't Know/Suspect outcomes, and the dotted "No Falsification" line includes all remaining outcomes assigned at the LCO (Pass, Soft Fail, Don't Know/No Suspect, and LCO Relief).

Figure 9 shows that, overall, more codes were assigned later in the operation. This is most likely due to delays in previous stages as discussed earlier. Unfortunately, this means that most RI cases that discovered enumerator mistakes were not coded until it was too late to retrain the enumerator. The NRFU end date was scheduled for July 10, but the offices completed much of their work long before that date. In fact, as illustrated earlier in Figure 2, half of all enumerators had completed all of their cases by June 12. Most LCO outcomes were assigned after this date, so we missed our opportunity to retrain enumerators and possibly improve the quality of their interviews. This also increased the amount of rework because Hard Fail outcomes were not assigned earlier in the enumerators' workloads.

Figure 9: Cases Coded at the LCOs by Date and RI Outcome



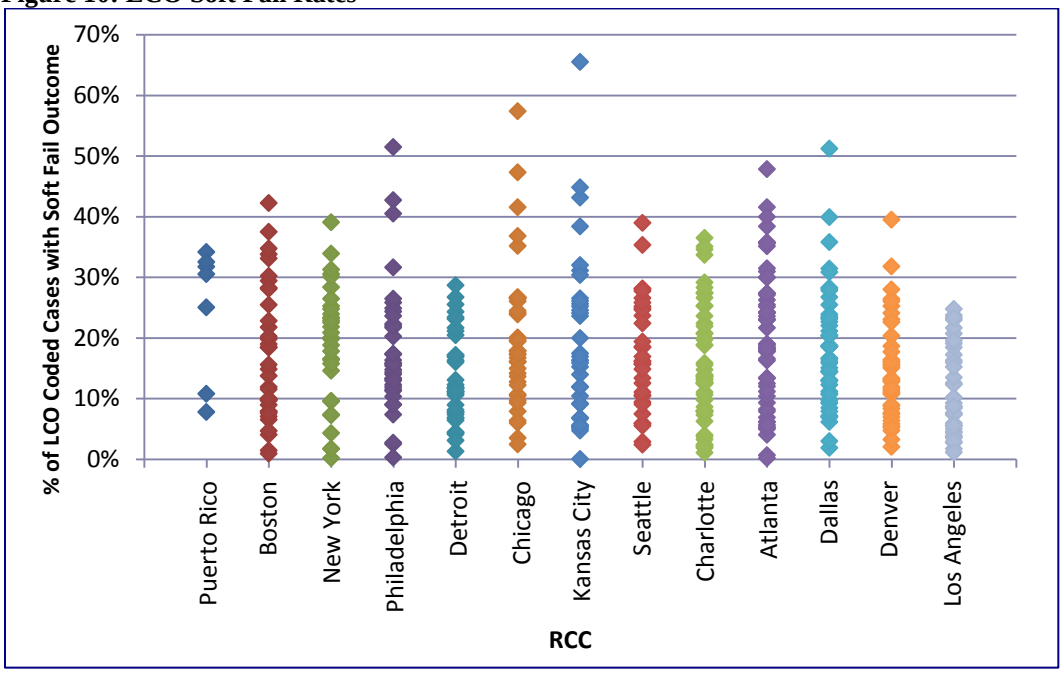
Source: MaRCS

This also affected the assignment of Hard Fail codes for enumerators intentionally not following procedures. It is extremely difficult to determine if procedural violations are intentional or not, so our procedures assumed the first violation was a mistake. If the enumerator continued to violate the same procedures after retraining, then it was deemed intentional and the case was marked falsified. Without the opportunity to retrain enumerators for the first procedural violation, the LCO managers were reluctant to Hard Fail enumerators who may (or may not) have intentionally violated procedures.

Figure 9 also shows that most of the cases of suspected or confirmed falsification were assigned in the last three weeks of the operation. This could be due to the additional research required before the LCOs could assign such codes, or maybe the enumerators tended to falsify data later in the operation in order to complete all their cases before the end date.

Although the national coding results seem reasonable, we found that some LCOs appeared not to be following proper coding procedures. For example, we expected that every LCO would discover enumerators who committed some sort of mistake during the operation, and we found that 17 percent of all RI cases coded at the LCOs were coded Soft Fail. However, LCO 2616 (Cedar Rapids, IA) in the Kansas City RCC coded no cases as Soft Fail, and eight other LCOs coded fewer than ten RI cases as Soft Fail. We suspect these LCOs did not objectively review and code their RI MaRCS cases as instructed. The Soft Fail rates for all LCOs are illustrated in Figure 10. We see that most RCCs had a couple LCOs with unusually high and low rates of Soft Fail.

Figure 10: LCO Soft Fail Rates

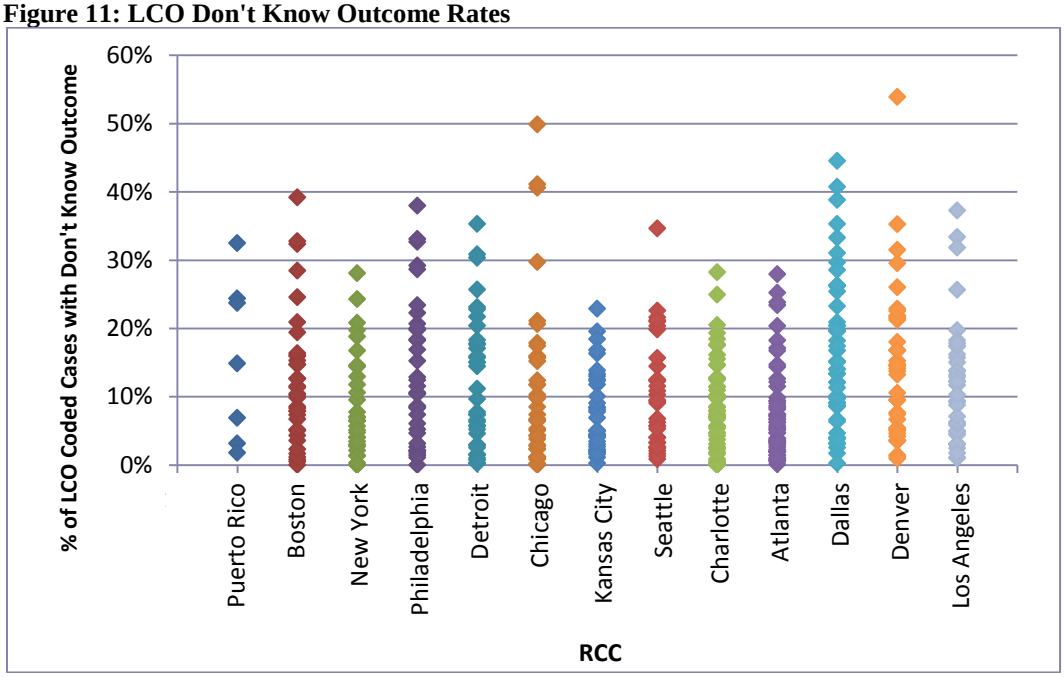


Source: MaRCS

The LCOs were instructed to assign an outcome of Don't Know only as a last resort when they could not determine if the case should pass or fail. Figure 11 shows the distribution of LCOs by what percent of their RI cases were coded "Don't Know – No suspect" or "Don't Know – Suspect."

Of all cases coded by the LCOs we found that 11 percent received a Don't Know outcome. This is higher than we would like due to the uncertainty of these Don't Know outcomes and might be due to the data capture errors. However, some LCO Don't Know rates are too high to be explained just by data capture errors. LCO 3119 (Window Rock, AZ) in the Denver RCC only coded 128 cases total, but more than half of the outcomes were Don't Know. Post-operation debriefings revealed that this LCO had a high percent of cases with no city-style address, which further complicated their MaRCS coding efforts.

Figure 11: LCO Don't Know Outcome Rates



Source: MaRCS

I. Fail Outcomes

1. Reinterview Hard Fail Recommendations

Whenever LCO MaRCS clerks believed a case should receive outcome Hard Fail, they alerted the Assistant Manager for QA (AMQA) who was responsible for making the final decision and coding the case. If the AMQA agreed that the case should receive a Hard Fail outcome, procedures required that they consult the Assistant Manager for Field Operations (AMFO) before assigning the code in MaRCS. If the AMFO did not agree with the AMQA's conclusions, both consulted with the Local Census Office Manager (LCOM), who made the final decision. Regardless of the decision, we expected the AMQA to then enter the final outcome code into MaRCS.

All AMQAs who coded a case in MaRCS were automatically taken to a Hard Fail Recommendation screen. This allowed them to enter their initial hard fail recommendations and the recommendations of the AMFO and LCOM. We provided this screen to the AMQAs to ensure the NRFU production staff did not consistently over-rule the AMQA regarding hard fail decisions.

MaRCS did not provide an option to exit the Hard Fail Recommendation screen because we wanted this information for all cases coded by an AMQA. However, some AMQAs avoided this screen by closing the MaRCS application window altogether. If the case they just coded was a Hard Fail outcome, this prevented MaRCS from flagging the enumerator as Hard Fail and selecting their remaining

eligible cases for Hard Fail RI. This also means we have no data on how many cases the AMQAs coded.

Table 15 shows how many cases the AMQA believed should be Hard Fail and the final outcomes of those cases.

Table 15: Hard Fail Recommendations

	Final Outcome is Hard Fail?	
	Yes	**No**
Cases coded by the AMQA	12,912	9,140
AMQA did not fill in recommendations	600	unknown
AMQA does not recommend Hard Fail	42	9,007
AMQA recommends Hard Fail	12,270	133
AMFO Agrees – case Hard Failed	12,222	103
AMFO Disagrees	48	30
LCOM Agrees – case Hard Failed	45	1
LCOM Disagrees – case not Hard Failed	3	29

Source: MaRCS

Overall, we see that the production staff tended to agree with the AMQA regarding Hard Fail outcomes. In fact, only one percent of all cases the AMQA suspected of falsification received a final outcome other than Hard Fail. Examination of the AMQA notes finds a couple cases where the AMQA believes the final decision is incorrect but there was no real evidence of the production staff constantly over-ruling the AMQA. There were two LCOs where the AMFO and LCOM over-ruled all three cases the AMQAs thought were Hard Fail, but the notes do not indicate that the AMQAs felt the LCOMs were unfairly siding with the production managers.

2. Hard Fail Enumerators

Enumerators are Hard Failed whenever an RI case they completed receives a Hard Fail outcome code or someone discovers them falsifying data outside the RI program (indicated in MaRCS as a Non-RI Fail). Once an enumerator is Hard Failed, they should be terminated and all their completed cases reworked through Hard Fail RI. However, if an enumerator was Hard Failed after July 30, Hard Fail RI cases were not selected because there was no time to complete and code them.

All Hard Fail selections were made in MaRCS, but the MaRCS Applicant ID data-errors made it difficult to match them to PBOCS Applicant IDs for identification of unique Hard Fail enumerators. Some enumerators were Hard Failed multiple times within MaRCS for different applicant IDs and other enumerators were never Hard Failed but have an RI case with a hard fail outcome because they reworked a case from a different hard fail enumerator. The following enumerator Hard Fail results were determined by matching the MaRCS applicant IDs to the PBOCS applicant IDs using the case-level data from each system. This was a many-to-many match, and special care was taken so no MaRCS Hard Fail flags were counted more than once.

A total of 1,419 enumerators (or 0.27 percent of all production enumerators) were discovered falsifying data or intentionally not following procedures, which resulted in the selection of 107,444 Hard Fail RI cases. Table 16 shows when these Enumerators were Hard Failed and how many Hard Fail RI cases were selected (or not) for rework. Around 9 percent of all hard failed enumerators were failed after the July 30 cut-off, and a total of 13,827 eligible cases were not selected for Hard Fail RI.

Table 16: Hard Failed Enumerators

	All	Non-RI Fail	RI Hard Fail Outcome
All Hard Failed Enumerators	1,419	291	1,128
Hard Failed on or before July 30, 2010	1,287	287	1,000
Hard Fail RI Cases Selected[11]	102,884	11,348	91,496
Hard Fail RI Cases Not Selected	10,198	5,991	4,207
Hard Failed After July 30, 2010	132	4	128
Hard Fail RI Cases Selected	0	0	0
Hard Fail RI Cases not Selected	13,827	271	13,556

Source: PBOCS and MaRCS

One unexpected observation from Table 16 is that 10,198 eligible cases were not selected even for enumerators who were hard failed before July 30. This occurred for any combination of the following reasons:

- Cases had applicant ID capture errors so MaRCS did not associate the case with the hard failed enumerator.
- MaRCS had a different enumerator completing the case.
- Case data were received after July 30.
- The AMQA abnormally exited the MaRCS application after assigning a hard fail outcome to a case but before flagging the enumerator as hard failed (which leads to selection of their remaining cases).

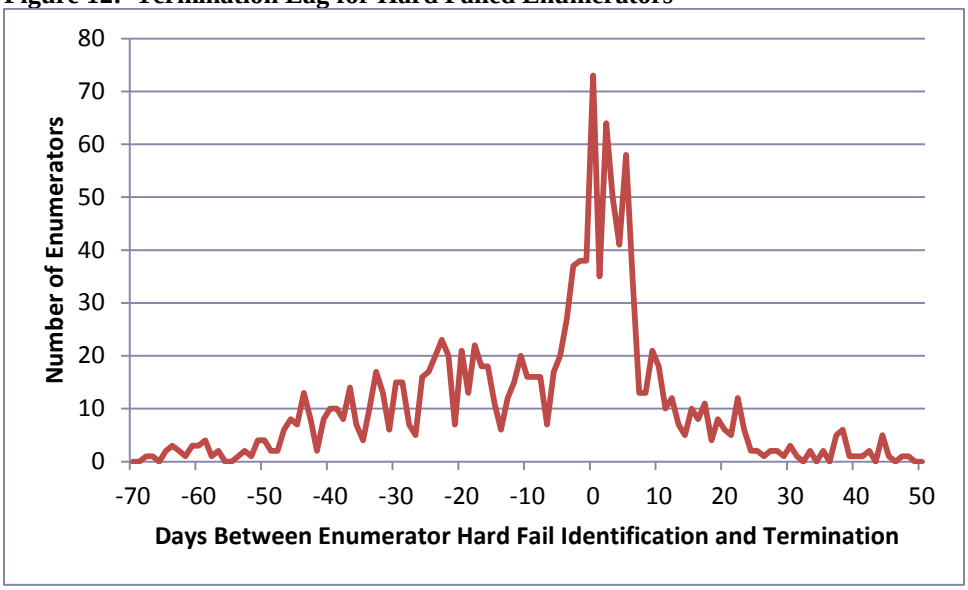
All enumerators discovered falsifying data should have been immediately terminated and their remaining cases reassigned to another enumerator. If we compare enumerator termination dates with their hard fail dates, we find that more than half of enumerators were terminated before they were hard failed in MaRCS. By examining the distribution in Figure 12, we see that some enumerators were terminated a full two months before they were hard failed in MaRCS. Two possible explanations for this are:

1. The enumerators were terminated for lack of work before the falsification was discovered.
2. The hard fail decision was made and the enumerator terminated, but the hard fail outcome was not entered into MaRCS until later.

[11] This table excludes 4,560 Hard Fail RI case selections because we do not know which enumerators they were originally selected for.

Unfortunately we have no way of knowing which happened for each enumerator. Regardless, we should make every effort in the future to reduce this delay so the Hard Fail RI cases may be selected and reworked as early as possible.

Figure 12: Termination Lag for Hard Failed Enumerators[12]



Source: MaRCS and DAPPS

It appears that most enumerators were terminated promptly according to procedures, but we did have some enumerators who were not terminated until more than a month after they were hard failed.

3. Fail File

If any RI case received an outcome that indicated the NRFU procedures were not followed correctly, the case was included on a Fail File that instructed the Census Bureau to replace the NRFU data with the NRFU RI data. A case was put on the fail file if it was not in the Residual NRFU universe and any of the following were true:

- The RI Matching Outcome was Soft Fail, Hard Fail, or Don't Know – Suspect.
- The Enumerator who completed the case was Hard Failed and the RI Matching Outcome was Don't Know – No Suspect or LCO Relief.
- The case was part of the Lexington, KY proxy rework effort.

For more information about these selection criteria, please refer to "Specifications for Handling Replacement Cases Resulting from the Nonresponse Followup and Update Enumerate Reinterview Operations (Revision)" (Whitford, 2010).

[12] This graph excludes 122 enumerators missing termination date or hard fail date and 7 enumerators outside the (-70, 50) range.

Refer to Table 17 for the count of cases on the Fail File by final RI outcome and the amount of data collected during the RI. We see that 93,634 RI cases (or 4.9 percent of the NRFU RI cases) were selected to replace the production data and 72,100 (or 77.0 percent) of them were occupied households. Of the occupied households, 47.7 percent had all demographic data collected instead of just household member names. Cases with a Soft Fail outcome are the only cases with fewer full interviews than names only in RI.

Table 17: Cases on Fail File by RI Outcome and Data Collected

Final RI Matching Outcome	Total Cases	Not Occupied	Occupied	Occupied RI data collected (and % of occupied cases)		
				Full Interview	Names Only	No Person Data
All Fail File Cases[13]	93,634	21,534 (23.0%)	72,100 (77.0%)	34,361 (47.7%)	31,143 (43.2%)	6,596 (9.1%)
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%)

Source: MaRCS

J. Vacant Delete Check Reinterview

The VDC was the first enumeration for all cases in the supplemental universe, so any vacants 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 determine that the original VDC unit status was not correct, they completed a new VDC enumerator questionnaire (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, no new VDC EQ was created and the original vacant or delete VDC unit status was retained. Every step of this process, including VDC RI case selection, was implemented by the LCO staff and tracked in Excel spreadsheets.

The VDC RI tracking spreadsheets from the LCOs and RCCs are the only data we have on the VDC RI operation. We could not use the LCO files for a detailed analysis of VDC RI cases because some LCO files were incomplete, unreadable, or

[13] The 348 cases on the Fail File from the Lexington, KY proxy rework effort are not included in this table because they were not legitimate RI cases.

missing altogether. Therefore, the results presented here are all from the RCC reports. All of these files were subject to errors because we had no controls in place for tracking the VDC RI. The quality of this analysis is limited by the quality of the available data.

Table 18 shows the results of the VDC RI. We see that the LCO telephone clerks had a relatively high contact rate of 72.3 percent, with 95.3 percent of those contacts confirming that the original VDC status was correct. We also see that 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 it should be noted again that these data come straight from the VDC RI tracking spreadsheets which are subject to error.

Table 18: VDC RI Results

Description	Cases	Percent
VDC Supplemental Universe	2,846,722	
VDC RI Cases (Vacants and Deletes)	1,657,011	58.2% of VDC Supplemental Universe
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

Source: RCC VDC RI Reports

K. MaRCS Issues

We designed MaRCS to receive unedited data from DRIS with the understanding that it may affect our computer matching rates. We also encountered unexpected issues that caused us to change the MaRCS processing mid-operation. This section discusses how these two situations affected the MaRCS coding effort.

1. Data Interfaces and Processing

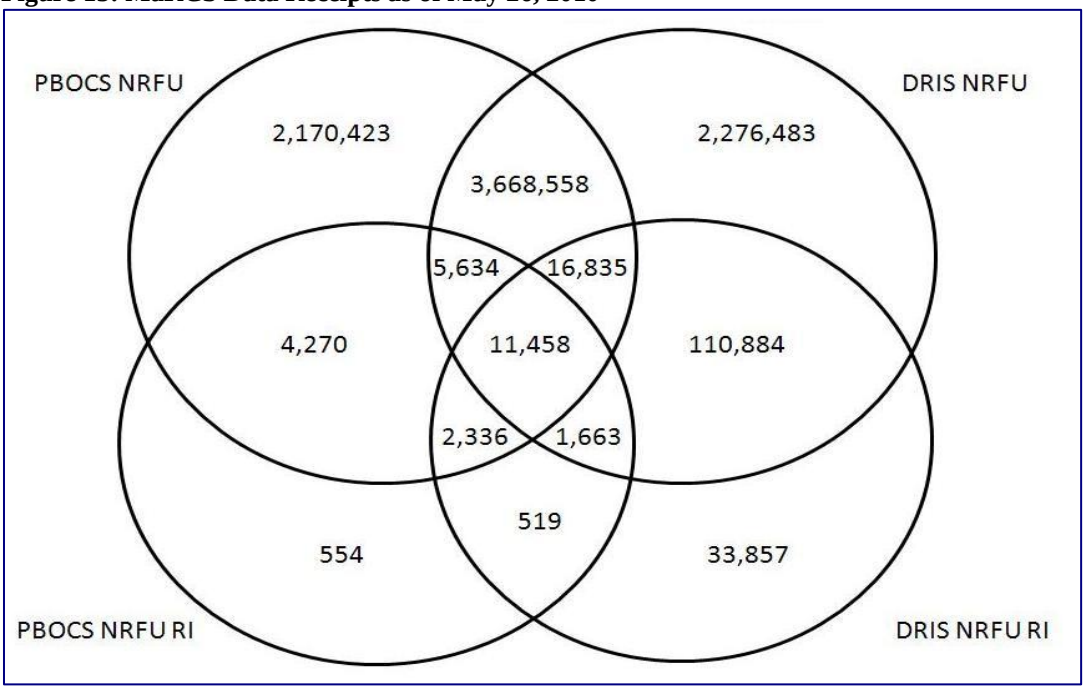
   The MaRCS was designed to receive data from PBOCS and DRIS and combine those data to create one data record per case. The matching effort could not begin for a case until all data were received from both PBOCS and DRIS. We expected to receive the PBOCS data immediately upon check-in and then receive the DRIS data up to ten days later once the form was shipped and data captured.

   See Figure 13 for the distribution of cases MaRCS had received as of May 26, 2010 (23 days into the NRFU RI operation). This diagram shows that MaRCS had received all NRFU and RI data from both PBOCS and DRIS for 11,458 cases. We also see that MaRCS had received NRFU and RI data from DRIS but was missing everything from PBOCS for 110,884 cases.

   As of May 26, 2010, the LCOs had checked in 18,322,114 NRFU cases and 396,781 NRFU RI cases, but MaRCS had only received 5,879,514 NRFU cases

and 26,434 NRFU RI cases from PBOCS. Due to this lag and the UE RI contingency that did not use PBOCS, we changed the MaRCS processing to use only data from DRIS starting on June 1, 2010.

Figure 13: MaRCS Data Receipts as of May 26, 2010[14]



Source: MaRCS

Due to the quick turnaround needed for timely RI coding, DRIS delivered data to MaRCS immediately after it computer scanned the forms and before any keying or QA. We designed the system this way even though DRIS managers expected us to see errors in the data for 10 to 20 percent of the fields.

Refer to Table 19 for a distribution of the errors received for all fields used by MaRCS. As expected, the check-boxes had much better accuracy than the write-in fields, and the longer write-in fields had the highest error rate. The 20.4 percent error rate for applicant ID means that one-fifth of all NRFU and RI cases were not associated with the correct enumerator within the MaRCS system. Field staffing reports indicated that 624,383 enumerators worked on NRFU production, but the MaRCS reports counted 5,301,456 unique Applicant IDs as enumerators. These additional applicant IDs caused performance delays in MaRCS, forced the LCOs to use external sources to determine the correct enumerator for each MaRCS case, and complicated our analysis efforts as explained in the limitations section.

[14] Cell sizes do not represent the number of cases in each group.

Table 19: Data Capture Errors Received by MaRCS

Field type	Field	Items Analyzed[15]	Items with errors	
Check-boxes	Contact Type	223,497,990	311,451	(0.1%)
	Contact AM/PM	223,497,990	440,317	(0.2%)
	Unit Status	393,660,856	496,241	(0.1%)
	OI Contact	7,478,708	5,988	(0.1%)
Write-in boxes (1-5 characters)	Contact Month	111,748,995	2,651,452	(2.4%)
	Contact Day	111,748,995	2,914,367	(2.6%)
	Contact Outcome	111,748,995	8,502,368	(7.6%)
	Population count	49,207,607	2,370,184	(4.8%)
	Crew Leader District	49,207,607	1,991,065	(4.1%)
Write-in boxes (6+ characters)	Applicant ID	49,207,607	10,041,440	(20.4%)
	First Name	73,969,621	9,059,697	(12.3%)
	Last Name	73,969,621	9,693,999	(13.1%)

Source: MaRCS and DRF

It is likely the data capture errors for Unit Status, Population count, and respondent name resulted in cases not passing the computer matching that should have. Table 20 shows the computer matching outcomes we had during NRFU RI (with data capture errors) compared to what would have happened with clean data. We see that the RI Noninterview outcome was the outcome most affected by data capture errors because only 61.1 percent remained a noninterview with clean data while 21.4 percent should have passed.

We also see that 20.1 percent of all cases originally deferred to NPC would have passed without the data capture errors. In Section V.H.3, we saw that NPC passed 41.9 percent of all cases they coded. However, if we remove these cases that should have passed computer matching, we find that NPC passed 31 percent of the cases they would have coded.

Table 20: Computer Matching Outcomes with and without Data Capture Errors

Original Outcome	New Outcome with Clean Data			
	All	Pass	RI NI	Defer
All[16]	1,863,633 (100%)	1,227,889 (65.9%)	72,421 (3.9%)	563,323 (30.2%)
Pass	1,073,106 (100%)	1,067,327 (99.5%)	826 (0.1%)	4,953 (0.5%)
RI NI	106,668 (100%)	22,856 (21.4%)	65,185 (61.1%)	18,627 (17.5%)
Defer	683,859 (100%)	137,706 (20.1%)	6,410 (0.9%)	539,743 (78.9%)

Source: MaRCS and DRF

[15] For check-boxes, the items analyzed are the number of different check-boxes used for that item. For example, each NRFU form would have two Contact Type items analyzed because there were two different check-boxes (telephone and personal visit) for that field.

[16] This analysis excludes 3,522 RI cases that were originally coded because we were unable to match the final data to the original dataset.

Table 21 shows how many cases were deferred to NPC that should have passed the computer matching. As expected, the Vacant and Delete addresses have fewer cases affected by the data capture errors.

Table 21: Computer Matching Defer Outcomes Affected by Data Capture Errors

NRFU Housing Unit Status	Total Cases	Computer Matching Outcome	
		Deferred	Should have Passed
All[17]	1,863,623	683,850	137,706 (20.1%)
Vacant	239,286	42,670	921 (2.2%)
Delete	28,070	12,087	244 (2.0%)
Occupied (OI Contact = Y)	1,319,031	429,823	129,583 (30.2%)
Occupied (OI Contact = N)	277,236	199,270	6,958 (3.5%)

Source: MaRCS and DRF

Occupied RI cases with the original contact confirmed account for most of the cases affected by data capture errors, while occupied RI cases with no confirmed original contact have relatively few affected cases. This is likely because more of the cases with no confirmed contact are actual instances of NRFU or RI enumerator mistakes or falsification, so the NRFU and RI data were actually different. On the other hand, the cases with confirmed contact are more likely to have the same data collected for NRFU and RI, which is why corrected data would improve their matching rate. We assume the LCO MaRCS coding workloads were not affected by these data capture errors because NPC clerks resolved the cases that should have passed the computer matching.

The Outlier RI selection was affected first by the PBOCS delay and then by the DRIS delay and applicant ID data capture errors. See Table 22 for the actual enumerator outlier selections after the contingency compared to what we would have seen if the system remained as designed.

Table 22: Enumerator Outlier Selections: Design and Actual

	Enumerators…			
	Eligible for Outlier Test		Flagged as Outlier[18]	
	As designed	Actual[19]	As designed	Actual[19]
All Enumerators	429,013	380,533	141,439	108,545
By Week:				
1	401,439	232,602	82,026	34,480
2	181,812	71,164	43,227	13,089
3	99,114	111,641	30,428	16,694
4	37,490	65,835	13,431	13,133
5	17,277	224,486	7,390	43,153
6	2,566	23,588	1,133	8,620
7	187	8,806	120	6,670

Source: MaRCS and DRF

[17] This analysis excludes 10 more cases than in Table 20 because we do not know the Housing Unit status.
[18] Analysis excludes the Excessive Soft Fail/Don't Know-Suspect Outlier test.
[19] Actual numbers represent Applicant IDs in MaRCS, which differ from the actual enumerators represented in Table 6.

Overall, there were fewer enumerators eligible for the actual outlier test (and therefore fewer enumerators flagged as outliers), which is likely due to the previously mentioned applicant ID errors. The weekly distribution in Table 22 illustrates how the data delay affected the outlier selections. If MaRCS had received the data within an hour of PBOCS check-in, as designed, then most of the outliers would have been selected in the first few weeks of the operation. However, due to the delay in receiving and processing data we had a large number of outlier selections in week 5.

Some LCO comments from their MaRCS debriefings are consistent with these findings. We found that 11 percent of all LCOs thought the production information available in MaRCS was useless. The main reasons cited were:

- Data capture errors
- Data were not loaded into MaRCS in a timely manner
- Notes from the form were not available for production

2. Remedy Tickets

During the UE and NRFU operations, there were a total of 487 problem tickets that were resolved by the software developers or Field QA. There were many more routine requests resolved by the 2010 Decennial Operations Technical Support staff. Refer to Table 23 for the count of tickets by problem category.

Table 23: Census MaRCS Remedy Tickets by Category

Problem description	Tickets
All tickets	487
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

Source: Remedy Ticket Export Spreadsheet

We see that 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 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 approximately 630,000 enumerators.

Other factors that affected MaRCS performance were:

- More concurrent users than the system was designed to handle, because LCO MaRCS coding workloads fluctuated by day and 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. Further analysis of these tickets may identify some topics we could add in order to improve future MaRCS training materials. We should also develop better knowledge-based articles in the remedy system to prevent these types of tickets in the future.

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 been forced 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 types of tickets for future enumerations.

Of the tickets listed in Table 23, some were opened for major incidents that required immediate MaRCS changes implemented during brief MaRCS shutdowns during the work day. Some other incidents required a MaRCS shutdown but do 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 24.

Table 24: Census MaRCS Incidents

Incident	Resolution	Occurrences
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 PI 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 restored after fix – both times within 30 minutes.	2
Widespread MaRCS Access Denied	Fixed the authentication username search to return FDCA users missed in original query.	1

Source: Remedy Ticket Export Spreadsheet and E-mail documentation

VI. Related Evaluations, Experiments, and/or Assessments

The following assessments, evaluations, and experiments are related to the NRFU Quality Profile.

- Nonresponse Followup Operations Assessment
- DRIS Data Capture Assessment
- Update Enumerate Quality Profile

VII. Conclusions and Recommendations

The NRFU RI program successfully identified enumerator mistakes and falsification. We identified 68,043 cases (or 3.6 percent of all RI) with enumerator mistakes and 12,912 cases (or 0.7 percent of all RI) with falsification. This falsification was discovered for 1,419 enumerators, and most of their work was reinterviewed to identify any more cases of falsification. The fact that about 13,000 hard fail cases were discovered for only about 1,400 enumerators indicates that cheaters tend to cheat more than once.

While the NRFU RI was successful, the operation could be improved with an automated instrument. The enumerator observations should be automated so we may better track the results and ensure that enumerators do not work on NRFU unless they have had at least one satisfactory observation. An automated questionnaire (for NRFU and RI) would eliminate the data capture errors we saw throughout the program and drastically reduce the delay between NRFU interviewing and RI final coding. The Census Bureau should develop these systems without any major mid-decade changes that may cause the kinds of setbacks that led us to a paper-based NRFU in 2010.

Even with the data capture errors, the MaRCS automatically coded 63 percent of all RI cases, which means the NPC worked only 37 percent of all RI cases. The NPC passed an additional 16 percent, so the LCOs only coded 21 percent of all RI cases. However, we saw that 1.5 percent of all RI cases did not receive a meaningful RI outcome at all, which was due to a combination of unexpected processing issues and data capture delays inherent in paper operations. It is also unknown how many of the "Don't Know" outcomes could have been better evaluated without data capture errors.

We reran MaRCS computer matching with clean data and found that the NPC workload was reduced by 20 percent. If we remove these cases from the NPC workload, the resulting NPC pass rate is 31 percent. We also saw that NPC took an average of six days to code a case, so one could argue that the time lag is not worth the benefits of having an NPC coding stage. However, the NPC lag was mostly because they were understaffed and received the bulk of their workload late due to interface issues and data capture errors. It is reasonable to expect that this delay would be reduced without these issues. More research is needed on ways to improve this process and whether or not to continue using NPC clerks for RI MaRCS coding.

The final outcome codes appear reasonable at the national level, but we saw many instances of LCOs that appeared to not follow proper coding procedures. We should develop reports in the future that allow headquarters and RCCs to monitor LCO-level metrics during the operation so we can correct issues before work is completed.

The VDC RI was limited because it was added too late to fully develop the types of controls we had for the NRFU RI operation. There were also concerns about the quality of an enumerator's NRFU work once they were discovered falsifying during VDC because the NRFU was completed before VDC and could not be reworked. Therefore, the Census Bureau should research possible ways to complete VDC at the same time as NRFU (or part of NRFU RI, as in the 2010 Update Enumerate operation). If there is a separate VDC operation, a formal VDC RI program should be developed during the early stages of planning.

VIII. Acknowledgements

Special thanks to the Gunnison Consulting Group (GCG) for re-running some MaRCS processes for this analysis. Thanks also to Kathy Ott, Ryan Cecchi, Francis Anderson, and the critical reviewers who took the time to review the content and accuracy of the results reported in this Quality Profile.

IX. References

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Appendix A -- RCC Results

For every table in this section, the RCC counts do not sum up to the national totals due to data records with missing RCC code. The table numbers in this section correspond to the table numbers of the national data presented in the body of the report. An "F" in the table number means the data correspond to a figure from the body of the report.

Table A1.1 shows the number of enumerators who completed any NRFU or NRFU RI cases and how many enumerators for whom we received at least one observation form. The "Excluded Observation Forms" column shows how many forms were not included in any analysis due to missing/invalid applicant IDs or late delivery to NPC. Table A1.2 shows the results of the observations analyzed.

Table A1.1: Enumerators Observed by RCC

RCC	NRFU			NRFU RI			Excluded Observation Forms
	Worked	Observed		Worked	Observed		
National Totals	528,960	274,543	51.9%	27,276	13,224	48.5%	17,824
Puerto Rico	8,622	6,524	75.7%	365	169	46.3%	350
Boston	37,604	16,678	44.4%	1,840	428	23.3%	838
New York	37,699	15,034	39.9%	1,789	478	26.7%	835
Philadelphia	39,160	20,346	52.0%	2,224	1,268	57.0%	1,124
Detroit	37,467	19,496	52.0%	2,021	821	40.6%	2,047
Chicago	37,178	17,952	48.3%	1,792	940	52.5%	1,482
Kansas City	36,700	17,036	46.4%	1,776	886	49.9%	1,006
Seattle	39,038	21,835	55.9%	2,016	918	45.5%	1,053
Charlotte	57,201	28,432	49.7%	3,077	1,066	34.6%	1,684
Atlanta	64,565	28,505	44.1%	2,687	1,036	38.6%	1,496
Dallas	53,993	25,327	46.9%	3,018	1,029	34.1%	1,227
Denver	41,948	21,495	51.2%	2,721	1,674	61.5%	1,148
Los Angeles	37,785	22,160	58.6%	1,950	1,107	56.8%	1,018

Source: NPC Observation Form Keying

Table A1.2: Enumerator Observation Results by RCC

RCC	Observed	Pass		Fail		Other		Blank	
NRFU									
National Totals	274,543	237,499	86.5%	2,149	0.8%	3,035	1.1%	31,860	11.6%
Puerto Rico	6,524	5,930	90.9%	60	0.9%	49	0.8%	485	7.4%
Boston	16,678	14,513	87.0%	109	0.7%	119	0.7%	1,937	11.6%
New York	15,034	12,975	86.3%	175	1.2%	269	1.8%	1,615	10.7%
Philadelphia	20,346	17,530	86.2%	150	0.7%	123	0.6%	2,543	12.5%
Detroit	19,496	16,995	87.2%	118	0.6%	142	0.7%	2,241	11.5%
Chicago	17,952	15,212	84.7%	98	0.5%	183	1.0%	2,459	13.7%
Kansas City	17,036	14,741	86.5%	93	0.5%	95	0.6%	2,107	12.4%
Seattle	21,835	19,234	88.1%	153	0.7%	94	0.4%	2,354	10.8%
Charlotte	28,432	24,912	87.6%	206	0.7%	162	0.6%	3,152	11.1%
Atlanta	28,505	24,251	85.1%	205	0.7%	231	0.8%	3,818	13.4%
Dallas	25,327	22,384	88.4%	186	0.7%	126	0.5%	2,631	10.4%
Denver	21,495	18,610	86.6%	144	0.7%	173	0.8%	2,568	11.9%
Los Angeles	22,160	19,716	89.0%	161	0.7%	142	0.6%	2,141	9.7%
NRFU RI									
National Totals	13,224	11,538	87.3%	87	0.7%	86	0.7%	1,513	11.4%
Puerto Rico	169	149	88.2%	3	1.8%	0	0%	17	10.1%
Boston	428	378	88.3%	0	0%	1	0.2%	49	11.5%
New York	478	413	86.4%	3	0.6%	1	0.2%	61	12.8%
Philadelphia	1,268	1,105	87.1%	5	0.4%	3	0.2%	155	12.2%
Detroit	821	710	86.5%	0	0%	2	0.2%	109	13.3%
Chicago	940	849	90.3%	4	0.4%	5	0.5%	82	8.7%
Kansas City	886	782	88.3%	5	0.6%	6	0.7%	93	10.5%
Seattle	918	822	89.5%	9	1.0%	4	0.4%	83	9.0%
Charlotte	1,066	942	88.4%	1	0.1%	1	0.1%	122	11.4%
Atlanta	1,036	889	85.8%	5	0.5%	6	0.6%	136	13.1%
Dallas	1,029	921	89.5%	5	0.5%	2	0.2%	101	9.8%
Denver	1,674	1,430	85.4%	8	0.5%	8	0.5%	228	13.6%
Los Angeles	1,107	1,009	91.1%	14	1.3%	6	0.5%	78	7.0%

Source: NPC Observation Form Keying

Table A5: RI Selections by RCC

RCC	NRFU	RI Eligible	Selected for RI				
			All	Random	Outlier	Supplemental	Hard Fail
National Totals	47,367,647	31,991,588	1,894,664 5.9%	1,525,297 4.8%	247,511 0.8%	14,412 0.0%	107,444 0.3%
Puerto Rico	767,242	482,440	25,455 5.3%	23,234 4.8%	1,908 0.4%	13 0.0%	300 0.1%
Boston	3,420,574	2,538,340	144,684 5.7%	118,938 4.7%	20,031 0.8%	2,409 0.1%	3,306 0.1%
New York	2,584,771	1,784,446	105,372 5.9%	89,704 5.0%	11,403 0.6%	1,146 0.1%	3,119 0.2%
Philadelphia	3,402,973	2,312,295	135,575 5.9%	111,004 4.8%	17,666 0.8%	1,117 0.0%	5,788 0.3%
Detroit	3,622,763	2,336,058	146,642 6.3%	110,998 4.8%	19,526 0.8%	2,022 0.1%	14,096 0.6%
Chicago	3,216,208	2,125,575	129,203 6.1%	102,250 4.8%	17,036 0.8%	1,165 0.1%	8,752 0.4%
Kansas City	3,536,894	2,277,996	130,687 5.7%	107,973 4.7%	17,561 0.8%	480 0.0%	4,683 0.2%
Seattle	3,559,397	2,602,023	150,707 5.8%	122,002 4.7%	18,516 0.7%	723 0.0%	9,460 0.4%
Charlotte	5,294,078	3,467,405	202,531 5.8%	164,841 4.8%	28,245 0.8%	602 0.0%	8,843 0.3%
Atlanta	5,902,363	3,734,247	229,542 6.1%	179,113 4.8%	32,680 0.9%	186 0.0%	15,883 0.4%
Dallas	5,144,163	3,382,775	206,748 6.1%	160,355 4.7%	26,491 0.8%	366 0.0%	19,536 0.6%
Denver	3,728,595	2,527,315	148,968 5.9%	120,569 4.8%	20,312 0.8%	1,563 0.1%	6,524 0.3%
Los Angeles	3,187,626	2,420,673	138,434 5.7%	114,316 4.7%	16,111 0.7%	950 0.0%	7,057 0.3%

Source: PBOCS and MaRCS

Table A9 shows the median number of days taken for each step of the RI operation. Each column shows the median number of days that elapsed between the completion of the previous column (to the left) and the current column.

Table A9: Median Days Needed to Complete Interviews and Code Cases by RCC

RCC	NRFU Check-in	RI Check-in	RI Matching		
			Computer	NPC	LCO
National Totals	-	10	13	4	3
Puerto Rico	-	6	15	5	3
Boston	-	11	9	4	5
New York	-	9	12	5	3
Philadelphia	-	10	11	5	3
Detroit	-	12	10	4	2
Chicago	-	10	12	4	2
Kansas City	-	9	12	5	3
Seattle	-	10	11	6	4
Charlotte	-	7	14	4	2
Atlanta	-	11	13	4	3
Dallas	-	10	13	5	4
Denver	-	11	14	4	2
Los Angeles	-	11	19	4	2

Source: PBOCS and MaRCS

Table A11: RI Results by RCC

RCC	RI Selected	RI Matching Outcome							
		Pass	Soft Fail	Hard Fail	DK-Suspect	DK-No Suspect	LCO Relief	RI NI	None
National Totals	1,894,664	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%	106,924 5.6%	27,509 1.5%
Puerto Rico	25,455	23,119 90.8%	921 3.6%	78 0.3%	52 0.2%	874 2.3%	13 0.1%	624 2.5%	74 0.3%
Boston	144,684	129,207 89.3%	3,984 2.8%	169 0.1%	565 0.4%	2,251 1.6%	90 0.1%	6,663 4.6%	1,755 1.2%
New York	105,372	88,495 84.0%	5,169 4.9%	124 0.1%	460 0.4%	1,649 1.6%	172 0.2%	7,861 7.5%	1,442 1.4%
Philadelphia	135,575	116,167 85.7%	4,549 3.4%	1,313 1.0%	942 0.7%	2,419 1.8%	58 0.0%	7,435 5.5%	2,692 2.0%
Detroit	146,641	123,869 84.5%	4,199 2.9%	1,861 1.3%	1,280 0.9%	2,554 1.7%	96 0.1%	10,411 7.1%	2,372 1.6%
Chicago	129,203	112,938 87.4%	5,188 4.1%	482 0.4%	1,072 0.8%	2,023 1.6%	72 0.1%	5,650 4.4%	1,678 1.3%
Kansas City	130,687	116,538 89.2%	4,665 3.6%	505 0.4%	351 0.3%	1,510 1.2%	153 0.1%	5,505 4.2%	1,460 1.1%
Seattle	150,701	130,969 86.9%	4,682 3.1%	1,213 0.8%	521 0.3%	2,313 1.5%	44 0.0%	9,025 6.0%	1,934 1.3%
Charlotte	202,531	177,536 87.7%	6,808 3.4%	1,268 0.6%	858 0.4%	3,075 1.5%	230 0.1%	10,456 5.2%	2,300 1.1%
Atlanta	229,542	196,480 85.6%	10,980 4.8%	1,405 0.6%	884 0.4%	3,143 1.4%	147 0.1%	12,736 5.5%	3,767 1.6%
Dallas	206,748	169,878 82.2%	8,513 4.1%	1,977 1.0%	1,260 0.6%	6,294 3.0%	454 0.2%	14,082 6.8%	4,290 2.1%
Denver	148,968	126,563 85.0%	4,775 3.2%	681 0.5%	595 0.4%	4,097 2.8%	230 0.2%	10,212 6.9%	1,815 1.2%
Los Angeles	138,434	121,038 87.4%	3,510 2.5%	1,836 1.3%	746 0.5%	3,192 2.3%	38 0.0%	6,265 4.5%	1,809 1.3%

Source: MaRCS

Table AF6 shows the number of RI cases coded at each stage of MaRCS coding. The percents in the NPC and LCO columns are percents of only the RI cases that were coded and all of these cases started with computer matching.

Table AF6: MaRCS Matching Stage by RCC

RCC	Computer	NPC		LCO	
National Totals	1,867,155	683,910	36.6%	397,504	21.3%
Puerto Rico	25,381	9,556	37.7%	3,915	15.4%
Boston	142,929	42,934	30.0%	22,717	15.9%
New York	103,930	46,141	44.4%	26,607	25.6%
Philadelphia	132,883	46,046	34.7%	25,891	19.5%
Detroit	144,270	50,921	35.3%	31,140	21.6%
Chicago	127,525	46,123	36.2%	26,345	20.7%
Kansas City	129,227	43,916	34.0%	24,762	19.2%
Seattle	148,767	48,493	32.6%	26,769	18.0%
Charlotte	200,231	71,555	35.7%	43,275	21.6%
Atlanta	225,775	86,872	38.5%	53,479	23.7%
Dallas	202,458	80,404	39.7%	46,870	23.2%
Denver	147,153	54,534	37.1%	33,463	22.7%
Los Angeles	136,625	56,414	41.3%	32,270	23.6%

Source: MaRCS

Table A16: Hard Fail Enumerators by RCC

RCC	Total NRFU Enumerators	Hard Failed Enumerators			Avg. Days to Termination[20]
		All	RI	Non-RI	
National Totals	528,960	1,419	1,128	291	-8.2
Puerto Rico	8,622	4	3	1	-18.0
Boston	37,604	56	37	19	-7.2
New York	37,701	46	36	10	-2.1
Philadelphia	39,163	117	84	33	-10.3
Detroit	37,469	174	159	15	-7.4
Chicago	37,180	102	93	9	-4.5
Kansas City	36,702	63	45	18	-8.9
Seattle	39,043	147	92	55	-3.6
Charlotte	57,204	109	79	30	-7.4
Atlanta	64,571	196	163	33	-10.8
Dallas	53,995	213	169	44	-5.9
Denver	41,953	105	88	17	-9.5
Los Angeles	37,786	87	80	7	-19.4

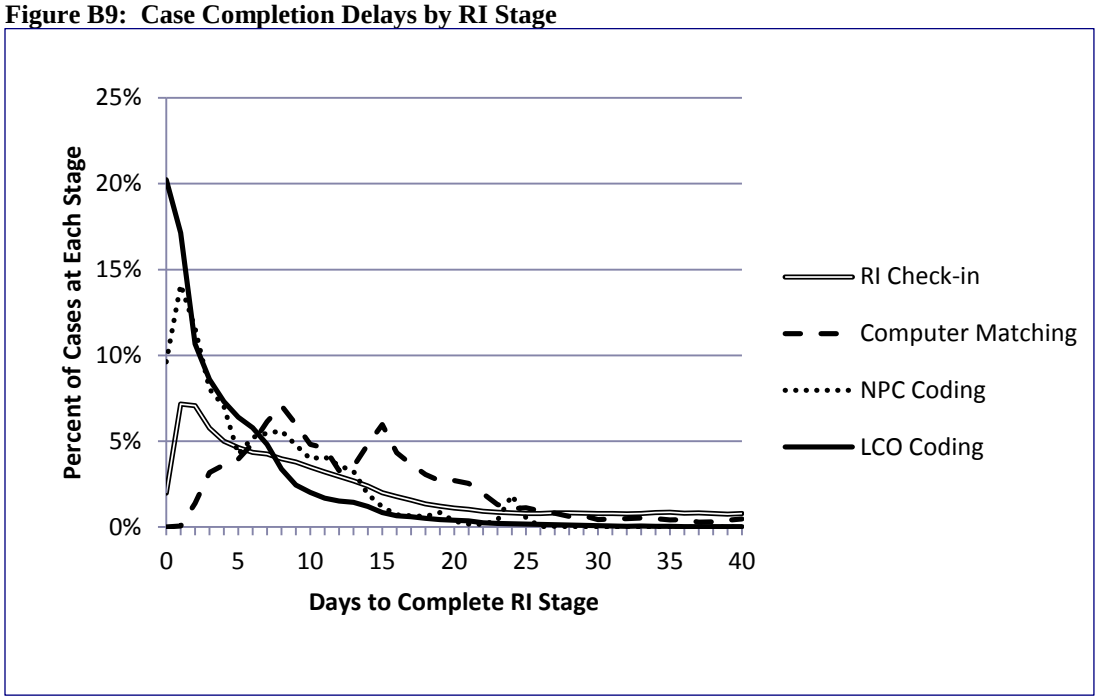
Source: MaRCS and DAPPS

[20] Negative numbers indicate the enumerators were terminated before they were hard failed in MaRCS.

Appendix B -- Distribution Illustrations

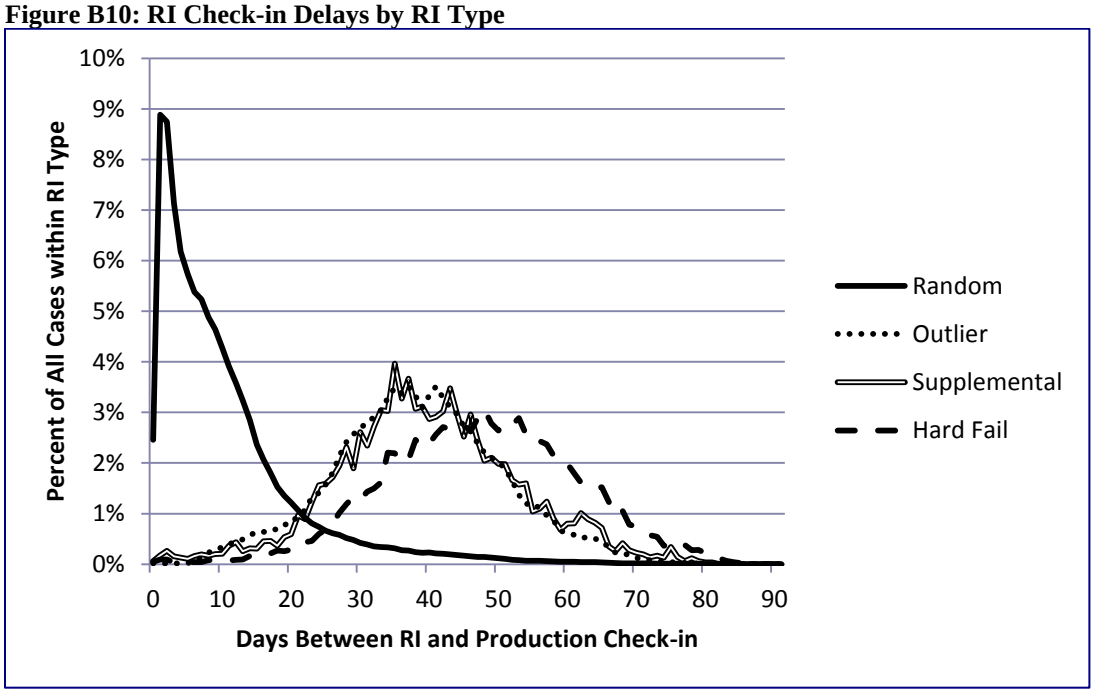
This appendix illustrates some distributions that are described in the paper. The figure number here corresponds to the table number in the paper.

Figure B9: Case Completion Delays by RI Stage



Source: PBOCS and MaRCS

Figure B10: RI Check-in Delays by RI Type



Source: PBOCS and MaRCS

Appendix C -- NRFU and NRFU RI Observation Checklist

This report contains information protected by the Privacy Act of 1974 (Title 5, U.S.C., Section 552a). The Privacy Act requires appropriate safeguards to 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.

Form D-1222 (NRFU/NRFU RI) U.S. DEPARTMENT OF COMMERCE U.S. CENSUS BUREAU **OBSERVATION CHECKLIST** **NRFU and NRFU RI** 2010 Census		IDENTIFICATION ITEMS 1. Enumerator Name:		2. Applicant ID
		3. Type of Observation [X]: NRFU: _____ NRFU RI: _____		
1st Observation	4. Observer Name:	5. Date [Month/Day]: /	6.No Interviews Observed:	7. CLD No:
2nd Observation		/		8. LCO No:

SAFETY & SECURITY REMINDERS

- As required by law, use a seatbelt while driving
- Protect all Title 13 data or any medium that may contain Personally Identifiable Information (PII)
- Any lost or stolen medium containing Title 13 data or PII must be reported as soon as possible according to the instructions in your manuals

GENERAL INSTRUCTIONS

- Use this checklist to evaluate and document overall performance of Enumerators as you observe them in the field
- As you are observing, keep in mind the tasks listed
- For every task listed, mark "**X**" in the appropriate column:
  - **Y** -> Yes, task observed and performed correctly
  - **N** -> No, task observed but not performed correctly (discuss proper procedure before observing next address)
  - **N/A** -> Not Applicable, task not observed (discuss proper procedure at the end of observation)
- Use Section A to record performance for NRFU or NRFU RI Enumerators
- Record observation result in Section B for NRFU or NRFU RI Enumerators

Section A – OBSERVATION PERFORMANCE

Tasks:	1st Observation			2nd Observation		
	Y	**N**	**N/A**	**Y**	**N**	**N/A**
1. Introduced him/herself to contact person and showed Census ID.						
2. Handed the Information Sheet containing the Privacy Act Notice to the contact person and allowed the person time to read it.						
3. Planned an efficient route of travel to the followup addresses.						
4. Used Census maps to confirm the location of the NRFU/NRFU RI case.						
5. Interviewed or attempted to interview an eligible respondent.						
6. Read the questions as worded.						
7. Filled in the questionnaire neatly and completely.						
8. Understood how to use the various forms, such as the Information Sheet, Language Flashcards, Notice of Visit, InfoCoMM, etc.						
9. Followed census procedures to protect PII and confidentiality.						
10. Wore a seatbelt when traveling by automobile.						

Section B – OBSERVATION RESULT

- **Rate "Satisfactory" if the Enumerator demonstrated a good overall understanding of the tasks**
- If you believe the Enumerator did NOT demonstrate a good overall understanding of the tasks, contact your immediate supervisor to discuss action to be taken (retraining, 2nd observation, marking "Unsatisfactory", etc)
  - **Do not mark "Unsatisfactory"** unless instructed by your supervisor
- Other - can be used if the Enumerator has resigned before you could observe him/her in the field
- Notes are required detailing procedural problems observed and actions to be taken

[ ] Satisfactory – By the end of observation, Enumerator understands and follows procedures.
[ ] Unsatisfactory – By the end of observation, Enumerator does NOT understand or follow procedures. (Notes required to explain)
[ ] Other -- for example, employee resigned before observation could take place. (Notes required to explain)

NOTES

Appendix D -- NRFU RI Enumerator Questionnaire

This image is saved as a separate pdf with filename “Q-01 Appendix D.pdf”. If viewing a hard copy, please see the following two pages for the questionnaire.

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?	☐ Yes	☐ No
Foster children?	☐ Yes	☐ No
Any other relatives?	☐ Yes	☐ No
Roommates?	☐ Yes	☐ No
Any other nonrelatives?	☐ Yes	☐ 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

Anyone else?

First Name Last Name

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

H2. **Do you or does someone in this household own this (house/apartment/mobile home) with a mortgage or loan, including home equity loans; own it free and clear; rent it; or occupy it without having to pay rent?**

- ☐ Own with a mortgage or loan (including home equity loans)
- ☐ Own free and clear (without a mortgage or loan)
- ☐ Rent
- ☐ Occupy without payment of rent

RECORD OF CONTACT

NOTES

Type	Mo	Day	Time		Outcome
☐ Personal ☐ Telephone			:	☐ a.m. ☐ p.m.	
☐ Personal ☐ Telephone			:	☐ a.m. ☐ p.m.	
☐ Personal ☐ Telephone			:	☐ a.m. ☐ p.m.	
☐ Personal ☐ Telephone			:	☐ a.m. ☐ p.m.	
☐ Personal ☐ Telephone			:	☐ a.m. ☐ p.m.	
☐ Personal ☐ Telephone			:	☐ a.m. ☐ p.m.	

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

REINTERVIEW RESPONDENT INFORMATION

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

☐ Mark ✗ this box if respondent is the same as OR1 on the cover page.

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

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

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

01 - 49 = Total people
00 = Vacant
98 = Delete
99 = POP unknown

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

- ☐ English
- ☐ Spanish
- ☐ Other – *Specify language number from flashcard* ↦ ☐☐

	UHE	MOV	PI	REF
E.	☐	**F.** ☐	**G.** ☐	**H.** ☐
	CO	REP	VDC	
I.	☐	**J.** ☐	**K.** ☐	
	JIC1	JIC2		
L.	☐☐☐	**M.** ☐☐☐		

CERTIFICATION

I certify that the entries I have made on this questionnaire are true and correct to the best of my knowledge.

Enumerator's signature Employee ID

Month Day

Crew Leader's initials

CLD number

Month Day

OMB No. 0607-0919-C: Approval Expires 12/31/2011

United States Census 2010

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

ENUMERATOR REINTERVIEW 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

ORIGINAL RESPONDENT INFORMATION

OR1. Original Respondent's Name –

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
- ☐ Neighbor or other proxy

OR4. Address –

OR5. Original Interview Language –

- ☐ English
- ☐ Spanish
- ☐ Other – *Specify language number from flashcard* ↦ ☐☐

NOTES

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 repsondent, 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 an Information Sheet.) **The first part of this sheet explains that your answers are confidential. I'll refer to the other parts later.**

- 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** (Address)**?**

- ☐ Yes
- ☐ No

S4. **Did anyone live or stay at** (*Address*) **on April 1, 2010?**

- ☐ Yes – *Continue with S5.*
- ☐ No – *Skip to back page.*

S5. **Does someone usually live at this (house/apartment/mobile home), or is this a vacation or seasonal home?**

- ☐ Usually lives here - *Continue with S6.*
- ☐ Vacation or seasonal home or held for occasional use - *Skip to back page.*

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?

☐☐ = Number of people

ENUMERATOR ITEM: Did the respondent confirm that the original interview was conducted (S3 = "Yes")?

- ☐ Yes – *Complete only Question 1 for all household members, then skip to back page.*
- ☐ No – *Conduct full interview.*

USCENSUSBUREAU

140301

Form **D-1(E) RI** (1-10-2009)

D-1(E) RI - Tone prints in Green 368 - 10%, 40%, and 65%

D-1(E) RI - Base print in Black ink

1. **Let's make a list of all those people. Please start with the name of an owner or renter who was living here on April 1. Otherwise, start with any adult living here.**

2. **Please look at list B on the Information Sheet. How is** *(Name)* **related to** *(Read name of Person 1)*?

Mark ✗ ONE box.

- ☐ Husband or wife
- ☐ Biological son or daughter
- ☐ Adopted son or daughter
- ☐ Stepson or stepdaughter
- ☐ Brother or sister
- ☐ Father or mother
- ☐ Grandchild
- ☐ Parent-in-law
- ☐ Son-in-law or daughter-in-law
- ☐ Other relative
- ☐ Roomer or boarder
- ☐ Housemate or roommate
- ☐ Unmarried partner
- ☐ Other nonrelative

3. **Is** *(Name)* **male or female?**

Mark ✗ ONE box.

- ☐ Male
- ☐ Female

4. **What was** *(Name's)* **age on April 1, 2010? What is** *(Name's)* **date of birth?**

Please report babies as age 0 when the child is less than 1 year old.
Print numbers in boxes.

Age on April 1, 2010

DATE OF BIRTH

Month

Day

Year of birth

5. **Please look at List C. Is** *(Name)* **of Hispanic, Latino, or Spanish origin?**

Read if necessary:
Examples of another Hispanic, Latino, or Spanish origin include Argentinean, Colombian, Dominican, Nicaraguan, Salvadoran, Spaniard, and so on.

- ☐ **No**, not of Hispanic, Latino, or Spanish origin
- ☐ Yes, Mexican, Mexican American, Chicano
- ☐ Yes, Puerto Rican
- ☐ Yes, Cuban
- ☐ Yes, another Hispanic, Latino, or Spanish origin – **What is that origin?**

6. **Please look at List D and choose one or more races. For this census, Hispanic origin is not a race. What is** *(Name's)* **race?**

Read if necessary:
Examples of other Asian groups include Hmong, Laotian, Thai, Pakistani, Cambodian, and so on.
Examples of other Pacific Islander groups include Fijian, Tongan, and so on.

- ☐ White
- ☐ Black, African American, or Negro
- ☐ American Indian or Alaska Native — **What is the name of the enrolled or principal tribe?**
- ☐ Asian Indian
- ☐ Chinese
- ☐ Filipino
- ☐ Japanese
- ☐ Korean
- ☐ Vietnamese
- ☐ Native Hawaiian
- ☐ Guamanian or Chamorro
- ☐ Samoan
- ☐ Other Asian — **What is that group?**
- ☐ Other Pacific Islander — **What is that group?**
- ☐ Some other race — **What is that group?**

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

Person 1

First Name MI

Last Name

✗ Person 1

Person 2

First Name MI

Last Name

Person 3

First Name MI

Last Name

Person 4

First Name MI

Last Name

Person 5

First Name MI

Last Name