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MEMORANDUM FOR   The Distribution List

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

Subject: 2010 Census Update Enumerate Quality Profile

Attached is the 2010 Census Update Enumerate 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 any questions about this document, please contact Ryan Kitts-Jensen at (301) 763-2789.

Attachment

2010 Census Update Enumerate Quality Profile

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

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Executive Summary

The Update Enumerate operation assigned enumerators to interview and update addresses in selected rural areas. These interviews were completed on paper questionnaires and collected information on housing unit status, population count at the address, and demographic data about the people living at the housing unit. All completed questionnaires were returned to the Local Census Office for check-in and subsequently shipped to a data capture center. The Update Enumerate quality assurance program ensured the Update Enumerate enumerators understood and followed interviewing and listing procedures through enumerator observations, a separate reinterview operation of enumerators to detect and deter falsification, a Dependent Quality Control Check of production listing work, and through Delete Verification. A Final Delete Verification was also conducted to verify addresses deleted for the first time by a quality control enumerator.

Enumerator observations were required for all production and quality control enumerators to ensure the enumerators understood and followed operational procedures. Observations should have been conducted and observation checklists were supposed to be filled out for all 15,082 production and 5,884 Quality Control enumerators. However, we received a little less than half of the observation checklists we expected. Of the forms received, we saw that 89.83 percent of enumerators passed the observation and 0.86 percent failed. The remaining enumerators had "Other" or no outcome marked, likely because they left the operation before an observation could be completed. An automated observation checklist would eliminate these data issues and ensure all enumerators were observed in a timely manner.

The Update Enumerate reinterview assigned a separate staff of enumerators to revisit a sample of Update Enumerate addresses and verify select data from the original interview. All reinterview paper forms were shipped to data capture centers, and all Update Enumerate and Update Enumerate reinterview data were delivered to the Matching, Review, and Coding System for comparison and final reinterview outcome coding. Cases were selected for reinterview by five different methods:
- Random – a sample of all eligible cases was automatically selected for each enumerator
- Outlier – additional reinterview was automatically selected for enumerators whose work differed significantly from all work within their Crew Leader District
- Supplemental – additional reinterview could have been manually selected by the Local Census Office Quality Control staff
- Hard fail – when an enumerator received a "Hard Fail" outcome (either through reinterview failure, or non-reinterview failure), all eligible cases completed by that enumerator were selected for reinterview
- Vacant – any Housing Unit with a status of Vacant – regular was automatically selected for reinterview

The total number of cases selected for reinterview was 232,276 (16.74 percent) of the 1,387,564 Update Enumerate cases that were eligible for reinterview. Random reinterview accounted for 74,932 (5.40 percent) of the cases eligible for reinterview. 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 starting within the first three cases for each enumerator (i.e., it was stratified by enumerator). Therefore, enumerators who only worked a small number of Update

Enumerate cases had a higher percentage of their cases selected for random reinterview. This design was used in an effort to ensure all enumerators had at least one case checked in reinterview.

Of the 215,833 reinterview cases received by the Matching, Review, and Coding System, 175,247 (81.20 percent) were assigned a final reinterview outcome of "Pass," which means the original data were collected with no critical mistakes or intentional falsification by the enumerators. Another 2,698 (1.25 percent) were found to have unintentional mistakes, and 80 (0.04 percent) were found to have intentional data falsification. This falsification was found for 33 enumerators, which is 0.22 percent of all Update Enumerate enumerators. Another 21,845 cases (10.12 percent) had no meaningful final outcome because the majority of their data were received after the coding effort closed. This indicates that the reinterview operation needed more time to account for shipping and data capture delays after the field work was concluded.

The Dependent Quality Control Check was a dependent verification of the listing activities conducted by Update Enumerate enumerators. A sample of the listing actions with every assignment area was verified by the quality control enumerators. The Dependent Quality Control Check was successful in identifying listing errors. Only 4.55 percent of all assignment areas failed and needed to be recanvassed. The Dependent Quality Control Check results showed an outgoing error rate of 0.18 percent. In Delete Verification, which was implemented to provide verification for 100 percent of all "delete" actions, 15.40 percent of the "delete" actions were reversed by the quality control enumerators. Final Delete Verification, where deletes introduced by quality control enumerators were double checked, showed that 3 of the 11 deletes (27.27 percent) that were first found by a quality control enumerator were reversed after being checked a second time.

We recommend using an automated instrument for these data collection components in the future. An automated form would assist in conducting Delete Verification, because 32.32 percent of the write-in box responses that were supposed to contain the corrected action code instead contained invalid codes, while 26.42 percent were simply blank.

I.   Introduction

Update Enumerate (UE) was a field operation where enumerators canvassed selected rural areas to update address lists, update maps, and conduct interviews for all occupied or vacant housing units (HUs) as well as addresses that were not HUs on April 1, 2010. Enumerators conducted UE interviews on paper questionnaires. After processing in the Local Census Offices (LCOs), the questionnaires were shipped to data capture centers where they were data captured by the Decennial Response Integration System (DRIS). The DRIS then made all data available to the Census Bureau for tabulation.

The objective of the UE quality assurance program was to ensure that UE enumerators understood and followed appropriate UE procedures. This objective was accomplished through initial observations, a UE reinterview (RI) operation, a Dependent Quality Control Check (DQC), and through Delete Verification (DV). A Final Delete Verification (FDV) was also conducted for addresses that were deleted for the first time by a Quality Control (QC) enumerator. A brief description follows, but refer to "2010 Census: Quality Control Plan for the Update Enumerate Operation" (Kitts-Jensen, 2009) for a detailed description of the UE QC plan.

Enumerator observations were conducted immediately after training in order to identify any procedures the enumerators did not understand. A supervisor accompanied each enumerator as he/she conducted listing and interviews, and kept track of all procedures done correctly and incorrectly on a UE Observation checklist. This was done for both production and QC enumerators. If the supervisor considered the performance of the enumerator unsatisfactory, then a second observation was conducted after retraining. If an enumerator failed the second observation, then the enumerator should have been terminated.

The UE RI was a field operation conducted by separate QC staff designed to detect and deter enumerator errors and data falsification. A sample of each enumerator's completed UE cases was selected for UE RI. A case could have been selected for UE RI in one of five ways:

1. Random – a sample of all eligible UE cases was automatically selected for each enumerator.
2. Outlier – additional RI was automatically selected for enumerators whose work differed significantly from all work within their Crew Leader District.
3. Supplemental – additional RI could have been manually selected by the LCO QC staff.
4. Hard Fail – when an enumerator received a "Hard Fail" outcome (either through RI failure, or non-RI failure), all eligible UE cases completed by that enumerator were selected for RI.
5. Vacant – any HU with a status of "Vacant – regular" was automatically selected for RI. (Note that seasonally vacant units were eligible for selection through Random RI)

For all cases selected for UE RI, QC enumerators attempted to contact the original UE respondent to determine the following:

1. Whether the respondent was interviewed during production UE
2. The housing unit status ("Occupied," "Vacant," "Demolished," etc.) of the UE address as of April 1, 2010
3. If occupied, how many people lived at the UE address on April 1, 2010
4. If occupied, the names of everyone living at the UE address on April 1, 2010
5. If occupied and the original respondent stated that he or she was not previously contacted, or did not remember being contacted, then full census demographic data for everyone living at the UE address was collected

All UE RI data were written onto a UE RI paper questionnaire and delivered to DRIS for data capture after being processed in the LCO. The DRIS provided all UE and UE RI data to the UE Matching, Review, and Coding System (MaRCS) for matching and assignment of final RI outcomes to all UE RI cases. Because a quick turnaround was critical for timely RI coding, the data delivered to the MaRCS were not subject to any data capture quality assurance measures by DRIS. Therefore, we expected some data capture errors in the MaRCS data, but those errors were later corrected for use in the census tabulations.

We originally relied on the Paper Based Operations Control System (PBOCS) interface for critical data items such as case ID and applicant ID, but abandoned that interface mid-operation due to unexpected delivery delays. Instead, MaRCS used only the data from DRIS for all processing. As a result, the data errors we then had for critical items adversely affected many aspects of the reinterview program. For instance, some additional enumerators were created within the MaRCS system because of applicant IDs that were incorrectly scanned.

Once the MaRCS received all UE and UE RI data, it began a three-stage matching process:

1. <u>Computer Matching</u> – the MaRCS automatically compared the UE data to the UE RI data and assigned a final outcome of "Pass" to all cases that matched. Cases that did not match were deferred to the National Processing Center (NPC). A case was considered a "match" if the housing unit status matched, the population counts matched or differed by one, and at least 50 percent of the persons matched (if the housing unit was occupied).
2. <u>NPC Clerical Matching</u> – NPC clerks reviewed all data in the MaRCS and, based on their review and assessment, assigned a final outcome of "Pass" to all cases that matched. Cases that did not match were deferred to the LCOs.
3. <u>LCO Final Coding</u> – LCO clerks reviewed all data available to them in the MaRCS and elsewhere and assigned a final RI outcome to all cases deferred to them.

The final RI matching outcomes were as follows:

1. <u>Pass</u> – The enumerator followed procedures without significant mistakes.
2. <u>Soft Fail</u> – The enumerator made an unintentional mistake.
3. <u>Hard Fail</u> – The enumerator falsified data or intentionally did not follow procedures.
4. <u>Don't Know/Suspect</u> – The MaRCS clerk was unable to determine a final RI outcome but suspected the enumerator falsified data or intentionally did not follow procedures.
5. <u>Don't Know/No Suspect</u> – The MaRCS clerk was unable to determine a final RI outcome and did not suspect the enumerator of falsification.
6. <u>LCO Relief</u> – The case did not pass the Computer Matching, but the LCO did not have time to determine a final RI outcome for the case.
7. <u>RI Noninterview (NI)</u> – The reinterviewer was unable to collect enough RI data for a valid comparison to the UE data.

The UE RI was conducted concurrently with the UE production operation, beginning March 29, 2010 (one week after the start of UE) and ending June 9, 2010 (two weeks after the finish of UE). The MaRCS coding effort began April 15, 2010 and ended June 16, 2010.

Another aspect of the UE QC program was the DQC of production listing work. The purpose of the DQC was to make sure enumerators followed proper procedures when canvassing the assignment area (AA) and updating the address list. Every AA was subjected to the DQC, where a QC enumerator canvassed a small subsection of the AA and verified that the original enumerator's notations were correct. A pass/fail decision was made for each AA depending on the number of critical and non-critical errors found by the QC enumerator. If the AA failed the DQC, the QC enumerator recanvassed the entire AA immediately.

The last major aspect of the UE QC program was the DV for all deletes. The Census Bureau does not delete a unit from the Master Address File (MAF) unless it is marked as a delete by two different operations or two different enumerators in the same operation. The UE DV and FDV operations were designed to meet this requirement. If an existing address (with a MAF ID) was deleted during production UE, a QC enumerator had to verify that the unit should have been deleted from the MAF. This DV was conducted in the same visit as the DQC. If a QC enumerator deleted an existing address during the DQC or recanvassing, then a different QC enumerator (or the Crew Leader) had to verify that first-time delete. This FDV was completed after all the DQC and/or recanvassing was completed for the AA.

II.   Methodology

Quantitative analysis in this report was completed using the following datasets:

1. MaRCS Datasets – various datasets directly from the MaRCS database. Includes the Fail File, which was a file of case IDs for which the RI data were possibly more accurate than the original data based on the final coding outcomes.
2. UE and UE QC Observation Checklist Data – one record per form received and keyed at NPC.
3. DQC Data – one header and footer record with multiple row records per form received and keyed at NPC.
4. DV and FDV Data – one header and footer record with multiple row records per form received and keyed at NPC.
5. Decennial Applicant, Personnel and Payroll System (DAPPS) Termination Dataset – one record per enumerator and termination date (some enumerators have more than one termination date) during the UE time-frame.

These files were combined and/or split to create multiple datasets to answer the study questions. These datasets were used to create all analysis tables presented in the results section.

UE and Nonresponse Followup (NRFU) both used the MaRCS system for coding cases in a very similar manner. Towards the end of the UE operation, a debriefing with a sample of UE and NRFU MaRCS NPC clerks was held. The clerks were asked various questions about how the training was conducted and how well it prepared them to do their jobs. Notes from this debriefing are summarized in the results section.

At the end of NRFU, the Field Division distributed and tabulated responses to LCO questionnaires on all aspects of the Quality Assurance operation, including specific questions about the MaRCS training and application. The results from this questionnaire along with results on MaRCS automation that apply to both NRFU and UE can be found in the "2010 Census: Nonresponse Followup Reinterview Quality Profile" (Peterson, 2011).

III.   Limitations

The success of an 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 10 days of DRIS receiving the form. However, the only way to meet this deadline was for DRIS to deliver raw data from their optical character recognition scanners. Errors were expected in these data because they had not yet gone through any DRIS QC. The impacts of these errors were expected to be minimal because all control data were coming from PBOCS and should have been free of these errors.

Once the operation began, unexpected delays in the PBOCS interface caused us to substantively 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. A consequence of this change was that the data capture errors began to affect control data such as case ID and applicant ID. These data capture errors complicated the final analyses presented here, and sometimes limited the type of analyses possible. Additionally, PBOCS was abandoned completely for UE RI check-in, and we lost quite a bit of tracking power as we moved to a manual tracking system. For this reason, any analyses that required the PBOCS RI check-in date could not be completed.

For DQC, DV, FDV, and Observation analyses, there were limitations that stemmed from being based on keyed data from paper forms. NPC received roughly half the number of observation checklists that were expected. There were many DQC, DV, FDV, and Observation forms with invalid or missing data in necessary fields such as result, applicant ID, and action code that limit our ability to simply report on what happened. These are all issues that could be greatly reduced by moving to an automated system.

IV.   Results

These results are all presented at the national level. For selected Regional Census Center (RCC)-specific results, please refer to Appendix A.

A. Matching, Review, and Coding System (MaRCS) Training

Before any NPC or LCO clerks could code cases in MaRCS, they attended training. This section describes feedback received from NPC regarding the MaRCS training only. The NPC MaRCS debriefing was held a few weeks before the end of the UE operation. We were 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 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 are the following situations:

1. Either the production case or the RI case indicated that the HU was not occupied,
2. The RI enumerator incorrectly listed the household members at the proxy address and not the UE 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 the NPC clerks were 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 to LCO staff, and
4. Schedule question and answer sessions a week into production so clerks can have questions resolved in a setting that would share the knowledge with all clerks.

B. Observations

Enumerator observations were conducted immediately after training in order to identify any procedures the enumerators did not understand. All observation checklists were shipped to NPC for keying.

We expected to receive one checklist for every enumerator that worked on UE and UE RI. However, we only received observation checklists for 49.99 percent of UE production enumerators and 38.22 percent of UE QC enumerators. There was no tracking of observations, so we do not know if this is because the observations were not done or the observation checklists were lost or never shipped. Please see Table 1 for a distribution of observation checklists received.

Table 1: Enumerator Observation Checklists Received

	UE	UE QC
Total Enumerators	15,082	5,884
	(100.00%)	(100.00%)
Total Unique Forms Received	7,539	2,249
	(49.99%)	(38.22%)
1st Observation done	7,446	2,180
	(49.37%)	(37.05%)
2nd Observation done	1,174	723
	(7.78%)	(12.29%)

Source: Form D-1222 – Observation Checklist

Please see Table 2 for a distribution of observation results. We see that the majority of enumerators passed their observations, but there was a fair number that did not receive an outcome. Some of these observations that are missing an outcome may be the result of an enumerator quitting before an observation was done or a Crew Leader forgetting to mark an outcome, but in either case an automated instrument would help reduce the possibility for this to occur.

Table 2: Enumerator Observation Results

Final Observation Outcome	UE	UE QC	All Enumerators
Total	7,539	2,249	9,788
	(100.00%)	(100.00%)	(100.00%)
Pass	6,812	1,981	8,793
	(90.36%)	(88.08%)	(89.83%)
Fail	53	31	84
	(0.70%)	(1.38%)	(0.86%)
Other	50	18	68
	(0.66%)	(0.80%)	(0.69%)
Missing	624	219	843
	(8.28%)	(9.74%)	(8.61%)

Source: Form D-1222 – Observation Checklist

Procedures stated that enumerators who failed their observation should have been terminated. Table 2 shows that a total of 84 enumerators failed their observations in UE or UE QC. Of these enumerators, 27 were terminated within three weeks of their observation and 34 continued to work. The outcome for the remaining 23 enumerators is unknown due to either missing observation date or a termination date.

Table 1 shows that 7,446 production enumerators had a first observation done. A total of 664, or 8.92 percent, of these had at least one recorded error. A total of 77 production enumerators had at least one recorded error during their second observation, which is 6.56 percent of the 1,174 production enumerators that had second observations.

A total of 200 QC enumerators had at least one recorded error during their first observation, which is 9.17 percent of the 2,180 QC enumerators that had first observations. A total of 47 QC enumerators had at least one recorded error during their second observation, which is 6.5 percent of the 723 QC enumerators that had second observations.

See Table 3 for the distribution of specific errors observed during observations. The most commonly marked error across UE and UE QC is not reading the questions as worded. Among QC enumerators, forgetting to provide an information sheet was a common error marked. All percentages in Table 3 are based on the total number of errors, not on the number of observation checklists received.

Table 3: Errors Discovered During Observations

	UE		UE RI	
	1st Obs	2nd Obs	1st Obs	2nd Obs
Errors discovered	1,567	255	543	125
	(100.00%)	(100.00%)	(100.00%)	(100.00%)
Introduction/show badge	41	6	19	4
	(2.62%)	(2.35%)	(3.50%)	(3.20%)
Provide Information Sheet	86	19	59	16
	(5.49%)	(7.45%)	(10.87%)	(12.80%)
Wore seatbelt while driving	59	6	10	4
	(3.77%)	(2.35%)	(1.84%)	(3.20%)
Used map correctly to find HU address	140	18	42	7
	(8.93%)	(7.06%)	(7.73%)	(5.60%)
Made corrections as necessary to block maps	142	21	47	9
	(9.06%)	(8.24%)	(8.66%)	(7.20%)
Used Census maps to confirm locations of cases	102	15	25	5
	(6.51%)	(5.88%)	(4.60%)	(4.00%)
Correctly map spotted multi-unit structure	117	12	39	5
	(7.47%)	(4.71%)	(7.18%)	(4.00%)
Correctly added HU(s) to Add Page(s)	104	16	31	5
	(6.64%)	(6.27%)	(5.71%)	(4.00%)
Correctly deleted HU(s) when it could not be found	103	16	33	4
	(6.57%)	(6.27%)	(6.08%)	(3.20%)
Assigned correct address status on Address Listing Page	81	24	32	8
	(5.17%)	(9.41%)	(5.89%)	(6.40%)
Correctly made changes to address information	95	22	25	4
	(6.06%)	(8.63%)	(4.60%)	(3.20%)
Planned an efficient travel route	86	10	21	10
	(5.49%)	(3.92%)	(3.87%)	(8.00%)
Interviewed eligible respondent	21	7	10	5
	(1.34%)	(2.75%)	(1.84%)	(4.00%)
Read the questions as worded	173	22	60	12
	(11.04%)	(8.63%)	(11.05%)	(9.60%)
Filled in questionnaire neatly and accurately	125	23	45	13
	(7.98%)	(9.02%)	(8.29%)	(10.40%)
Understood how to use various forms	62	8	35	9
	(3.96%)	(3.14%)	(6.45%)	(7.20%)
Followed census procedures to protect PII	30	10	10	5
	(1.91%)	(3.92%)	(1.84%)	(4.00%)

*Obs in the header row is short for Observation.
Source: Form D-1222 – Observation Checklist

C. Reinterview Workloads

Refer to Table 4 for the distribution of cases selected for RI. The Supplemental RI was used sparingly and that the majority of selected cases were Vacant RI. Of the total UE production workload of 1,465,869 cases, 1,387,564 or 94.66 percent were eligible for RI. Cases were ineligible for RI if any of the following was true:

- Unit Status = Demolished/burned out/cannot locate, Nonresidential, Uninhabitable (open to elements, condemned, under construction), or Duplicate.
- Population count = 99 (unknown population count).
- Questionnaire Status = Count Only, Mover, or Usual Home Elsewhere (UHE).
- Version is greater than 1 **and** a previous version was already selected for RI.
- The case was completed by a QC enumerator.

Table 4: Update Enumerate Reinterview Selections

	Cases
Total UE production	1,465,869
UE production eligible for RI	1,387,564
	(100.00%)
Selected for Reinterview	232,276
	(16.74%)
Random	74,932
	(5.40%)
Outlier	16,913
	(1.22%)
Supplemental	72
	(0.01%)
Hard Fail	3,446
	(0.25%)
Vacant	136,913
	(9.87%)

Source: Census MaRCS

The PBOCS was designed to select one of the first three cases checked in and then every 25th eligible case for each enumerator, which should have yielded a four percent Random RI sample. PBOCS actually selected 5.40 percent of all eligible cases for Random RI. The reason for this is the enumerators with low numbers of cases had much higher overall selection rates.

This discrepancy can be seen in Figure 1. The dark solid line indicates the hypothetical Random RI selection rate by our design for a given enumerator based on how many cases that enumerator completed while the lighter dashed line gives us the four percent reference. It is clear in this figure that the actual Random RI selection rate is consistently higher than four percent for enumerators with smaller workloads, and slowly converges towards four percent as the number of cases an enumerator completes becomes larger.

Figure 1: Random Reinterview Selection Rate by Number of Cases
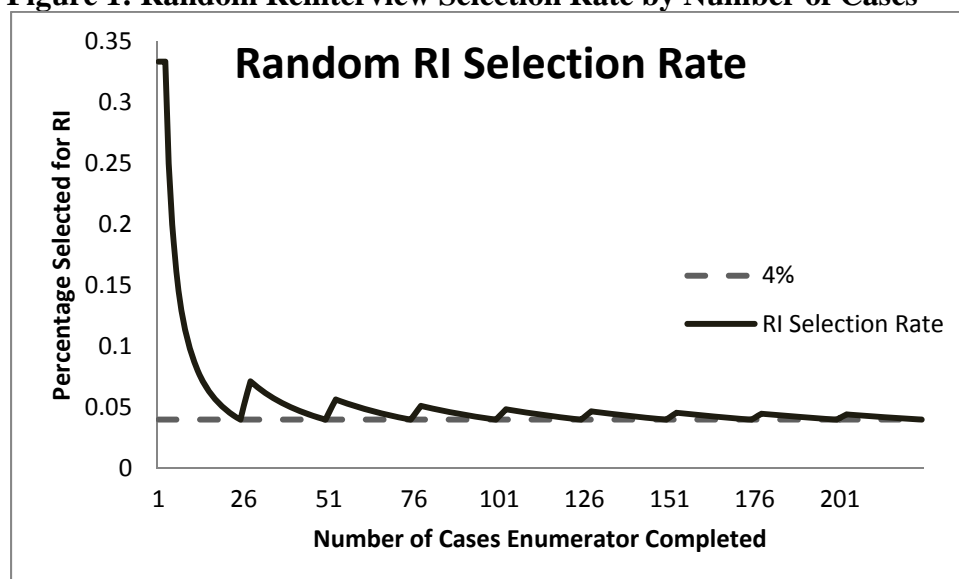
Source: UE QC Plan

The MaRCS ran automatic outlier tests each week of the operation that compared an enumerator's work to the work of all other enumerators in their Crew Leader District (CLD) based on specified characteristics believed to be indicators of possible falsification. The MaRCS selected cases for Outlier RI if an enumerator's work failed a particular outlier test. The variables that the MaRCS compared and tested were:

- Percentage of Proxy cases.
- Percentage of Population One cases (occupied and population is one).
- Percentage of Missing Phone Number cases (no telephone number).
- Percentage of Vacant – UHE cases.
- Excessive Soft Fail/DK-Suspect cases (two cases).

For the first four tests, the MaRCS flagged all enumerators whose weekly percentage was significantly higher than the cumulative percentage within the enumerator's CLD. For the Excessive Soft Fail/DK-Suspect test, the MaRCS flagged enumerators when their cumulative number of Soft Fail or DK-Suspect cases reached two. Enumerators were placed into Outlier RI every week that they failed any of the tests. An enumerator could only fail the Excessive Soft Fail/DK-suspect test once during the operation.

The MaRCS automatically selected two Outlier RI cases for each flagged enumerator the first time that enumerator failed any outlier test. If an enumerator was flagged again in a different week for Outlier RI, the MaRCS selected one case from the enumerator's workload. The types of cases selected for Outlier RI were chosen based on which outlier test the enumerator failed. For more information on the outlier tests, please see "2010 Census: Quality Control Plan for the Update Enumerate Operation" (Kitts-Jensen, 2009).

We saw in Table 4 that 16,913 cases were selected for Outlier RI. Table 5 shows the distribution of enumerators by failed outlier test. We see that the most common way to be flagged for outlier RI was through the Seasonal Vacant Rate test, closely followed by the Missing Phone Rate test. The Population 1 Rate test flagged far fewer enumerators and the Excessive Soft Fail/DK Suspect test flagged the least. This is most likely due to the fact that these are fairly rare final outcomes so it is harder to deem enumerators to be statistical outliers with such a small sample size. The final outcomes of these Outlier RI cases are presented in Section IV.E below.

Table 5: Enumerators Flagged as Outliers

Outlier Test	Enumerators Flagged	Enumerators Flagged More Than Once
All	6,289	2,468
Population 1 Rate	660	63
Missing Phone Rate	2,766	634
Proxy Rate	2,162	389
Seasonal Vacant Rate	2,943	803
Excessive Soft Fail/DK Suspect	124	0

* The zero in the final cell is by system design – enumerators could only be flagged for the Excessive Soft Fail/DK Suspect test once.
Source: Census MaRCS

D. Reinterview Data Collection

The success of the UE RI depended on how soon after the UE interview the RI took place. We originally wanted to look at the time difference between production check-in and RI check-in. However, we did not have check-in dates for UE RI because the LCOs had to abandon the PBOCS for UE RI check-in, so we took a look at the time lag between RI selection and the MaRCS receiving the data from DRIS instead. Table 6 shows this lag by RI type.

We see that Outlier RI had the longest average and median time gap. Random RI cases appear to be the quickest, followed by Hard Fail RI cases, but this is a little misleading. After the MaRCS contingency, MaRCS would not know about Random RI selections until it actually received the data for the RI from DRIS, so this measure of lag would essentially be zero after that point. This lag was even negative for some cases, presumably instances where MaRCS received the RI data before the production data from DRIS, and thus assigned a RI selection date associated with the receipt of the production data. Even with these issues, we can see that the average and median time lags were far longer than we expected for UE, which could be one of the reasons so many RI cases were received in MaRCS after the coding closeout. We will discuss this further in the following section.

Table 6: Lag Between Reinterview Selection and Reinterview Data Received in Matching, Review, and Coding System (MaRCS) by Reinterview Type

	Number of Days Between RI Selection and RI Receipt		
	Average	Median	Maximum
All RI Cases	34.45	29.00	141.00
Random	22.92	16.00	140.00
Vacant	38.75	33.00	141.00
Outlier	61.76	61.00	130.00
Hard Fail	32.99	23.00	102.00
Supplemental	51.64	53.50	89.00

Source: Census MaRCS

E. Reinterview Outcomes

See Table 7 for the distribution of final RI outcomes by RI type in MaRCS. The majority of RI cases received a final outcome of "Pass," meaning enumerators were following procedures. A large portion of cases received the LCO Relief outcome.

Table 7: Final Reinterview Outcomes in Matching, Review, and Coding System (MaRCS)

RI Type	Total	Pass	Soft Fail	Hard Fail	DK-Suspect	DK-No Suspect	LCO Relief	RI NI	None*
All	215,833	175,247	2,698	80	186	1,983	21,845	13,788	6
	(100.00%)	(81.20%)	(1.25%)	(0.04%)	(0.09%)	(0.92%)	(10.12%)	(6.39%)	(0.00%)
Random	72,638	53,939	395	4	43	381	11,726	6,146	4
	(100.00%)	(74.26%)	(0.54%)	(0.01%)	(0.06%)	(0.52%)	(16.14%)	(8.46%)	(0.01%)
Vacant	130,696	114,324	2,237	45	133	1,522	7,352	5,081	2
	(100.00%)	(87.47%)	(1.71%)	(0.03%)	(0.10%)	(1.16%)	(5.63%)	(3.89%)	(0.00%)
Outlier	10,161	5,993	60	0	7	78	2,160	1,863	0
	(100.00%)	(58.98%)	(0.59%)	(0.00%)	(0.07%)	(0.77%)	(21.26%)	(18.33%)	(0.00%)
Supplemental	66	43	0	0	2	1	14	6	0
	(100.00%)	(65.15%)	(0.00%)	(0.00%)	(3.03%)	(1.52%)	(21.21%)	(9.09%)	(0.00%)
Hard Fail	2,272	948	6	31	1	1	593	692	0
	(100.00%)	(41.73%)	(0.26%)	(1.36%)	(0.04%)	(0.04%)	(26.10%)	(30.46%)	(0.00%)

*These are cases that had an error in MaRCS preventing them from being final coded.
**In header row, "DK" is short for "do not know," "RI NI" is short for "reinterview non-interview."
Source: Census MaRCS

The LCO Relief outcome was used for two different purposes:
1. For cases deferred by NPC that the LCO did not have time to code before MaRCS coding closeout, and
2. For cases with all data received in MaRCS after the MaRCS coding closeout.

There were a total of 21,845 LCO Relief outcomes assigned, but only 239 of them were actually assigned by the LCOs. The remaining 21,606 cases were automatically assigned to cases with data received after MaRCS coding closeout. This distribution by RI type can be seen in Table 8.

Table 8: LCO Relief Outcome by Source and Reinterview Type

	LCO Relief*		
RI Type	**By LCOs**	**By MaRCS**	**Total**
Outlier	0	2,160	2,160
	(0.00%)	(9.89%)	(9.89%)
Random	35	11,691	11,726
	(0.16%)	(53.52%)	(53.68%)
Supplemental	0	14	14
	(0.00%)	(0.06%)	(0.06%)
Vacant	204	7,148	7,352
	(0.93%)	(32.72%)	(33.66%)
Hard Fail	0	593	593
	(0.00%)	(2.71%)	(2.71%)
Total	239	21,606	21,845
	(1.09%)	(98.91%)	(100.00%)

*All percentages are based on the total number of LCO Relief cases (21,845).
Source: Census MaRCS

F. Matching, Review, and Coding System (MaRCS) Coding

1. MaRCS Coding by Stage

   Table 9 shows the average time lag for each of the MaRCS matching stages.
   Specifically, this is the time between when a case first entered that stage to when
   it was completed for that stage. The UE and UE RI data were loaded into MaRCS
   on a flow basis as the forms were data captured. The LCO matching stage took
   the longest, as expected.

Table 9: Matching, Review, and Coding System (MaRCS) Lag at Each Matching Stage in Days

	Mean	**Median**
Computer Matching Lag	0.02	0.00
NPC Matching Lag	1.01	0.00
LCO Matching Lag	6.62	5.00

Source: Census MaRCS

2. Computer Matching

   Refer to Table 10 for a distribution of the computer matching outcomes for all RI
   cases. The MaRCS final coded 92.38 percent of all RI cases, passing 75.98
   percent of all RI cases, and deferring 7.62 to the NPC for clerical matching. Hard
   Fail and Outlier RI had the highest RI NI and LCO Relief rates. We also see that
   Vacant RI had the highest pass rate. This was expected because there were no
   roster data to compare when an HU was Vacant.

Table 10: Computer Matching Outcomes by Reinterview Type

RI Type	Total Cases	Pass	Defer	RI NI	LCO Relief
All	215,833 (100.00%)	163,986 (75.98%)	16,452 (7.62%)	13,789 (6.39%)	21,606 (10.01%)
Random	72,638 (100.00%)	49,545 (68.21%)	5,255 (7.23%)	6,147 (8.46%)	11,691 (16.09%)
Vacant	130,696 (100.00%)	107,894 (82.55%)	10,573 (8.09%)	5,081 (3.89%)	7,148 (5.47%)
Outlier	10,161 (100.00%)	5,567 (54.79%)	571 (5.62%)	1,863 (18.33%)	2,160 (21.26%)
Supplemental	66 (100.00%)	41 (62.12%)	5 (7.58%)	6 (9.09%)	14 (21.21%)
Hard Fail	2,272 (100.00%)	939 (41.33%)	48 (2.11%)	692 (30.46%)	593 (26.10%)

Source: Census MaRCS

3. NPC Coding

See Table 11 for the distribution of NPC clerical matching outcomes by RI type. The NPC final coded 1.39 percent of RI cases. It seems that the vast majority of cases were deferred by NPC with no suspicion. However, it is clear that Vacant RI cases were deferred at a higher rate than the other types except for Hard Fail. Outlier RI cases were deferred with suspicion at the highest rate.

Table 11: NPC Outcomes by Reinterview Type

RI Type	Total Cases	Pass	Defer – No Suspect	Defer - Suspect
All	16,452 (100.00%)	2,996 (18.21%)	12,568 (76.39%)	888 (5.40%)
Random	5,255 (100.00%)	2,149 (40.89%)	2,883 (54.86%)	223 (4.24%)
Vacant	10,573 (100.00%)	665 (6.29%)	9,314 (88.09%)	594 (5.62%)
Outlier	571 (100.00%)	178 (31.17%)	326 (57.09%)	67 (11.73%)
Supplemental	5 (100.00%)	0 (0.00%)	3 (60.00%)	2 (40.00%)
Hard Fail	48 (100.00%)	4 (8.33%)	42 (87.50%)	2 (4.17%)

Source: Census MaRCS

4. LCO Coding

See Table 12 for the distribution of LCO Matching outcomes by NPC "Defer" type. The LCOs final-coded 6.23 percent of all RI cases. The cases with a "Defer – Suspect" NPC code have a lower percentage of "Pass" as the final outcome when compared to those with a "Defer – No Suspect" code. Similarly, "Defer – Suspect" cases had a much higher incidence of "Soft Fails," "Hard Fails," and "Don't Know – Suspects" compared to "Defer – No Suspect" cases.

Table 12: LCO Outcomes by NPC Defer Type

NPC Code	Total	Pass	Soft Fail	Hard Fail	DK – Suspect	DK – No Suspect	LCO Relief
All Cases	13,451	8,265	2,698	80	186	1,983	239
	(100.00%)	(61.45%)	(20.06%)	(0.59%)	(1.38%)	(14.74%)	(1.78%)
Defer – No Suspect	12,563	7,888	2,413	64	143	1,855	200
	(100.00%)	(62.79%)	(19.21%)	(0.51%)	(1.14%)	(14.77%)	(1.59%)
Defer - Suspect	888	377	285	16	43	128	39
	(100.00%)	(42.45%)	(32.09%)	(1.80%)	(4.84%)	(14.41%)	(4.39%)

*The total number of cases in the first cell is five less from the total number deferred by NPC from Table 11 because of coding inconsistencies.
**In header row, "DK" is short for "do not know."
Source: Census MaRCS

G. Fail Outcomes

1. Reinterview "Hard Fail" Recommendations

Whenever the Assistant Manager for Quality Assurance (AMQA) concluded that a case should receive a "Hard Fail" outcome, procedures required that they consult the Assistant Manager for Field Operations (AMFO) before assigning the code in the MaRCS. If the AMFO did not agree with the AMQA's conclusions, both consulted with the LCO Manager (LCOM), who made the final decision. Table 13 shows the "Hard Fail" recommendations for cases with a "Hard Fail" final outcome. Since the AMQAs and AMFOs agreed for all of the cases where the AMQA recommended "Hard Fail," it appears that the LCOMs were consulted more often than required by the procedures. Also, the AMQA only filled out the recommendations in the MaRCS for 74 of the 80 "Hard Fail" cases. For this reason, the recommendations for the remaining six cases are unknown.

Table 13: Hard Fail Recommendations

Cases with Hard Fail Outcome	Yes, Hard Fail	No, Not Hard Fail	Not Consulted
AMQA Decision	74	0	0
AMFO Decision	74	0	0
LCOM Decision	57	0	17

Source: Census MaRCS

2. "Hard Fail" Enumerators

Enumerators were "Hard Failed" whenever an RI case they completed received a "Hard Fail" outcome code or someone discovered the enumerator falsifying data outside of the RI program (indicated in the MaRCS as a Non-RI Fail). Once an enumerator was "Hard Failed," the enumerator was terminated and all of their completed cases that were eligible for RI were reworked as "Hard Fail" RI. The cases they had not yet completed were reassigned to another enumerator. Table 14 shows the distribution of "Hard Fail" enumerators by the type of fail for the enumerator (Non-RI Fail or RI Hard Fail). There were a total of 33 "Hard Fail" enumerators during the UE operation, which is only 0.22 percent of all production enumerators. The majority of these enumerators were failed through our RI program, while one was failed outside of the RI program.

Table 14: Hard Failed Enumerators

Hard Fail Type	Count	Percent
Total	33	100.00%
Non-RI Fail	1	3.03%
RI Hard Fail	32	96.97%

Source: Census MaRCS

Table 15 shows the number of days between the first "Hard Fail" outcomes and the day the "Hard Fail" enumerator was terminated in DAPPS. Table 15 is based on 28 "Hard Fail" enumerators because five had no termination date. The majority of these enumerators were actually terminated well before their "Hard Fail" date in the MaRCS. There are a couple of possible explanations:
1. The enumerators either quit or were terminated due to lack of work before the falsification was discovered.
2. The "Hard Fail" decision was made and the enumerator was terminated, but the "Hard Fail" outcome was not entered into MaRCS until later.

Unfortunately, we have no way of knowing the reason for each enumerator termination. In any case, we need to make every effort in the future to minimize this delay (especially for those enumerators in the second category above) so that the "Hard Fail" cases can be selected and reworked as early as possible.

Table 15: Time in Days Between Hard Fail and DAPPS Termination

	Mean	Median	Minimum	Maximum
Termination Lag	-20.14	-23.50	-51.00	26.00

Source: Census MaRCS and DAPPS

3. Fail File from MaRCS

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

- The RI Matching Outcome = "Soft Fail," "Hard Fail," or "Don't Know – Suspect."
- The Enumerator who completed the case was "Hard Failed" and the RI Matching Outcome = "Don't Know – No Suspect" or "LCO Relief."

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)" (Kitts-Jensen, 2010).

Refer to Table 16 for the count of cases on the Fail File by final RI outcome. If we compare this to Table 12, we can confirm that all "Soft Fails," "Hard Fails," and "Don't Know – Suspect" cases did in fact get put onto the Fail File.

Table 16: Cases on Fail File by Reinterview Outcome

RI Outcome	Count	Percent
Total	3,610	100.00%
Soft Fail	2,698	74.74%
Hard Fail	80	2.22%
Don't Know – Suspect	186	5.15%
Don't Know – No Suspect	27	0.75%
LCO Relief	619	17.15%

Source: Census MaRCS

H. Dependent Quality Control Check

The UE DQC was performed on a sample of HUs within every AA using a random start-with case and specified number of units to continue sampling on the ground that depended on AA size. During the DQC, the QC enumerator dependently verified the completeness and accuracy of the sample of UE addresses within the AA. The QC enumerator also determined if any errors detected on the selected UE addresses were critical or non-critical as specified on the DQC form. An AA passed the DQC if the number of critical and non-critical errors detected were less than or equal to the acceptance numbers designated for the AA size. For example, any AA with 275 or fewer addresses was allowed one non-critical error and zero critical errors (and had varying sample sizes depending on AA size). For a full description of acceptable

error rates by AA size, please see "2010 Census: Quality Control Plan for the Update Enumerate Operation" (Kitts-Jensen 2009). If an AA failed the DQC, the QC enumerator recanvassed the remainder of the addresses in the AA.

During the UE DQC, we expected every AA to be checked. Of the 32,574 AAs in UE, we received DQC data for 31,656 AAs, or 97.18 percent of all UE AAs. Of the 1,465,869 HUs listed in UE, 109,016 HUs or 7.44 percent, were checked during DQC. While we budgeted for five percent, we expected the overall sample to be higher because the sample size of each range of total units in the AA was five percent of the maximum size of the range. As a result, some AAs had more than five percent of the housing units sampled if that AA's size was closer to the minimum size of the range. For example, an AA of size 50 had a sample size of three, while an AA of size 51 had a sample size of five. Table 17 below shows the distribution of DQC results. A total of 4.55 percent of the AAs failed DQC and therefore required a recanvass.

Table 17: Dependent Quality Control Check Results

DQC Result	Count
Pass	29,863 (94.34%)
Fail	1,439 (4.55%)
Missing	354 (1.12%)
Total	31,656 (100.00%)

Source: Form D-950 (UE QC)

For enumerators who had at least one of their AAs fail DQC, we investigated how often there were repeated fails. Table 18 shows the total number of enumerators who had a given number of their AAs fail DQC. The highest number of a single enumerator's AAs that failed was 6. Only 11.07 percent of enumerators had an AA fail, and the majority of these enumerators had only one AA fail. This analysis only includes forms that had a captured applicant ID and DQC result.

Table 18: Number of Enumerators who had Given Amount of their Assignment Areas Fail Dependent Quality Control Check

# of AAs Failed	# of Enumerators	Percent
0	8,926	88.89%
1	994	9.90%
2	103	1.03%
3	14	0.14%
4	3	0.03%
5	0	0.00%
6	2	0.02%
Total	10,042	100.00%
Total with at least one fail	1,116	11.11%

Source: Form D-950 (UE QC)

Tables 19 and 20 below show the distributions of critical and non-critical DQC errors. The most common critical DQC error was when the production enumerator marked a housing unit as a type of delete, while the QC enumerator marked that it existed. The two most common non-critical DQC errors were map spot errors and incorrect house numbers.

Table 19: Total Number and Distribution of Critical Dependent Quality Control Check Errors

Type of Error	Count	Percent
Total Critical Errors	2,358	100.00%
Production Enumerator missed an Add that QC Enumerator found	506	21.46%
Production Enumerator says Exists, QC Enumerator says Delete	874	37.07%
Production Enumerator says Delete, QC Enumerator says Exists	978	41.48%

Source: Form D-950 (UE QC)

Table 20: Total Number and Distribution of Non-critical Dependent Quality Control Check Errors

Type of Error	Count	Percent
Total Non-Critical Errors	3,420	100.00%
House Number Incorrect	896	26.20%
Error in Street Name on Address List Page	765	22.37%
Incorrect or Missing Unit Designation	321	9.39%
No Location Description for Address with no House Number	132	3.86%
Map Spot Error: Not Added or Not Deleted on Map	936	27.37%
Street or Road Name Not Corrected on Map	370	10.82%

Source: Form D-950 (UE QC)

We set the allowable critical errors to achieve the lowest Average Outgoing Quality Limit (AOQL) that was practical based on the five percent sample size budgeted for the operation. The selected plan had an overall weighted AOQL of 5.5 percent for critical errors. The AOQL was the worst possible outgoing error rate for any incoming error rate if procedures were followed, but we expected to achieve a lower rate in production.

During the 2010 Census UE operation, the incoming DQC critical error rate was lower than expected, at 1.63 percent. This is the estimated percentage of UE addresses that were in error before rectification and recanvassing. The corresponding outgoing critical error rate after recanvassing AAs that failed the DQC was 0.18 percent, which is well below the AOQL limit. This is the estimated percentage of UE addresses that remained in error after the QC enumerators rectified incorrect sampled addresses and recanvassed failed AAs.

I. Delete Verification and Final Delete Verification

The Census Bureau does not delete a unit from the MAF unless it is marked as a delete by two different operations or two different enumerators in the same operation. The UE DV and FDV operations were designed to meet this requirement. If an existing address (with a MAF ID) is deleted during production UE, a QC enumerator must have verified that the unit should be deleted from the MAF. This DV was conducted in the same visit as the DQC.

If a QC enumerator deleted an existing address during DQC or recanvassing, then a different QC enumerator (or the Crew Leader) must have verified the first-time delete. This FDV was completed after all DQC and/or recanvassing was completed for the AA. There were a total of 81,332 deletes that went through DV and 11 that went through FDV. Table 21 below shows the distribution of DV and FDV results. We can see that the majority of deletes were confirmed as correct deletes. However, 15.4 percent of the DV cases were considered incorrect deletes.

Table 21: Delete Verification and Final Delete Verification Results

Type	DV	FDV
No, Do Not Delete	12,527	3
	(15.40%)	(27.27%)
Yes, Delete	68,805	8
	(84.60%)	(72.73%)
Total	81,332	11
	(100.00%)	(100.00%)

Source: Form D-957 (UE QC)

When a QC enumerator marked a case as a mistaken delete during DV, the QC enumerator was supposed to write in what the action code should be. We expected this to be either "Verify" or "Correction." Table 22 below shows the distribution of this write-in field. All write-ins that began with the letters "V" or "C" were recoded

as "Verify" or "Correction," respectively, and anything else was recorded as "Other."
A very large proportion of these outcomes were coded as "Other" or "Missing."
These could both be greatly reduced if an automated instrument was used or
checkboxes instead of a write-in box were on the paper form.

Table 22: Delete Verification and Final Delete Verification Recodes

	DV	FDV
Total	12,527	3
	(100.00%)	(100.00%)
Verify	4,182	0
	(33.38%)	(0.00%)
Correction	986	3
	(7.87%)	(100.00%)
Other	4,049	0
	(32.32%)	(0.00%)
Missing	3,310	0
	(26.42%)	(0.00%)

Source: Form D-957 (UE QC)

V.   Conclusions, Lessons Learned, and Recommendations

The UE RI program was successful in deterring and identifying enumerator mistakes and
falsification. We identified 2,698 cases (1.25 percent of all RI) of enumerator mistakes
("Soft Fails") and 80 cases (0.04 percent of all RI) of falsification ("Hard Fails"). This
falsification was discovered for 33 enumerators, and all of their work was reinterviewed
through Hard Fail RI in order to identify and rectify any more cases of falsification.

While the UE RI was successful, our operations 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 UE unless they have had at least one
satisfactory observation.

There were 21,845 RI cases (10.12 percent of all RI) that received an outcome of "LCO
Relief." Of these, 21,606 were assigned "LCO Relief" because the data for them were
received by the MaRCS after the RI coding effort was closed. We recommend using an
automated questionnaire (for UE and RI) to reduce or eliminate the data capture errors we
saw throughout the program and substantively reduce the delay between UE interviewing
and RI final coding.

Even with the data capture errors, the MaRCS computer matching component final coded
92.38 percent of all RI cases, while NPC and the LCOs final coded 1.39 percent and 6.23
percent of all cases, respectively. We saw that NPC took an average of one day to code a
case and had a pass rate of 18.21 percent. However, their workload would have more
than doubled if there were fewer delays in the entire process because more cases were
assigned "LCO Relief" by the MaRCS after the operation had ended than were deferred

to NPC during the operation. Again, these delays in the process could be reduced by using an automated instrument.

The DQC was successful in identifying listing errors. Only 4.55 percent of AAs failed and needed to be recanvassed and there was an average outgoing critical error rate of 0.18 percent. As for DV, 15.4 percent of "deletes" were reversed after being checked the second time. We recommend using an automated form for DV, because 32.32 percent of the write-in box responses that were supposed to contain the corrected action code instead contained invalid codes, while 26.42 percent were simply blank.

VI.   References

Kitts-Jensen, Ryan. (2009), "2010 Census: Quality Control Plan for the Update Enumerate Operation." DSSD 2010 Decennial Census Memorandum Series # F-03, October 6, 2009.

Kitts-Jensen, Ryan. (2010), "Specifications for Handling Replacement Cases Resulting from the Update Enumerate and Update Enumerate Reinterview Operations (Revision)" DSSD 2010 Decennial Census Memorandum Series # E-03R1, September 9, 2010.

Peterson, Sandy. (2011), "2010 Census: Nonresponse Followup Reinterview Quality Profile" DSSD 2010 Decennial Census Memorandum Series #Q-01, September 9, 2011.

Appendix A – RCC Results

For every table in this section, the RCC counts do not necessarily sum up to the national totals due to data records missing an RCC code. The table numbers in this section correspond to the table numbers of the national data presented in the body of this report. Additionally, there was no UE work done in Puerto Rico or the Philadelphia and Detroit RCCs, which is why they do not appear in the tables below. The RCC-level tables were only generated for selected tables from the report due to small counts across RCCs.

Table A2 shows the observation results for enumerators who were observed during UE and UE QC.

Table A2: Enumerator Observation Results by RCC

RCC	Observed		Pass		Fail		Other		Missing	
UE										
	#	%	#	%	#	%	#	%	#	%
National Totals	7,539	100.0	6,812	90.4	53	0.7	50	0.7	624	8.3
Boston	757	100.0	689	91.0	6	0.8	7	0.9	55	7.3
New York	566	100.0	532	94.0	5	0.9	1	0.2	28	5.0
Chicago	1,081	100.0	962	89.0	4	0.4	8	0.7	107	9.9
Kansas City	283	100.0	262	92.6	0	0.0	1	0.4	20	7.1
Seattle	274	100.0	257	93.8	2	0.4	0	0.0	15	5.5
Charlotte	459	100.0	437	95.2	1	0.2	2	0.4	19	4.1
Atlanta	684	100.0	637	93.1	0	0.0	1	0.2	46	6.7
Dallas	520	100.0	448	86.2	7	1.4	0	0.0	65	12.5
Denver	1,361	100.0	1,194	87.7	9	0.7	20	1.5	138	10.1
Los Angeles	934	100.0	848	90.8	10	1.1	8	0.9	68	7.3
UE RI										
	#	%	#	%	#	%	#	%	#	%
National Totals	2,249	100.0	1,981	88.1	31	1.4	18	0.8	219	9.7
Boston	198	100.0	168	84.9	3	1.5	1	0.5	26	13.1
New York	67	100.0	64	95.5	0	0.0	0	0.0	3	4.5
Chicago	127	100.0	109	85.8	0	0.0	2	1.6	16	12.6
Kansas City	100	100.0	89	89.0	2	2.0	3	3.0	6	6.0
Seattle	110	100.0	101	91.8	0	0.0	0	0.0	9	8.2
Charlotte	166	100.0	150	90.5	1	0.6	1	0.6	14	8.4
Atlanta	264	100.0	248	93.9	1	0.4	3	1.1	12	4.6
Dallas	235	100.0	220	93.6	4	1.7	0	0.0	11	4.7
Denver	456	100.0	371	81.4	16	3.5	0	0.0	69	15.1
Los Angeles	362	100.0	320	88.4	2	0.6	7	1.9	33	9.1

Source: Form D-1222 – Observation Checklist

Table A4 shows the distribution of RI selections across RCCs.

Table A4: RI Selections

RCC	UE	RI Eligible	Selected for RI					
			All	Random	Outlier	Supp.	Hard Fail	Vacant
National Totals	1,465,869	1,387,564	232,276	74,932	16,913	72	3,446	136,913
			16.7%	5.4%	1.2%	0.0%	0.2%	9.9%
Boston	198,064	191,419	25,908	8,113	2,487	1	0	15,307
			13.5%	4.2%	1.3%	0.0%	0.0%	8.0%
New York	99,358	97,246	9,861	6,934	1,072	0	0	1,855
			10.1%	7.1%	1.1%	0.0%	0.0%	1.9%
Chicago	236,204	227,488	24,856	11,533	2,334	1	275	10,713
			10.9%	5.1%	1.0%	0.0%	0.1%	4.7%
Kansas City	61,874	58,984	8,601	2,787	799	0	0	5,015
			14.6%	4.7%	1.4%	0.0%	0.0%	8.5%
Seattle	55,147	51,314	8,321	2,808	679	10	154	4,670
			16.2%	5.5%	1.3%	0.0%	0.3%	9.1%
Charlotte	110,476	106,655	18,613	4,397	1,009	15	73	13,119
			17.5%	4.1%	0.9%	0.0%	0.1%	12.3%
Atlanta	187,881	178,978	57,653	6,724	2,440	7	1328	47,154
			32.2%	3.8%	1.4%	0.0%	0.7%	26.3%
Dallas	140,166	131,577	16,696	7,322	1,409	1	682	7,282
			12.7%	5.6%	1.1%	0.0%	0.5%	5.5%
Denver	256,426	229,685	41,766	16,855	3,392	20	667	20,832
			18.2%	7.3%	1.5%	0.0%	0.3%	9.1%
Los Angeles	120,165	11,4110	19,992	7,450	1,292	17	267	10,966
			17.5%	6.5%	1.1%	0.0%	0.2%	9.6%

Source: Census MaRCS

Table A7 shows the distribution of RI final outcomes by RCC.

Table A7: RI Final Outcome Codes

RCC	Total RI	RI Final Outcomes							
		Pass	Soft Fail	Hard Fail	DK - Susp	DK – No Susp	LCO Relief	RI NI	None
National Totals	215,833	175,247	2,698	80	186	1,983	21,845	13,788	6
	100.00%	81.20%	1.25%	0.04%	0.09%	0.92%	10.12%	6.39%	0.00%
Boston	24,089	21,694	420	1	4	220	1,106	640	4
	100.00%	90.06%	1.74%	0.00%	0.02%	0.91%	4.59%	2.66%	0.02%
New York	8,447	6,625	16	-	6	16	1,124	660	-
	100.00%	78.43%	0.19%	0.00%	0.07%	0.19%	13.31%	7.81%	0.00%
Chicago	23,463	19,152	134	3	-	73	2,663	1,438	-
	100.00%	81.63%	0.57%	0.01%	0.00%	0.31%	11.35%	6.13%	0.00%
Kansas City	7,747	6,873	124	-	1	28	494	227	-
	100.00%	88.72%	1.60%	0.00%	0.01%	0.36%	6.38%	2.93%	0.00%
Seattle	7,900	5,985	137	33	11	118	610	1,006	-
	100.00%	75.76%	1.73%	0.42%	0.14%	1.49%	7.72%	12.73%	0.00%
Charlotte	18,044	17,138	119	3	20	96	423	245	-
	100.00%	94.98%	0.66%	0.02%	0.11%	0.53%	2.34%	1.36%	0.00%
Atlanta	54,139	48,099	838	21	27	248	2,876	2,029	1
	100.00%	88.84%	1.55%	0.04%	0.05%	0.46%	5.31%	3.75%	0.00%
Dallas	14,789	9,745	222	6	51	201	3,416	1,148	-
	100%	65.89%	1.50%	0.04%	0.34%	1.36%	23.10%	7.76%	0.00%
Denver	37,928	23,884	463	8	54	747	7,472	5,299	1
	100.00%	62.97%	1.22%	0.02%	0.14%	1.97%	19.70%	13.97%	0.00%
Los Angeles	19,277	16,049	225	5	12	236	1,656	1,094	-
	100.00%	83.25%	1.17%	0.03%	0.06%	1.22%	8.59%	5.68%	0.00%

Source: Census MaRCS

Table A14 shows the distribution of hard fail enumerators by RCC.

Table A14: Hard Fail Results

RCC	Total	Hard Fail	Non RI Fail
National Totals	33	32	1
Boston	1	1	0
New York	0	0	0
Chicago	2	2	0
Kansas City	0	0	0
Seattle	2	2	0
Charlotte	2	2	0
Atlanta	11	11	0
Dallas	5	5	0
Denver	6	5	1
Los Angeles	4	4	0

Source: Census MaRCS

Table A17 shows the distribution of DQC results by RCC.

Table A17: DQC Results

RCC	Total	Pass		Fail		Missing	
		#	%	#	%	#	%
National Totals	31,610	29,822	94.3	1,437	4.5	351	1.1
Boston	3,980	3,745	94.1	214	5.4	21	0.5
New York	2,001	1,971	98.5	18	0.9	12	0.6
Chicago	5,943	5,670	95.4	216	3.6	57	1.0
Kansas City	1,179	1,123	95.3	50	4.2	6	0.5
Seattle	1,410	1,287	91.3	96	6.8	27	1.9
Charlotte	1,824	1,731	94.9	80	4.4	13	0.7
Atlanta	1,951	1,841	94.4	91	4.7	19	1.0
Dallas	2,535	2,318	91.4	188	7.4	29	1.1
Denver	8,470	7,920	93.5	397	4.7	153	1.8
Los Angeles	2,317	2,216	95.6	87	3.8	14	0.6

Source: Form D-950 (UE QC)