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October 10, 2012

2010 CENSUS PLANNING MEMORANDA SERIES

No. 242

MEMORANDUM FOR The Distribution List

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

Subject: 2010 Census Coverage Measurement Person Matching and Followup Operations Assessment Report

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

If you have any questions about this document, please contact Susanne Johnson at (301) 763-1996 or Patricia Sanchez at (301) 763-9268.

Attachment

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[October 3, 2012]

Assessment Report for the 2010 Census Coverage Measurement Person Matching and Followup Operations

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

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EXECUTIVE SUMMARY

This report presents the assessment of the 2010 Census Coverage Measurement Person Matching and Followup Operations, including Person Computer Matching, Person Clerical Matching, and Person Followup. These operations provided data used to estimate person coverage for the 2010 Census.

The purpose of the 2010 Census Coverage Measurement Program was to evaluate the 2010 Census by providing estimates of net coverage error and components of census coverage (including omissions, erroneous enumerations, and correct enumerations) for housing units and persons in housing units in the Unites States and Puerto Rico in an effort to improve the 2020 Census, and censuses thereafter. The 2010 Census Coverage Measurement Program was designed to address problems identified with the Census 2000 Accuracy and Coverage Evaluation[1] Program in determining a person's Census Day residence, which resulted in not being able to adequately identify erroneous enumerations (many of which were found to be duplicates in the census). (Kostanich et al., 2004b) The 2010 Census Coverage Measurement Program expanded upon the 2000 Accuracy and Coverage Evaluation by collecting additional respondent-provided addresses where people lived or stayed around Census Day, conducting nationwide matching to identify duplication in the census, and measuring components of coverage error.

The Census Coverage Measurement Program excluded Remote Alaska. Coverage in group quarters facilities and persons residing in those facilities was also out of scope. Census Coverage Measurement operations were conducted in a probability sample of block clusters[2] in each state, the District of Columbia (DC), and Puerto Rico. The Population sample and Enumeration sample were the two samples used for dual system estimation employed by the Census Coverage Measurement program. The Population sample was derived from an independent listing of housing units (completely separate from the census) and independent enumeration of persons in those units (during the Census Coverage Measurement Person Interview). The source of the Enumeration sample is the census housing units and census person enumerations in housing units geocoded to the sample of block clusters selected for the Population sample. In order to identify which persons were correctly enumerated in the census, which persons were erroneously enumerated in the census, and which persons were omitted from the census, Census Coverage Measurement matched people enumerated by the census and rosters of people independently collected by the Person Interview. Field followup was also conducted when necessary to resolve match, duplicate, residence, or enumeration status.

Prior to conducting the Person Matching and Followup Operations, the Census Coverage Measurement Person Interview collected a roster of people living at each sample address on the day of the interview and rostered people who had lived at the sample address on Census Day (April 1, 2010) but were no longer there. This included people who lived there on both Census Day and

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[1] The 2000 Accuracy and Coverage Evaluation was the program that measured the coverage of Census 2000, similar to the 2010 Census Coverage Measurement program.
[2] A block cluster consists of one or more geographically contiguous census collection blocks.

Interview Day (nonmovers), people who had moved in after Census Day (inmovers), and people who had moved out after Census Day (outmovers). The Person Interview also probed for additional people who may have lived or stayed at the address that the respondent may not have originally included (people who may have been tenuously attached to the household). The Person Interview was designed to cast a wide net in capturing who may have lived or stayed at the sample address and then collected additional information that further activities could use to determine who really should have been included in the Population sample based on residence status guidelines that may have been too complex for the respondents to have interpreted correctly. This included collecting move dates, cycle patterns if people went back and forth between addresses, the address where each inmover lived on Census Day (inmover address), and additional addresses where each person rostered may have lived or stayed around Census Day (alternate addresses). Inmover and alternate addresses were also referred to as respondent-provided or other addresses.

The Person Computer Matching and Automated Processing included the activities listed below.

- Person data collected during the Person Interview were prepared for matching (including automated assignment of residence status).
- Respondent-provided addresses collected during the Person Interview were geocoded by the Geography Division's automated geocoding processing.
- Computer matching was conducted between people rostered in the Person Interview and census enumerations throughout the country.
- Computer matching was conducted to identify duplicates between census enumerations in the Enumeration sample and census enumerations throughout the country.
- Computer matching was conducted to identify duplicates within the sample block cluster for people rostered in the Person Interview.

The Person Clerical Matching and Coding included the activities listed below.

- The clerical matching staff used computer-assisted clerical matching techniques to geocode respondent-provided addresses from the Person Interview that needed further review following automated geocoding.
- The clerical matching staff assigned residence status codes to people rostered during the Person Interview that needed further review following the automated residence status coding process.
- During the Person Before Followup Clerical Matching, the clerical matching staff reviewed the computer matching results, searched for additional matches and duplicates in each search area (around the sample address, around any inmover or alternate addresses, and within the nationwide address), and updated codes and links as appropriate. Cases needing more information were sent to the Person Followup field operation.
- During the Person After Followup Clerical Matching, the clerical matching staff used information obtained during Person Followup interviews to attempt to resolve match, residence, enumeration, and duplication status.
- The person clerical coding and matching performed by the first level of National Processing Center matchers (technicians) underwent quality assurance verification by the second level of matchers (analysts).

The Person Followup data collection methods included establishing where the person <u>should</u> have been counted in the census (their Census Day residence) and collecting additional information on

alternate locations and addresses where the person could have been counted on Census Day. A sample of each interviewer's completed work underwent a reinterview.

Output files with the results from the Person Interview, Person Matching, and Person Followup operations were made available for the Census Coverage Measurement Estimation activities. Persons that remained unresolved were handled through statistical techniques for missing data.

Schedule and Costs

The clerical geocoding and residence status coding activities were completed on or before the planned dates, however the Before Followup Clerical Matching was completed five calendar days later than planned. The delay in Before Followup matching also delayed the Person Followup forms reaching the field, which gave interviewers less time to complete the cases. However, the workload was smaller than anticipated, so only one additional week was necessary to complete the fieldwork. As a result of the previous delays, the After Followup Clerical Matching was also delayed one week. In addition to clerical matching activities running late, additional resources (Census Bureau Headquarters staff in addition to the planned National Processing Center staff and overtime for Census Bureau Headquarters and National Processing Center staff) were also required for each phase of clerical matching (geocoding, residence status coding, and Before and After Followup Clerical Matching). Due to all of the complexities associated with the expansion of the 2010 Census Coverage Measurement program to collect respondent-provided inmover and alternate addresses, conduct nationwide matching, and measure components of census coverage the clerical operations were more demanding than originally planned. Many of the Census Coverage Measurement operations were cut from the 2008 Census Dress Rehearsal due to budgetary restrictions, thus these operations were not tested in a production environment. Further, predicting the impacts of nationwide matching based on site tests like those conducted for the 2006 Census Test and the 2008 Census Dress Rehearsal was problematic. Thus, it was difficult to estimate the amount and complexity of the 2010 Census Coverage Measurement Person Matching and Followup workloads.

Overall, the Person Followup operation was under budget by $6,370,758 (29.93 percent less than the estimated total cost of $21,287,848). Person Followup was under budget by $3,466,759 (22.58 percent less than the estimated production cost of $15,356,052) and Person Followup Reinterview was under budget by $2,903,999 (48.96 percent less than the estimated reinterview cost of $5,931,796). The main reason was the lower than estimated workload.

Person Computer and Clerical Matching Results

Unweighted results from the automated geocoding, automated residence status coding, person computer matching (including Before Followup Preprocessing), and the Before Followup and After Followup Clerical Matching are presented below. For simplicity, all the matching results discussed below will exclude Puerto Rico. These results are given from an operation standpoint; they do not reflect the final Census Coverage Measurement estimates of person coverage.

Prior to any computer matching or clerical review, the data from the Person Interview were processed through automated geocoding and automated residence status coding. Respondent-provided addresses had to be geocoded to determine where the address was located based on census geography. Census geography for these addresses was used to develop the search areas to look for

matches and duplicates for people with respondent-provided addresses. Geocoding was first attempted by the Geography Division using automated geocoding techniques. Addresses that were not successfully geocoded were then reviewed clerically. The Person Followup also asked respondents to provide additional places where a person could have been counted. All Person Followup respondent-provided addresses were clerically geocoded during After Followup Clerical Matching (there was no automated geocoding process for these addresses).

There were 51,980 inmover and alternate addresses collected in the Person Interview. There were an additional 27,059 respondent-provided addresses obtained from Person Followup. Based on the results of automated geocoding, search areas were identified for 65.41 percent of the Person Interview respondent-provided addresses (i.e., geocoded to a specific address on the Master Address File or geocoded to one or more blocks). Upon completion of After Followup Clerical Matching, 79.19 percent of the addresses from Person Interview and 75.44 percent of the addresses from Person Followup were successfully geocoded.

Using the additional residence information collected during the Person Interview, the automated residence status coding operation assigned a residence status code to each person rostered during the Person Interview to indicate the person's mover status (nonmover, inmover, or outmover) and whether or not the person should be included in the Population sample. To be included in the Population sample, the person must have been rostered in a housing unit that was eligible and selected for the Population sample (i.e., listed during the Independent Listing) and assigned a Population-sample residence status code. Any case that required additional review to determine the appropriate residence status was reviewed clerically. Cases requiring additional information to resolve residence status were sent to Person Followup and this information was reviewed during After Followup Clerical Matching to assign the final residence status code.

Upon completion of After Followup Clerical Matching, 92.51 percent of the 392,711 Person Interview people rostered in Population-sample housing units were assigned Population-sample residence status codes: 82.89 percent were nonmovers, 6.85 percent were inmovers, 0.36 percent were Population-sample outmovers, and 2.42 percent had unclassified residence status. There were fewer people for whom the residence status could not be determined after clerical review and followup (2.42 percent unclassified following After Followup) compared to the results of automated residence status coding (0.69 percent unclassified and 18.92 percent needing clerical review) and the results of clerical review prior to followup (5.48 percent unclassified). The After Followup Clerical Matching results also show that 7.49 percent of the people rostered in Population-sample housing units were assigned non Population-sample residence status codes.

Computer matching linked Person Interview people to census people throughout the country and also searched for duplicates between Enumeration-sample people and other census enumerations throughout the country. In addition to searching around the sample address (as was done for the 2000 Accuracy and Coverage Evaluation), the 2010 Census Coverage Measurement also conducted searches around any inmover or alternate addresses provided by the Person Interview or Person Followup respondents and conducted nationwide computer matching to identify matches and duplicates. During Before Followup Clerical Matching, the matching staff reviewed the computer matching results, searched for additional matches and duplicates in each search area, and updated links and codes as warranted by their review. During After Followup Clerical Matching, they

reviewed Person Followup forms to geocode respondent-provided addresses and assign final match codes and/or residence status codes.

Upon completion of After Followup Clerical Matching, 91.49 percent of the 363,290 Population-sample people were classified as matches, 0.09 percent were possible matches, 7.89 percent were nonmatches, and 0.53 percent were duplicates or possible duplicates of other Person Interview records. After clerical review and followup, there were fewer nonmatches, possible matches, and possible duplicates than after computer matching. The majority of the Population-sample people (85.41 percent) were matches in the sample search area and a smaller percentage were matches in an inmover search area (5.10 percent), an alternate search area (0.76 percent), or some other nationwide location that was not in an inmover or alternate search area (0.23 percent).

Upon completion of After Followup Clerical Matching, 83.51 percent of the 383,537 Enumeration-sample people were classified as matches, 0.02 percent were possible matches, 13.50 percent were nonmatches, and 2.97 percent were duplicates or possible duplicates. There were fewer nonmatches, possible matches, and possible duplicates after clerical review and followup than after computer matching. There were also more Enumeration-sample duplicates as a result of the After Followup clerical review (2.96 percent following After Followup compared to 1.92 percent prior to followup and 1.25 percent after computer matching).

Recall that for the 2010 Census Coverage Measurement Program, computer matching was expanded to include nationwide searches for matches and duplicates. Census people outside of the sample block cluster and surrounding blocks that were linked to either Person Interview or census people inside the sample block cluster during computer matching were referred to as nationwide links (or nationwide cases). After field followup and clerical review, if it was determined that the nationwide address corresponded to a respondent-provided address, then that served as confirmation that the two person records in distant locations (the record in the sample and the nationwide record) actually did refer to the same person.

Computer matching identified 46,423 nationwide links (i.e., a census person beyond the sample search area was matched (or possibly matched) to a Person Interview person or was part of a census duplicate (or possible duplicate) pair). Of those original nationwide links, 82.30 percent were confirmed (i.e., the nationwide census record corresponded to an inmover or alternate location for the person). Nearly all of the matches and duplicates from the nationwide computer matching were confirmed when there was a Person Interview respondent-provided address indicating that the person in the sample also lived or stayed at the nationwide address. After final clerical review, 11.12 percent of the original nationwide links were unlinked and not confirmed (i.e., it was determined that the records did not actually refer to the same person). The final disposition remained undetermined for 6.59 percent of the original nationwide links (i.e., Census Coverage Measurement was unable to determine whether the two records actually referred to the same person).

In addition to the match status, the 2010 Census Coverage Measurement Person Matching and Followup operations (which included nationwide searches to identify census duplication and the collection of additional residence information during the Person Interview and Person Followup interviews) determined an enumeration status for each Enumeration-sample person. The enumeration status indicated whether an Enumeration-sample person should have been counted in

the census based on the 2010 Census Residence Rule. Upon completion of After Followup Clerical Matching, 89.52 percent of the 383,537 Enumeration-sample people were correct enumerations, 4.48 percent were erroneous enumerations, and 6.00 percent were unresolved. There were fewer people with unresolved enumeration status after clerical review and followup (6.00 percent following After Followup) than prior to followup (17.67 percent) and after computer matching (22.29 percent).

Person Followup Results

Recall that the Person Followup workload was identified from the Person Matching Before Followup activities. There were 59,402 cases in the United States and Puerto Rico that required an interview about one or more people living at a Person Interview address and/or a census address, which was 80.98 percent of the anticipated workload of 73,357 cases. The actual Person Followup Reinterview workload was 8,447 cases, which was 76.76 percent of the anticipated workload of 11,004 cases.

There were 113,632 total people selected for followup, 34,774 Person Interview people and 78,858 census people (including nationwide matches and duplicates). There was an average of 1.9 followup people per case. The largest category of Population-sample people selected for Person Followup had unresolved residence status (49.01 percent). The majority of Enumeration-sample people selected for followup were nonmatched people (85.30 percent).

The noninterview rate for non-nationwide Person Followup cases was 6.1 percent. The 2000 Accuracy and Coverage Evaluation Person Followup had a noninterview rate of 0.2 percent (Balutis, 2011). There are many possible reasons for the increase in noninterviews including the increased time since Census Day for the 2010 Person Followup operation, changes in the assigning of outcome codes from the 2000 PFU to the 2010 PFU, increased census fatigue, and overall declining survey responses over the last decade. In addition to case-level outcome codes, each followup person in a case received a person-level outcome code. Stateside followup persons were considered complete 79.26 percent of the time.

Prior to the start of Person Matching, we had very little data to predict the magnitude of the nationwide cases so we estimated that nationwide cases would account for five percent of the Person Followup workload. With a total of 59,402 Person Followup cases, this would have been about 2,970 cases. Instead the nationwide workload was much larger than anticipated: there were 11,191 nationwide cases, which was about 19 percent of the total Person Followup workload.

The main residence questions in the Person Followup were the most important items for resolving residence or enumeration status. The majority of stateside followup people lived or stayed at the address where they were collected in either the Person Interview or the census enumeration (82.37 percent). Most alternate addresses collected in this operation were collected in Question 2 (Did *NAME* live anywhere else in 2010?): 47,950 addresses or 44.22 percent. The college alternate address question had yes responses for 15.68 percent of cases and the staying with relatives alternate address question had 5.13 percent yes responses. Questions 3 through 9 (all collecting alternate addresses) all had missing rates around 24 percent.

The average number of alternate addresses reported in the main questions per person for stateside is 0.70 addresses. For people with at least one alternate address reported in the main questions, the average number of addresses reported was 1.34 addresses. About 52.09 percent of people in Person Followup indicated having one or more alternate addresses. Most (37.12 percent) only had one alternate address and 12.33 percent reported two alternate addresses. By age, those 18-24 reported the largest percentages of alternate addresses, including 35.91 percent reporting one, 22.72 percent reporting two, and 22.72 reporting three alternate addresses. Also, 14.32 percent of people age 61 or older reported having two alternate addresses.

The majority of stateside Person Followup interviews were conducted in the English language (94.59 percent). Less than one percent of all interviews were conducted in languages other than English or Spanish (0.47 percent).

Person Computer and Clerical Matching Lessons Learned and Recommendations

- Clerical review was required to resolve many of the cases that could not be resolved by automated geocoding or automated residence status coding. Therefore, it is recommended that Census Coverage Measurement conduct further research to ensure that the data collected in the field (during Person Interview and Person Followup) can be easily and reliably used in post-data collection coding to increase the amount and accuracy of automated coding.

- The final person matching results show that the computer did well in linking records together, especially when inmover or alternate addresses were obtained from the Person Interview to confirm links beyond the sample search area. Therefore, it is recommended that Census Coverage Measurement:
  - Continue conducting nationwide searches for matches and duplicates as well as targeted searches around respondent-provided inmover and alternate addresses.
  - Determine if there is a timely way to incorporate the results of any clerical geocoding of Person Interview and/or Person Followup respondent-provided addresses into computer matching search areas.
  - Continue research to improve person computer matching and automated coding techniques. This research should address the quality/accuracy of suggested improvements and the expected impact on reducing the clerical coding workload.

- In general, the clerical matching tasks may have been too difficult for the newly-hired, first-level clerical matching staff (technicians) to learn in the timeframe given. In order to meet quality assurance standards, the expert clerical matching staff (analysts) had to verify a majority of the work conducted by the technicians. Therefore, it is recommended that Census Coverage Measurement investigate ways to simplify the clerical matching tasks, some suggestions are listed below (Gunnison, 2011).
  - Explore moving away from a single match/residence status code system to more discrete concepts using a series of codes to capture the concepts of interest.
  - Investigate an interactive visualization of how people within Census Coverage Measurement and census units interrelate.
  - Consider an interactive visualization using a graphical timeline to indicate where a person was living or staying at certain times.

- Consider integrating a web-based map viewing system into our clerical matching software.

- The amount of cases requiring clerical review and the high analyst verification rates for quality assurance purposes created a bottleneck between the technician and analyst review stages of clerical matching. This resulted in the need for additional resources (Census Bureau Headquarters staff and overtime) as well as a short delay in the completion of the clerical matching activities. This demonstrates the need to reduce the initial clerical workload (by improving the automated coding and computer matching activities) and the need to simplify the clerical matching activities so that less expert review is required.

- The Person Followup was conducted on paper forms, thus the data collected could not be used until the forms were shipped back from the field and then all data collected was clerically reviewed to assign final codes. Therefore, moving Person Followup to an electronic instrument to collect and transfer data would have positive impacts on person matching, as described below.
  - Automation would allow the potential to conduct automated geocoding, automated residence status coding and/or additional computer matching using the Person Followup data.
  - Automation would give matching quicker and easier access to Person Followup data and matching could more easily be conducted in multiple locations.

Person Followup Lessons Learned and Recommendations

- The Person Followup instrument should be automated. This would reduce the time needed to get a case to and from the field and would provide the followup results in electronic format, eliminating the need for data capture and operational controls of paper questionnaires. It would also simplify skip patterns for interviewers and respondents, making the interview process easier.

- If the Person Followup instrument is not automated, it is not necessary to print a Spanish translation for every stateside case. This will reduce printing costs and reduce the complexity of the Docuprint programming and testing. This will also simplify the data capture process and make the output files easier to interpret. Targeted Spanish printing or Spanish language job aids are some potential options to consider.

- The process of identifying a knowledgeable respondent needs to be simplified or the definition needs to be emphasized more in interviewer training. This will make the interviewer's job easier as well as helping the interviewer to find the best possible respondent, leading to better data quality.

- Consider allowing the Person Followup interview to be conducted via telephone. Since 24.36 percent of the stateside cases were completed by telephone, this suggests that interviewers did not have difficulty conducting interviews over the phone. A telephone phase could be implemented or interviewers could be given training and procedures in order to conduct an interview over the telephone.

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1 INTRODUCTION

1.1 Scope

The primary purpose of this assessment is to provide a record of the results of the 2010 Census Coverage Measurement (CCM) Person Matching and Followup (PMF) operations and provide information on how well the staff implemented the field data collection, computer matching, and clerical matching operations. This assessment will provide valuable data for the planning cycle for the 2020 Census and provide information on the successes and any issues encountered with the PMF operations and impacts to the 2010 CCM Program.

There were three components to the CCM PMF Operations -- Person Computer Matching, Person Clerical Matching, and Person Followup (PFU). These operations provided data used to estimate person coverage for the 2010 Census.

This assessment documents final volumes/rates and lessons learned for all aspects of the PMF Operations, including field work data collection and processing (keying questionnaires at the National Processing Center (NPC)), computer matching, clerical matching, Cost and Progress (C&P) Reporting System, and the software used for PMF operations, including Coverage Measurement Operations Control System (CMOCS), Docuprint, and the Person Matching, Review, and Coding System (PerMaRCS).

1.2 Intended Audience

This document is intended to be a review of the 2010 CCM PMF operations and should be used by anyone interested in the successes and issues that resulted from implementing the 2010 PMF operations. The program managers and staff responsible for planning the 2020 CCM should use this assessment for guidance on operational development for the 2020 PMF operations.

2 BACKGROUND

The purpose of the 2010 CCM program was to evaluate the 2010 Census by providing estimates of net coverage error and census coverage components (including omissions, erroneous enumerations, and correct enumerations) for housing units and persons in housing units in the United States (U.S.) and Puerto Rico in an effort to improve the 2020 Census, and censuses thereafter. The CCM Program excluded Remote Alaska. Coverage in group quarters (GQ) facilities and persons residing in those facilities was also out of scope. Since the CCM was an evaluation, its results did not affect the 2010 Census.

The 2010 CCM was a large, complex survey conducted independently of the 2010 Census. The 2010 CCM consisted of five sampling activities, five data collection activities, six matching activities, and separate estimation of the national housing unit coverage and coverage of the U.S. and Puerto Rico population as of Census Day (April 1, 2010). There were seven separate operation and system plans that describe the entire CCM process:

- CCM Sample Design Operation
- CCM Independent Listing (IL) Operation
- CCM Initial Housing Unit (IHU) Matching and Followup Operational Group
- CCM Person Interview (PI) Field Operation
- CCM Person Matching and Followup Operational Group
- CCM Final Housing Unit Matching and Followup Operational Group
- CCM Estimation Operation

CCM operations were conducted in a probability sample of block clusters[3] in each state, the District of Columbia (DC), and Puerto Rico. The Population sample (P sample) and Enumeration sample (E sample) were the two samples used for dual system estimation employed by the CCM program. The P sample is derived from an independent listing of housing units (completely separate from the census) and independent enumeration of persons in those units (during the PI). The source of the E sample is the census housing units and census person enumerations in housing units geocoded to the sample of block clusters selected for the P sample. In order to identify which persons in the CCM samples were correctly enumerated in the census, which persons were erroneously enumerated in the census, and which persons were omitted from the census, the CCM matched people enumerated by the census and rosters of people independently collected by the PI. Field followup was also conducted when necessary to resolve match, residence, and enumeration status.

Prior to conducting the PMF Operations, the PI collected a roster of people living at each sample address on the day of the interview and rostered people who had lived at the sample address on Census Day but were no longer there. This included people who lived there on both Census Day and Interview Day (nonmovers), people who had moved in after Census Day (inmovers), and people who had moved out after Census Day (outmovers). The PI also probed for additional people who may have lived or stayed at the address that the respondent may not have originally included (people who may have been tenuously attached to the household). The PI was designed to cast a wide net in capturing who may have lived or stayed at the sample address and then collected additional information that further activities could use to determine who really should have been included in the P sample based on residence status guidelines that may have been too complex for the respondents to have interpreted correctly. This included collecting move dates, cycle patterns if people went back and forth between addresses, the address where each inmover lived on Census Day (inmover address), and additional addresses where each person rostered may have lived or stayed around Census Day (alternate addresses). Inmover and alternate addresses were also referred to as respondent-provided or other addresses.

The Person Computer Matching and Automated Processing included the activities listed below.

- Person data collected during the PI were prepared for matching (including automated assignment of residence status).
- Respondent-provided addresses collected during the PI were geocoded by the Geography Division's (GEO) automated geocoding processing.

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[3] A block cluster consists of one or more geographically contiguous census collection blocks.

- Computer matching was conducted between people rostered in the PI and census enumerations throughout the country.
- Computer matching was conducted to identify duplicates between census enumerations in the E sample and census enumerations throughout the country.
- Computer matching was conducted to identify duplicates within the sample block cluster for people rostered in the PI.

The Person Clerical Matching and Coding included the activities listed below.

- Prior to reviewing the results of computer matching, the clerical matching staff used computer-assisted clerical matching techniques to geocode respondent-provided addresses from the PI that needed further review following automated geocoding.
- Also prior to reviewing the results of computer matching, the clerical matching staff assigned residence status codes to people rostered during the PI that needed further review following the automated residence status coding process.
- During the Person Before Followup (BFU) Clerical Matching, the clerical matching staff reviewed the computer matching results, searched for additional matches and duplicates, and updated codes and links as appropriate. Cases needing more information were sent to the PFU field operation.
- During the Person After Followup (AFU) Clerical Matching, the clerical matching staff used information obtained during PFU interviews to attempt to resolve match, residence, enumeration, and duplication status.

The person clerical matching performed by the first level of NPC matchers (technicians) underwent quality assurance (QA) verification by the second level of matchers (analysts).

The PFU questionnaires were created via the Docuprint technology at NPC. The questions included for each followup case varied depending upon the reason the case was being sent to followup. Note that a case could have been sent to followup for multiple reasons. The PFU data collection methods included establishing where the person <u>should</u> have been counted in the census (their Census Day residence) and collecting information on alternate locations and addresses where the person <u>could</u> have been counted on Census Day. A sample of each interviewer's completed work underwent a reinterview.

Output files with the results from the PI, Person Matching, and PFU operations were made available for the CCM Estimation activities. Persons that remained unresolved were handled through statistical techniques for missing data.

2.1 The Recommendation to Reduce Nonsampling Error in the 2010 Census Coverage Measurement Program

In September 2009, the Census Bureau implemented an initiative to reduce nonsampling error in the CCM program. To implement the required changes without requiring additional funds, the sample size for operations *after* the CCM IL was decreased and resulting surplus funds from the reduced workload were put towards approaches to reduce the nonsampling error. CCM IL was in the field at the time the initiative was put in place, and therefore no change was made to the IL sample.

To appropriately reduce the sample while maintaining appropriate controls, the Decennial Statistical Studies Division (DSSD) recommended reducing the P sample from 300,000 housing units in the U.S. and 15,000 in Puerto Rico to about 170,000 housing units and 7,500 housing units, respectively. Under this plan, the original sample sizes for Hawaii and for American Indian Reservations were unchanged to help the reliability of two relatively small race/origin domains: (a) Native Hawaiians and Pacific Islanders, and (b) American Indians living on reservations. The remaining housing unit sample was reduced, with the restriction imposed of a minimum target sample size of 1,000 housing units per state, by dropping whole block clusters from the initial sample. The 12,364 block clusters in the initial sample became 6,416 block clusters following the sample reduction as well as previously planned small-block cluster subsampling.

Based on the initiative, the proposed major changes to the CCM PMF operations included the following:

- Higher field work Quality Control (QC) rates for Person Followup – By increasing the QC rate, a higher quality product could be ensured. Initially the sample size for PFU Reinterview (RI) was approximately 10.0 percent of each PFU interviewer's workload and one initial observation per interviewer was required. The revised plan had a sample size for QC of approximately 15.0 percent of each interviewer's workload and an extra observation, in addition to the initial observations, for interviewers. It is difficult to measure if this actually helped improve quality, but there were only 102 failed RI cases (1.2 percent), which correspond to PFU cases completed by 84 PFU interviewers.

- Extra observations for PFU Interviewers – To help insure that the interviewers (both production and RI) knew how to complete the PFU cases correctly and to provide individual feedback to interviewers, so that he or she could correct erroneous actions and continue correct actions, the Crew Leaders (CLs) or Crew Leader Assistants (CLAs) observed each interviewer conducting an interview. All interviewers were to undergo initial observations as soon as possible after training. Initial observations were a continuation of training, rather than a test of the interviewer's ability. As part of the initiative to reduce nonsampling error in the CCM program, an extra observation was to be conducted on each interviewer approximately two weeks after the initial observation to ensure interviewers continued to follow correct procedures and interview correctly. Operationally this did not seem to work well, because most regions ran out of time before they could get the extra observation done due to the delay in sending work to the field and the short duration of PFU.

- Higher clerical matching review rates and analyst spot checks for Person Matching – The review rates of technicians' work by the analysts for clerical matching operations were increased and a review of the work of the less experienced analysts was implemented to ensure higher quality data. The initial and revised plans included a Sample Dependent Verification of technician's work to achieve a specified Average Outgoing Quality Limit (AOQL). The initial and final AOQL for each activity is given below. (Hartman, 2010)
    - Clerical Geocoding – AOQL was changed from 7.67 to 6.13 percent
    - Clerical Residence Status Coding – AOQL was changed from 7.36 to 6.13 percent
    - Person BFU Clerical Matching – AOQL was changed from 4.09 to 3.50 percent
    - Person AFU Clerical Matching – AOQL was changed from 9.20 to 6.13 percent

- Smaller employee-to-supervisor ratios for field operations – Fewer interviewers were assigned to each CL and fewer CLs were assigned to each Field Operations Supervisor (FOS). This should have ensured a greater control over the quality of the field work by allowing more monitoring of work at each level. The initial plan was to have eight interviewers/reinterviewers supervised by each (QC) CL, six CLs supervised by each FOS, and four QC CLs supervised by each QC FOS. The revised plan was to have six interviewers/reinterviewers supervised by each (QC) CL, four CLs supervised by each FOS, and two QC CLs supervised by each QC FOS.

It is difficult to measure if this actually helped improve quality, but based on feedback from regional managers, we believe it depended on the region and proximity of staff. If all the crew members were concentrated in one area as in smaller geographic regions, it seemed to work because staff could meet daily, in the larger regions the staff was very decentralized, so it made meeting oversight more difficult. Regional management had the prerogative to utilize their field supervisory staff in various ways depending on what was necessary in their jurisdictions to complete the operation.

- Personal visit interviewing for nationwide cases – The original plan was to interview nationwide cases by phone in a telephone center. The revised plan was to send nationwide cases out for a personal visit interview. By sending these cases out for personal visit interview, we were hoping to decrease the noninterview rate and hopefully improve data quality. In some instances, proxies might have been available in cases where the household moved or was unavailable. It is difficult to measure if this actually helped improve quality, since there are no historical results to compare. We did test contacting nationwide cases by telephone in 2006 in a limited site test and the nationwide people had a high level of unresolved residence status (Adams, Nichols 2007). The noninterview rate for nationwide cases was only 6.4 percent so this would appear to have been successful

For more information on the initiative to reduce nonsampling error in CCM, see Whitford, 2009.

2.2 Independence

A requirement to be able to use dual system estimation for producing the CCM coverage estimates is that census and CCM operations must be independent. Independence requires that the areas in the CCM sample remain unknown to the census. If those areas were to be known, and the census staff then treated those areas differently from the areas not selected for CCM, the CCM results would be compromised. Also, CCM staff could not work in areas they had previously worked in other similar census operations. For example, PFU interviewers could not be assigned cases in any block clusters that they had worked during census enumeration operations or in PI since they would have been in the position of judging their own work.

All Regional Census Center (RCC) CCM staff had access to CCM sample information. However, once they had access to the sample, these RCC CCM staff could not later work on any non-CCM Census operations. This applied to field staff and office staff.

Strict procedures were followed during the CCM field operations to ensure independence was not violated. See Monaghan, 2008 for more information on the independence rules. The rules listed in

this memorandum also included some provisions to ensure that CCM staff were not allowed to work QC operations in any geographical area where they had worked in the CCM production operation (e.g., a PFU interviewer could not work PFU and PFU RI in the same area.)

2.3 2010 Census Cycle Testing

2.3.1 2006 Census Test Census Coverage Measurement Person Matching and Followup

Coverage measurement was not part of the 2004 or 2005 Census Tests. Testing for CCM began in the 2006 Census Test and continued with the 2008 Census Dress Rehearsal; however the amount of testing was limited. In the 2006 Census Test, coverage measurement addressed the problems identified with the Census 2000 Accuracy and Coverage Evaluation (A.C.E.) program and began testing new methods to measure the components of census coverage. During the 2000 A.C.E., the PI and PFU interviews were ineffective in determining a person's Census Day residence. This resulted in the A.C.E. not being able to adequately identify erroneous enumerations, many of which were found to be duplicates in the census (see Kostanich et al., 2004b). Therefore, the sole purpose of coverage measurement in the 2006 Census Test was to develop and test the CCM survey person phase operations – data collection and matching – with an aim at improving coverage measurement methods. The 2006 CCM plans included conducting an evaluation on whether the new methods were successful in determining a person's Census Day residence. No testing of the CCM housing unit phase operations was conducted. The coverage measurement operations for the 2006 Census Test were not designed to evaluate the coverage of the 2006 Census Test.

2.3.2 2008 Census Coverage Measurement Person Matching

Originally the plan was to do a complete dress rehearsal of all CCM person and housing unit operations in 2008 (Vitrano, 2007a). Due to budget shortfalls while the Census Bureau was operating under a continuing resolution at the start of the 2008 fiscal year, it became necessary to cancel many census and CCM operations for the 2008 Census Dress Rehearsal and delay "Census Day" to May 1, 2008 (Vitrano, 2007b). Additionally, the Census Bureau decided to descope CCM from the Field Data Collection Automation contract to reduce risk to the 2010 Census operations. The Census Bureau's Technologies Management Office (TMO) was tasked with the responsibility for the CCM field data collection systems and software development, known as CMOCS, as well as with developing the PI and Reinterview automated data collection instruments (see Angueira 2008). The only CCM operations included in the 2008 Census Dress Rehearsal were the IL, IHU Computer Matching, and IHU BFU Clerical Matching. The results of this test allowed the Census Bureau to develop, refine, and improve our IL processes and procedures for a more accurate decennial census.

Due to these changes, the PI operation was significantly delayed for the 2008 Census Dress Rehearsal. This delay necessitated revising the 2008 CCM Person Matching plans in order to complete the 2008 PerMaRCS development and testing cycle without introducing significant risk into the 2010 PerMaRCS development and testing cycle.

There were significant changes for the 2008 PerMaRCS based on lessons learned from 2006. In order to evaluate the effectiveness of those changes and to determine whether additional changes

should be made for the 2010 PerMaRCS, we implemented a two-phase approach to inform the 2010 PerMaRCS requirements, which needed to be completed by July 2009.

<u>2008 CCM Person Matching – Phase 1</u>

- *Goal* – to evaluate significant changes in the 2008 clerical processes and workflow (i.e., Clerical Geocoding and Clerical Residence Status Coding stages, QA batching/processing, new PFU Universe criteria, AFU check-in and batching) in "production" environment
- *Data Source* - use 2006 PerMaRCS data (translated into 2008 format) in the 2008 clerical "production" environment
- *Activities* - all PerMaRCS stages, including sending progress data to C&P and PFU data to Docuprint (but no other systems)
- *Timing* - approximately the time frame originally slotted for clerical matching with a one month delay of some activities (January – May 2009)

<u>2008 CCM Person Matching – Phase 2</u>

- *Goal* – to evaluate pre-clerical matching data processing (was the data coming from PI and census what we expected and was everything working properly to get this data processed and loaded into computer and clerical matching) and to identify and resolve the impact of any unexpected/ unanticipated data-specific issues (such as unexpected values) on the clerical matching system
- *Data Source* – 2008 PI and Census data
- *Activities* – PI and census data preparation and computer matching, automated alternate address geocoding, maps, PerMaRCS pre-processing, and limited clerical matching through BFU
- *Timing* – after receiving data from the 2009 PI operation and prior to the start of the 2010 CCM Housing Unit operations (June – September 2009)

2.3.3 2008 Census Coverage Measurement Person Followup Mini-Operational Tests

Although the PFU questionnaire and operation were tested in the 2006 Census Test, findings revealed that changes were needed to the PFU instrument and training prior to the 2010 PFU. However, since the CCM PFU operation was dropped from the 2008 Census Dress Rehearsal, in order to assess specific changes and determine if any further changes were required for the 2010 Census, DSSD conducted a reduced-scope field test for the PFU questionnaire in March 2009. Based on the results of the March 2009 test, new changes were made to the PFU questionnaire and an additional test was conducted in August 2009.

The main goal of these operational tests was to test changes to Section A – Introduction of the PFU questionnaire, which includes questions to help the interviewer identify either a knowledgeable respondent who knows the followup person or three knowledgeable respondents who can verify if the followup person did not exist. In addition, minor layout changes to the Cover Page, Person Questions (Section C), and the Record of Visits section were tested.

To conduct the March 2009 test, 250 households were selected from recently expired sample from the Current Population Survey (CPS). People who had recently moved into or out of the CPS sample households were targeted. Due to insufficient name data and safety issues, only 184 cases were sent to the field (143 in Washington, DC and Fairfax County, VA; 41 in Louisville, KY).

Interviewers for this test were comprised of nine regular Census Bureau Headquarters and NPC employees who were not familiar with the PFU operation. Each interviewer was paired with an observer for each day of interviewing. There were 11 observers who were also from Census Bureau Headquarters and NPC. The majority of the observers had participated in the development of the PFU questionnaire.

To conduct the August 2009 test, the sample included 424 households from the recently expired sample of the CPS. People who had recently moved into or out of the CPS sample households were targeted. Due to insufficient name data, only 391 households remained. Of these, 286 cases were sent to the field (159 around Washington, D.C. in the suburbs of Virginia, and Maryland; 127 in Long Island, NY). Interviewers for this test were eight Census Bureau Headquarters employees who were not familiar with the PFU operation. There were 11 observers who were also from Census Bureau Headquarters and NPC. Each interviewer was paired with an observer for each day of interviewing. The majority of the observers had participated in the development of the PFU questionnaire.

For more information on the findings of the PFU mini-operation test, see Donnalley, 2009a and Donnalley, 2009b.

2.4 Person Matching and Followup Operations Software and Systems

Several software and systems were developed to implement and manage the PMF Operations.

The primary software and systems for person clerical matching included the following:

- PerMaRCS software
- Software/systems with which PerMaRCS software interfaced, such as the data preparation, computer matching, and automated geocoding software.

The primary software and systems for PFU included the following:

- CMOCS
- PerMaRCS software
- Docuprinting
- ATAC
- Data Capture
- Software/systems with which CMOCS software interfaced, such as the Decennial Applicant, Personnel and Payroll System (DAPPS) software.

Testing for these systems was conducted by the software developers, Alpha testers in DSSD, Beta testers in the Decennial System and Contract Management Office, Census Bureau Headquarters staff, NPC staff, and/or Census Bureau regional staff.

For additional details see Appendix C.

3 METHODOLOGY

3.1 Questions to be Answered

The focus of this assessment is to assess how efficient the PMF operations were, and to indicate how well the operations did collecting the information needed to make CCM a success. The following questions will be answered by this assessment.

3.1.1 Schedule - How did actual start and completion dates compare to planned start and completion dates?

Data from the Decennial Master Activity Schedule was used to assess how the PMF operations actual dates compared to planned dates.

3.1.2 Costs – Was the operation over or under budget?

C&P data were used to assess how the actual operational costs compared to the budgeted costs.

3.1.3 Productivity Rates

C&P data were used to analyze the effort required to complete a single unit of work (a completed followup case) in terms of work hours and mileage charged.

3.1.4 Staffing - What was the number of field staff authorized and trained?

Staffing authorizations provided an upper limit for hiring in each RCC. RCC staff was then able to hire for each position at their discretion based on regional implementation plans. We will present the difference between the staffing authorizations and hired staff.

Person Computer Matching

Data from the 2010 PerMaRCS database tables were used to analyze all Person Computer Matching questions. The 2010 PerMaRCS database tables contain the results of person matching.

3.1.5 How many persons were computer matched, possibly matched, and remained nonmatched between the Census Coverage Measurement Person Interview rosters and the Census Unedited File?
How many duplicates did the computer find within the Census Coverage Measurement Person Interview rosters, within the block cluster?
How many duplicates did the computer find within the Census Unedited File?

Computer Matching results are given by search area for PI and census people separately. Each person's match and duplication status was reflected in the match code, which categorized the person as a match, possible match, nonmatch, duplicate, or possible duplicate.

3.1.6 What is the distribution of number of duplicates found per census person?

Computer Matching results are given for census duplicates and possible duplicates by total, none, one, two, or three or more duplicates or possible duplicates.

3.1.7 What is the residence status assigned for each Person Interview person[4](e.g., nonmover, inmover, unresolved, etc.)?

Automated Residence Status Coding results are given for P-sample and Non P-sample residence status codes.

3.1.8 What is the enumeration status assigned for each E-sample person[5] (e.g., correct, erroneous, unresolved)?

Computer Matching results are given for correct, erroneous, and unresolved enumerations.

3.1.9 How many alternate addresses were attached to Person Interview people (from Person Interview)?
How many alternate addresses were geocoded during automated geocoding?

Automated Geocoding results are given for alternate addresses (i.e., other addresses) collected during PI by level of geocoding.

3.1.10 What is the distribution of the number of alternate addresses attached to people?

Preprocessing results of the number of other addresses reported for PI people are given by total, none, one, two, or three or more attached addresses.

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[4] PI person is a person rostered during the PI operation (includes P-sample people and non P-sample people).
[5] E-sample person is a person enumerated during the census in a housing unit selected for the E sample.

Person Clerical Matching

3.1.11 How many persons were clerically matched, possibly matched, and remained nonmatched between the Census Coverage Measurement Person Interview rosters and the Census Unedited File?
How many duplicates did the clerical matchers find within the Census Coverage Measurement Person Interview rosters, within the block cluster?
How many duplicates did clerical matchers find within the Census Unedited File, by the locations of the duplicate?

BFU and AFU results are given by search area for PI and census people separately. Each person's match and duplication status was reflected in the match code, which categorized the person as a match, possible match, nonmatch, duplicate, or possible duplicate.

3.1.12 What is the distribution of number of duplicates found per census person?

BFU and AFU results are given for census duplicates and possible duplicates by total, none, one, two, or three or more duplicates or possible duplicates.

3.1.13 What is the residence status assigned for each Person Interview person[6] (e.g., nonmover, inmover, unresolved, etc.)?

BFU and AFU results are given for P-sample and Non P-sample residence status codes.

3.1.14 What is the enumeration status assigned for each E-sample person[7] (e.g., correct, erroneous, unresolved)?

BFU and AFU results are given for correct, erroneous, and unresolved enumerations

3.1.15 How many followup notes did clerical matchers enter?

The number of followup notes are given for linked and unlinked PI and census persons.

3.1.16 How many block clusters went to outlier review?
What kinds of block clusters were sent to outlier review?

The number of block clusters selected for outlier review are given by outlier review category.

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[6] PI person is a person rostered during the PI operation (includes P-sample people and non P-sample people).
[7] E-sample person is a person enumerated during the census in a housing unit selected for the E sample.

3.1.17 How many census persons were coded insufficient information for followup and what was their match status?
How many Person Interview persons were coded insufficient information for followup?

AFU results for people with insufficient information for followup are given for PI and census people separately. Each person's match and duplication status was reflected in the match code, which categorized the person as a match, possible match, nonmatch, duplicate, or possible duplicate.

3.1.18 How many alternate addresses were attached to Person Interview and E-sample people, by source (Person Interview or Person Followup)?
How many alternate addresses were geocoded during each phase?
How confident were we in the search areas for each geocoded address?

AFU results are given for alternate addresses (i.e., other addresses) collected during PI and PFU by level of geocoding. For inmover addresses attached to PI inmovers, AFU results regarding how confident we were that we were searching in the correct location for the person are also given.

3.1.19 What is the distribution of the number of alternate addresses attached to people?

AFU results of the number of other addresses reported for PI and census people are given by total, none, one, two, or three or more attached addresses.

3.1.20 What was the disposition of nationwide matches and duplicates (e.g., confirmed, nonconfirmed, unresolved)?

AFU results are given for each link originally identified in the nationwide computer matching operation.

Person Followup

3.1.21 How many block clusters, cases, and persons were sent to Person Followup?

Using information from the PerMaRCS Docuprint input files and PerMaRCS output files, we present the block clusters, cases, and person workloads for PFU.

3.1.22 What types of cases were sent to Person Followup?

Using information from the PerMaRCS Docuprint input files, we present the PI case types, census case types, nationwide case types, and address case types for PFU.

3.1.23 What is the distribution of respondent type and what is the distribution for the number of knowledgeable respondents needed to complete the cases?

Using information from the PFU data capture output files and CMOCS data, we present the respondent classification for PFU. The respondent classification collected on the PFU questionnaire

grouped respondents into nonproxy (single respondent), proxy (single respondent), and multiple respondents (these could be nonproxies, proxies, or both).

3.1.24 What is the noninterview rate for Person Followup, by non-nationwide and nationwide cases?

Using information from the PFU data capture output files and CMOCS data, we present the outcome codes for PFU. Outcomes are grouped into complete interviews, partial interviews, and noninterviews.

3.1.25 How many cases were sent for a nationwide followup interview?

Using information from the PerMaRCS Docuprint input files, we present nationwide cases and nationwide person workloads for PFU.

3.1.26 How many people did not go to Person Followup as a result of interviewing census-only units in Person Interview?

Census-only units sent to PI are census addresses in the CCM sample block cluster that are valid housing units and missed by the CCM IL or units that are actually located outside the CCM sample block cluster (in a surrounding block).

Using information from the PerMaRCS output files, we present person counts.

3.1.27 What are the missing data rates for key questions in the Person Followup?

The main residence questions are the most important for resolving residence or enumeration status for a person. PFU data capture output files as well as PerMaRCS Docuprint input files were used to determine the missing data for these questions.

3.1.28 How many interviews used the Spanish-language Person Followup questionnaire pages?

All Puerto Rico questionnaires were printed in Spanish only. This question focuses on how often the Spanish translation was used in stateside interviews. The PFU data capture output files are used to determine when the Spanish-language questionnaire was used for Sections D and E (case-level sections), for Sections A and C (person-level sections), and Section B (pair-based section). The language in which most of the interview was conducted is also reviewed for both stateside and Puerto Rico.

3.2 Methods

The assessment questions listed in Section 3.1 were answered by gathering and/or tallying information from the PMF operations production files, C&P reports, Decennial Master Activity Schedule data, staffing tallies, and lessons learned documents and debriefings. The data is presented as totals and broken out by stateside and Puerto Rico. Some stateside statistics are also broken out

into RCC totals. When appropriate, results are presented by stage of clerical matching (BFU vs. AFU); non-nationwide and nationwide PFU cases; and by demographics.

The C&P System served as the primary management reporting system for all 2010 Census field operations monitoring progress and accounting for expenditures. The C&P System provided high-level daily summary reporting for Census Bureau Headquarters and RCC staff to monitor the progress of the operation. The C&P System retrieved, summarized, stored, and reported operational data from source systems, primarily the DAPPS and the TMO's CMOCS. Source data also included the Decennial Management Division (DMD) cost model and the Field Division (FLD) progress goals. The FLD production progress goals provided by the FLD budget office were used to determine weekly "expected" percentages of workload and cost goals for the RCCs and Local Census Offices (LCOs).

Source data were pulled from different systems at different times and depending on the system, the data may have been refreshed regularly, such as daily or weekly, or periodically at designated times. This variation required that algorithms be written to ensure that when the data were pulled into C&P, the data for all prior days were reflected in the reports. Upon release of the C&P system, the algorithm for "Progress as of Date (from NPC)" in the C&P system had to be corrected to ensure all data prior to the current date were captured.

C&P reports were used to provide updates to monitor the workloads, workflow, and costs of the operations. Details of the C&P reports used in this assessment are provided in Section 3.2.2.1 on page 15.

The Decennial Master Activity Schedule data was used to compare actual start dates to planned dates.

Since PFU was a paper-based operation, automation implementation dealt with the systems used to track and process the questionnaires. Details on these systems are provided in Appendix C.

All results in this report are given from an operation standpoint and do not reflect the final CCM estimates of person coverage[8]. These results reflect unweighted data, thus no statistical significance testing was conducted and no inferences to the general population are intended.

3.2.1 Person Computer Matching and Person Clerical Matching

The Person Computer and Clerical Matching summary statistics presented in this report are based on the analysis of data from the 2010 PerMaRCS database tables. Each table in the Person Computer Matching Results and Person Clerical Matching Results sections has the data source listed in the footnote. The 2010 PerMaRCS database tables contain the results of person matching. These tables

[8] After the person matching activities, there were multiple processing steps, including CCM characteristic imputation, weight trimming, noninterview adjustment, first-stage ratio adjustment, and final estimation.

include: Cluster Control, PI Address, Census Address, PI Person, Census Person, PI Person Coding History, Census Person Coding History, PI Other Address, Census Other Address, PI Other Address Person, and Census Other Address Person.

3.2.2 Person Followup

The PFU summary statistics presented in this report to answer the PFU assessment questions are based on the analysis of the PFU C&P reports, output files from PerMaRCS and data capture results. Files are listed below. Each table in the Results Section has a data source listed in a footnote.

3.2.2.1 Person Followup Cost and Progress Reports

The C&P System included eleven CCM PFU/PFU RI reports and two graphs. The following four reports were used to answer the questions in this assessment:

- *Preliminary Total Cost*
- *Current Employee Cost – Training*
- *Current Employee Cost – Field Work*
- *PFU Production and RI Cases Overview*

Expected FLD progress goals in the C&P reports for CCM PFU were based on weekly estimates of work to be completed for each Friday during the operation.

3.2.2.2 Person Clerical Matching Person Followup Docuprint Input Files

Each day during BFU Person Clerical Matching, PerMaRCS identified the PFU cases that needed to go to followup. To create the PFU questionnaires, Docuprint input files were output from PerMaRCS. These included five file types – PI Address, PI Person, Census Address, Census Person, and a PFU Case file. Each PFU case had at most one PI address and at most one census address as well as all PI and census people associated with those addresses.

3.2.2.3 Person Clerical Matching Output Files

Following AFU Person Clerical Matching, a final version of all tables was output from PerMaRCS. Tables used in the PFU section of this assessment include PI Person, Census Person, Cluster Control, and PFU Case output files. The PFU Case output file is a final version of the PFU Case Docuprint input file.

3.2.2.4 Person Followup Keyed Data Output Files

PFU questionnaire output from data capture was delivered in seven different file types – Person Followup Case Level Keyed Data Stateside, Person Followup Case Level Keyed Data Puerto Rico, Person Followup Pair Level Keyed Data Stateside, Person Followup Pair Level Keyed Data Puerto Rico, Person Followup Person Level Keyed Data Stateside English, Person Followup Person Level Keyed Data Stateside Spanish, Person Followup Person Level Keyed Data Puerto Rico. Case level data stateside and pair level data stateside include responses from both the English and Spanish-

language sections. Person level data is separated into an English-language file and a Spanish-language file based on the side of the questionnaire where the data were recorded.

3.2.2.5 Coverage Measurement Operations Control System Oracle View

CMOCS data was stored in oracle tables. A view of this data was created for DSSD. This data was updated in real time when accessed by DSSD. A copy of this data obtained following the end of the operation was used in this assessment. Outcome codes and respondent classification were used when no value had been keyed from the PFU questionnaire.

4 LIMITATIONS

This section discusses the assumptions and limitations for this report.

4.1 Person Computer and Clerical Matching

- All results in this report are given from an operation standpoint and reflect unweighted data, thus no inferences to the general population are intended.
- A complete history of when geocodes were assigned to each respondent-provided address was not maintained in the PerMaRCS tables used for this analysis. Therefore, a distinction could only be made between geocodes assigned prior to clerical matching (i.e., from automated geocoding) and those assigned as of the end of clerical matching (i.e., after AFU Clerical Matching was completed). Further, the confidence in the search areas for these other addresses was only needed for inmover addresses (and thus was not captured for other respondent-provided addresses). Therefore, the following questions from the PMF Assessment Study Plan were modified as follows:

    - Original - How many alternate addresses were geocoded during each phase? How confident were we in the search areas for each geocoded address?

    - Modified - How many alternate addresses were geocoded during automated geocoding? (See Section 5.9.) How many alternate addresses were geocoded during clerical matching? How confident were we in the search areas for inmover addresses? (See Section 5.18.)

4.2 Person Followup

- All results in this report are given from an operation standpoint and reflect unweighted data, thus no inferences to the general population are intended.
- Data on stateside cases could have been collected on either the English-language or the Spanish-language side of the questionnaire for each person in each case. In some cases there were data collected on both the English-language and Spanish-language sides. This data may duplicate or contradict each other. For this reason, questions with a “Yes” or “No” answer were combined, conflicting “Yes” and “No” responses were assigned a “Yes”, conflicting responses where one response was a “Don’t Know/Refused” were assigned to the “Yes” or “No” response. All other questions had the English-language and Spanish-language data

reviewed independently. Because of this, those tables (i.e., English) may contain data that duplicates or contradicts the data in the associated tables (i.e., Spanish).

- Because of the way the questionnaire was designed, respondent provided addresses can not be directly linked to questions about other relative address (Q4), military address (Q5), job address (Q6), seasonal home (Q7), or any other place (Q8).

5 RESULTS

5.1 Schedule - How did actual start and completion dates compare to planned start and completion dates?

5.1.1 Person Followup Schedule

PFU was scheduled from January 28, 2011 through March 19, 2011. Per a change request (CR), initiated by DSSD, the Baseline Finish Date was changed to March 26, 2011. The PFU operation started as scheduled and finished March 26, 2011.

PFU Reinterview (PFU RI) was scheduled from February 4, 2011 through March 26, 2011. Per a CR, initiated by DSSD, the Baseline Finish Date was changed to April 2, 2011. The PFU RI operation started as scheduled and finished April 2, 2011.

The baseline finish dates for PFU and PFU RI were extended due to delays in the Person BFU Clerical Matching. Since PFU cases were created following matching, the delay in matching also delayed the forms reaching the field, which gave interviewers less time to complete the cases, however, the workload was smaller than anticipated, so only one additional week was necessary to complete the fieldwork.

Please see Table 1 for the planned and actual dates the field training was conducted.

Table 1
The 2010 Census Coverage Measurement Person Followup Operation
Production and Reinterview Training Schedule

	Person Followup				Person Followup Reinterview			
Training	**Planned**		**Actual**		**Planned**		**Actual**	
	Start	End	Start	End	Start	End	Start	End
Field Operations Supervisors	1/3/2011	1/7/2011	1/3/2011	1/7/2011	1/5/2011	1/28/2011	1/5/2011	1/28/2011
Crew Leaders	1/13/2011	1/19/2011	1/13/2011	1/19/2011	1/5/2011	1/28/2011	1/5/2011	1/28/2011
Interviewers/ Crew Leader Assistants	1/25/2011	1/27/2011	1/24/2011	1/27/2011	1/5/2011	1/28/2011	1/5/2011	1/28/2011

Source: Decennial Master Activity Schedule

There were 25 schedule CRs to the Master Activity Schedule (MAS) implemented for the PFU operation. The CRs included date changes, predecessor/successor changes, activity name changes, deletes, and logic corrections. Activity lines affected by the CRs were those of PFU, PerMaRCS, Clerical Geocoding (CGC), Clerical Residence Status Coding (RSC), and Quality Assurance Profile. Also affected were materials, geocoding, testing, and training. There were no known issues or risks associated with implementing these CRs.

5.1.2 Person Matching Schedule

The CCM Person Matching operations were conducted as shown in Table 2.

Table 2
The 2010 Census Coverage Measurement Person Matching Operation
Person Matching Schedule

Matching Activities	Planned		Actual	
	Start	End	Start	End
Clerical Geocoding and Residence Status Coding Training	10/6/2010	11/12/2010	10/22/2010	11/19/2010
Clerical Geocoding – Wave 1	10/21/2010	12/23/2010	10/21/2010	12/17/2010
Clerical Geocoding – Wave 2	11/4/2010	12/23/2010	11/22/2010	12/17/2010
Residence Status Coding - Wave 1	11/12/2010	12/23/2010	10/25/2010	12/23/2010
Residence Status Coding - Wave 2	11/12/2010	12/23/2010	12/23/2010	1/6/2011
Clerical Geocoding – Wave 3	12/7/2010	1/7/2011	12/6/2010	12/23/2010
Residence Status Coding - Wave 3	12/7/2010	1/7/2011	12/7/2010	1/6/2011
Before Followup Clerical Matching Training	1/3/2011	1/14/2011	1/4/2011	1/14/2011
Before Followup Clerical Matching	1/18/2011	2/25/2011	1/13/2011	3/2/2011
After Followup Clerical Matching Training	2/7/2011	3/11/2011	3/8/2011	3/28/2011
After Followup Clerical Matching	2/25/2011	4/15/2011	3/3/2011	4/22/2011

Source: Decennial Master Activity Schedule
NOTE: CRs were prepared to allow the changes for activities running late and to adjust the remaining schedule as needed.

The clerical geocoding and residence status coding activities were scheduled from October 21, 2010 through January 7, 2011. These activities were completed on or before the planned dates. However, it should be noted that this required additional resources (Census Bureau Headquarters staff in addition to the planned NPC staff and overtime for Census Bureau Headquarters and NPC staff). The BFU Clerical Matching was scheduled from January 18, 2011 through February 25, 2011, however this activity was not actually completed until March 2, 2011 (five calendar days later than

planned). This resulted in a delay of the completion of PFU and AFU Clerical Matching. AFU was conducted March 3, 2011 through April 22, 2011 (finishing one week later than planned). Additional resources (Census Bureau Headquarters staff and overtime) were also required for BFU and AFU Clerical Matching.

5.2 Costs – Was the operation over or under budget?

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

The CCM PFU operations were under budget. The DMD budget estimates assumed various factors. These assumptions were based on the results of prior field operations, as well as standardized and operation specific factors.

Assumptions included in the budget estimates, that were based on prior field operation results included: production rate per hour, field work hours per day, field work miles per day, training hours per day, and training miles per day. Standardized factors included salary, salary application rates, and mileage reimbursement rates. Operation specific factors included workload estimates and number of production days. Combining these factors as follows, the budget proportions were estimated:

Total Cost = *Field Work Cost + Training Cost + Mileage Cost + Per Diem and Other Costs*

Field Work Cost is the cost of non-training wages and *Training Cost* is the cost of wages incurred during training hours, both excluding mileage. *Mileage Cost* is the total reimbursed mileage cost incurred during field work and training. *Per Diem and Other Costs* are the M&IE, lodging cost, telephone costs and other expenses incurred during field work and training travel.

As can be seen from the above equations, costs depend on many factors. These factors must be considered when comparing budget estimates to actual costs. For instance, when comparing training budget estimates to actual training costs, differences could be caused by either differences in the number of training staff, number of training days, training hours per day, salary rate, salary applications, or combinations of these. This document will attempt to explain why actual cost components varied from the budget estimate, whenever possible. In some instances, the data required to identify precise reasons for variation was not available or does not exist.

Table 3 provides the total budget and actual expenditures for the four components of total cost. A more detailed analysis of each component follows.

Table 3
The 2010 Census Coverage Measurement Person Followup Operation
Cost by Component

Component	Budgeted Cost	Actual Cost	Difference of Budgeted to Actual Cost	Percent Over/Under Spent
Total	$21,287,848	$14,917,090	$6,370,758	29.93
Field Work Cost	$13,092,537	$8,178,392	$4,914,145	37.53
Training Cost	$2,656,808	$2,143,746	$513,062	19.31
Mileage Cost	$2,614,832	$3,773,157	($1,158,325)	(44.30)
Per Diem and Other Costs	$2,923,671	$821,795	$2,101,876	71.89

*Data reflected is for both the PFU and PFU RI operations combined.
†Values in ( ) denote values over budget.
Source: Person Followup C&P Reports: Preliminary Total Cost ; Current Employee Cost – Field Work; Current Employee Cost – Training
Note: Totals may not sum exactly due to rounding.

Overall, the PFU operation was under budget by 6.4 million dollars. As described below, this savings resulted mainly because the actual workload for this operation was much lower than estimated (80.98 percent of the expected workload). Still, the PFU operation was more efficient than expected, using fewer hours per case than budgeted (see Table 10).

5.2.1 Census Coverage Measurement Person Followup Cost Analysis

In this section, total cost is defined as all costs incurred during the operation. These costs, as defined in following sections, are field work cost, training cost, mileage cost, and Per Diem and other costs.

Table 4 provides the total budgeted and actual costs by position for both PFU and PFU RI.

Table 4 **The 2010 Census Coverage Measurement Person Followup Operation** **Cost by Position**				
Position	Budgeted Cost	Actual Cost	Difference of Budgeted to Actual Cost	Percent Over/Under Spent
Total	$21,287,848	$14,917,090	$6,370,758	29.93
Census Coverage Measurement Person Followup				
Subtotal – Person Followup	$15,356,052	$11,889,293	$3,466,759	22.58
Interviewer	$8,034,248	$6,592,932	$1,441,316	17.94
Crew Leader Assistant	$1,912,737	$925,635	$987,102	51.61
Crew Leader	$3,216,077	$3,130,453	$85,624	2.66
Field Operations Supervisor	$2,192,990	$1,240,273	$952,717	43.44
Census Coverage Measurement Person Followup Reinterview				
Subtotal – Person Followup Reinterview	$5,931,796	$3,027,798	$2,903,998	48.96
Interviewer	$2,434,143	$1,244,109	$1,190,034	48.89
Crew Leader Assistant	$806,104	$263,644	$542,460	67.29
Crew Leader	$1,435,310	$924,725	$510,585	35.57
Field Operations Supervisor	$1,256,239	$595,319	$660,920	52.61
Source: Person Followup C&P Reports: Preliminary Total Cost Note: Totals may not sum exactly due to rounding.				

Total Cost Summary

Overall, the 2010 CCM PFU operation was under budget by $6,370,758 (29.93 percent). PFU was under budget by $3,466,759 (22.58 percent) and PFU RI was under budget by $2,903,998 (48.96 percent).

Total Cost by Position

PFU was more efficient than expected. Interviewer cost was under budget by $1,441,316 (17.94 percent). CLA cost was under budget by $987,102 (51.61 percent). CL cost was under budget by $85,624 (2.66 percent). FOSs cost was under budget by $952,717 (43.44 percent).

PFU RI was also more efficient than expected. Interviewer cost was under budget by $1,190,034 (48.89 percent). CLA cost was under budget by $542,460 (67.29 percent). CL cost was under budget by $510,585 (35.57 percent). FOS cost was under budget by $660,920 (52.61 percent).

5.2.1.1 Cost Per Case

In this section, cost per case is defined as the total cost incurred for each case completed by a PFU Interviewer/Reinterviewer.

The actual PFU workload was 59,402 cases—this was 80.98 percent of the anticipated workload of 73,357 cases. It was difficult to estimate the number of PFU cases since the CCM methodology changed significantly from the 2000 A.C.E. Also, this was the first time that Nationwide matching had been conducted. The actual PFU RI workload was 8,447 cases—this was 76.76 percent of the anticipated workload of 11,004 cases.

Table 5 provides the budgeted and actual cost per case by position for PFU and PFU RI.

Table 5
The 2010 Census Coverage Measurement Person Followup Operation
Cost Per Case by Position

Position	Budgeted Cost	Actual Cost	Budgeted Cost per Case[1]	Actual Cost per Case[2]	Difference of Budgeted to Actual Cost	Percent Over/Under Spent
Total	$21,287,848	$14,917,090	$252.34	$219.86	$32.48	12.87
	Census Coverage Measurement Person Followup					
Subtotal – Person Followup	$15,356,052	$11,889,293	$209.33	$200.15	$9.18	4.39
Interviewer	$8,034,248	$6,592,932	$109.52	$110.99	($1.47)	(1.34)
Crew Leader Assistant	$1,912,737	$925,635	$26.07	$15.58	$10.49	40.24
Crew Leader	$3,216,077	$3,130,453	$43.84	$52.70	($8.86)	(20.20)
Field Operations Supervisor	$2,192,990	$1,240,273	$29.89	$20.88	$9.01	30.14
Census Coverage Measurement Person Followup Reinterview						
Subtotal – Person Followup Reinterview	$5,931,796	$3,027,797	$539.06	$358.45	$180.61	33.50
Interviewer	$2,434,143	$1,244,109	$221.21	$147.28	$73.93	33.42
Crew Leader Assistant	$806,104	$263,644	$73.26	$31.21	$42.05	57.40
Crew Leader	$1,435,310	$924,725	$130.44	$109.47	$20.97	16.08
Field Operations Supervisor	$1,256,239	$595,319	$114.16	$70.48	$43.68	38.26

[1] Budgeted Person Followup Workload is 73,357 cases and Budgeted Person Followup Reinterview Workload is 11,004 cases.
[2] Actual Person Followup Workload is 59,402 cases and Actual Person Followup Reinterview Workload is 8,447 cases.
†Values in ( ) denote values over budget.
Source: Person Followup C&P Reports: Preliminary Total Cost
Note: Totals may not sum exactly due to rounding.

Cost Per Case Summary
PFU actual cost per case was $200.15. This is $9.18 less per case (4.39 percent). PFU RI actual cost per case was $358.45. This is $180.61 less per case (33.50 percent).

Cost Per Case by Position
Although PFU was more efficient than expected, Interviewers and CLs observed higher marginal costs per case than expected, while CLAs and FOSs observed lower costs per case than expected. Interviewer cost was over budget by $1.47 per case (1.34 percent). CLA cost was under budget by $10.49 per case (40.24 percent). CL cost was over budget by $8.86 per case (20.20 percent). FOS cost was under budget by $9.01 per case (30.14 percent).

PFU RI was also more efficient than expected. Interviewers, CLAs, CLs, and FOSs, all, observed lower costs per case than expected. Interviewer cost was under budget by $73.93 per case (33.42 percent). CLA cost was under budget by $42.05 per case (57.40 percent). CL cost was under budget by $20.97 per case (16.08 percent), and FOS cost was under budget by $43.68 per case (38.26 percent).

5.2.1.2 Field Work Costs

In this section, field work cost is defined as the cost of non-training wages. For the purpose of this section, mileage costs are not included; however, they are discussed in a later section.

Table 6 provides the budgeted and actual field work costs by position for both PFU and PFU RI.

Table 6
The 2010 Census Coverage Measurement Person Followup Operation
Field Work Cost by Position

Position	Budgeted Field Work Hours Cost	Actual Field Work Hours Cost	Difference of Budgeted to Actual Cost	Percent Over/Under Spent
Total	$13,092,537	$8,178,392	$4,914,145	37.53
Census Coverage Measurement Person Followup				
Subtotal – Person Followup	$9,538,726	$6,795,574	$2,743,152	28.76
Interviewer	$5,003,017	$3,496,744	$1,506,273	30.11
Crew Leader Assistant*	$1,503,392	$558,046	$945,346	62.88
Crew Leader	$2,053,413	$1,990,094	$63,319	3.08
Field Operations Supervisor	$978,904	$750,690	$228,214	23.31
Census Coverage Measurement Person Followup Reinterview				
Subtotal – Person Followup Reinterview	$3,553,811	$1,382,817	$2,170,994	61.09
Interviewer	$1,407,900	$433,240	$974,660	69.23
Crew Leader Assistant*	$634,609	$120,144	$514,465	81.07
Crew Leader	$866,690	$495,410	$371,280	42.84
Field Operations Supervisor	$644,612	$334,023	$310,589	48.18

*Crew Leaders Assistants were trained as Interviewers.
Source: Person Followup C&P Reports: Current Employee Cost – Field Work
Note: Totals may not sum exactly due to rounding.

Field Work Cost Summary

Overall, the cost for field work associated with conducting the 2010 CCM PFU operation was under budget by $4,914,145 (37.53 percent). PFU field work cost was under budget by $2,743,152 (28.76 percent). PFU RI field work cost was under budget by $2,170,994 (61.09 percent).

Field Work Cost by Position

The PFU field work cost was lower than its expected budget. Interviewer field work cost was under budget by $1,506,273 (30.11 percent). CLA field work cost was under budget by $945,346 (62.88 percent). CL field work cost was under budget by $63,319 (3.08 percent). FOS field work cost was under budget by $228,214 (23.31 percent).

The PFU RI field work cost was also lower than its expected budget. Interviewer field work cost was under budget by $974,660 (69.23 percent). CLA field work cost was under budget by $514,465 (81.07 percent). CL field work cost was under budget by $371,280 (42.84 percent). FOS field work cost was under budget by $310,589 (48.18 percent).

5.2.1.3 Training Cost

In this section, training cost is defined as the cost of wages incurred during training hours. For the purpose of this section, costs for mileage are not included; however, mileage costs are discussed in a later section.

Table 7 provides the budgeted and actual training cost by position for both PFU and PFU RI.

Table 7
The 2010 Census Coverage Measurement Person Followup Operation
Training Hours Cost by Position

Position	Budgeted Training Hours Cost	Actual Training Hours Cost	Difference of Budgeted to Actual Cost	Percent Over/Under Spent
Total	$2,656,808	$2,143,746	$513,062	19.31
Census Coverage Measurement Person Followup				
Subtotal – Person Followup	$1,863,809	$1,536,044	$327,765	17.59
Interviewer	$1,401,531	$1,081,829	$319,702	22.81
Crew Leader Assistant*	$37,300	$74,870	($37,570)	(100.72)
Crew Leader	$282,105	$280,493	$1,612	0.57
Field Operations Supervisor	$142,873	$98,852	$44,021	30.81
Census Coverage Measurement Person Followup Reinterview				
Subtotal – Person Followup Reinterview	$792,999	$607,703	$185,297	23.37
Interviewer	$514,858	$375,853	$139,005	27.00
Crew Leader Assistant*	$15,967	$40,643	($24,676)	(154.54)
Crew Leader	$147,124	$122,690	$24,434	16.61
Field Operations Supervisor	$115,050	$68,517	$46,533	40.45

*Crew Leaders Assistants were trained as Interviewers.
Source: Person Followup C&P Reports: Current Employee Cost – Training
Note: Totals may not sum exactly due to rounding.

Training Cost Summary

Overall, the cost for training associated with the 2010 CCM PFU operation was under budget by $513,062 (19.31 percent). PFU training cost was under budget by $327,765 (17.59 percent). PFU RI training cost was under budget by $185,297 (23.37 percent).

Training Cost by Position

The PFU training cost was lower than its expected budget. Interviewer training cost was under budget by $319,702 (22.81 percent); however, CLA training cost was over budget by $37,570

(100.72 percent). CL training cost was under budget by $1,612 (0.57 percent). FOS training cost was under budget by $44,021 (30.81 percent).

The PFU RI interviewer training cost was also lower than its expected budget. Interviewer training cost was under budget by $139,005 (27.00 percent); however, CLA training cost was over budget by $24,676 (154.54 percent). CL training cost was under budget by $24,434 (16.61 percent). FOS training cost was under budget by $46,533 (40.45 percent).

5.2.1.4 Mileage Costs

In this section, mileage costs are defined as the total reimbursed mileage costs incurred for field work and training. During PFU and PFU RI, field staff was reimbursed at a rate of $0.50 per mile.

Table 8 provides the budget and actual mileage costs by position for both PFU and PFU RI.

Table 8 **The 2010 Census Coverage Measurement Person Followup Operation** **Mileage Cost by Position**				
Position	Budgeted Miles Cost**	Actual Miles Cost**	Difference of Budgeted to Actual Cost	Percent Over/Under Spent
Total	$2,614,832	$3,773,157	($1,158,325)	(44.30)
Census Coverage Measurement Person Followup				
Subtotal – Person Followup	$1,926,381	$2,986,276	($1,059,895)	(55.02)
Interviewer	$692,391	$1,764,351	($1,071,960)	(154.82)
Crew Leader Assistant*	$372,045	$238,747	$133,298	35.83
Crew Leader	$486,359	$705,447	($219,088)	(45.05)
Field Operations Supervisor	$375,586	$277,731	$97,855	26.05
Census Coverage Measurement Person Followup Reinterview				
Subtotal – Person Followup Reinterview	$688,451	$786,882	($98,431)	(14.30)
Interviewer	$166,866	$340,422	($173,556)	(104.01)
Crew Leader Assistant*	$155,528	$77,351	$78,177	50.27
Crew Leader	$207,582	$236,835	($29,253)	(14.09)
Field Operations Supervisor	$158,475	$132,275	$26,200	16.53

*Crew Leaders Assistants were trained as Interviewers.
**Mileage reflects miles cost for both field work and training.
Source: Person Followup C&P Reports: Current Employee Cost – Field Work
Note: Totals may not sum exactly due to rounding.

Mileage Cost Summary

Overall, the mileage cost for the 2010 CCM PFU operation was over budget by $1,158,325 (44.30 percent). PFU mileage cost was over budget by $1,059,895 (55.02 percent). PFU RI mileage cost was over budget by $98,431 (14.30 percent).

Mileage Cost by Position

Mileage costs for Interviewers and CLs were over budget, greatly contributing to the overall higher mileage expenditures for the operation, while mileage costs for CLAs and FOSs were under budget. Interviewer mileage cost was over budget by $1,071,960 (154.82 percent). CLA mileage cost was

under budget by $133,298 (35.83 percent). CL mileage cost was over budget by $219,088 (45.05 percent). FOS mileage cost was under budget by $97,855 (26.05 percent).

Mileage costs for PFU RI were also over budget, exhibiting similar cost trends to PFU. Interviewer mileage cost was over budget by $173,556 (104.01 percent). CLA mileage cost was under budget by $78,177 (50.27 percent). CL mileage cost was over budget by $29,253 (14.09 percent). FOS mileage cost was under budget by $26,200 (16.53 percent).

5.2.1.5 Per Diem and Other Costs

In this section, Per Diem and other costs are defined as the meals and incidental expenses (M&IE), lodging cost, telephone costs and other expenses incurred during field work and training. For the purpose of this section, mileage costs are not included.

Table 9 provides the budgeted and actual Per Diem costs by position for both PFU and PFU RI.

Table 9
The 2010 Census Coverage Measurement Person Followup Operation
Per Diem and Other Costs by Position

Position	Budgeted Per Diem Reimbursement	Actual Per Diem Reimbursement	Difference of Budgeted to Actual Cost	Percent Over/Under Spent
Total	$2,923,671	$821,793	$2,101,878	71.89
Census Coverage Measurement Person Followup				
Subtotal - Person Followup	$2,027,136	$571,399	$1,455,737	71.81
Interviewer	$937,309	$250,008	$687,301	73.33
Crew Leader Assistant*	$0	$53,972	($53,972)	n/a
Crew Leader	$394,200	$154,419	$239,781	60.83
Field Operations Supervisor	$695,627	$113,000	$582,627	83.76
Census Coverage Measurement Person Followup Reinterview				
Subtotal – Person Followup Reinterview	$896,535	$250,394	$646,141	72.07
Interviewer	$344,519	$94,594	$249,925	72.54
Crew Leader Assistant*	$0	$25,506	($25,506)	n/a
Crew Leader	$213,914	$69,790	$144,124	67.37
Field Operations Supervisor	$338,102	$60,504	$277,598	82.10

*Crew Leaders Assistants were trained as Interviewers.
**Telephone budget rolled up into PFU operation Interviewers.
***Per Diem reflects Per Diem costs for both field work and training.
n/a stands for not applicable.
Source: Person Followup C&P Reports: Current Employee Cost – Training; Current Employee Cost – Field Work; Preliminary Total Cost
Note: Totals may not sum exactly due to rounding.

Per Diem Cost Summary

Overall, the per diem cost for the 2010 CCM PFU operation was under budget by $2,101,878 (71.89 percent). PFU per diem cost was under budget by $1,455,737 (71.81 percent). PFU RI per diem cost was under budget by $646,141 (72.07 percent).

Per Diem Cost by Position

Per diem costs for PFU were under budget for all positions, with the exception of CLAs. Interviewer per diem cost was under budget by $687,301 (73.33 percent). CLA per diem cost was

over budget by $53,972, as no budget was allocated for this position. CL per diem cost was under budget by $239,781 (60.83 percent). FOS per diem cost was under budget by $582,627 (83.76 percent).

Per diem cost for PFU RI was also under budget, reflecting similar cost ratios to PFU. Interviewer per diem cost was under budget by $249,925 (72.54 percent). CLA per diem cost was over budget by $25,506, as no budget was allocated for this position. CL per diem cost was under budget by $144,124 (67.37 percent). FOS per diem cost was under budget by $277,598 (82.10 percent).

5.3 Productivity Rates

This section analyzes the effort required to complete a single unit of work (a followup case completed) in terms of field work (non-training) hours and mileage charged.

5.3.1 Production Rates of Completion for Person Followup Operations

In this section, production rate is defined as the effort required to complete a single unit of work in terms of field work (non-training) hours.

Table 10 provides the budget and actual production rates by position for both PFU and PFU RI.

Table 10
The 2010 Census Coverage Measurement Person Followup Operation
Production Rate by Position

Position	Budgeted Field Work Hours	Actual Field Work Hours	Budgeted Hours per Case[1]	Actual Hours per Case[2]	Difference of Budgeted to Actual Hours per Case	Percent Over/Under Spent
Census Coverage Measurement Person Followup						
Total - Person Followup	584,110	403,252	7.96	6.79	1.17	14.70
Interviewer	318,693	219,390	4.34	3.69	0.65	14.98
Crew Leader Assistant	95,768	34,604	1.31	0.58	0.73	55.73
Crew Leader	118,131	111,135	1.61	1.87	(0.26)	(16.15)
Field Operations Supervisor	51,518	38,123	0.70	0.64	0.06	8.57
Census Coverage Measurement Person Followup Reinterview						
Total - Person Followup Reinterview	213,686	79,757	19.42	9.44	9.98	51.39
Interviewer	89,591	26,922	8.14	3.19	4.95	60.81
Crew Leader Assistant	40,380	7,694	3.67	0.91	2.76	75.20
Crew Leader	49,813	28,221	4.53	3.34	1.19	26.27
Field Operations Supervisor	33,902	16,920	3.08	2.00	1.08	35.06

[1] Budgeted Person Followup Workload is 73,357 cases and Budgeted Person Followup Reinterview Workload is 11,004 cases.
[2] Actual Person Followup Workload is 59,402 cases and Actual Person Followup Reinterview Workload is 8,447 cases.
Source: Person Followup C&P Report: Current Employee Cost – Field Work
Note: Totals may not sum exactly due to rounding.

Production Rate Summary

The 2010 CCM PFU operation was more efficient than expected, using fewer hours per case than budgeted. During PFU, 6.79 hours were used to complete a case. This is 1.17 hours lower per case (14.70 percent) than expected. During PFU RI, 9.44 hours were used to complete a case. This is 9.98 hours per case less (51.39 percent) than expected.

Production Rate by Position

PFU interviewers and CLAs were more efficient than expected. Interviewers used 3.69 hours per case. This is 0.65 hours lower per case (14.98 percent) than expected. CLAs used 0.58 hours per case. This is 0.73 hours lower per case (55.73 percent) than expected. Alternatively, CLs were less efficient than expected, using 1.87 hours more per case. This is 0.26 hours more per case (16.15 percent) than expected. FOSs were more efficient than expected, using 0.64 hours per case. This is 0.06 hours lower per case (8.57 percent) than expected.

Similarly, PFU RI showed more efficiency than expected in their production rates. Interviewers used 3.19 hours per case. This is 4.95 hours per lower case (60.81 percent) than expected. CLAs used 0.91 hours per case. This is 2.76 hours lower per case (75.20 percent) than expected. CLs used 3.34 hours per case. This is 1.19 hours lower per case (26.27 percent) than expected. FOSs used 2.00 hours per case. This is 1.08 hours lower per case (35.06 percent) than expected.

5.3.2 Mileage Rates

In this section, mileage rate is defined as the mileage required to complete a single unit of work.

Table 11 provides the budgeted and actual mileage rates by position for both PFU and PFU RI.

Table 11
The 2010 Census Coverage Measurement Person Followup Operation
Mileage Rates by Position

Position	Budgeted Miles	Actual Miles	Budgeted Miles per Case[1]	Actual Miles per Case[2]	Difference of Budgeted to Actual Miles per Case	Percent Over/Under Spent
Census Coverage Measurement Person Followup						
Total - Person Followup	3,704,580	5,855,588	50.50	98.58	(48.08)	(95.21)
Interviewer	1,331,523	3,459,514	18.15	58.24	(40.09)	(220.88)
Crew Leader Assistant	715,475	468,131	9.75	7.88	1.87	19.18
Crew Leader	935,305	1,383,245	12.75	23.29	(10.54)	(82.67)
Field Operations Supervisor	722,277	544,698	9.85	9.17	0.68	6.90
Census Coverage Measurement Person Followup Reinterview						
Total- Person Followup Reinterview	1,323,958	1,542,967	120.32	182.66	(62.34)	(51.81)
Interviewer	320,891	667,493	29.16	79.02	(49.86)	(170.99)
Crew Leader Assistant	299,101	151,670	27.18	17.96	9.22	33.92
Crew Leader	399,202	464,388	36.28	54.98	(18.70)	(51.54)
Field Operations Supervisor	304,764	259,416	27.70	30.71	(3.01)	(10.87)

[1] Budgeted Person Followup Workload is 73,357 cases and Budgeted Person Followup Reinterview Workload is 11,004 cases.
[2] Actual Person Followup Workload is 59,402 cases and Actual Person Followup Reinterview Workload is 8,447 cases.
(80.98% and 76.76% of the expected workload, respectively.)
†Values in ( ) denote values over budget.
Source: Person Followup C&P Report: Current Employee Cost – Field Work
Note: Totals may not sum exactly due to rounding.

Mileage Rate Summary
The 2010 CCM PFU operation was less efficient on mileage rate usage than expected, using more miles per case than budgeted. During PFU, 98.58 miles were charged per case. This is 48.08 more miles per case (95.21 percent) than expected. During PFU RI, 182.66 miles were charged per case. This is 62.34 more miles per case (51.81 percent) than expected.

Mileage Rate by Position
The mileage rate for PFU was less efficient than expected, with a greater mileage charged per case. The mileage rate for Interviewers was less efficient by 40.09 miles per case (220.88 percent), while the mileage rate for CLAs was more efficient by 1.87 miles per case (19.18 percent). The mileage rate for CLs was less efficient by 10.54 miles per case (82.67 percent), while the mileage rate for FOSs was more efficient by 0.68 miles per case (6.90 percent).

The mileage rate for PFU RI was also less efficient than expected, with a greater mileage charged per case. The mileage rate for Interviewers was less efficient by 49.86 miles per case (170.99 percent), while the mileage rate for CLAs was more efficient by 9.22 miles per case (33.92 percent). The mileage rate for CLs was less efficient by 18.70 miles per case (51.54 percent), and the mileage rate for FOSs was less efficient by 3.01 miles per case (10.87 percent).

5.4 How did Field staffing and training plans meet the needs for PFU production?

FLD Coverage Measurement Branch provided a staffing authorization to each RCC. This authorization provided an upper limit for hiring in each RCC. RCC staff hired for each position at their discretion based on their regional implementation plans for the PFU Operation. Table 12 shows the staffing authorized and trained for PFU production and PFU RI, by field position. Authorized staffing levels were more than sufficient to perform and complete both PFU production and PFU RI.

Table 12
The 2010 Census Coverage Measurement Person Followup Operation
Person Followup Field Staffing

	Production Staff				Reinterview Staff			
	Interviewer	Crew Leader Assistant	Crew Leader	Field Office Supervisor	Reinterviewer	Crew Leader Assistant	Crew Leader	Field Office Supervisor
Person Followup Staff Authorized	3,043	364	449	116	883	145	182	93
Person Followup Staff Trained	2,549	229	409	107	698	87	157	81

Source: Budget and Staffing Models from Decennial Management Division and Field Division and Weekly Staff Trained Reports from Assistant Regional Census Manager

Person Computer Matching Results

Unweighted results from the automated geocoding, automated residence status coding, and person computer matching (including BFU Preprocessing) are presented in the following sections. No

inferences to the general population are intended. These results are from an operation standpoint and do not reflect the final CCM estimates of person coverage.

5.5 How many persons were computer matched, possibly matched, and remained nonmatched between the Census Coverage Measurement Person Interview rosters and the Census Unedited File? How many duplicates did the computer find within the Census Coverage Measurement Person Interview rosters, within the block cluster? How many duplicates did the computer find within the Census Unedited File?

The results provided in this section reflect the match codes that were assigned by the PerMaRCS BFU Preprocessing software using the results of the Person Computer Matching Operation. Each person's match and duplication status was reflected in the match code, which categorized the person as a match, possible match, nonmatch, duplicate, or possible duplicate.

Computer matching linked PI people to census people throughout the country. Links were identified in the sample, inmover, alternate or nationwide search areas, as defined below.

Match Search Areas:
a. If the census person was located in the block cluster containing the sample address or the ring of blocks surrounding the sample block cluster, then the link was in the sample search area.
b. Otherwise, if the census person was located in the block cluster or surrounding blocks of an inmover address reported for the linked PI person, then the link was in the inmover search area.
c. Otherwise, if the census person was located in the block cluster or surrounding blocks of an address that was reported for the linked PI person as an alternate address or reported for some other PI person in the household as an inmover or alternate address, then the link was in the alternate search area.
d. If the link was beyond the sample search area and it was not associated with an inmover nor an alternate address, then the link was in the nationwide search area.

In addition, computer matching searched for census duplicates throughout the country, so similar search areas were also identified for census duplicate links, as defined below. Computer matching also searched for PI duplicates, but within the sample block cluster only.

Duplicate Search Areas:
a. If both census persons were located in the sample block cluster or its surrounding blocks, then the link was in the sample search area.
b. Inmover and alternate addresses weren't collected for census persons until PFU, however if a census duplicate link was located in the block cluster or surrounding blocks of an inmover or alternate address reported for a PI person linked to someone in the census person's household, then the link was considered to be in an inmover or alternate search area.
c. If the link was beyond the sample search area and it was not associated with an inmover nor an alternate address, then the link was in the nationwide search area.

During the modeling phase of computer matching, links were classified as matches, possible matches, or nonmatches based on the strength of matching factors such as geographic proximity, phone numbers, person characteristics and surname frequencies. A link in the sample search area or

the nationwide search area was modeled based on geographic proximity to the PI person's sample address. A link in the inmover search area was modeled based on geographic proximity to the linked PI person's inmover address. A link in the alternate search area was modeled based on geographic proximity to the PI person's alternate address. Note: Computer matching only had access to the automated geocoding results to identify the inmover and alternate search areas.

The PI workload had two components: those housing units eligible for and selected to be in the P sample and those housing units not eligible to be in the P sample. These latter units were referred to as "census-only" units. Census-only units were listed by census in the CCM sample block clusters but not by the CCM IL, and were determined to be valid housing units either missed in the IL or actually located outside the sample block cluster. Since these units were not listed in the IL, they were not eligible for the P sample. To improve the matching and followup operations, DSSD decided to include these census-only units in the PI operation. The PI attempted to roster people in the census-only units and collect the data needed to determine their enumeration status. The census-only people rostered in the PI were matched to the census enumerations from the Census Unedited File. By doing this we were able to reduce the number of nonmatched census enumerations that otherwise would have needed followup during PFU. In addition to reducing the PFU workload, we also hoped to reduce recall error by collecting the data during PI rather than the PFU operation that occurred much later (February 2011). Note, however, that since these census-only people were not included in the P sample, they are not presented in any unweighted PI results in this report. If a census-only PI person was linked to a census person (as a match or possible match), then this link is reflected in the census results.

Responses obtained during the PI were used to assign a residence status to each person collected in the interview. The residence status, which could change throughout the person matching process, indicated the person's mover status (nonmover, inmover, or outmover) and whether or not the person should have been included in the P sample. To be included in the P sample, the person must have been rostered in a housing unit that was eligible and selected for the P sample (i.e., listed during the IL Operation) and assigned a P-sample residence status code.[9]

The census workload consisted of E-sample people and non E-sample people (within the sample block cluster and surrounding blocks or beyond).[10] We were primarily interested in searching for matches and duplicates for E-sample people. However, census people in other housing units and GQs in the sample, alternate, inmover, and nationwide search areas were available for matching.

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[9] Residence status codes for people included in the P sample were Nonmover, Inmover, P-sample Outmover, and Unclassified. Residence status codes for people not included in the P sample were Non P-sample Outmover, Unclassified Outmover, Out-of-Scope, and Never Resident. Out-of-scope people include people who were in GQs, outside the nation, or experiencing homelessness on Census Day. People who were born after Census Day or died before Census Day were also out of scope. People who were Census Day residents of the sample address but were out of scope at the time of the PI were P-sample Outmovers. Non P-sample Outmovers moved from the sample address to another housing unit inside the nation.

[10] An E-sample person is a census person in a housing unit that is in the sample block cluster and selected for the E sample. Non E-sample people include census people in GQs, people in housing units subsampled out of the E sample, and people in housing units that are not in the sample block cluster.

Since non E-sample people were not part of the CCM sample, they are not included in any unweighted results.

The unweighted results of PI computer match codes (after BFU preprocessing) by search area are presented in Table 13 and Table 14. Results are presented for people eligible to be included in the P sample (rostered in housing units that were listed during IL) who were assigned either P-sample or non P-sample residence status codes. The residence status codes used when presenting the computer matching match code results reflect the residence status after the Clerical Residence Status Coding Operation[11] was completed. (The residence status codes could have been updated later during the BFU and AFU stages, if needed.) The unweighted results of E-sample computer match codes (after BFU preprocessing) are presented in Table 15 and Table 16**.**

Table 13
The 2010 Census Coverage Measurement Person Computer Matching Operation
Number of Person Interview People by Match Code, Search Area, and Sample Indicator:
Unweighted, United States Only

	Person Interview People in Independent Listing Housing Units			
	P-sample Residence Status		**Non P-sample Residence Status**	
	Count	**Percent of Total***	**Count**	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**370,853**	**100.00**	**21,858**	**100.00**
Matches	313,561	84.55	13,536	61.93
Sample Search Area	293,477	79.14	6,128	28.04
Inmover Search Area	13,876	3.74	4,892	22.38
Alternate Search Area	1,281	0.35	1,521	6.96
Nationwide Search Area	4,927	1.33	995	4.55
Possible Matches	5,250	1.42	574	2.63
Sample Search Area	4,497	1.21	285	1.30
Inmover Search Area	140	0.04	66	0.30
Alternate Search Area	11	0.00	40	0.18
Nationwide Search Area	602	0.16	183	0.84
Nonmatches	50,318	13.57	7,582	34.69
Duplicates	1,599	0.43	120	0.55
Possible Duplicates	125	0.03	46	0.21

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person, vw_pm_pi_coding_history, vw_pm_census_person, and vw_pm_census_coding_history

Looking at the unweighted U.S. (excluding Puerto Rico) computer matching results (after BFU Preprocessing) in Table 13, 84.55 percent of the 370,853 P-sample people (PI persons in IL housing units who were assigned P-sample residence status codes) were matches, 1.42 percent were possible

[11] After PI, DSSD conducted automated residence status coding. The Clerical Residence Status Coding Operation workload included PI households that contained people assigned an "R" (Review Needed) residence status code by the automated residence status coding operation. The technicians/analysts reviewed notes and other information collected during the PI to try to resolve the residence status for these cases.

matches, 13.57 percent were nonmatches, and 0.46 percent were duplicates or possible duplicates of other PI records. The majority of the P-sample matches and possible matches were found in the sample search area. However, 3.74 percent of the P-sample people were matched in an inmover search area that was beyond the sample search area. The nationwide search linked 1.33 percent of the U.S. P-sample people as matches and 0.16 percent as possible matches, which were not found in an inmover or alternate address search area.

Looking at the unweighted U.S. results, among the 21,858 PI people who were in IL housing units and were assigned non P-sample residence status codes, 61.93 percent were matches, 2.63 percent were possible matches, 34.69 percent were nonmatches, and 0.76 percent were duplicates or possible duplicates of other PI records. Recall that the non P-sample residence status codes include Non P-sample Outmover, Unclassified Outmover, Out-of-Scope, and Never Resident. Thus, some of these people should have been counted at the sample address on Census Day (the outmovers who moved out before PI) and some should have been counted somewhere else (those that were coded Out-of-Scope and Never Resident). Therefore, it is not surprising that some of the non P-sample people in IL housing units were matched in the sample search area (28.04 percent) while others were not. Although non P-sample residence status codes do not include inmovers, 22.38 percent of the non P-sample people in IL housing units were matched in an inmover search area that was beyond the sample search area. Also note that there were relatively more nonmatches among the non P-sample people in IL housing units (34.69 percent) that among P-sample people (13.57 percent). So even though we attempted to collect alternate addresses for these people and conduct searches around those alternate addresses (if one was provided and we were able to geocode the address), we did not find as many matches for the non P-sample people.

Table 14
The 2010 Census Coverage Measurement Person Computer Matching Operation
Number of Person Interview People by Match Code, Search Area, and Sample Indicator: Unweighted, Puerto Rico Only

	Person Interview People in Independent Listing Housing Units			
	P-sample Residence Status		Non P-sample Residence Status	
	Count*	Percent of Total*	Count*	Percent of Total*
Total Puerto Rico	**15,955**	**100.00**	**1,084**	**100.00**
Matches	13,558	84.98	512	47.23
Sample Search Area	13,103	82.12	321	29.61
Inmover Search Area	284	1.78	118	10.89
Alternate Search Area	35	0.22	37	3.41
Nationwide Search Area	136	0.85	36	3.32
Possible Matches	283	1.77	61	5.63
Sample Search Area	220	1.38	22	2.03
Inmover Search Area	21	0.13	22	2.03
Alternate Search Area	5	0.03	8	0.74
Nationwide Search Area	37	0.23	9	0.83
Nonmatches	1,964	12.31	496	45.76
Duplicates	140	0.88	13	1.20
Possible Duplicates	10	0.06	2	0.18

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person, vw_pm_pi_coding_history, vw_pm_census_person, and vw_pm_census_coding_history

Looking at the unweighted Puerto Rico computer matching results (after BFU Preprocessing) in Table 14, 84.98 percent of the 15,955 P-sample people were matches, 1.77 percent were possible matches, 12.31 percent were nonmatches, and 0.94 percent were duplicates or possible duplicates of other PI records. Of the 1,084 non P-sample people, 47.23 percent were matches, 5.63 percent were possible matches, 45.76 percent were nonmatches, and 1.38 percent were duplicates or possible duplicates.

The unweighted results of computer match codes for all PI people (including people in IL housing units and people in census-only units) presented in Table 78 in Appendix A are similar to the unweighted results discussed above.

Table 15
The 2010 Census Coverage Measurement Person Computer Matching Operation
Number of E-sample People by Match Code and Search Area: Unweighted, United States Only

	E-sample People	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**
Matches	301,064	78.50
Sample Search Area	301,064	78.50
Inmover Search Area	n/a	n/a
Alternate Search Area	n/a	n/a
Nationwide Search Area	n/a	n/a
Possible Matches	4,633	1.21
Sample Search Area	4,633	1.21
Inmover Search Area	n/a	n/a
Alternate Search Area	n/a	n/a
Nationwide Search Area	n/a	n/a
Nonmatches	71,963	18.76
Duplicates	4,802	1.25
Sample Search Area	4,802	1.25
Inmover Search Area	n/a	n/a
Alternate Search Area	n/a	n/a
Nationwide Search Area	0	0.00
Possible Duplicates	1,075	0.28
Sample Search Area	1,063	0.28
Inmover Search Area	n/a	n/a
Alternate Search Area	n/a	n/a
Nationwide Search Area	12	0.00

*Percents may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pm_census_person and vw_pm_census_coding_history

Looking at the unweighted U.S. (excluding Puerto Rico) computer matching results (after BFU preprocessing) in Table 15, 78.50 percent of the 383,537 E-sample people were matches, 1.21 percent were possible matches, 18.76 percent were nonmatches, and 1.53 percent were duplicates or possible duplicates of other census records. Nearly all of the E-sample duplicates and possible duplicates were in the sample search area.

Two census records that were believed to refer to the same person were linked together as a duplicate link. In each duplicate pair, there was a primary and duplicate record. The primary record should have reflected the true residence of the duplicated pair. The true residence was the place where the person should have been counted according to the 2010 Census Residence Rule. The E-sample person was usually the primary in a census duplicate pair unless there was further information based on a link to a PI person or further field followup to determine that the person referred to in the duplicate pair should have actually been counted outside the sample cluster.

Thus, for the computer matching results, an E-sample record was only assigned a duplicate or possible duplicate match code if the primary was another E-sample record or if the primary was linked to a PI person that we determined should have been counted at a location other than the sample address. In duplicate pairs where the E-sample person was the primary, the E-sample person was assigned a match code of match, possible match, or nonmatch and a counter was maintained to reflect the number of census duplicates linked to that primary record. Section 5.6 provides computer matching (including BFU preprocessing) results for the number of census duplicates (E-sample and non E-sample) found per person.

Table 16
The 2010 Census Coverage Measurement Person Computer Matching Operation
Number of E-sample People by Match Code and Search Area: Unweighted, Puerto Rico Only

	E-sample People	
	Count	**Percent of Total***
Total Puerto Rico	**17,584**	**100.00**
Matches	13,191	75.02
Sample Search Area	13,191	75.02
Inmover Search Area	n/a	n/a
Alternate Search Area	n/a	n/a
Nationwide Search Area	n/a	n/a
Possible Matches	213	1.21
Sample Search Area	213	1.21
Inmover Search Area	n/a	n/a
Alternate Search Area	n/a	n/a
Nationwide Search Area	n/a	n/a
Nonmatches	3,439	19.56
Duplicates	625	3.55
Sample Search Area	625	3.55
Inmover Search Area	n/a	n/a
Alternate Search Area	n/a	n/a
Nationwide Search Area	0	0.00
Possible Duplicates	116	0.66
Sample Search Area	116	0.66
Inmover Search Area	n/a	n/a
Alternate Search Area	n/a	n/a
Nationwide Search Area	0	0.00

*Percents may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pm_census_person and vw_pm_census_coding_history

Looking at the unweighted Puerto Rico computer matching results (after BFU Preprocessing) in Table 16, 75.02 percent of the 17,584 E-sample people were matches, 1.21 percent were possible matches, 19.56 percent were nonmatches, and 4.21 percent were duplicates or possible duplicates of other census records.

The unweighted results of computer match codes for all census persons (including E-sample and non E-sample people) presented in Table 79 of Appendix A are similar to the unweighted results discussed above.

5.6 What is the distribution of number of computer duplicates found per census person?

Recall that computer matching conducted a nationwide search for census duplicates. A person could have been enumerated in multiple locations resulting in duplication. If a person was enumerated (or possibly enumerated) in two locations then a duplicate link was created between the primary record and the duplicate or possible duplicate record. If a person was enumerated (or possibly enumerated) in more than two locations, then a duplicate link was created between the primary record and each of its duplicate or possible duplicate records.

Table 17 shows the unweighted results for census people by the number of duplicates or possible duplicates found per person upon completion of computer matching (including BFU Preprocessing). Although CCM was primarily interested in searching for duplicate records of E-sample people, census people in non E-sample housing units and those in GQs nationwide were included in the duplicate searches.

Table 17
The 2010 Census Coverage Measurement Person Computer Matching Operation
Number of E-sample People by Number of Duplicates or Possible Duplicates Per Person and Sample Indicator: Unweighted

	E-sample People	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**
No Duplicates or Possible Duplicates	360,209	93.92
One Duplicate or Possible Duplicate	22,174	5.78
Two Duplicates or Possible Duplicates	1,040	0.27
Three or More Duplicates or Possible Duplicates	114	0.03
Total Puerto Rico	**17,584**	**100.00**
No Duplicates or Possible Duplicates	15,334	87.20
One Duplicate or Possible Duplicate	2,095	11.91
Two Duplicates or Possible Duplicates	138	0.78
Three or More Duplicates or Possible Duplicates	17	0.10

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pm_census_person and vw_pm_census_coding_history

Computer matching results (after BFU preprocessing) in Table 17 show that if an E-sample person was duplicated then they were more often duplicated only once. In the U.S. (excluding Puerto Rico), 93.92 percent of the 383,537 E-sample people had no duplicates or possible duplicates, 5.78 percent

had one duplicate or possible duplicate, and 0.30 percent had two or more duplicates or possible duplicates. In Puerto Rico, 11.91 percent of the 17,584 E-sample people had one duplicate or possible duplicate, 0.78 percent had two duplicates or possible duplicates, and 0.10 percent had three or more duplicates or possible duplicates.

The unweighted results for all census persons (including E-sample and non E-sample people) presented in Table 80 in Appendix A are similar to the results discussed above.

5.7 What is the automated residence status assigned for each Person Interview person[12] (e.g., nonmover, inmover, unresolved, etc.)?

The results presented in this section reflect the residence status codes assigned during automated residence status coding (prior to any computer matching[13] or clerical coding). (The residence status codes could have been updated later during the Clerical Residence Status Coding, BFU, and AFU stages, if needed.) Recall that the PI cast a wide net when collecting rosters of people living or staying at the sample address and that residence status codes were assigned to indicate the person's mover status and whether or not the person should have been included in the P sample.

During automated residence status coding, the software assigned a residence status code to each PI person based on the responses to various fields in the PI instrument. The PI people rostered in IL housing units were classified as P-sample or non P-sample people, based on their residence status codes. As noted earlier, census-only PI people are excluded from the unweighted PI results. To assign a residence status code, the software used information about whether the person was in a GQ on Census Day, whether the person was a mover, when the person moved, whether the person had an alternate residence (besides a mover address), and where the person lived most of the time if the person cycled between addresses. The residence status codes of Unclassified Outmover and Never Resident required additional clerical review and thus were not assigned during automated residence status coding. Any case that required additional review to determine the appropriate code was assigned a residence status code of Clerical Review Needed. These cases were reviewed during the Clerical Residence Status Coding stage (prior to BFU). If automated residence status coding could not resolve the residence status code and there was no additional information available to be reviewed clerically, the software assigned a code of Unclassified. Cases with unclassified residence status codes were sent to PFU in attempt to collect the additional information needed to determine the person's residence status.

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[12] Person Interview (PI) person is a person rostered during the PI operation (includes P-sample people and non P-sample people).

[13] The residence status codes used to classify people into the P-sample and non P-sample columns in Table 78 (which presents the match codes assigned during computer matching) reflect the residence status code prior to the Before Followup clerical matching activity and thus reflect the results of the Clerical Residence Status Coding Operation that was conducted prior to computer matching.

Residence status codes for people included in the P sample were Nonmover, Inmover, P-sample Outmover, and Unclassified (or Clerical Review Needed).

- Nonmovers were residents of the sample address on Census Day and at the time of the PI.
- Inmovers were residents of the sample address at the time of the PI that moved in after Census Day (from another housing unit in the nation).
- P-sample Outmovers were Census Day residents of the sample address but were out of scope at the time of the PI. This includes Census Day residents who moved to GQs, moved to addresses outside the nation, were experiencing homelessness at the time of the PI, or died prior to PI.
- If there was not enough information to determine whether a person was a resident of the sample address on Census Day and or at the time of the PI, then the residence status was unclassified. If automated residence status coding could not determine the residence status and there was additional information that could be reviewed clerically (such as notes from the PI interviewer) then the case was assigned a residence status of Clerical Review Needed instead of Unclassified so the case could be reviewed during the Clerical Residence Status Coding stage.

Residence status codes for people not included in the P sample (i.e., non P-sample codes) were Out-of-Scope, Never Resident, Non P-sample Outmover, and Unclassified Outmover.

- Out-of-Scope people include people who were in GQs, outside the nation, or experiencing homelessness on Census Day. People who were born after Census Day or died before Census Day were also out of scope.
- Never Resident people were not residents of the sample address and should have been counted at another housing unit in the nation according to the 2010 Census Residence Rule. This includes people who moved out of the sample address before Census Day to another in-scope address and people who cycled between addresses and should have been counted at another in-scope address. (This code could only be assigned clerically.)
- Non P-sample Outmovers were Census Day residents of the sample address who moved to another housing unit inside the nation (i.e., another in-scope location).
- Unclassified Outmovers were Census Day residents of the sample address who moved out before PI but we were unable to determine if the person moved to an in-scope or out-of-scope location. (This code could only be assigned clerically.)

Table 18
The 2010 Census Coverage Measurement Person Automated Residence Status Coding Operation Number of Person Interview People by Residence Status Code and Sample Indicator: Unweighted, United States Only

	Person Interview People in Independent Listing Housing Units	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**392,711**	**100.00**
P-sample Residence Status	386,924	98.53
Nonmover	305,953	77.91
Inmover	3,365	0.86
P-sample Outmover	599	0.15
Unclassified	2,716	0.69
Clerical Review Needed	74,291	18.92
Non P-sample Residence Status	5,787	1.47
Out-of-scope	2,992	0.76
Non P-sample Outmover	2,795	0.71
Unclassified Outmover	n/a	n/a
Never Resident	n/a	n/a

*Percents may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pi_person and vw_pm_pi_coding_history

As shown by the unweighted automated residence status coding results for the U.S. (excluding Puerto Rico) in Table 18, 98.53 percent of the 392,711 PI people in IL housing units were assigned P-sample residence status codes by the computer. A majority of the people assigned P-sample residence status codes were considered nonmovers. Automated residence status coding determined that a clerical review was needed to assign a residence status code for 18.92 percent of the PI people in IL housing units. Note that people with unclassified residence status or those for whom clerical review was needed after automated residence status coding were considered part of the P sample until further processing could be done to determine their residence status.

Table 19 The 2010 Census Coverage Measurement Person Automated Residence Status Coding Operation Number of Person Interview People by Residence Status Code and Sample Indicator: Unweighted, Puerto Rico Only		
	Person Interview People in Independent Listing Housing Units	
	Count	**Percent of Total***
Total Puerto Rico	**17,039**	**100.00**
P-Sample	16,837	98.81
Nonmover	13,986	82.08
Inmover	81	0.48
P-sample Outmover	73	0.43
Unclassified	64	0.38
Clerical Review Needed	2,633	15.45
Non-P-Sample	202	1.19
Out-of-Scope	76	0.45
Non-P-Sample Outmover	126	0.74
Unclassified Outmover	n/a	n/a
Never Resident	n/a	n/a

*Percents may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pi_person and vw_pm_pi_coding_history

As shown by the unweighted automated residence status coding results for Puerto Rico in Table 19, 98.81 percent of the 17,039 PI people in IL housing units were assigned P-sample residence status codes by the computer. Automated residence status coding determined that a clerical review was needed to assign a residence status code for 15.45 percent of the PI people in IL housing units in Puerto Rico.

The unweighted results of automated residence status codes for all PI persons (including persons in IL housing units and persons in census-only units) presented in Table 81 are similar to the results discussed above.

5.8 What is the enumeration status assigned for each E-sample person[14] (e.g., correct, erroneous, unresolved)?

The enumeration status indicates whether an E-sample person should have been counted in the census based on the 2010 Census Residence Rule. The E-sample person could have been a correct enumeration, an erroneous enumeration, or an unresolved enumeration. The enumeration status of an E-sample person linked to a PI person was determined by the residence status code of the PI person and the address at which the person was linked. If the E-sample person was unlinked, then the enumeration status was reflected in the match code.

[14] An E-sample person is a person enumerated during the census in a housing unit selected for the E sample.

The unweighted results presented in this section reflect the enumeration status based on the match codes, residence status codes, and links from computer matching[15]. (The codes and links could have been updated later during BFU based on clerical review or during AFU based on review of the information collected during PFU.) During computer matching, there was no information to determine enumeration status for nonmatched E-sample people so they were classified as having unresolved enumeration status. All E-sample nonmatches were sent to PFU to try to resolve the person's enumeration status. Possible duplicates, possible matches, and matches to PI people with unclassified residence status were also sent to PFU to collect additional information that could be used to resolve the person's enumeration status.

Table 20
The 2010 Census Coverage Measurement Person Computer Matching Operation
Number of E-sample People by Enumeration Status: Unweighted

		E-sample People	
		Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)		**383,537**	**100.00**
Correct Enumeration		290,491	75.74
Erroneous Enumeration		7,540	1.97
	Duplicate	4,802	1.25
	Fictitious	n/a	n/a
	Geocoding Error	n/a	n/a
	Other	2,738	0.71
Unresolved Enumeration		85,506	22.29
Total Puerto Rico		**17,584**	**100.00**
Correct Enumeration		12,914	73.44
Erroneous Enumeration		793	4.51
	Duplicate	625	3.55
	Fictitious	n/a	n/a
	Geocoding Error	n/a	n/a
	Other	168	0.96
Unresolved Enumeration		3,877	22.05

*Percents may not sum to totals due to rounding.
n/a stands for not applicable
Source: PerMaRCS tables: vw_pm_census_person, vw_pm_census_coding_history, vw_pi_person, and vw_pm_pi_coding_history

The unweighted results for the U.S. (excluding Puerto Rico) in Table 20 show that 75.74 percent of the 383,537 E-sample people were correct enumerations, 1.97 percent were erroneous enumerations, and 22.29 percent were unresolved enumerations after computer matching (and BFU preprocessing).

[15] Since these results look at how things were coded after computer matching, the residence status codes reflect the results of both the automated residence status coding and the Clerical Residence Status Coding stage (which was completed prior to conducting BFU matching).

In Puerto Rico, 73.44 percent of the 17,584 E-sample people were correct enumerations, 4.51 percent were erroneous enumerations, and 22.05 percent were unresolved after computer matching (and BFU preprocessing).

The unweighted results of computer enumeration status codes for all E-sample persons in the U.S. and Puerto Rico combined presented in Table 82 are similar to the results discussed above.

5.9 How many alternate addresses were attached to Person Interview people prior to clerical matching (based on data collected during the Person Interview)? How many alternate addresses were geocoded during automated geocoding?

In addition to the automated residence status coding operation, an automated geocoding operation was conducted prior to any computer matching or clerical coding. Recall that the PI collected an independent roster of all persons living at the sample address on Interview Day, their demographic characteristics, and any other addresses where the person might have been counted on Census Day. These other addresses were also referred to as respondent-provided addresses or other addresses. Respondent-provided addresses could have been collected for a number of reasons. For example, the address could have been an inmover address, which was the address where a household member lived on Census Day before moving into the sample address. It could also have been an alternate address, which was the address where the household member lived part of the time in addition to the sample address. Alternate addresses could have included, among others, the address where a college student lived while attending school, the residence of a former spouse or relative who had shared custody of a child, or the seasonal address where someone lived part of the year. The interviewer attempted to collect as complete an address as possible from the respondent. In order to identify inmover and alternate address search areas to look for matches and duplicates for people who had respondent-provided addresses, these addresses needed to be geocoded to identify the census geography[16] for each address. To identify a search area, addresses had to be geocoded to a specific address on the Master Address File (MAF) (identified by a MAFID) or one or more blocks[17].

GEO conducted an automated geocoding operation for respondent-provided addresses collected during PI. Computer matching used the results of automated geocoding to search for matches to PI people with inmover and alternate addresses. Any respondent-provided address from the PI that the automated geocoding operation was unable to geocode to a MAFID or one or more blocks was reviewed during the Clerical Geocoding stage. During BFU, clerical matchers used the geocoding results from automated geocoding and the Clerical Geocoding stage to search for additional matches and census duplicates.

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[16] Census geography assigned during automated and clerical geocoding includes the state, county, block, and/or Master Address File Identifier (MAFID) of the address.

[17] If an address is geocoded to a MAFID or one or more blocks, then a search area was identified consisting of all census enumerations in the block(s) and all census enumerations in the block cluster(s) in which each block is located and the surrounding blocks of the block cluster(s).

Table 21 shows the number of alternate addresses that were reported for PI people prior to any clerical review[18] and the unweighted automated geocoding results for these addresses.

Table 21
The 2010 Census Coverage Measurement Automated Geocoding Operation
Number of Person Interview Respondent-Provided Addresses by Level of Geocoding: Unweighted

	Person Interview Respondent-Provided Addresses	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**51,980**	**100.00**
Search Area Identified	34,000	65.41
Geocoded to Master Address File Identifier	24,554	47.24
Geocoded to Block	9,446	18.17
No Search Area Identified	17,980	34.59
Geocoded to County	12,285	23.63
Geocoded to State	1,201	2.31
Ungeocoded	4,494	8.65
In-scope – U.S. Address	2,184	4.20
Out-of-Scope - Puerto Rico Address	63	0.12
Out-of-Scope - Other Country	2,247	4.32
Total Puerto Rico	**2,097**	**100.00**
Search Area Identified	865	41.25
Geocoded to Master Address File Identifier	62	2.96
Geocoded to Block	803	38.29
No Search Area Identified	1,232	58.75
Geocoded to County	875	41.73
Geocoded to State	28	1.34
Ungeocoded	329	15.69
In-scope – Puerto Rico Address	9	0.43
Out-of-Scope - U.S. Address	258	12.30
Out-of-Scope - Other Country	62	2.96

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_other_address_person, pm_other_address, and pm_other_address_geocode

The unweighted results for the U.S. (excluding Puerto Rico) in Table 21 show that there were 51,980 other addresses (inmover and alternate addresses) attached to PI people prior to clerical matching. These are respondent-provided addresses collected during PI interviews conducted within the U.S. (excluding Puerto Rico). We were able to identify a search area based on the results of automated

[18] The results of this section reflect the results prior to any clerical review (i.e., prior to the Clerical Residence Status Coding and Clerical Geocoding stages). The first stage of BFU preprocessing attached inmover and alternate addresses to people based on the addresses reported for each person during PI. The linking of inmover and alternate addresses could have been updated later during the Clerical Residence Status Coding, BFU, and AFU stages.

geocoding for 65.41 percent of these addresses (47.24 percent were geocoded to a MAFID and 18.17 percent were geocoded to one or more blocks without finding a specific address on the MAF). We were unable to identify a search area for the remaining 34.59 percent of the other addresses (23.63 percent were geocoded to the county level, 2.31 percent were geocoded to the state, and 8.65 percent remained ungeocoded during automated geocoding). More than half of the 4,494 ungeocoded addresses were out-of-scope. These include 63 addresses located in Puerto Rico and 2,247 addresses located in other countries. According to the CCM survey design, people rostered in an interview conducted within the U.S. were only eligible for matching to other people in the U.S. (excluding Puerto Rico). Therefore, respondent-provided addresses in Puerto Rico and other countries did not need to be geocoded to identify search areas for these people.

Of the 2,097 respondent-provided addresses attached to Puerto Rico PI people prior to clerical matching, we were able to identify a search area based on the results of automated geocoding for 41.25 percent of the addresses. When we were able to identify a search area, more addresses were geocoded to one or more blocks (38.29 percent) than to a specific MAFID (2.96 percent). Furthermore, a large portion of the other addresses could only be geocoded to the county level (41.73 percent). Of the 329 ungeocoded addresses collected in Puerto Rico interviews, only nine were in scope.[19] All of the other ungeocoded addresses were out-of-scope because they were located in the U.S. (258) or in another country (62). People rostered in interviews conducted within Puerto Rico could only be matched to other people in Puerto Rico, thus there was no need to geocode respondent-provided addresses and identify search areas when these addresses were located in the U.S. or in another country.

The unweighted automated geocoded results for all respondent-provided addresses in the U.S. and Puerto Rico combined presented in Table 83 in Appendix A are similar to the results discussed above.

5.10 What is the distribution of the number of alternate addresses attached to Person Interview people prior to clerical matching (based on data collected during the Person Interview)?

The results in this section reflect the attachment of inmover and alternate addresses to PI people assigned in the first stage of BFU preprocessing prior to any clerical review. Recall that for people who moved into the sample address after Census Day, the PI asked the respondent to provide the location where the person lived on Census Day (i.e., the inmover address). For people who lived at the sample address on Census Day but moved out before PI, the PI asked the respondent to provide the address where the person moved to (i.e., the outmover address). The PI also probed for additional alternate locations where the person could have been counted, including places where the person may have stayed while attending college, with another relative (such as with another parent in shared custody situations), while serving in the military, for the purposes of a job (other than

[19] With the exception of these nine cases, in-scope addresses collected in Puerto Rico could at least be geocoded to the state level (i.e., geocoded to the Puerto Rico state code).

military), as a seasonal address (such as a second home), at a GQ, and other places where a person may have stayed often.

Table 22 shows how many respondent-provided addresses (unweighted) were attached to each PI person prior to any clerical review.[20]

Table 22
The 2010 Census Coverage Measurement Automated Geocoding and Residence Status Coding Operations Number of Person Interview People by Respondent-Provided Addresses Per Person and Sample Indicator: Unweighted

	Person Interview People in Independent Listing Housing Units			
	P-sample Residence Status		Non P-sample Residence Status	
	Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)	**386,924**	**100.00**	**5,787**	**100.00**
No Respondent-Provided Addresses	321,052	82.98	1,373	23.73
One Respondent-Provided Address	60,517	15.64	4,412	76.24
Two Respondent-Provided Addresses	5,080	1.31	2	0.03
Three or More Respondent-Provided Addresses	275	0.07	0	0.00
Total Puerto Rico	**16,837**	**100.00**	**202**	**100.00**
No Respondent-Provided Addresses	14,277	84.80	50	24.75
One Respondent-Provided Address	2,359	14.01	152	75.25
Two Respondent-Provided Addresses	185	1.10	0	0.00
Three or More Respondent-Provided Addresses	16	0.10	0	0.00

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person, vw_pm_pi_coding_history, vw_pi_other_address_person, and pm_other_address

As shown by the unweighted BFU preprocessing results for the U.S. (excluding Puerto Rico) in Table 22, 82.98 percent of the 386,924 P-sample people had no other addresses, 15.64 percent had one other address, 1.31 percent had two other addresses, and 0.07 percent had three or more other addresses. As expected, there were proportionally fewer people with no other addresses reported among the people in IL housing units who were assigned non P-sample residence status codes compared to the P-sample people (23.73 percent for people with non P-sample residence status codes compared to 82.98 percent for people assigned P-sample residence status codes in IL housing units). A majority of the 5,787 PI people rostered in IL housing units that were assigned non P-sample residence status codes had one other address (76.24 percent).

In Puerto Rico, the unweighted BFU preprocessing results in Table 22 show that 84.80 percent of the 16,837 P-sample people had no other addresses, 14.01 percent had one other address, 1.10

[20] The first stage of BFU preprocessing attached inmover and alternate addresses to people based on the addresses reported for each person during PI. The linking of inmover and alternate addresses could have been updated later during the Clerical Residence Status Coding, BFU, and AFU stages.

percent had two other addresses, and 0.10 percent had three or more other addresses. As expected, there were proportionally fewer people with no other addresses reported among the people in IL housing units who were assigned non P-sample residence status codes compared to the P-sample people (24.75 percent for people with non P-sample residence status codes compared to 84.80 percent for people assigned P-sample residence status codes in IL housing units).

The unweighted distribution of the number of alternate addresses attached to all PI persons (including persons in IL housing units and persons in census-only units) prior to clerical matching are presented in Table 84 in Appendix A and are similar to the results discussed above.

Person Clerical Matching Results

Unweighted results from the person BFU and AFU Clerical Matching are presented in the following sections. No inferences to the general population are intended. These results are from an operation standpoint and do not reflect the final CCM estimates of person coverage.

5.11 How many persons were clerically matched, possibly matched, and remained nonmatched between the Census Coverage Measurement Person Interview rosters and the Census Unedited File? How many duplicates did the clerical matchers find within the Census Coverage Measurement Person Interview rosters, within the block cluster? How many duplicates did the computer find within the Census Unedited File, by location of the duplicate?

This section presents the unweighted matching results of BFU and AFU Clerical Matching. The first set of tables shows the unweighted BFU Clerical Matching results for PI people in IL housing units and E-sample people, based on their BFU match codes. Census-only PI people and non E-sample people were not part of the CCM sample and are excluded from the tables presented here. The PI people rostered in IL housing units were classified as P-sample or non P-sample people, based on their residence status codes. The BFU match code identifies each person as a match, possible match, nonmatch, duplicate, or possible duplicate. During BFU Clerical Matching, matchers reviewed the results of computer matching and the computer match codes assigned during BFU preprocessing. They linked records, unlinked records, and changed match codes and other codes, as warranted by their review. The clerical matching staff searched for additional matches and possible matches. They reviewed the census enumerations in the sample search area, inmover search areas, and alternate search areas[21] to identify links to PI people (some of the inmover and alternate search areas may not have been available during computer matching if the address was geocoded during the Clerical Geocoding stage, since computer matching only had access to the automated geocoding results). (To identify the inmover and alternate search areas, the inmover and alternate addresses must have been geocoded to a MAFID or one or more blocks.) They also searched for matches at

[21] The sample, inmover, and alternate search areas included all census enumerations in the block cluster and surrounding blocks of each address associated with the person (the sample address and any inmover or alternate addresses).

the census addresses corresponding to the nationwide links identified in computer matching[22]. BFU Clerical Matching also involved a review of the duplicate persons identified from computer matching and a search for additional duplicates. Matchers checked all census enumerations in each available search area (sample, inmover, alternate, and/or nationwide) to find duplicates to E-sample people. To find PI duplicates, matchers searched all PI people in the sample block cluster.

Table 23 The 2010 Census Coverage Measurement Person Before Followup Matching Operation Number of Person Interview People by Match Code, Search Area, and Sample Indicator: Unweighted, United States Only

	Person Interview People in Independent Listing Housing Units			
	P-sample Residence Status		Non P-sample Residence Status	
	Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)	**370,389**	**100.00**	**22,322**	**100.00**
Matches	335,194	90.50	15,456	69.24
Sample Search Area	312,628	84.41	6,294	28.20
Inmover Search Area	16,733	4.52	6,346	28.43
Alternate Search Area	1,802	0.49	2,255	10.10
Nationwide Search Area	4,031	1.09	561	2.51
Possible Matches	1,190	0.32	101	0.45
Sample Search Area	922	0.25	34	0.15
Inmover Search Area	103	0.03	26	0.12
Alternate Search Area	26	0.01	25	0.11
Nationwide Search Area	139	0.04	16	0.07
Nonmatches	32,070	8.66	6,555	29.37
Duplicates	1,893	0.51	209	0.94
Possible Duplicates	42	0.01	1	0.00

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person, vw_pm_pi_coding_history, vw_pm_census_person, and vw_pm_census_coding_history

Table 23 shows the unweighted BFU Clerical Matching results for PI people in IL housing units from the CCM sample areas within the U.S. (excluding Puerto Rico). PI people in IL housing units were classified as P-sample or non P-sample based on their BFU residence status codes. Residence status codes from previous automated and clerical activities could have been updated during BFU Clerical Matching. Therefore, people who were tallied as non P-sample people in the computer matching results could have been recoded as P-sample people, and vice versa.

Looking at the unweighted results of BFU Clerical Matching in Table 23, 90.50 percent of the 370,389 P-sample people in the U.S. were matches, 0.32 percent were possible matches, 8.66 percent were nonmatches, and 0.52 percent were duplicates or possible duplicates of other PI records. Most of the P-sample matches and possible matches were found in the sample search area.

[22] When the computer found a link beyond the sample search area that was not associated with an inmover or alternate address, the clerical matching staff searched for additional person links within that address (i.e., the nationwide search area, which did not include the rest of the cluster not the surrounding blocks).

However, 4.52 percent of P-sample people were matched to census people who were enumerated in an inmover search area located beyond the sample search area. The nationwide search linked 1.09 percent of the U.S. P-sample people as matches (and 0.04 percent as possible matches), which were not found in an inmover or alternate address search area.

The unweighted U.S. results show that among the 22,322 PI people in IL housing units who were assigned non P-sample residence status codes, 69.24 percent were matches, 0.45 percent were possible matches, 29.37 percent were nonmatches, and 0.94 percent were duplicates or possible duplicates of other PI records. Non P-sample residence status codes include people who should have been counted at the sample address on Census Day (Outmovers) and people who should have been counted somewhere else (Out-of-Scope and Never Resident). As expected, some of the non P-sample people in IL housing units were matched in the sample search area (28.20 percent) while others were not. Although non P-sample residence status codes do not include inmovers, 28.43 percent of the non P-sample people in IL housing units were matched in an inmover search area beyond the sample search area. Also note that the percent of nonmatches was higher for non P-sample people in IL housing units (29.37 percent) than it was for P-sample people (8.66 percent), even though we attempted to collect alternate addresses and conduct searches near the alternate addresses for those people.

A comparison of the unweighted results in Table 23 with the unweighted results from computer matching in Table 13 shows that after completion of the BFU clerical review, more PI people in IL housing units were coded as matches and fewer were coded as nonmatches than there were as a result of computer matching alone. Among U.S. P-sample people, 90.50 percent were BFU matches compared to 84.55 percent computer matches and 8.66 percent were BFU nonmatches compared to 13.57 percent computer nonmatches. Among U.S. non P-sample in IL housing units, 69.24 percent were BFU matches compared to 61.93 percent computer matches and 29.37 percent were BFU nonmatches compared to 34.69 percent computer nonmatches. Recall that the clerical matching staff was able to conduct searches in additional inmover and alternate search areas that were not available during computer matching (which only had access to the automated geocoding results). Thus, it is not surprising that there were more matches and fewer nonmatches following the BFU clerical review.

Table 24
The 2010 Census Coverage Measurement Person Before Followup Matching Operation
Number of Person Interview People by Match Code, Search Area, and Sample Indicator: Unweighted, Puerto Rico Only

	Person Interview People in Independent Listing Housing Units			
	P-sample Residence Status		Non P-sample Residence Status	
	Count	Percent of Total*	Count	Percent of Total*
Total Puerto Rico	**15,789**	**100.00**	**1,250**	**100.00**
Matches	14,174	89.77	657	52.56
Sample Search Area	13,620	86.26	373	29.84
Inmover Search Area	351	2.22	176	14.08
Alternate Search Area	51	0.32	63	5.04
Nationwide Search Area	152	0.96	45	3.60
Possible Matches	59	0.37	9	0.72
Sample Search Area	41	0.26	4	0.32
Inmover Search Area	5	0.03	4	0.32
Alternate Search Area	4	0.03	1	0.08
Nationwide Search Area	9	0.06	0	0.00
Nonmatches	1,404	8.89	563	45.04
Duplicates	152	0.96	21	1.68
Possible Duplicates	0	0.00	0	0.00

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person, vw_pm_pi_coding_history, vw_pm_census_person, and vw_pm_census_coding_history

Table 24 provides the unweighted BFU Clerical Matching results for PI people in IL housing units from the CCM sample areas within Puerto Rico. As discussed previously, PI people in IL housing units were classified as P-sample or non P-sample based on their BFU residence status codes. Looking at the unweighted results of BFU Clerical Matching in Table 24, 89.77 percent of the 15,789 P-sample people in the U.S. were matches, 0.37 percent were possible matches, 8.89 percent were nonmatches, and 0.96 percent were duplicates or possible duplicates of other PI records. Among the non P-sample people in IL housing units, 14.08 percent matched in the inmover search area and 5.04 percent matched in the alternate search area.

A comparison of the unweighted results in Table 24 with the unweighted results from computer matching in Table 14 shows that after completion of the BFU clerical review, more PI people in IL housing units were coded as matches and fewer were coded as nonmatches than there were as a result of computer matching alone. Among Puerto Rico P-sample people, 89.77 percent were BFU matches compared to 84.98 percent computer matches and 8.89 percent were BFU nonmatches compared to 12.31 percent computer nonmatches. Among Puerto Rico non P-sample people in IL housing units, 52.56 percent were BFU matches compared to 47.23 percent computer matches and 45.04 percent were BFU nonmatches compared to 45.76 percent computer nonmatches.

The unweighted results of BFU match codes for all PI people (including people in IL housing units and people in census-only units) presented in Table 85 in Appendix A are similar to the results discussed above.

Table 25 The 2010 Census Coverage Measurement Person Before Followup Matching Operation Number of E-sample People by Match Code and Search Area: Unweighted, United States Only		
	E-sample People	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**
Matches	320,198	83.49
Sample Search Area	320,198	83.49
Inmover Search Area	n/a	n/a
Alternate Search Area	n/a	n/a
Nationwide Search Area	n/a	n/a
Possible Matches	883	0.23
Sample Search Area	883	0.23
Inmover Search Area	n/a	n/a
Alternate Search Area	n/a	n/a
Nationwide Search Area	n/a	n/a
Nonmatches	54,887	14.31
Duplicates	7,379	1.92
Sample Search Area	7,317	1.91
Inmover Search Area	0	0.00
Alternate Search Area	5	0.00
Nationwide Search Area	57	0.01
Possible Duplicates	190	0.05
Sample Search Area	183	0.05
Inmover Search Area	0	0.00
Alternate Search Area	2	0.00
Nationwide Search Area	5	0.00

*Percents may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pm_census_person and vw_pm_census_coding_history

Table 25 presents the unweighted BFU Clerical Matching results for E-sample people in the CCM sample areas in the U.S. (excluding Puerto Rico). Looking at the unweighted U.S. results, 83.49 percent of the 383,537 E-sample people were matches, 0.23 percent were possible matches, 14.31 percent were nonmatches, and 1.97 percent were duplicates or possible duplicates of other census records.

A comparison of unweighted results in Table 25 with the unweighted results from computer matching in Table 15, shows that after completion of the BFU clerical review, more E-sample people were coded as matches and fewer were coded as nonmatches than there were as a result of computer matching alone. Among U.S. E-sample people, 83.49 percent were BFU matches compared to 78.50 percent computer matches, and 14.31 percent were BFU nonmatches compared to 18.76 percent computer nonmatches. There were also more E-sample duplicates and fewer possible duplicates as a result of the BFU clerical review. The unweighted BFU results show that 1.92 percent of E-sample people were duplicates (compare to 1.25 percent from computer matching) and 0.05 percent were possible duplicates (compared to 0.28 percent from computer matching). During BFU, clerical matchers reviewed all computer duplicates and possible duplicates to determine if they

should be duplicates, possible duplicates, or unlinked as duplicates. In addition, clerical matching searched for additional duplications. Although no additional data were collected prior to BFU, the BFU clerical review took into account the uniqueness of names and common name variation situations along with agreement of demographics and household composition when determining whether two records referred to the same person. After reviewing the information clerically, they were often able to have more confidence that the records did in fact refer to the same person and thus could change records that were computer possible duplicates to strong duplicates during BFU. They could also have determined that records linked by the computer were probably not the same people and thus coded them as nonmatches during BFU.

Note that the duplicate results in this table are limited to E-sample records that were coded as duplicates or possible duplicates. As discussed in Section 5.5, if a duplicate pair involved an E-sample and non E-sample person, the E-sample person would typically have been the primary and coded as a match, nonmatch, or possible match and a counter would have been maintained to reflect the number of census duplicates linked to that primary record. The non E-sample person would have been coded as the duplicate or possible duplicate. Table 25 excludes all non E-sample records. Section 5.12 provides BFU results for the number of census duplicates (E-sample and non E-sample) found per person.

Table 26 The 2010 Census Coverage Measurement Person Before Followup Matching Operation Number of E-sample People by Match Code and Search Area: Unweighted, Puerto Rico Only		
	E-sample People	
	Count	**Percent of Total***
Total Puerto Rico	**17,584**	**100.00**
Matches	13,897	79.03
Sample Search Area	13,897	79.03
Inmover Search Area	n/a	n/a
Alternate Search Area	n/a	n/a
Nationwide Search Area	n/a	n/a
Possible Matches	32	0.18
Sample Search Area	32	0.18
Inmover Search Area	n/a	n/a
Alternate Search Area	n/a	n/a
Nationwide Search Area	n/a	n/a
Nonmatches	2,845	16.18
Duplicates	793	4.51
Sample Search Area	793	4.51
Inmover Search Area	0	0.00
Alternate Search Area	0	0.00
Nationwide Search Area	0	0.00
Possible Duplicates	17	0.10
Sample Search Area	15	0.09
Inmover Search Area	0	0.00
Alternate Search Area	0	0.00
Nationwide Search Area	2	0.01

*Percents may not sum to totals due to rounding.
n/a stands for not applicable.
PerMaRCS tables: vw_pm_census_person and vw_pm_census_coding_history

Table 26 presents the unweighted BFU Clerical Matching results for E-sample people in the CCM sample areas in Puerto Rico. Of the 17,584 E-sample people, 79.03 percent were matches, 0.18 percent were possible matches, 16.18 percent were nonmatches, and 4.61 percent were duplicates or possible duplicates of other census records.

A comparison of unweighted results in Table 26 with the unweighted results from computer matching in Table 16, shows that after completion of the BFU clerical review, more E-sample people were coded as matches and fewer were coded as nonmatches than there were as a result of computer matching alone. Among Puerto Rico E-sample people, 79.03 percent were BFU matches compared to 75.02 percent computer matches, and 16.18 percent were BFU nonmatches compared to 19.56 percent computer nonmatches.

The unweighted results of BFU match codes for all census people (including E-sample and non E-sample people) presented in Table 86 of Appendix A are similar to the results discussed above.

Next, the unweighted results of AFU Clerical Matching are presented and then compared to the unweighted results of BFU Clerical Matching. The unweighted AFU match code results for PI people in IL housing units are presented in Table 27 and Table 28. The unweighted AFU match code results for E-sample people are presented in Table 29 and Table 30. During AFU, clerical matchers reviewed PFU forms to geocode respondent-provided addresses and assign final match codes and/or residence status codes. The PFU interview attempted to collect additional information needed to establish match status, duplicate status, residence status, or enumeration status. The PFU data collection methods included establishing where the person should have been counted (their "usual residence" on Census Day) and collecting information on alternate addresses where the person could have been counted on Census Day. Usual residence was defined as the place where a person lived and slept most of the time when the person had more than one residence (this was determined based on the 2010 Census Residence Rule).

In addition to following up people at the sample address, a nationwide followup was conducted for nationwide matches, possible matches, duplicates, and possible duplicates at the nationwide address (i.e., at the census address that was beyond the surrounding blocks). In order to preserve confidentiality, we attempted to collect alternate address information from two different interviews for each pair of people linked at a nationwide address, one conducted at the sample address (on the within-cluster form) and one at the nationwide address (on the nationwide form). (In other words, persons on the within-cluster form could not be asked any questions about the linked address on the nationwide form, and persons on the nationwide form could not be asked questions about the linked sample address on the within-cluster form.) The expectation was that if the same person lived or stayed at both of these addresses, the respondents would mention the other address.

For this reason, coding these cases in AFU was slightly different than coding other PFU cases. The clerical matchers had to consider both the within-cluster and the nationwide PFU forms together when coding a nationwide pair. The addresses collected on the nationwide form were compared to the sample address and the addresses collected on the within-cluster form were compared to the nationwide address to determine if they represented the same place. In other words, the clerical matchers tried to determine if the respondent for the nationwide case reported the sample address as an other address and whether the respondent for the within-cluster case reported the nationwide address as an other address.

Note that any match or duplicate from the nationwide computer matching that was determined to be within an inmover or alternate address search area (based on geocoding of the PI respondent-provided addresses) would not have been sent to PFU because the data from PI provided evidence that the two records in the nationwide pair referred to the same person. However, sometimes alternate addresses could not be geocoded to the block-level because only a partial address was provided by the respondent, so the inmover or alternate address search area could not be identified. As a result, some of the nationwide links were sent to PFU. During AFU, information from PI and PFU were compared to the nationwide address to determine if the geocoding of the respondent-provided address could be resolved as being the same as the nationwide address, in which case, the respondent-provided address was geocoded to the MAFID corresponding to the nationwide address. The clerical matchers were flexible when comparing addresses if the locations were geographically distant.

Table 27
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of Person Interview People by Match Code, Search Area, and Sample Indicator:
Unweighted, United States Only

		Person Interview People in Independent Listing Housing Units			
		P-sample Residence Status		Non P-sample Residence Status	
		Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)		**363,290**	**100.00**	**29,421**	**100.00**
Matches		332,389	91.49	20,465	69.56
	Sample Search Area	310,280	85.41	8,762	29.78
	Inmover Search Area	18,520	5.10	6,715	22.82
	Alternate Search Area	2,744	0.76	4,696	15.96
	Nationwide Search Area	845	0.23	292	0.99
Possible Matches		321	0.09	84	0.29
	Sample Search Area	77	0.02	11	0.04
	Inmover Search Area	79	0.02	22	0.07
	Alternate Search Area	14	0.00	24	0.08
	Nationwide Search Area	151	0.04	27	0.09
Nonmatches		28,654	7.89	8,603	29.24
Duplicates		1,922	0.53	268	0.91
Possible Duplicates		4	0.00	1	0.00

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person, vw_pm_pi_coding_history, vw_pm_census_person, and vw_pm_census_coding_history

Table 27 shows the unweighted results for PI people in IL housing units from the CCM sample areas within the U.S. Each PI person was classified as either P-sample or non P-sample, based on the person's residence status code from AFU Clerical Matching. Of the 363,290 P-sample people, 91.49 percent were matches, 0.09 percent were possible matches, 7.89 percent were nonmatches, and 0.53 percent were duplicates or possible duplicates of other PI records. Most of the P-sample matches were found in the sample search area. However, 5.10 percent of P-sample people were matched in an inmover search area located beyond the sample search area. The nationwide search linked 0.23 percent of the U.S. P-sample people as matches, which were not found in an inmover or alternate address search area.

Per the unweighted U.S. results, of the 29,421 PI people in IL housing units with non P-sample residence status codes, 69.56 percent were matches, 0.29 percent were possible matches, 29.24 percent were nonmatches, and 0.91 percent were duplicates or possible duplicates of other PI records. Recall that non P-sample residence status codes include people who should have been counted at the sample address on Census Day (Outmovers) and people who should have been counted somewhere else (Out-of-Scope and Never Resident). Among the PI people in IL housing units with non P-sample residence status codes, 29.78 percent were matched in the sample address search area, 22.82 percent were matched in the inmover address search area, 15.96 percent were matched in the alternate address search area, and 0.99 percent were matched in the nationwide address search area. There were proportionally more nonmatches among the non P-sample people in IL housing units (29.24 percent) than among the P-sample people (7.89 percent), even though we

attempted to collect alternate addresses and conduct searches near the alternate addresses for those people.

When comparing the unweighted AFU results for the U.S. in Table 27 to the unweighted BFU results in Table 23, first note the differences in the number of P-sample people and non P-sample people in IL housing units. There were 363,290 P-sample people in the U.S. based on the residence status codes from AFU, compared to 370,389 P-sample people based on the residence status codes from BFU. (See Section 5.13 for more details on the BFU and AFU residence status code results.) Thus, the number of U.S. non P-sample people in IL housing units increased from 22,322 in BFU to 29,421 in AFU. Next, when comparing U.S. results for the two operations, note that the proportion of matches increased slightly, while the proportion of nonmatches and possible matches went down slightly. The unweighted AFU results for P-sample people show that the percent of matches in AFU was 91.49 percent compared to 90.50 percent in BFU; the percent of nonmatches was 7.89 percent in AFU compared to 8.66 percent in BFU; and the percent of possible matches was 0.09 percent in AFU compared to 0.32 percent in BFU. However, the percent of P-sample people who matched in the inmover and alternate search areas increased slightly in AFU (5.10 percent of P-sample people matched in an inmover search area in AFU compared to 4.52 percent in BFU and 0.76 percent of P-sample people matched in an alternate search area in AFU compared to 0.49 percent in BFU). However, the percent of P-sample people who matched in the nationwide search area decreased in AFU (0.23 percent in AFU compared to 1.09 percent in BFU). This makes sense given that the geocoding of the nationwide address was applied to inmover and alternate addresses if the respondent-provided address confirmed the location of the nationwide address, even if the respondent only provided enough information to partially geocode an address. Therefore, some people who were counted as matches in the nationwide search area in BFU would have been counted as matches in an inmover or alternate address search area in AFU, since these address search areas would now contain the nationwide address.

There was very little change in the percent of P-sample people coded as duplicates (0.53 percent in AFU compared to 0.51 percent in BFU). However, the number of possible matches and possible duplicates decreased as a result of AFU Clerical Matching.[23] The unweighted results show there were 321 P-sample possible matches in AFU compared to 1,190 P-sample possible matches in BFU, and four P-sample possible duplicates in AFU compared to 42 P-sample possible duplicates in BFU.

[23] Possible matches and possible duplicates with sufficient information for followup were sent to PFU to try to resolve their match status.

Table 28
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of Person Interview People by Match Code, Search Area, and Sample Indicator:
Unweighted, Puerto Rico Only

		Person Interview People in Independent Listing Housing Units			
		P-sample Residence Status		Non P-sample Residence Status	
		Count	Percent of Total*	Count	Percent of Total*
Total Puerto Rico		**15,604**	**100.00**	**1,435**	**100.00**
Matches		14,156	90.72	761	53.03
	Sample Search Area	13,628	87.34	393	27.39
	Inmover Search Area	402	2.58	187	13.03
	Alternate Search Area	103	0.66	164	11.43
	Nationwide Search Area	23	0.15	17	1.18
Possible Matches		13	0.08	7	0.49
	Sample Search Area	2	0.01	2	0.14
	Inmover Search Area	4	0.03	4	0.28
	Alternate Search Area	3	0.02	1	0.07
	Nationwide Search Area	4	0.03	0	0.00
Nonmatches		1,283	8.22	645	44.95
Duplicates		151	0.97	22	1.53
Possible Duplicates		1	0.01	0	0.00

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person, vw_pm_pi_coding_history, vw_pm_census_person, and vw_pm_census_coding_history

Table 28 presents the unweighted AFU Clerical Matching results for PI people in Puerto Rico. The unweighted AFU results are as follows (with the comparable percents from BFU in parentheses). In Puerto Rico, 90.72 percent of the 15,604 P-sample people were matches (compared to 89.77 percent after BFU), 0.08 percent were possible matches (compared to 0.37 percent after BFU), 8.22 percent were nonmatches (compared to 8.89 percent after BFU), and .098 percent were duplicates or possible duplicates (compared to 0.96 percent after BFU). Thus, the proportion of matches increased slightly, while the proportion of nonmatches and possible matches went down slightly. Also note that that fewer PI people in IL housing units were classified as P-sample in AFU than in BFU, due to changes in the residence status codes between the two operations (there were 15,604 P-sample people in Puerto Rico upon completion of AFU compared to 15,789 P-sample people after BFU). Thus, the number of Puerto Rico non P-sample people in IL housing units increased from 1,250 following BFU to 1,435 following AFU.

The unweighted results of AFU match codes for all PI people (including people in IL housing units and people in census-only units) presented in Table 87 in Appendix A are similar to the results discussed above.

Table 29 The 2010 Census Coverage Measurement Person After Followup Matching Operation Number of E-sample People by Match Code and Search Area: Unweighted, United States Only		
	E-sample People	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**
Matches	320,273	83.51
Sample Search Area	320,273	83.51
Inmover Search Area	n/a	n/a
Alternate Search Area	n/a	n/a
Nationwide Search Area	n/a	n/a
Possible Matches	72	0.02
Sample Search Area	72	0.02
Inmover Search Area	n/a	n/a
Alternate Search Area	n/a	n/a
Nationwide Search Area	n/a	n/a
Nonmatches	51,780	13.50
Duplicates	11,357	2.96
Sample Search Area	9,224	2.40
Inmover Search Area	56	0.01
Alternate Search Area	1,786	0.47
Nationwide Search Area	291	0.08
Possible Duplicates	55	0.01
Sample Search Area	32	0.01
Inmover Search Area	0	0.00
Alternate Search Area	8	0.00
Nationwide Search Area	15	0.00

*Percent may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pm_census_person and vw_pm_census_coding_history

Table 29 presents the AFU Clerical Matching results for E-sample people in the U.S. (excluding Puerto Rico). It is useful to compare the AFU results to those from BFU to see the impact of followup. The unweighted AFU results are as follows (with the comparable percents from BFU in parentheses). For the U.S., 83.51 percent of the 383,537 E-sample people were matches (compared to 83.49 percent after BFU), 0.02 percent were possible matches (compared to 0.23 percent after BFU), 13.50 percent were nonmatches (compared to 14.31 percent after BFU), 2.96 percent were duplicates (compared to 1.92 percent after BFU); and 0.01 percent were possible duplicates (compared to 0.05 percent after BFU). So, the percent of matches increased slightly and the percents of nonmatches and possible matches decreased. The percent of duplicates increased and the percent of possible duplicates decreased.

Recall that in a census duplicate pair, the E-sample person was usually the primary unless there was further information based on a link to a PI person or further field followup (i.e., PFU) to determine that the person referred to in the duplicate pair should have actually been counted outside the sample cluster. Thus it is not surprising that there were relatively more E-sample duplicates in AFU (2.96 percent) than in BFU (1.92 percent). (See Section 5.12 for the AFU results for the number of census

duplicates, E-sample and non E-sample, found per person.) Furthermore, a greater portion of the duplicates in AFU were made to census people in the alternate search area compared to the nationwide search area. The unweighted AFU results show that 0.47 percent of the E-sample people were duplicates to people in the alternate search area and 0.08 percent were duplicates to people in the nationwide search area. Also, a small percentage of duplicates were made to people in the inmover search area (0.01 percent) during AFU. Nationwide duplicates, like nationwide matches, were sent to PFU for field confirmation. Clerical matchers reviewed the data from PFU and could have determined that the nationwide address corresponded to the alternate address (or inmover address) collected in PFU thus confirming the duplicate and changing the classification of the search area from nationwide to alternate (or inmover).[24]

Table 30
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of E-sample People by Match Code and Search Area: Unweighted, Puerto Rico Only

	E-sample People	
	Count	**Percent of Total***
Total Puerto Rico	**17,584**	**100.00**
Matches	13,905	79.08
Sample Search Area	13,905	79.08
Inmover Search Area	n/a	n/a
Alternate Search Area	n/a	n/a
Nationwide Search Area	n/a	n/a
Possible Matches	2	0.01
Sample Search Area	2	0.01
Inmover Search Area	n/a	n/a
Alternate Search Area	n/a	n/a
Nationwide Search Area	n/a	n/a
Nonmatches	2,657	15.11
Duplicates	1,018	5.79
Sample Search Area	932	5.30
Inmover Search Area	1	0.01
Alternate Search Area	77	0.44
Nationwide Search Area	8	0.05
Possible Duplicates	2	0.01
Sample Search Area	0	0.00
Inmover Search Area	0	0.00
Alternate Search Area	0	0.00
Nationwide Search Area	2	0.01

*Percent may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pm_census_person and vw_pm_census_coding_history

[24] During AFU, if a respondent-provided address was determined to be the same as the nationwide address, then the inmover or alternate address was assigned the same geocodes as the nationwide address. Thus, the nationwide address would be contained in the inmover or alternate address search area and any link that would have been in the nationwide search area would then be in the new inmover or alternate address search area.

The unweighted AFU results for Puerto Rico are as follows (with the comparable results from BFU in parenthesis). In Puerto Rico, 79.08 percent of the 17,584 E-sample people were matches (compared to 79.03 percent after BFU), 0.01 percent were possible matches (compared to 0.18 percent after BFU), 15.11 percent were nonmatches (compared to 16.18 percent after BFU), 5.79 percent were duplicates (compared to 4.51 percent after BFU); and 0.01 percent were possible duplicates (compared to 0.10 percent after BFU). So, the percent of matches increased slightly and the percents of nonmatches and possible matches decreased. The percent of duplicates increased and the percent of possible duplicates decreased. After AFU, there were also more duplicate links in the alternate search area than there were to the nationwide search area (0.44 percent were duplicates linked in the alternate search area and 0.05 percent were duplicates linked in the nationwide search area).

The unweighted results of AFU match codes for all census persons (including E-sample and non E-sample people) presented in Table 88 in Appendix A are similar to the results discussed above.

5.12 What is the distribution of number of duplicates found per census person during clerical matching?

During BFU Clerical Matching, matchers reviewed the duplicate and possible duplicate people identified by computer matching and updated the match codes when warranted by their review. They also searched for additional duplicates to E-sample persons in the sample, alternate, inmover, and nationwide search areas.

Depending on the type of duplicate link and where the duplicate was found, followup was conducted in PFU to gather further information. These data were reviewed during AFU Clerical Matching and final match codes were assigned.

Table 31 and Table 32 show unweighted BFU and AFU results for E-sample people by the number of duplicates or possible duplicates found per person (which can include E-sample and non E-sample duplicates).

Table 31 **The 2010 Census Coverage Measurement Person Before Followup Matching Operation Number of E-sample People by Number of Duplicates or Possible Duplicates Per Person and Sample Indicator: Unweighted**		
	E-sample People	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**
No Duplicates or Possible Duplicates	362,582	94.54
One Duplicate or Possible Duplicate	20,212	5.27
Two Duplicates or Possible Duplicates	698	0.18
Three or More Duplicates or Possible Duplicates	45	0.01
Total Puerto Rico	**17,584**	**100.00**
No Duplicates or Possible Duplicates	15,287	86.94
One Duplicate or Possible Duplicate	2,152	12.24
Two Duplicates or Possible Duplicates	135	0.77
Three or More Duplicates or Possible Duplicates	10	0.06
*Percents may not sum to totals due to rounding. Source: PerMaRCS tables: vw_pm_census_person and vw_pm_census_coding_history		

The unweighted BFU Clerical Matching results for the U.S. (excluding Puerto Rico) in Table 31 show that, 94.54 percent of the 383,537 E-sample people had no duplicates or possible duplicates, 5.27 percent had one duplicate or possible duplicate, and only 0.19 percent had two or more duplicates or possible duplicates. Compared to the computer matching results in Table 17, there were fewer E-sample people with duplicates or possible duplicates following BFU clerical review than after computer matching (20,955 E-sample people had at least one duplicate or possible duplicate following BFU compared to 23,328 E-sample people after computer matching). Thus, more people had no duplicates or possible duplicates following BFU than after computer matching. Following BFU, 94.54 percent of E-sample people had no duplicates or possible duplicates compared to 93.92 percent for computer matching.

The unweighted BFU Clerical Matching results for Puerto Rico in Table 31 show that 86.94 percent of the 17,584 E-sample people Puerto Rico had no duplicates. If an E-sample person was duplicated, they were more often duplicated only once: 12.24 percent of the Puerto Rico E-sample people had one duplicate or possible duplicate compared to 0.77 percent with two duplicates or possible duplicate and 0.06 percent with three or more duplicates or possible duplicates.

The following table shows the unweighted AFU Clerical Matching results.

Table 32 The 2010 Census Coverage Measurement Person After Followup Matching Operation Number of E-sample People by Number of Duplicates or Possible Duplicates Per Person and Sample Indicator: Unweighted		
	E-sample People	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**
No Duplicates or Possible Duplicates	366,056	95.44
One Duplicate or Possible Duplicate	16,886	4.40
Two Duplicates or Possible Duplicates	552	0.14
Three or More Duplicates or Possible Duplicates	43	0.01
Total Puerto Rico	**17,584**	**100.00**
No Duplicates or Possible Duplicates	15,518	88.25
One Duplicate or Possible Duplicate	1,947	11.07
Two Duplicates or Possible Duplicates	108	0.61
Three or More Duplicates or Possible Duplicates	11	0.06
*Percents may not sum to totals due to rounding. Source: PerMaRCS tables: vw_pm_census_person and vw_pm_census_coding_history		

Per Table 32, 95.44 percent of the 383,537 E-sample people in the U.S. (excluding Puerto Rico) had no duplicates or possible duplicates upon completion of AFU Clerical Matching and 4.40 percent had one duplicate, whereas only 0.15 percent had two or more duplicate or possible duplicates. In Puerto Rico, 88.25 percent of the 17,584 E-sample people had no duplicates or possible duplicates upon completion of AFU Clerical Matching and 11.07 percent had one duplicate, whereas only 0.67 percent had two or more duplicate or possible duplicates. As a result of PFU and final clerical review, there were fewer E-sample people with duplicates or possible duplicates (there were more people with no duplicates or possible duplicates and fewer had one or more).

The unweighted BFU and AFU Clerical Matching results for all census persons (including E-sample and non E-sample people) presented in Table 89 and Table 90 in Appendix A are similar to the results discussed above.

5.13 What is the residence status assigned for each Person Interview person (e.g., nonmover, inmover, unresolved, etc.) during clerical matching?

The residence status codes assigned to PI people by automated residence status coding may have been changed at several points in the clerical review process. During Clerical Residence Status Coding, staff reviewed all households with people who were assigned a residence status code of Clerical Review Needed during the automated residence status coding operation. Then, during BFU Clerical Matching, matchers were also able to update residence status codes, although that was not a specific goal of BFU. If residence status was still undetermined and there was sufficient data for followup, the person was sent to PFU. The followup data from PFU were reviewed in AFU Clerical Matching and matchers made the final updates to the residence status codes.

Table 33 and Table 34 show the unweighted residence status coding results upon completion of BFU Matching (which includes the results of the Clerical Residence Status Coding). Table 35 and Table

36 show the unweighted residence status coding results upon completion of the AFU Clerical Matching. Refer to Section 5.7 for definitions of each residence status code.

Table 33
The 2010 Census Coverage Measurement Person Before Followup Matching Operation Number of Person Interview People by Residence Status Code and Sample Indicator: Unweighted, United States Only

		Person Interview People in Independent Listing Housing Units	
		Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)		**392,711**	**100.00**
P-sample Residence Status		370,389	94.32
	Nonmover	322,974	82.24
	Inmover	24,821	6.32
	P-sample Outmover	1,074	0.27
	Unclassified	21,520	5.48
	Clerical Review Needed	n/a	n/a
Non P-sample Residence Status		22,322	5.68
	Out-of-scope	7,487	1.91
	Non P-sample Outmover	5,573	1.42
	Unclassified Outmover	313	0.08
	Never Resident	8,949	2.28

*Percents may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pi_person and vw_pm_pi_coding_history

The unweighted results for the U.S (excluding Puerto Rico) in Table 33 show that 82.24 percent of the 392,711 PI people in IL housing units were coded nonmovers as of the completion of BFU. The next largest residence status classification for this group was inmovers at 6.32 percent, followed closely by unclassified at 5.48 percent. Clerical residence status coding (conducted in the Clerical Residence Status Coding Phase and BFU Clerical Matching Stage) was able to determine residence status code for more people than automated residence status coding (only 5.48 percent of the PI people were unclassified following BFU compared to 0.69 percent unclassified and 18.92 percent needing clerical review based on automated residence status coding). Unclassified people were considered part of the P sample, however if additional information was obtained in PFU to resolve their residence status, they could have been assigned a P-sample or non P-sample residence status during AFU. Although the majority of PI people in IL housing units were assigned P-sample residence status codes (94.32 percent), 5.68 percent of them were assigned non P-sample residence status codes, including 1.91 percent who were determined to be out of scope and 2.28 percent who were determined to be never resident.

Table 34 The 2010 Census Coverage Measurement Person Before Followup Matching Operation Number of Person Interview People by Residence Status Code and Sample Indicator: Unweighted, Puerto Rico Only		
	Person Interview People in Independent Listing Housing Units	
	Count	**Percent of Total***
Total Puerto Rico	**17,039**	**100.00**
P-sample Residence Status	15,789	92.66
Nonmover	14,570	85.51
Inmover	717	4.21
P-sample Outmover	120	0.70
Unclassified	382	2.24
Clerical Review Needed	n/a	n/a
Non P-sample Residence Status	1,250	7.34
Out-of-scope	460	2.70
Non P-sample Outmover	306	1.80
Unclassified Outmover	6	0.04
Never Resident	478	2.81

*Percents may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pi_person and vw_pm_pi_coding_history

Looking at the unweighted Puerto Rico results in Table 34, 92.66 percent of the 17,039 PI people in IL housing units were assigned P-sample residence status codes as of the completion of BFU, 85.51 percent were coded nonmovers, 4.21 percent were coded inmovers, and 2.24 percent were unclassified. Although the majority of Puerto Rico PI people in IL housing units were assigned P-sample residence status codes, 7.34 percent of them were assigned non P-sample residence status codes, including 2.70 percent who were determined to be out of scope. Note that people rostered during Puerto Rico interviews were classified as out-of -scope if they resided in the U.S. on Census Day, as determined by the 2010 Census Residence Rule.

The unweighted BFU residence status coding results for all PI persons (including those in IL housing units and those in census-only units) presented in Table 91 in Appendix A show similar results as those discussed above.

Table 35
The 2010 Census Coverage Measurement Person After Followup Matching Operation Number of Person Interview People by Residence Status Code and Sample Indicator: Unweighted, United States Only

	Person Interview People in Independent Listing Housing Units	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**392,711**	**100.00**
P-sample Residence Status	363,290	92.51
Nonmover	325,505	82.89
Inmover	26,884	6.85
P-sample Outmover	1,413	0.36
Unclassified	9,488	2.42
Clerical Review Needed	n/a	n/a
Non P-sample Residence Status	29,421	7.49
Out-of-scope	8,753	2.23
Non P-sample Outmover	7,972	2.03
Unclassified Outmover	624	0.16
Never Resident	12,072	3.07

*Percents may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pi_person and vw_pm_pi_coding_history

The unweighted U.S. (excluding Puerto Rico) AFU residence status coding results in Table 35 show that 92.51 percent of the 392,711 PI people in IL housing units were assigned a P-sample residence status code. This is a decrease from the BFU results of 94.32 percent. The largest change in the distribution of P-sample residence status codes is in the percent of people with unclassified residence status. The percent of unclassified PI people in IL housing units decreased from 5.48 percent after BFU to 2.42 percent after AFU, a reduction of 3.06 percentage points. When PFU was able to resolve the unclassified cases, they could have been assigned another P-sample residence status code or a non P-sample residence status. However, since the proportion of nonmovers, inmovers, and P-sample outmovers were fairly similar following AFU compared to BFU, this would suggest that when PFU was able to resolve the residence status for BFU unresolved cases they were often assigned non P-sample codes during AFU. The percent of PI people in IL units that were assigned non P-sample residence status codes increased from 5.68 percent after BFU to 7.49 percent after AFU, an increase of 1.81 percentage points. Each category within the non P-sample residence status group increased as well: 2.23 percent were out-of-scope, 2.03 percent were non P-sample outmover, 0.16 were unclassified outmover, and 3.07 percent were never resident upon completion of AFU. The corresponding percents from after BFU were 1.91 percent, 1.42 percent, 0.08 percent and 2.28 percent, respectively. Note, during AFU, matchers were able to update residence status codes for all people, not just those who were unclassified. So, not all of the differences in counts between BFU and AFU are due to the recoding of unclassified people.

Table 36 The 2010 Census Coverage Measurement Person After Followup Matching Operation Number of Person Interview People by Residence Status Code and Sample Indicator: Unweighted, Puerto Rico Only		
	Person Interview People in Independent Listing Housing Units	
	Count	**Percent of Total***
Total Puerto Rico	**17,039**	**100.00**
P-sample Residence Status	15,604	91.58
Nonmover	14,646	85.96
Inmover	698	4.10
P-sample Outmover	137	0.80
Unclassified	123	0.72
Clerical Review Needed	n/a	n/a
Non P-sample Residence Status	1,435	8.42
Out-of-scope	484	2.84
Non P-sample Outmover	357	2.10
Unclassified Outmover	7	0.04
Never Resident	587	3.45

*Percents may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pi_person and vw_pm_pi_coding_history

The unweighted AFU residence status coding results for Puerto Rico in Table 36 show that 91.58 percent of the 17,039 PI people in IL housing units were assigned a P-sample residence status code and 0.72 percent were unclassified (compared to 2.24 following BFU). The Puerto Rico AFU results also show that 8.42 percent of the people in IL housing units were assigned a non P-sample residence status code (compared to 7.34 percent following BFU).

The unweighted AFU residence status coding results for all PI persons (including those in IL housing units and those in census-only units) presented in Table 92 in Appendix A show similar results as those discussed above.

5.14 What is the enumeration status assigned for each E-sample person (e.g., correct, erroneous, unresolved) during clerical matching?

As discussed when presenting the computer matching results, the enumeration status indicated whether an E-sample person should have been counted in the census based on the 2010 Census Residence Rule. Recall that the E-sample person could have been a correct enumeration, an erroneous enumeration, or an unresolved enumeration.

The unweighted results presented in this section reflect the enumeration status based on the match codes, residence status codes, and links at the end of the BFU and AFU stages of clerical matching. During computer matching and BFU, there was no information to determine enumeration status for nonmatched E-sample people so they were classified as having unresolved enumeration status. All E-sample nonmatches were sent to PFU to try to resolve the person's enumeration status. Possible duplicates, possible matches, and matches to PI people with unclassified residence status were also

sent to PFU to collect additional information that could be used to resolve the person's enumeration status.

Table 37
The 2010 Census Coverage Measurement Person Before Followup Matching Operation
Number of E-sample People by Enumeration Status: Unweighted

	E-sample People	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**
Correct Enumeration	305,749	79.72
Erroneous Enumeration	9,999	2.61
Duplicate	7,379	1.92
Fictitious	59	0.02
Geocoding Error	28	0.01
Other	2,533	0.66
Unresolved Enumeration	67,789	17.67
Total Puerto Rico	**17,584**	**100.00**
Correct Enumeration	13,540	77.00
Erroneous Enumeration	969	5.51
Duplicate	793	4.51
Fictitious	1	0.01
Geocoding Error	0	0.00
Other	175	1.00
Unresolved Enumeration	3,075	17.49

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pm_census_person, vw_pm_census_coding_history, vw_pi_person, and vw_pm_pi_coding_history

As shown in the unweighted results for the U.S. (excluding Puerto Rico) in Table 37, 79.72 percent of the 383,537 E-sample people were correct enumerations, 2.61 percent were erroneous enumerations, and 17.67 percent were unresolved enumerations upon completion of BFU Clerical Matching. Most of the BFU erroneous enumerations were due to duplication in the census: 1.92 percent of all E-sample people were duplicates compared to 2.61 percent of E-sample people who were erroneous enumerations of any kind. The percent of E-sample people in the U.S. who were unresolved decreased from 22.29 percent following computer matching to 17.67 percent following BFU Clerical Matching, a reduction of 4.62 percentage points. As discussed in Section 5.11, there were fewer E-sample nonmatches following BFU than computer matching. Prior to followup, there was no information to determine the enumeration status for nonmatched E-sample records. Thus it is not surprising that there were fewer cases with unresolved enumeration status following BFU when there were fewer nonmatches.

The unweighted BFU enumeration status results for Puerto Rico in Table 37 show that 77.00 percent of the 17,584 E-sample people were correct enumerations, 5.51 percent were erroneous enumerations, and 17.49 percent were unresolved enumerations after BFU Clerical Matching. Most of the BFU erroneous enumerations were due to duplication in the census: 4.51 percent of all

E-sample people were duplicates compared to 5.51 percent of E-sample people who were erroneous enumerations of any kind. The percent of people in Puerto Rico who were unresolved decreased from 22.05 percent after computer matching to 17.49 percent after BFU Clerical Matching, a reduction of 4.56 percentage points.

The unweighted BFU enumeration status results for all E-sample people in the U.S. and Puerto Rico combined presented in Table 93 in Appendix A are similar to the results discussed above.

During AFU, matchers reviewed the additional data from PFU to update linking and assign the final match codes and residence status codes. This information was used to try to resolve the enumeration status for those people who were unresolved from BFU Clerical Matching.

Table 38
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of E-sample People by Enumeration Status: Unweighted

	E-sample People	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**
Correct Enumeration	343,334	89.52
Erroneous Enumeration	17,191	4.48
Duplicate	11,357	2.96
Fictitious	351	0.09
Geocoding Error	360	0.09
Other	5,123	1.34
Unresolved Enumeration	23,012	6.00
Total Puerto Rico	**17,584**	**100.00**
Correct Enumeration	15,792	89.81
Erroneous Enumeration	1,420	8.08
Duplicate	1,018	5.79
Fictitious	30	0.17
Geocoding Error	40	0.23
Other	332	1.89
Unresolved Enumeration	372	2.12

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pm_census_person, vw_pm_census_coding_history, vw_pi_person, and vw_pm_pi_coding_history

The unweighted AFU enumeration status results for the U.S. (excluding Puerto Rico) in Table 38 show that the proportion of E-sample people with unresolved enumeration status decreased from 17.67 percent after BFU to 6.00 percent after AFU, a reduction of 11.67 percentage points. Therefore, more E-sample cases were classified as either a correct enumeration or erroneous enumeration upon completion of clerical matching (89.52 percent were correct enumerations after AFU compared to 79.72 percent after BFU and 4.48 percent were erroneous enumerations after AFU compared to 2.61 percent after BFU).

Based on the unweighted AFU enumeration status results for Puerto Rico in Table 38, the percent of E-sample people with unresolved enumeration status decreased from 17.49 percent after BFU to

2.12 percent after AFU, a reduction of 15.37 percentage points. To a greater extent, most of the erroneous enumerations were due to duplication (5.79 percent of all Puerto Rico E-sample people were duplicates following AFU compared to 4.51percent following BFU).

The unweighted AFU enumeration status results for all E-sample persons in the U.S. and Puerto Rico combined presented in Table 94 in Appendix A are similar to the results discussed above.

5.15 How many followup notes did clerical matchers enter?

Clerical matchers working in BFU operations could enter followup notes in PerMaRCS to be included as special questions on the PFU forms.

Table 39 shows there were 94 Person Followup notes (unweighted) entered for persons in the U.S. and two Person Followup notes entered for Puerto Rico. The majority of the U.S. notes were entered for PI persons (34.04 percent for unlinked PI persons and 51.06 percent for PI persons linked to census persons). Although the PI provided some information for these cases, the clerical matcher may have needed another specific piece of information to resolve the case and entered a followup note in an attempt to attain this information from PFU.

Table 39
The 2010 Census Coverage Measurement Person Before Followup Matching Operation
Number of Person Followup Notes by Person Record Type: Unweighted

	Person Followup Notes	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**94**	**100.00**
Unlinked Person Interview Person	32	34.04
Linked Person Interview and Census Persons	48	51.06
Unlinked E-sample Person	11	11.70
Unlinked Census Nationwide Person	3	3.19
Total Puerto Rico	**2**	**100.00**
Unlinked Person Interview Person	1	50.00
Linked Person Interview and Census Persons	1	50.00
Unlinked E-sample Person	0	0.00
Unlinked Census Nationwide Person	0	0.00

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person, vw_pm_pi_coding_history, vw_pm_census_person, and vw_pm_census_coding_history

The unweighted results for the U.S. and Puerto Rico combined are presented in Table 95 in Appendix A.

5.16 How many block clusters went to outlier review? What kinds of block clusters were sent to outlier review?

Selected block clusters were included in an After Followup Outlier (AFO) review, after they completed AFU Clerical Matching. The matching system calculated an Outlier Priority for each

block cluster based on unweighted counts of certain match codes. Block clusters with an Outlier Priority exceeding a specified parameter were sent for an outlier review. In addition, some block clusters were forced to AFO by Census Bureau Headquarters staff so that specific issues could be reviewed.

As shown in Table 40, 390 U.S. clusters and six Puerto Rico clusters (unweighted) were sent to AFO for clerical review. The majority of the U.S. clusters sent to outlier review were selected based on the Outlier Priority calculation (5.48 percent based on Outlier Priority compared to 0.86 percent that were forced to Outlier Review for a specific issue).

Table 40
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of Clusters by Outlier Review Category: Unweighted

	Census Coverage Measurement Clusters	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**6,148**	**100.00**
Sent to Outlier Review	390	6.34
Forced to Review For Specific Issue	53	0.86
Selected Based on Priority Calculation	337	5.48
No Outlier Review	5,758	93.66
Total Puerto Rico	**268**	**100.00**
Sent to Outlier Review	6	2.24
Forced to Review For Specific Issue	0	0.00
Selected Based on Priority Calculation	6	2.24
No Outlier Review	262	97.76

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: pm_cluster and pm_cluster_stage

The unweighted results for the U.S. and Puerto Rico combined are presented in Table 96 in Appendix A.

5.17 How many census persons were coded insufficient information for followup and what was their match status during clerical matching? How many Person Interview persons were coded insufficient information for followup?

During the BFU preprocessing of the PI and census person data, each record was given a sufficiency status code to indicate whether or not the person had sufficient information for followup based on the name data collected for the person. If there were at least two characters in the first name and middle initial fields combined and at least two characters in the last name field, the person had sufficient information for followup. Otherwise, the name data were insufficient for conducting the PFU interview. However, records with insufficient data for followup were available for matching. Matchers used other available data to attempt to search for matches and duplicates for people with insufficient information for followup.

For the purpose of measuring net error, E-sample records not meeting the requirements for sufficient information for followup were treated as erroneous enumerations; P-sample records not meeting these requirements were treated as unresolved and the residence status and match probability were imputed. On the other hand, when measuring component error, if it were assumed that all E-sample records with insufficient information were erroneous enumerations, the erroneous enumeration component estimate would have been greatly biased. Therefore, these records were included in matching in order to determine an appropriate enumeration status for component error estimation. For more information on how cases with insufficient information for followup were used in estimation, see Mule, 2008.

At the beginning of the BFU Clerical Matching stage, all E-sample people with insufficient information for followup were reviewed to determine if additional data could be obtained from images of the census forms. There could have been cases where information such as the census name was miskeyed or not captured. There also could have been cases where the name was complete, but the respondent compressed the first and last name into one data field on the census form. Clerical matchers were able to update name and demographic characteristics in the clerical matching software based on their review of the census forms[25]. Clerical matchers could also update persons with insufficient information for followup based on other data available in the system. For example, if a child was missing a last name, the parent's last name could be used to update the surname of the child based on household composition. They could also update name and demographic characteristics for PI people based on data available in the system. However, they had to preserve independence between the CCM and census. Therefore, they could only use census information to update census people and they could only use PI information to update PI people.

The BFU automated preprocessing could not identify all the names to exclude from followup. For example, a PFU interviewer would not have been able to followup on a person named Mickey Mouse or White Male, even though those names appeared to be sufficient according to the preprocessing rules regarding the number of characters in the name fields. So, prior to PFU, clerical matchers reviewed the name data and coded cases as insufficient if the names were not real or were invalid to prevent the people from going to PFU.

Table 41 and Table 42 show unweighted results for PI and census people, respectively, coded as insufficient for followup. The numbers reflect the updates to the sufficiency status codes made in clerical matching. Records were tabulated according to their final sufficiency status, residence status, and match codes.

[25] Updates were made in the clerical matching software and used for the purposes of clerical matching only. The 2010 Census files were never updated based on the CCM operations.

Table 41 The 2010 Census Coverage Measurement Person After Followup Matching Operation Number of Person Interview People with Insufficient Information for Followup by Match Code and Sample Indicator: Unweighted				
	Person Interview People with Insufficient Information for Followup in Independent Listing Housing Units			
	P-sample Residence Status		Non P-sample Residence Status	
	Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)	**8,699**	**100.00**	**985**	**100.00**
Matches	5,206	59.85	621	63.05
Possible Matches	18	0.21	3	0.30
Nonmatches	3,394	39.02	346	35.13
Duplicates	81	0.93	14	1.42
Possible Duplicates	0	0.00	1	0.10
Total Puerto Rico	**156**	**100.00**	**64**	**100.00**
Matches	92	58.97	42	65.63
Possible Matches	0	0.00	0	0.00
Nonmatches	63	40.38	21	32.81
Duplicates	1	0.64	1	1.56
Possible Duplicates	0	0.00	0	0.00

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person and vw_pm_pi_coding_history

From the unweighted AFU Clerical Matching results for the U.S. (excluding Puerto Rico) in Table 41, there were 8,699 PI people in IL housing units with P-sample residence status codes and 985 PI people in IL housing units with non P-sample residence status codes who were coded as insufficient for followup. The majority of the P-sample people coded as insufficient for followup were matches or possible matches (60.05 percent), 39.02 percent were nonmatches, and 0.93 percent were duplicates. Comparing these results for the insufficient cases to the results for all U.S. P-sample records (sufficient and insufficient) shown in Table 27, there were proportionally fewer matches for the insufficient cases (59.85 percent) than for all of the P-sample cases (91.49 percent), a difference of 31.64 percentage points. There were proportionally more nonmatches among the insufficient P-sample records (39.02 percent) than for all of the P-sample records (7.89 percent), a difference of 31.13 percentage points. There were also proportionally more duplicates among the insufficient P-sample records (0.93 percent for the insufficient compared to 0.53 percent for all P-sample cases).

Because we were not able to followup on these cases and because we expected that our ability to match cases would be affected by the lack of sufficient name data, PI records with insufficient information for followup were treated as unresolved and the residence status and match probability were imputed for purposes of measuring net error.

As shown by the unweighted U.S. results in Table 41, among the PI people in IL housing units who were assigned non P-sample residence status codes and had insufficient information for followup, 63.05 percent were coded as matches and 1.42 percent were coded as duplicates upon completion of AFU Clerical Matching. These are higher than the corresponding percents for the insufficient P-sample cases (59.85 percent matches and 0.93 percent duplicates). As was shown for the

P-sample cases, there were proportionally fewer matches among the PI people in IL housing units who were assigned non P-sample residence status codes and had insufficient information for followup than there were among all PI people in IL housing units with non P-sample residence status codes (63.05 percent for insufficient people compared to 69.56 percent for all PI people in IL housing units with non P-sample residence status codes). However, the difference is smaller (6.51 percentage points for PI people in IL housing units with non P-sample residence status codes compared to 31.64 percentage points for P-sample cases).

The unweighted results for Puerto Rico in Table 41 show that 58.97 percent of the P-sample people coded as insufficient for followup were matches and 40.38 percent were nonmatches. Compared to the results for all Puerto Rico P-sample people records shown in Table 28, there were proportionately fewer matches for the insufficient P-sample cases (58.97 percent) than for all P-sample cases (90.72 percent).

The unweighted match code results for all PI people coded as insufficient for followup (including those in IL housing units and those in census-only units) in the U.S. and Puerto Rico shown in Table 97 in Appendix A are similar to the results discussed above.

Table 42
The 2010 Census Coverage Measurement Person After Followup Matching Operation Number of E-sample People with Insufficient Information for Followup by Match Code and Sample Indicator: Unweighted

	E-sample People with Insufficient Information for Followup	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**8,769**	**100.00**
Matches	4,590	52.34
Possible Matches	12	0.14
Nonmatches	3,874	44.18
Duplicates	272	3.10
Possible Duplicates	21	0.24
Total Puerto Rico	**227**	**100.00**
Matches	93	40.97
Possible Matches	0	0.00
Nonmatches	109	48.02
Duplicates	25	11.01
Possible Duplicates	0	0.00

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pm_census_person and vw_pm_census_coding_history

From the unweighted AFU Clerical Matching results for the U.S. (excluding Puerto Rico) in Table 42, there were 8,769 E-sample people coded as having insufficient information for followup. A small majority of the E-sample people coded as insufficient were matches or possible matches (52.48 percent), 44.18 percent were nonmatches, and 3.34 percent were duplicates or possible duplicates. Given the lack of name data, matching of the E-sample people with insufficient data for followup was less successful than it was for E-sample people in general. From the AFU matching

results in Table 29, 83.51 percent of all E-sample people (sufficient and insufficient) in the U.S. matched, which is a difference of 31.17 percentage points. There was a higher percentage of duplicates among E-sample people with insufficient information for followup (3.10 percent) than among all E-sample people in the U.S. (2.96 percent). Recall that for the purpose of measuring net error, E-sample records not meeting the requirements for sufficient information for followup were treated as erroneous enumerations. However, these records were included in matching to determine an appropriate enumeration status for component error estimation.

The Puerto Rico results in Table 42 show that 40.97 percent of the 227 E-sample people coded insufficient for followup were matches, 48.02 percent were nonmatches, and 11.01 percent were duplicates. Compared to all E-sample people in Puerto Rico, there were relatively fewer matches (40.97 percent for the insufficient cases compared to 79.08 percent for all E-sample people) and nearly twice as many duplicates (11.01 percent for insufficient cases compared to 5.79 percent for all E-sample people).

The unweighted match code results for all E-sample people coded as insufficient for followup in the U.S. and Puerto Rico combined shown in Table 98 in Appendix A are similar to those discussed above.

5.18 How many alternate addresses were attached to Person Interview and E-sample people during clerical matching, by source (Person Interview or Person Followup)? How many alternate addresses were geocoded during clerical matching? How confident were we in the search areas for inmover addresses?

Recall that during PI, respondents were asked to provide additional places where a person could have been counted. The PI respondent-provided addresses (also referred to as other addresses) were sent to GEO for automated geocoding. The results of automated geocoding of the PI respondent-provided addresses were used to identify inmover and alternate address search areas[26] for computer matching. In order to identify a search area, addresses had to be geocoded to a MAFID or one or more blocks.

Addresses that were not geocoded to a MAFID or one or more blocks in the automated operation were reviewed during Clerical Geocoding. Together with the automated results, the geocodes from the clerical review were used to develop the search areas for BFU Clerical Matching. Clerical geocoding used information from the PI interview, the MAF, maps, and additional resources to attempt to determine the MAFID of the respondent-provided address or the block where the address was located. If the clerical geocoding was unable to pinpoint the location to a specific block but determined that the address likely existed within a certain group of blocks, then the address was

[26] A search area consisted of the block cluster containing the block where the inmover or alternate address was located, plus all blocks in the first ring of blocks surrounding the block cluster (i.e., the surrounding blocks). All census enumerations in the search area were available for matching.

geocoded to multiple blocks if it was believed that the resulting search area[27] would yield a reasonable number of census enumerations for review during BFU.

In addition to the Clerical Geocoding Stage, geocodes could have been updated clerically during the BFU and AFU Clerical Matching stages. As inmover and alternate address search areas were created and modified based on these geocoding updates, the clerical matchers looked for additional matches and duplicates for people associated with these addresses.

The PFU interview also asked respondents to provide additional places where a person could have been counted. The PFU respondent-provided addresses were clerically geocoded during the AFU stage. There was no automated geocoding for the addresses collected during PFU. If this geocoding resulted in new or modified inmover or alternate address search areas, the clerical matchers conducted additional searches for matches and duplicates.

Table 43 shows the number of respondent-provided addresses (unweighted) attached to PI and E-sample people as a result of the PI and PFU interviews and the geocoding results for those addresses. This table reflects the final results after all clerical matching was completed.

[27] If an address is geocoded to a MAFID or one or more blocks, then a search area was identified consisting of all census enumerations in the block(s) and all census enumerations in the block cluster(s) in which each block is located and the surrounding blocks of the block cluster(s).

Table 43
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of Respondent-Provided Addresses by Level of Geocoding and Source: Unweighted

	Person Interview Respondent-Provided Addresses		Person Followup Respondent-Provided Addresses	
	Count	**Percent of Total***	**Count**	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**51,474**	**100.00**	**27,059**	**100.00**
Search Area Identified	40,763	79.19	20,412	75.44
Geocoded to Master Address File Identifier	24,634	47.86	14,100	52.11
Geocoded to Block	16,129	31.33	6,312	23.33
No Search Area Identified	10,711	20.81	6,647	24.56
Geocoded to County	6,377	12.39	4,721	17.45
Geocoded to State	1,100	2.14	760	2.81
Ungeocoded	3,234	6.28	1,166	4.31
In-scope – U.S. Address	957	1.86	424	1.57
Out-of-Scope - Puerto Rico Address	59	0.11	16	0.06
Out-of-Scope - Other Country	2,218	4.31	726	2.68
Total Puerto Rico	**2,079**	**100.00**	**1,104**	**100.00**
Search Area Identified	1,532	73.69	830	75.18
Geocoded to Master Address File Identifier	406	19.53	489	44.29
Geocoded to Block	1,126	54.16	341	30.89
No Search Area Identified	547	26.31	274	24.82
Geocoded to County	209	10.05	147	13.32
Geocoded to State	21	1.01	8	0.72
Ungeocoded	317	15.25	119	10.78
In-scope – Puerto Rico Address	7	0.34	30	2.72
Out-of-Scope - U.S. Address	248	11.93	74	6.70
Out-of-Scope - Other Country	62	2.98	15	1.36

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: pm_other_address and pm_other_address_geocode

Per the unweighted AFU results for the U.S. (excluding Puerto Rico) in Table 43, 51,474 unique other addresses (inmover and alternate addresses) were collected from the PI interviews and attached to PI or E-sample people. Comparing the other address count following AFU to the count from automated geocoding (51,980 as shown in Table 21), there were 506 fewer PI other addresses attached to people after the clerical review.

After the clerical review of other addresses collected from PI interviews conducted with the U.S., 79.19 percent were geocoded to a MAFID or one or more blocks (resulting in the identification of a search area) compared to 65.41 percent as a result of automated geocoding alone, an increase of 13.78 percentage points. Most of the improvement comes from the additional addresses that the clerical review was able to geocode to one or more blocks without finding a specific address on the MAF; 31.33 percent following AFU Clerical Matching compared to 18.17 percent after automated geocoding, an increase of 13.16 percentage points.

During the clerical geocoding operation, staff used various resources to geocode partial addresses provided by the respondents. For example, suppose the respondent provided a street name and no house number, yielding a county-level geocode from the automated operation. Suppose the respondent also provided the name of the restaurant across the street, when questioned further in PI. Then, during clerical geocoding, various internet search engines could have been used to locate the restaurant and thereby attach a block to the respondent-provided address. Or if a cross street was provided, the address could have been geocoded to one or more blocks around that intersection. Also recall from the discussion in Section 5.11, if it was determined that an inmover or alternate address from PI referred to the sample place as a nationwide address (i.e., the address where the computer linked a person in the sample to someone beyond the surrounding blocks), the address would have been clerically geocoded to the MAFID corresponding to the nationwide address (even if the respondent had only provided enough information to partially geocode the address).

As discussed above, while the percent of U.S. PI other addresses geocoded to a MAFID or one or more blocks increased (by 13.78 percentage points) after the clerical review, the percent of addresses geocoded to the county level decreased from 23.63 percent after automated geocoding to 12.39 percent after the clerical review (a decrease of 11.24 percentage points). Furthermore, the percent of in-scope ungeocoded addresses decreased to 1.86 percent following AFU Clerical Matching from 4.20 percent after automated geocoding (a decrease of 2.34 percentage points).

Table 43 shows there was little change in the percent of U.S. PI other addresses that were geocoded to the state level, 2.14 percent following AFU Clerical Matching compared to 2.31 percent after automated geocoding. There was also very little change in the percent of other addresses collected during PI interviews conducted in the U.S. that were ungeocoded due to being out-of-scope (0.11 percent were determined to be in Puerto Rico following AFU compared to 0.12 percent based on automated geocoding and 4.31 percent were determined to be in another country following AFU compared to 4.32 percent based on automated geocoding).

The unweighted AFU results for the U.S. (excluding Puerto Rico) in Table 43 show that an additional 27,059 other addresses were attached to PI or E-sample people based on the clerical review of information collected during PFU. A majority of the U.S. PFU other addresses were geocoded to a MAFID or one or more blocks (75.44 percent), which is slightly lower than among the PI other addresses (79.19 percent). There were relatively more U.S. PFU other addresses geocoded to the county level (17.45 percent) compared to other addresses collected during PI (12.39 percent). There were also relatively more U.S. PFU other addresses that were ungeocoded due to being out-of-scope (0.06 percent U.S. PFU addresses were determined to be in Puerto Rico and 2.68 percent were determined to be in another country compared to 0.11 percent U.S. PI addresses determined to be in Puerto Rico and 4.31 percent determined to be in another country).

Looking at the unweighted AFU results for Puerto Rico in Table 43, a search area was identified for 73.69 percent of the 2,079 PI other addresses collected from Puerto Rico interviews: 19.53 percent were geocoded to a MAFID and 54.16 percent were geocoded to one or more blocks without finding a specific address on the MAF. Thus following clerical review, a search area could be identified for more of these addresses than based on automated geocoding (73.69 percent following AFU compared to 41.25 percent based on automated geocoding). All respondent-provided addresses collected in PI interviews conducted in Puerto Rico that were determined to be located in the U.S. or

another country were out-of-scope. In Puerto Rico, 11.93 percent of the PI other addresses were ungeocoded because they were determined to be located in the U.S.

Looking at the unweighted results for other addresses collected from Puerto Rico PFU interviews, a search area was identified for 75.18 percent of the other addresses: 44.29 percent were geocoded to a MAFID and 30.89 percent were geocoded to one or more blocks without finding a specific address on the MAF.

The unweighted clerical geocoding results for all PI and PFU respondent-provided addresses in the U.S. and Puerto Rico presented in Table 99 in Appendix A are similar to the results discussed above.

Recall that if a PI person had an inmover address (the person was not at the sample address on Census Day and the respondent provided the address where the person was residing on Census Day), we searched for that person in the block cluster containing the inmover address and its surrounding blocks. In addition to being asked to provide address information about where the inmover was living on Census Day, respondents were asked to provide names of neighbors and cohabitants at the Census Day residence and landmarks/cross streets or other features that could assist in geocoding. An inmover address code was assigned to each inmover address, assessing the quality of the information provided by the respondent and confidence in any search area resulting from geocoding of the address. The inmover address code indicated how likely it was that we were searching for the inmover in the right area. The inmover address is the location where the inmover should have been counted on Census Day. Thus, if the inmover address code indicated confidence in the search area identified using the results of automated and clerical geocoding, then the census should have enumerated the person in that location. If a match was not found for the inmover among the census enumerations in what was determined to be a good inmover search area (i.e., the clerical matching indicated confidence in the search area), then this would be an indication that the census did not enumerate the person where he or she should have been counted.

When the clerical matching staff assigned inmover address codes, they asked themselves, “If I search the census here and do not find the person, do I know I looked in the right area?” To answer the question, they considered agreement of landmarks, cross streets, neighbors, cohabitants, and other factors. For example, if the search area included the high school named as a landmark by the respondent, then the inmover address code should have been assigned to reflect confidence in the search area. Note that steps were taken so that assignment of the inmover address codes was not influenced by whether or not a match for the inmover was found. Therefore, to the extent possible, PI inmover addresses were assigned inmover address codes during the Clerical Geocoding stage, which occurred prior to BFU Clerical Matching. However if the PI respondent provided names of cohabitant and neighbors, the inmover address code could not be assigned until BFU matching, when census person records became available for searching. Inmover addresses collected during PFU were geocoded and assigned inmover address codes during AFU. To avoid potential bias in the CCM estimates, matchers were instructed to disregard any matching results when assigning inmover address codes during BFU or AFU matching.

Table 44 provides information to evaluate inmover addresses collected during the PI and PFU interviews based on the inmover address codes assigned to the addresses.

Table 44
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of P-sample Inmover Addresses by Confidence in Search Area and Source: Unweighted

	Person Interview Inmover Addresses		Person Followup Inmover Addresses	
	Count	**Percent of Total***	**Count**	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**12,855**	**100.00**	**1,662**	**100.00**
Confident Identified Search Area is Correct	11,927	92.78	1,339	80.57
Not Sure if Identified Search Area is Correct	488	3.80	152	9.15
Could Not Identify a Search Area	440	3.42	171	10.29
Total Puerto Rico	**324**	**100.00**	**48**	**100.00**
Confident Identified Search Area is Correct	283	87.35	42	87.50
Not Sure if Identified Search Area is Correct	32	9.88	5	10.42
Could Not Identify a Search Area	9	2.78	1	2.08

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person, vw_pm_pi_coding_history, vw_pi_other_address_person, pm_other_address, and pm_other_address_geocode

Based on the unweighted AFU results for the U.S. (excluding Puerto Rico) in Table 44, a search area could not be identified for 3.42 percent of the 12,855 inmover addresses collected in PI (i.e., no MAFID or blocks were identified during automated or clerical geocoding). This includes addresses that were outside the country and addresses where not enough information was provided to geocode the address to a MAFID or one or more blocks (at best the address was geocoded to the county level). However, the vast majority of the PI inmover addresses were geocoded to a MAFID or one or more blocks, resulting in a search area. For those addresses, the inmover address code indicated the confidence we had in the search area. For 92.78 percent of the PI inmover addresses, we were confident that the correct search area was identified (in other words, assuming that census enumerated the census person at their inmover address, we expected to be able to find that person within the search area). For 3.80 percent of the inmover addresses, we were not sure that the identified search area was correct. So if a match was not found, then perhaps it was because we were not looking in the right place and not because census did not enumerate the person where he or she should have been counted. Therefore, inmovers who had an inmover address for which we were unsure if the correct search area was identified were treated as unresolved for estimation purposes.

Looking at the unweighted AFU results in Table 44 for inmover addresses collected from PFU interviews conducted in the U.S. (excluding Puerto Rico), we identified a search area for 80.57 percent of the addresses and were confident that it was correct. However, for 9.15 percent of the addresses, we identified a search area but were unsure if it was correct. We were unable to identify a search area for 10.29 percent of the inmover addresses collected during PFU. Compared to the inmover addresses collected during PI, we were less successful in identifying search areas for PFU inmover addresses. There were relatively fewer PFU inmover addresses where we were confident the correct search area was identified (80.57 percent for PFU compared to 92.78 percent for PI). Furthermore, we were unable to identify a search area for 10.29 percent of the PFU inmover addresses compared to 3.42 percent for PI.

The unweighted AFU results for Puerto Rico in Table 44 indicate we were confident in the search area identified for 87.35 percent of the PI addresses and 87.50 percent of the PFU addresses. We were unsure of the search area for 9.88 percent of the PI addresses and 10.42 percent of the PFU addresses, and we did not find a search area for 2.78 percent of the PI addresses and 2.08 percent of the PFU addresses.

The unweighted results for all PI and PFU inmover addresses in the U.S. and Puerto Rico combined presented in Table 100 in Appendix A are similar to the results discussed above.

5.19 What is the distribution of the number of alternate addresses attached to Person Interview people and E-sample people during clerical matching?

The results in this section reflect the attachment of inmover and alternate addresses to PI people and census people upon completion of AFU Clerical Matching. These addresses, referred to as respondent-provided or other addresses were collected during the PI and PFU interviews. A particular address may have been attached to more than one person in the household. Also, one person may have had more than one other address. For example, a person could have had both a college address and an inmover address. During BFU and AFU Clerical Matching, matchers were able to attach the inmover and alternate addresses to additional people in the household or detach addresses from people, as needed.

Table 45 provides counts of PI people, by how many alternate addresses were attached to the PI person, upon completion of AFU Clerical Matching. The number of other addresses per PI person includes addresses that were attached directly to the person. In addition, if the PI person was a match or possible match to a census person, then any other addresses attached to the linked census person were also included. All results are unweighted.

Table 45 The 2010 Census Coverage Measurement Person After Followup Matching Operation Number of Person Interview People by Respondent-Provided Addresses Per Person and Sample Indicator: Unweighted				
	Person Interview People in Independent Listing Housing Units			
	P-sample Residence Status		**Non P-sample Residence Status**	
	Count	**Percent of Total***	**Count**	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**363,290**	**100.00**	**29,421**	**100.00**
No Respondent-Provided Addresses	307,686	84.69	3,085	10.49
One Respondent-Provided Address	48,928	13.47	21,709	73.79
Two Respondent-Provided Address	5,474	1.51	3,836	13.04
Three or More Respondent-Provided Addresses	1,202	0.33	791	2.69
Total Puerto Rico	**15,604**	**100.00**	**1,435**	**100.00**
No Respondent-Provided Addresses	13,682	87.68	241	16.79
One Respondent-Provided Address	1,667	10.68	1,037	72.26
Two Respondent-Provided Address	213	1.37	130	9.06
Three or More Respondent-Provided Addresses	42	0.27	27	1.88
*Percents may not sum to totals due to rounding. Source: PerMaRCS tables: vw_pi_person, vw_pm_pi_coding_history, vw_pi_other_address_person, and vw_pm_census_other_address_per				

As shown by the unweighted results for the U.S. (excluding Puerto Rico) in Table 45, 84.69 percent of the 363,290 P-sample people had no other addresses, 13.47 percent had one other address, 1.51 percent had two other addresses, and 0.33 percent had three or more other addresses. A majority of the 29,421 PI people in IL housing units that were assigned non P-sample residence status codes had one other address (73.79 percent), 13.04 percent had two other addresses, and 2.69 percent had three or more other addresses. As expected, there were proportionally fewer people with no other addresses reported among the non P-sample people (10.49 percent) compared to the P-sample people (84.69 percent). Recall that the majority of P-sample people were nonmovers, whereas the non P-sample people consisted primarily of outmovers and people who were out of scope or should have been counted elsewhere on Census Day.

Prior to any clerical review, 82.98 percent of the P-sample people and 23.73 percent of the non P-sample people had no other address, based on BFU preprocessing of other addresses collected in PI (see Table 22). After clerical review and the collection of additional other addresses in PFU, the percent of P-sample people with no other addresses increased to 84.69 percent and the percent of non P-sample people with no other addresses decreased to 10.49 percent.

Per the unweighted results in Table 45, 87.68 percent of the 15,604 Puerto Rico P-sample people had no other addresses, 10.68 percent had one other address, 1.37 percent had two other addresses, and 0.27 percent had three or more addresses. A majority of the PI people in IL housing units that were assigned non P-sample residence status codes had one other address (72.26 percent).

The unweighted distribution of other addresses per person for all PI persons (including those in IL housing units and those in census-only units) presented in

Table 101 The 2010 Census Coverage Measurement After Followup Matching Operation Number of Person Interview People by Other Addresses per Person and Sample Indicator: Unweighted

in Appendix A are similar to the results discussed above.

Table 46 provides unweighted results for E-sample people by the number of other addresses attached per person, upon completion of AFU Clerical Matching. The number of other addresses per person includes addresses that were attached directly to the census person. If the census person was a match or possible match to a PI person, then any other addresses attached to the linked PI person were also included.

Table 46
The 2010 Census Coverage Measurement Person After Followup Matching Operation Number of E-Sample People by Respondent-Provided Addresses Per Person and Sample Indicator: Unweighted

	E-sample People	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**
No Other Addresses	334,262	87.15
One Respondent-Provided Address	44,001	11.47
Two Respondent-Provided Address	4,524	1.18
Three or More Respondent-Provided Addresses	750	0.20
Total Puerto Rico	**17,584**	**100.00**
No Other Addresses	15,366	87.39
One Respondent-Provided Address	2,029	11.54
Two Respondent-Provided Address	169	0.96
Three or More Respondent-Provided Addresses	20	0.11

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_census_person, vw_pm_census_coding_history, vw_pm_census_other_address_per, and vw_pi_other_address_person

As shown by the unweighted results for the U.S. (excluding Puerto Rico) in Table 46, 87.15 percent of the 383,537 E-sample people had no other addresses, 11.47 percent had one other address, 1.18 percent had two other addresses, and 0.20 percent had three or more other addresses.

Per the unweighted Puerto Rico results in Table 46, 87.39 percent of the 17,584 E-sample people had no other addresses, 11.54 percent had one other address, 0.96 percent had two other addresses, and 0.11 percent had three or more other addresses.

The unweighted distribution of other addresses for all census persons (including all E-sample and non E-sample people) presented in Table 102 in Appendix A for census people are similar the results discussed above.

5.20 What was the disposition of nationwide matches and duplicates (e.g., confirmed, nonconfirmed, unresolved)?

Recall that computer matching linked PI people to census people throughout the country and also searched for census duplicates throughout the country. Links were identified in the sample, inmover, alternate, and nationwide search areas. A link that was identified in the nationwide search could also have been identified in an inmover and/or alternate address search area, resulting in an overlap. If the computer found a match or duplicate census record near a respondent-provided address for the person, this was a good indication that the two records in distant locations actually referred to the same person.

During BFU Clerical Matching, these links and their coding were updated as warranted. Any match or duplicate from the nationwide computer matching that was determined to be within an inmover or alternate address search area (based on geocoding of the PI respondent-provided addresses) did not need to be sent to PFU for verification. The other nationwide links with sufficient information for followup were sent to PFU to determine if the two records in different locations actually referred to the same person and if so, where the person should have been counted. During AFU, information from PI and PFU were compared to the nationwide address to determine if a person's respondent-provided address (from PI or PFU) could be resolved as being the same as the nationwide address. After field followup and clerical review, if it was determined that the nationwide address corresponded to a respondent-provided address (i.e., was within an inmover or alternate search area), then that served as confirmation that the two person records (the record in the sample and the nationwide record) actually did refer to the same person.

Table 47 presents the unweighted final results (upon completion of AFU Clerical Matching) for each census person originally linked in the nationwide computer matching[28]. The left side of the table shows the match code and search area in which the non E-sample person beyond the surrounding blocks was found as of the end of computer matching and BFU preprocessing. The right side of the table shows the final disposition following clerical review and followup, as described below.

- Confirmed – The non E-sample record was confirmed to refer to the same person as a PI record or another census record[29]. In other words, there was an indication that the nationwide address was an inmover or alternate location for the person.
- Not Confirmed (Unlinked) – The non E-sample record was unlinked because it did not refer to the same person as a PI or another census record.

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[28] For the computer matching results, any overlap between the inmover or alternate search areas and the nationwide search area was reported as an inmover or alternate search area link (removing the overlap so that each person was only presented once).

[29] The final linking of a non E-sample record beyond the surrounding block (i.e., a nationwide person) could be considered confirmed even if linked differently than in computer matching (e.g., there was a reversal of which record was the primary in a duplicate pair or the non E-sample person was linked to a different person within the P sample or E sample).

- Undetermined – It was unknown whether or not the non E-sample record referred to the same person as a PI or another census record. In other words, the record was in a possible match or possible duplicate pair (a weaker link than a match or duplicate) and/or it could not be determined whether the nationwide address corresponded to an inmover or alternate location for the person.

Table 47
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of Census People Beyond Surrounding Blocks by Computer Match Code and Search Area and Final Disposition: Unweighted

Computer Matching		After Followup			
Beyond Surrounding Blocks		Total	Confirmed	Not Confirmed (Unlinked)	Undetermined
	Count	Percent*	Percent*	Percent*	Percent*
Total U.S. (excluding Puerto Rico)	**46,423**	**100.00**	**82.30**	**11.12**	**6.59**
Matches	28,450	100.00	95.26	0.45	4.29
Inmover/Alternate Search Area	22,269	100.00	99.81	0.08	0.11
Nationwide Search Area	6,181	100.00	78.85	1.80	19.35
Possible Matches	1,085	100.00	51.06	33.18	15.76
Inmover/Alternate Search Area	266	100.00	93.98	3.01	3.01
Nationwide Search Area	819	100.00	37.12	42.98	19.90
Nonmatches	6	100.00	66.67	0.00	33.33
Duplicates	6,613	100.00	86.21	6.68	7.11
Inmover/Alternate Search Area	1,961	100.00	99.08	0.61	0.31
Nationwide Search Area	4,652	100.00	80.78	9.24	9.97
Possible Duplicates	10,269	100.00	47.17	41.20	11.63
Inmover/Alternate Search Area	199	100.00	94.97	3.52	1.51
Nationwide Search Area	10,070	100.00	46.23	41.95	11.83
Total Puerto Rico	**1,543**	**100.00**	**79.07**	**10.82**	**10.11**
Matches	692	100.00	94.08	1.30	4.62
Inmover/Alternate Search Area	507	100.00	99.41	0.59	0.00
Nationwide Search Area	185	100.00	79.46	3.24	17.30
Possible Matches	108	100.00	77.78	10.19	12.04
Inmover/Alternate Search Area	60	100.00	100.00	0.00	0.00
Nationwide Search Area	48	100.00	50.00	22.92	27.08
Nonmatches	0	100.00	0.00	0.00	0.00
Duplicates	251	100.00	89.24	5.98	4.78
Inmover/Alternate Search Area	61	100.00	93.44	4.92	1.64
Nationwide Search Area	190	100.00	87.89	6.32	5.79
Possible Duplicates	492	100.00	53.05	26.83	20.12
Inmover/Alternate Search Area	18	100.00	94.44	0.00	5.56
Nationwide Search Area	474	100.00	51.48	27.85	20.68

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pm_census_person, vw_pm_census_coding_history, vw_pi_person, and vw_pm_pi_coding_history

Per the unweighted U.S. (excluding Puerto Rico) results in Table 47, computer matching identified 46,423 nationwide links (i.e., a census person beyond the sample search area was matched or

possibly matched to a PI person or was part of a census duplicate or possible duplicate pair). Of those original nationwide links, 82.30 percent were confirmed (i.e., the nationwide census record corresponded to an inmover or alternate location for a PI person or another census person). Upon completion of AFU, 11.12 percent of the original nationwide links were unlinked and not confirmed (i.e., it was determined that the records did not actually refer to the same person). The final disposition remained undetermined for 6.59 percent of the original nationwide links (i.e., CCM was unable to determine whether the two records actually referred to the same person or not).

Based on the unweighted final clerical matching results for the U.S. (excluding Puerto Rico), nearly all of the computer matching matches and duplicates beyond the surrounding blocks were confirmed when there was a PI respondent-provided address indicating that the person in the sample also lived or stayed at the nationwide location[30] (99.81 percent of the computer matches and 99.08 percent of the computer duplicates in an inmover or alternate search area were confirmed). Recall that after being clerically reviewed during BFU, any nationwide link that the clerical matcher believed should remain linked but could not be confirmed via an inmover or alternate address were sent to PFU to determine if the nationwide record referred to the same person as the PI or E-sample record. A majority of the computer matching nationwide matches and duplicates that were not found in an inmover or alternate location prior to BFU were confirmed after clerical review and followup (78.85 percent of the nationwide computer matches and 80.78 percent of the nationwide computer duplicates that were not found in an inmover or alternate search area were confirmed upon completion of AFU). Among the weaker nationwide computer matching links (i.e., the possible matches and possible duplicates), there were relatively fewer links confirmed. Among the computer matching nationwide possible matches that were not found in an inmover or alternate search area, 37.12 percent were confirmed, 42.98 percent were not confirmed (unlinked), and 19.90 percent remained undetermined. Among the computer matching possible duplicates that were not found in an inmover or alternate search area, 46.23 percent were confirmed, 41.95 percent were not confirmed (unlinked), and 11.83 percent remained undetermined.

Per the unweighted Puerto Rico results in Table 47, computer matching identified 1,543 nationwide links (i.e., a census person beyond the sample search area but still within Puerto Rico[31] was matched or possibly matched to a PI person or was part of a census duplicate or possible duplicate pair). Of those original nationwide links, 79.07 percent were confirmed, 10.82 percent were unlinked and not confirmed (i.e., it was determined that the records did not actually refer to the same person), and the final disposition remained undetermined for 10.11 percent of the links. Nearly all of the computer matching matches, possible matches, duplicates, and possible duplicates beyond the surrounding blocks were confirmed when there was a PI respondent-provided address indicating that the person in the sample also lived or stayed in an inmover or alternate location (99.41 percent of the matches, 100.00 percent of the possible matches, 93.44 percent of the duplicates, and 94.44 percent of the

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[30] Following computer matching and BFU preprocessing, it was determined that the nationwide address was within an inmover or alternate search area based on the results of automated and clerical geocoding of PI respondent-provided addresses.

[31] All searches for matches and duplicates in Puerto Rico were restricted to searching within Puerto Rico. Similarly, all nationwide searches for matches and duplicates within the United States excluded Puerto Rico.

possible duplicates in an inmover or alternate search area were confirmed). A majority of the computer matching nationwide matches and duplicates that were not found in an inmover or alternate location prior to BFU were also confirmed after clerical review and followup (79.46 percent of the matches and 87.89 percent of the duplicates that were not found in an inmover or alternate search area were confirmed upon completion of AFU). Among the weaker nationwide computer matching links (i.e., the possible matches and possible duplicates) that were not found an inmover or alternate search area, there were relatively fewer links confirmed (50.00 percent of the possible matches and 51.48 percent of the possible duplicates).

The unweighted final disposition results for all nationwide computer matching links in the U.S. and Puerto Rico combined shown in Table 103 in Appendix A are similar to the results discussed above.

Person Followup Results

Unweighted results from the Person Followup are presented in the following sections. No inferences to the general population are intended. These results are from an operation standpoint and do not reflect the final CCM estimates of person coverage.

5.21 What was the Person Followup workload?

Table 48 shows the PFU workload by block cluster, number of PFU cases, and number of persons selected for followup for Puerto Rico, U.S., and each RCC. There were 59,402 PFU cases which required an interview about one or more people living at a PI address and/or a census address (the PI address may or may not have been the same as the census address). Nationally, the number of cases that required PFU was less than the 73,357 cases that had been estimated. Of the 6,416 block clusters included in the PI workload, 5,666 (88.3 percent) block clusters had housing units that were included in PFU. The RCC with the largest workload was Denver with 7,790 cases and 15,425 people. Puerto Rico had a small workload with 2,696 cases and 5,192 people. There were 113,632 total people selected for followup, 34,774 CCM people and 78,858 census people (including nationwide matches and duplicates).

Table 48
The 2010 Census Coverage Measurement Person Followup Operation
Workload by Block Cluster, Cases, and Persons: Unweighted

Workload	Block Clusters		Cases		Person Interview Persons		Census Persons	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Total	**5,666**	**100.00**	**59,402**	**100.00**	**34,774**	**100.00**	**78,858**	**100.00**
Puerto Rico	249	4.39	2,696	4.54	1,135	3.26	4,057	5.14
U.S. Total	5,417	95.61	56,706	95.46	33,639	96.74	74,801	94.86
Boston	424	7.48	3,882	6.54	2,140	6.15	4,913	6.23
New York	221	3.90	3,068	5.16	1,808	5.20	4,099	5.20
Philadelphia	391	6.90	3,887	6.54	2,100	6.04	5,089	6.45
Detroit	380	6.71	3,249	5.47	1,819	5.23	3,981	5.05
Chicago	365	6.44	3,637	6.12	2,103	6.05	4,596	5.83
Kansas City	406	7.17	3,494	5.88	2,103	6.05	4,282	5.43
Seattle	460	8.12	4,659	7.84	3,107	8.93	5,711	7.24
Charlotte	487	8.60	4,974	8.37	2,753	7.92	6,518	8.27
Atlanta	540	9.53	5,757	9.69	3,216	9.25	7,728	9.80
Dallas	511	9.02	5,777	9.73	3,323	9.56	7,738	9.81
Denver	756	13.34	7,790	13.11	5,099	14.66	10,326	13.09
Los Angeles	476	8.40	6,532	11.00	4,068	11.70	9,820	12.45

*Percents may not sum to totals due to rounding.
Source: Cluster Control File, PFU Case File, PI/Census person DIFs
NOTE: At least one case was physically located in a different RCC due to Census geocoding error

Table 49 shows the number of followup persons in each age group. The age groups are similar between CCM persons and census persons. Note that CCM persons selected for followup had a higher rate of item nonresponse for age data (20.93 percent) than census persons (5.97 percent).

Table 49
The 2010 Census Coverage Measurement Person Followup Operation
Workload by Age: Unweighted

Age	Person Interview Persons		Census Persons	
	Count	Percent of Total	Count	Percent of Total
Total	**34,774**	**100.00**	**78,858**	**100.00**
0-17	7,022	20.19	20,974	26.60
18-24	5,528	15.90	12,611	15.99
25-60	12,493	35.93	32,469	41.17
61+	2,452	7.05	8,095	10.27
Missing	7,279	20.93	4,709	5.97

*Percents may not sum to totals due to rounding.
Source: PI/Census person DIFs

Table 50 shows the distribution of followup people per case. There was an average of 1.9 followup people per case with 1,048 cases having 0 followup people (505 of these cases needed only a geocoding check, the others were sent to PFU in error mainly due to an oversight in the universe logic). Cases sent in error had no questions printed on the form, so these cases were sent directly back to NPC. There was one case sent to PFU having 39 followup people as a result of a misclassified GQs.

Table 50
The 2010 Census Coverage Measurement Person Followup Operation
Number of Followup Persons per Case: Unweighted

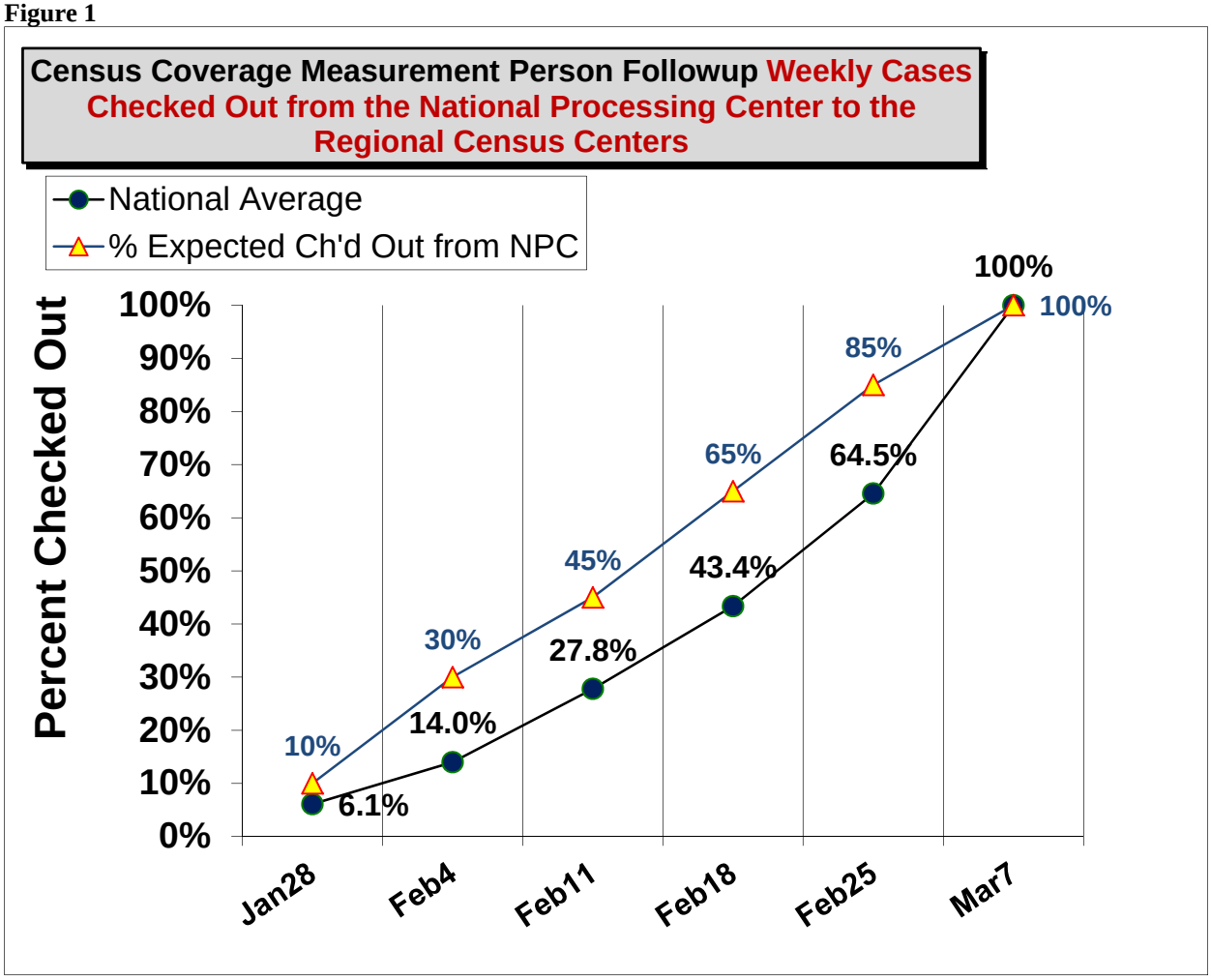
Number	Count	Percent of Total
None	1,048	1.76
One	31,672	53.32
Two	13,338	22.45
Three - Nine	13,179	22.19
Ten or more	165	0.28
Total	**59,402**	**100.00**

*Percents may not sum to totals due to rounding.
Source: PI/Census person DIF, PFU case file

PFU cases were identified on a flow basis as block clusters completed BFU person matching. Cases were identified on a nightly basis, printed, assembled, and shipped all on a flow. Because of this, it is always difficult to predict how many PFU cases there will be, and how they will flow out of matching.

Figure 1 shows the flow of work from NPC to the field. The selection of the PFU universe started as planned and ended as planned, but every other week during production, the number of PFU cases checked out of NPC was lower than the expected number. This made it difficult for the field staff since there was not enough work in the beginning of the operation and too much at the end of the operation.

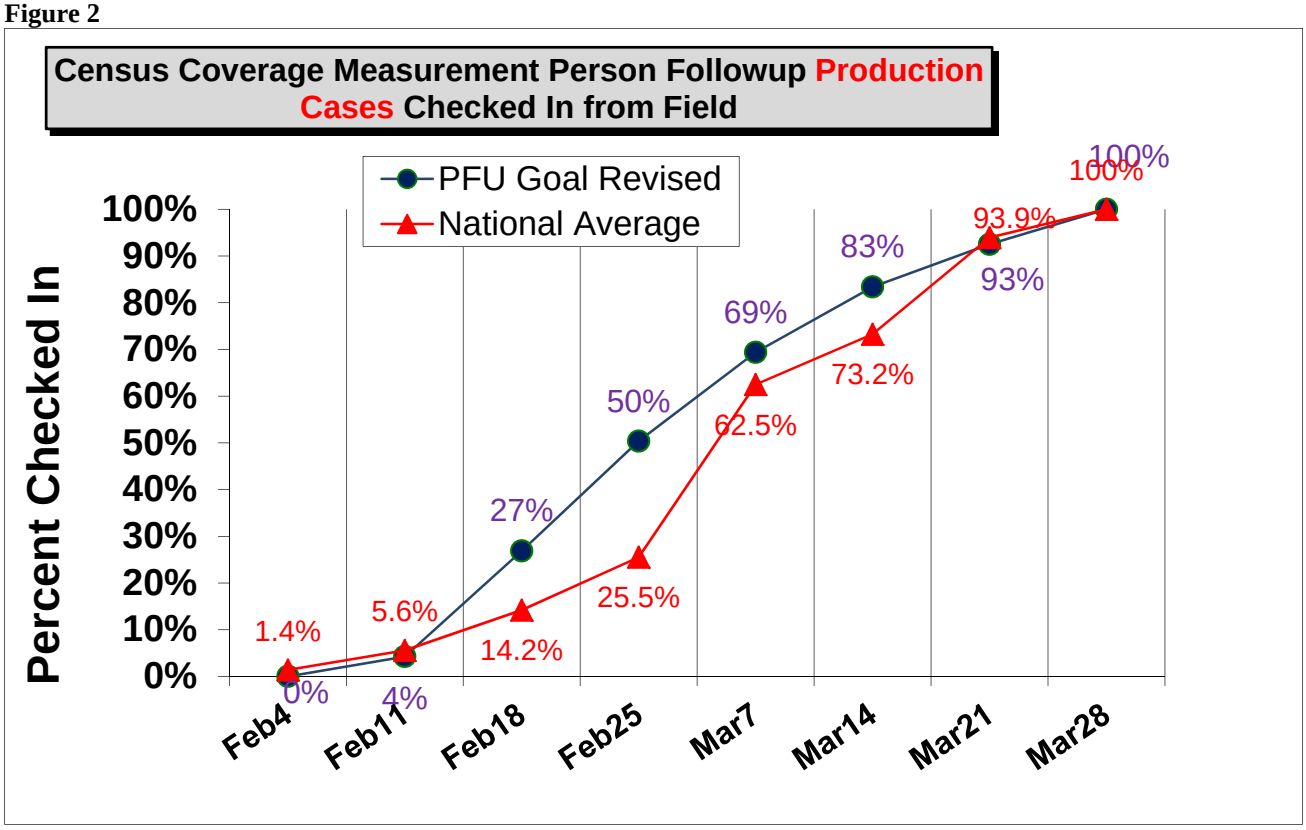
Figure 1



Sources: Coverage Measurement Operations Control System and Field Division Coverage Measurement Branch

Before production began, FLD set goals for each region to meet on a weekly basis. These were for the percent of cases to be completed by that date. These goals were revised after the dates for production were extended. Figure 2 displays the revised goals set and the national average for the percent of cases completed and checked in from the field by each RCC by that deadline. During most of production, the national average was lower than the revised goal. This is likely due to the lower than expected number of cases sent to the field early in the operation.

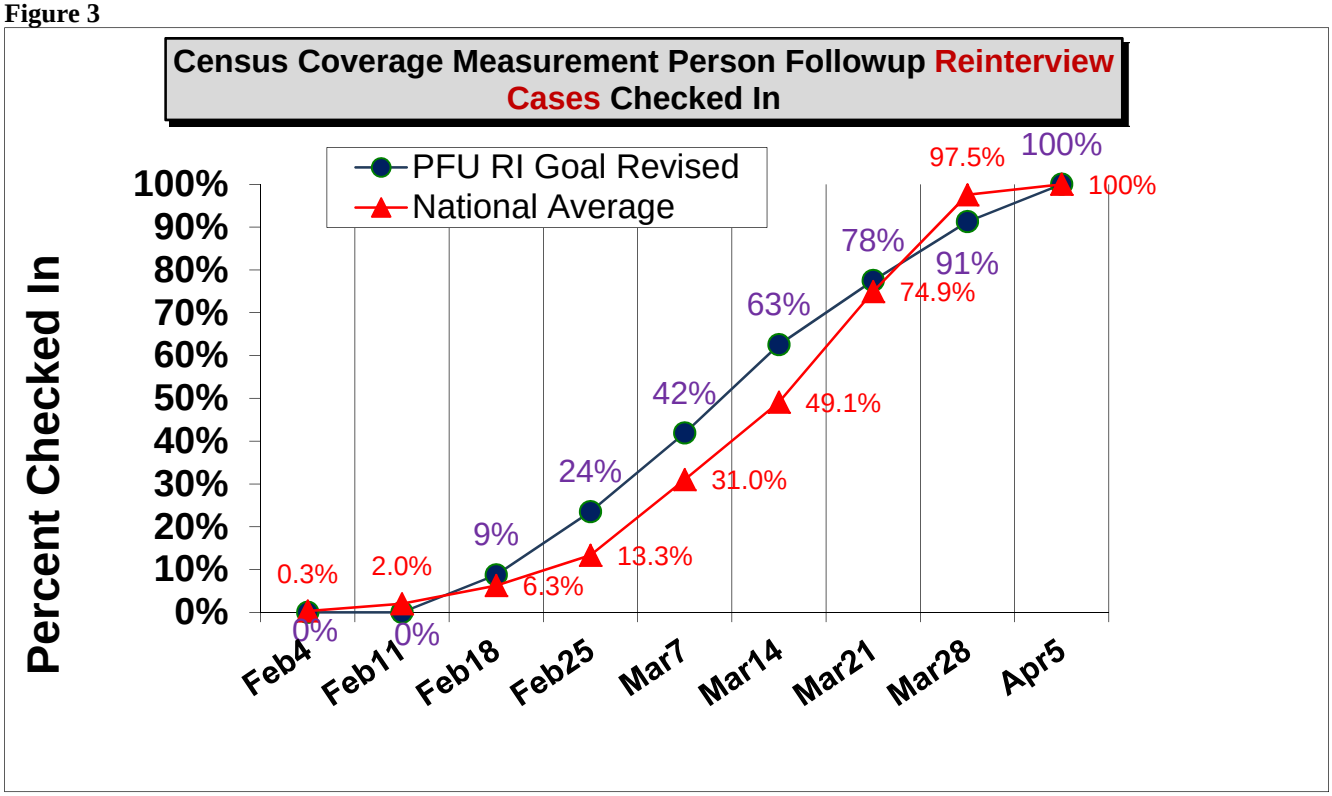
Figure 2



Sources: Coverage Measurement Operations Control System and Field Division Coverage Measurement Branch

Figure 3 displays the revised PFU RI goals set and the national average for the percent of cases completed and checked in from the field by each RCC by that deadline. During most of production, the national average was lower than the revised goal. This follows the path of PFU since PFU RI sample selection is dependent on the PFU cases being completed.

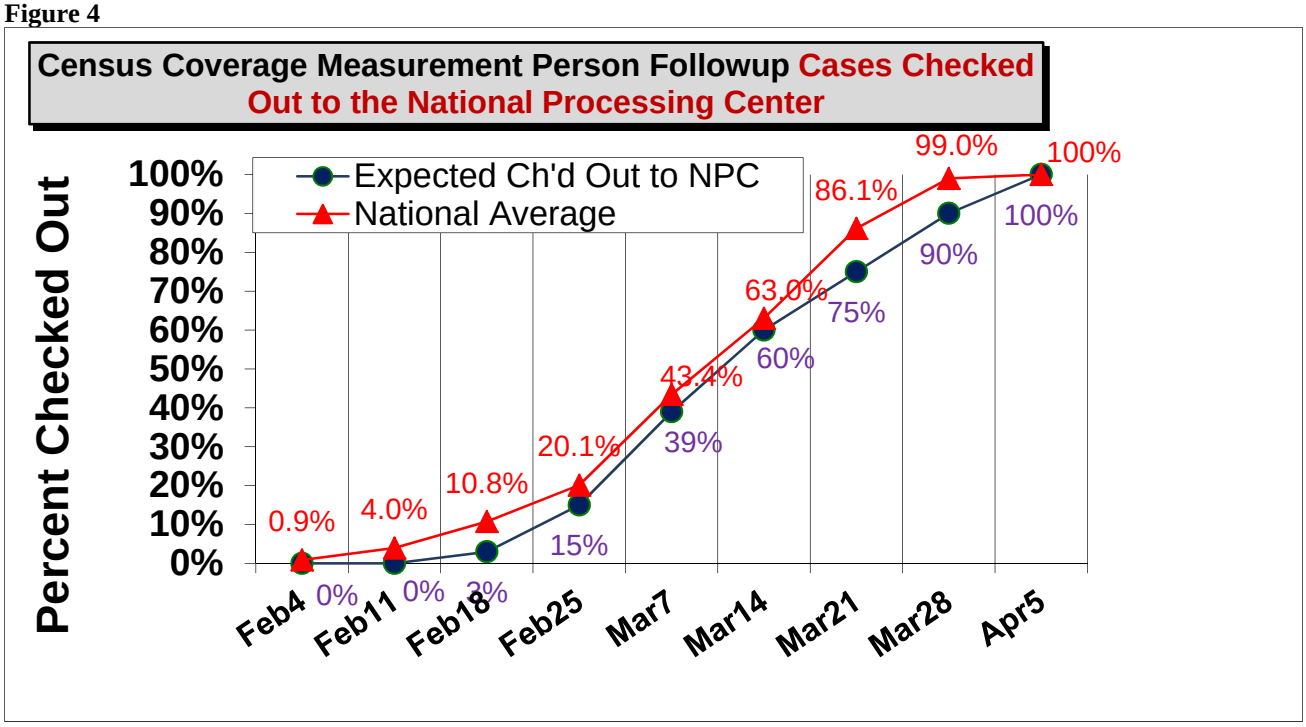
Figure 3



Sources: Coverage Measurement Operations Control System and Field Division Coverage Measurement Branch

Following a field office edit, cases that were not selected for RI were checked out to NPC. Cases that were selected for RI were not checked out to NPC until the RI case was also finished. Figure 4 displays the revised goal for cases to be checked out to NPC and the national average for the percent of cases checked out to NPC by each RCC. For all weeks, the national average was higher than the expected percentage.

Figure 4



Sources: Coverage Measurement Operations Control System and Field Division Coverage Measurement Branch

5.22 What types of cases were sent to Person Followup?

In order to be selected for PFU, a person must have been considered as having sufficient information for followup, which was defined as two characters in the first name and middle initial combined, and two characters in the last name. Insufficient people are excluded because it is difficult for field personnel to ask questions without sufficient name information. Each PI and E-sample person could be selected for followup for one or more of the reasons below. The two nationwide case types were mutually exclusive and by design anyone with an E-sample case type should not have been assigned a nationwide case type, though one census person was assigned both E-sample and nationwide case types.

Table 51 through Table 54 show the case types included in the PFU workload. The largest category of P-sample people selected for followup had unresolved residence status (49.01 percent) while the majority of E-sample people selected for followup were nonmatched people (85.30 percent). Six of the possibly matched census people were not sent to followup with their PI half due to a glitch in PFU universe selection. People sent to followup by the analysts were rare (P-sample: 13 people, E-sample: 0 people). P-sample Possible Matches to Census Insufficient people (Case Type 21), P-sample Possible duplicates where one of the pair is insufficient for followup (Case Type 26), and

Census Primary with Insufficient Possible Duplicate (Case Type 28) were added to get additional data on one half of a pair, when the other half was insufficient for followup. The low numbers of cases for these case types indicate that these situations were not common.

Stateside P-sample people were likely to have unclassified residence status following PI. Puerto Rico P-sample people were likely to be in partial nonmatch households (25.02 percent).

Table 51
The 2010 Census Coverage Measurement Person Followup Operation
Case Types – Person Interview Persons: Unweighted

Case Types	Person Interview Persons					
	Total		U.S.		Puerto Rico	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Total	**34,774**	**100.00**	**33,639**	**100.00**	**1,135**	**100.00**
P-sample Possible Match(Case Type 1)	903	2.60	870	2.59	33	2.91
P-sample partial household nonmatches (Case Type 2)	6,280	18.06	5,996	17.82	284	25.02
P-sample whole household nonmatches with a proxy respondent in the Person Interview and either no people in the matching census unit or no matching census unit (Case Type 3)	1,239	3.56	1,211	3.60	28	2.47
Inmovers with ungeocoded inmover addresses (regardless of match status) (Case Type 4)	3,312	9.52	3,137	9.33	175	15.42
P-sample person in a Conflicting household (Case Type 5)	2,411	6.93	2,266	6.74	145	12.78
Unclassified P-sample people who are not duplicates, regardless of match status (Case Type 6)	17,044	49.01	16,756	49.81	288	25.37
P-sample people who are a match or possible match to a nationwide person (Case Type 7)	4,321	12.43	4,160	12.37	161	14.19
P-sample person in a Person Interview Housing Unit where the Housing Unit did not exist during Initial Housing Unit Followup (Case Type 8)	411	1.18	357	1.06	54	4.76
P-sample person who is identified by the Matching analysts as needing followup (Case Type 9)	13	0.04	13	0.04	0	0.00
P-sample possible duplicates within the sample block cluster (Case Type 10)	37	0.11	37	0.11	0	0.00
Inmovers who don't match at their Census Day (inmover) address, with a Person Interview proxy respondent (Case Type 11)	94	0.27	93	0.28	1	0.09
P-sample Person in an Insufficient Conflicting Household (Case Type 16)	580	1.67	570	1.69	10	0.88
P-sample Possible Match to Census Insufficient (Case Type 21)	35	0.10	31	0.09	4	0.35
P-sample primary of a possible duplicate within the block cluster (Case Type 24)	37	0.11	37	0.11	0	0.00
P-sample Possible duplicate with an Insufficient person (Case Type 26)	2	0.01	2	0.01	0	0.00

Persons can be selected for multiple case types.
Source: PI person DIF

Table 52
The 2010 Census Coverage Measurement Person Followup Operation
Case Types – E-sample Persons: Unweighted

Case Types	E-sample Persons					
	Total		U.S.		Puerto Rico	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Total	**62,877**	**100.00**	**59,632**	**100.00**	**3,245**	**100.00**
E-sample Possible Match (Case Type 12)	897	1.43	864	1.45	33	1.02
E-sample person in a Conflicting household (Case Type 13)	4,944	7.86	4,758	7.98	186	5.73
Unclassified E-sample people who are not duplicates or insufficient information for followup, regardless of match status (Case Type 14)	2,459	3.91	2,408	4.04	51	1.57
E-sample nonmatches (Case Type 17)	53,637	85.30	50,901	85.36	2,736	84.31
E-sample person who is a primary to a nationwide person (followup at the sample address) (Case Type 18)	8,194	13.03	7,762	13.02	432	13.31
E-sample people who are a possible duplicate to a nationwide person if there are no Person Interview results or if there was a proxy respondent in the Person Interview (followup at the sample address) (Case Type 19)	1,362	2.17	1,286	2.16	76	2.34
E-sample person who is identified by the Matching analysts as needing followup (Case Type 22)	0	0.00	0	0.00	0	0.00
E-sample possible duplicates within the sample block cluster/surrounding blocks (at least one of the pair is an E-sample person) (Case Type 23)	495	0.79	416	0.70	79	2.43
E-sample primary of a possible duplicate within the block cluster (Case Type 25)	485	0.77	412	0.69	73	2.25
Census Person linked to Insufficient Inmover (Case Type 27)	2	0.00	2	0.00	0	0.00
Census Primary with an Insufficient Possible Duplicate (Case Type 28)	0	0.00	0	0.00	0	0.00

Persons can be selected for multiple case types.
Source: Census person DIF

Nationwide cases were much more prevalent than estimated. There were more nationwide duplicates of E-sample persons than nationwide matches to P-sample persons, both stateside and in Puerto Rico.

Table 53
The 2010 Census Coverage Measurement Person Followup Operation
Case Types – Nationwide Persons: Unweighted

Case Types	Nationwide Persons					
	Total		U.S.		Puerto Rico	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Total	**15,982**	**100.00**	**15,170**	**100.00**	**812**	**100.00**
Nationwide person who matches or possibly matches to P-sample person (Case Type 15)	5,188	32.46	4,965	32.73	223	27.46
Nationwide person who is a duplicate to E-sample person (Case Type 20)	10,794	67.54	10,205	67.27	589	72.54

Source: Census person DIF

There were also household-based case types – conflicting households (where the PI and Census claim different people lived at the same household on Census Day) and addresses needing geocoding checks. Only non-nationwide cases were eligible for these household-based case types. Addresses that were conflicting households should have had all people rostered in both the CCM and census households selected for followup. Addresses needing geocoding checks may or may not have had associated people selected for followup.

Table 54
The 2010 Census Coverage Measurement Person Followup Operation
Case Types – Household-based: Unweighted

Case Types	Cases					
	Total		U.S.		Puerto Rico	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Total Non-nationwide Cases	**48,211**	**100.00**	**46,081**	**100.00**	**2,130**	**100.00**
Conflicting Households	2,072	4.30	1,994	4.33	78	3.66
Census Coverage Measurement Geocoding Check	1,546	3.21	1,485	3.22	61	2.86
Census Geocoding Check	2,182	4.53	1,969	4.27	213	10.00

Source: PI/Census address DIF

5.23 What was the respondent type distribution?

For the 2010 PFU, a knowledgeable respondent was someone who knew the followup person well enough to answer questions about where the followup person was living in 2010 and other places where he or she stayed. A knowledgeable respondent was required for each followup person in a case; this could be one respondent for the whole case or a different respondent for each followup person. These knowledgeable respondents could be either nonproxy respondents (people who had been rostered at the followup address during either PI or census operations) or proxy respondents. Examples of proxy respondents are neighbors, landlords, visiting family members, or new occupants of the followup address.

Due to the length of time since Census Day as well as the nature of the PFU universe (often people with complex living situations), proxies were often required to resolve some cases. Interviewers were allowed to contact proxy respondents only if one of the following criteria were met:

1. After making at least six visits over ten days at different times of the day or evening (including weekend and weekday visits), the interviewer failed to find a knowledgeable respondent at the sample address.
2. The interviewer contacted the household and no one there was knowledgeable about the followup people. This could happen if the followup people had moved out of the address or if the address was incorrect.
3. Or, the CCM or census address was vacant or not a housing unit.

Table 55 displays the type of respondent and number of knowledgeable respondents needed for each case for the U.S. and Puerto Rico. 66.9 percent of all complete and partial PFU cases were completed with a single nonproxy respondent. 86.3 percent of cases were completed with a single respondent, either a nonproxy or a proxy respondent, while only 13.8 percent of cases required multiple knowledgeable respondents in order to complete the case. Puerto Rico PFU cases were likely to have been completed with a single nonproxy. The 2010 PI had a proxy rate of 3.69 percent which is lower than the 19.4 percent in PFU. This is not unexpected due to the differences in respondent and proxy rules between PI and PFU as well as the increased time since Census Day in 2010.

Table 55
The 2010 Census Coverage Measurement Person Followup Operation
Type of Respondent – Number of Complete and Partial Cases by Regional Census Center: Unweighted

Regional Census Center	Single Respondent - Nonproxy		Single Respondent - Proxy		Multiple Respondents	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Total	**37,289**	**66.9**	**10,796**	**19.4**	**7,680**	**13.8**
Puerto Rico	2,136	82.8	178	6.9	266	10.3
U.S. Total	35,153	66.1	10,618	20.0	7,414	13.9
Boston	2,440	67.7	638	17.7	527	14.6
New York	1,982	66.7	378	12.7	610	20.5
Philadelphia	2,389	65.5	829	22.7	428	11.7
Detroit	1,987	62.4	691	21.7	509	16.0
Chicago	2,126	62.5	733	21.6	543	16.0
Kansas City	2,100	62.2	834	24.7	442	13.1
Seattle	2,762	62.2	955	21.5	721	16.3
Charlotte	2,831	64.4	957	21.8	610	13.9
Atlanta	3,581	65.1	1,252	22.8	669	12.2
Dallas	3,661	66.6	1,273	23.2	561	10.2
Denver	5,200	71.2	954	13.1	1,146	15.7
Los Angeles	4,094	69.8	1,124	19.2	648	11.1

*Percents may not sum to totals due to rounding.
Source: CMOCS, PFU Keyed data files

5.24 What is the noninterview rate for Person Followup?

Table 56 shows the outcome codes for the non-nationwide PFU cases. Cases were coded as complete when interviews had been completed for all followup people in the case. Partial cases had either some followup people without complete data or some of the questions needed to determine residence status for at least one of the followup people was answered with a “Don’t Know” or “Refused” response. Noninterviews included Refusals (from a nonproxy respondent), No One Home (after six attempts), and Other. Some examples of the non-nationwide cases coded as Others are cases with no followup people, cases where the household or person had moved and a suitable proxy could not be found, and language barriers. There were a number of cases sent to the field that the RCCs were told not to interview, these include 543 PFU cases with no followup people that should not have been created, as well as several nationwide cases in prisons or sensitive GQs such as women’s shelters.

The noninterview rate for Non-nationwide cases was 6.1 percent. This varied widely by RCC from a low of 1.9 percent for the Detroit RCC to a high of 11.4 for the Charlotte RCC. The 2000 A.C.E. PFU had a noninterview rate of 0.2 percent (Balutis, 2011). There are many possible reasons for the increase in noninterviews including the increased time since Census Day (2010 PFU took place January to March, 2011; 2000 PFU occurred in October, 2000), changes in the assigning of outcome codes from the 2000 PFU to the 2010 PFU, increased census fatigue (there were more opportunities

for respondent contact in the 2010 Census as opposed to the 2000 Census), and overall declining survey responses over the last decade.

Table 56
The 2010 Census Coverage Measurement Person Followup Operation
Case Outcome Codes by Regional Census Center – Non-nationwide Cases: Unweighted

Regional Census Center	Complete		Partial		Noninterview		Total	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Total	**37,112**	**77.0**	**8,181**	**17.0**	**2,918**	**6.1**	**48,211**	**100.0**
Puerto Rico	1,977	92.8	55	2.6	98	4.6	2,130	100.0
U.S. Total	35,135	76.2	8,126	17.6	2,820	6.1	46,081	100.0
Boston	2,499	79.6	412	13.1	228	7.3	3,139	100.0
New York	2,063	79.7	442	17.1	82	3.2	2,587	100.0
Philadelphia	2,317	71.8	717	22.2	191	5.9	3,225	100.0
Detroit	2,076	80.7	448	17.4	50	1.9	2,574	100.0
Chicago	2,250	77.4	474	16.3	183	6.3	2,907	100.0
Kansas City	2,406	85.3	315	11.2	101	3.6	2,822	100.0
Seattle	2,823	73.8	808	21.1	193	5.0	3,824	100.0
Charlotte	2,688	66.3	904	22.3	460	11.4	4,052	100.0
Atlanta	3,604	76.3	890	18.8	231	4.9	4,725	100.0
Dallas	3,408	73.5	1,029	22.2	200	4.3	4,637	100.0
Denver	5,129	81.0	827	13.1	377	6.0	6,333	100.0
Los Angeles	3,872	73.7	860	16.4	524	10.0	5,256	100.0

*Percents may not sum to totals due to rounding.
Source: Keyed data + CMOCS

The noninterview rate for nationwide cases was 6.4 percent, similar to the non-nationwide cases. These varied from a low of 1.8 percent for the Detroit RCC to 12.6 percent for the Charlotte RCC. Several of the Charlotte nationwide cases were for military personnel serving on Navy ships whose homeport is Norfolk, Virginia. These cases had a higher degree of difficulty to interview than the typical PFU case.

While the noninterview rates are similar for nationwide and non nationwide cases, the partial rate is lower for nationwide cases. This may be due to a lower number of people per case for nationwide cases *(see the next question).*

Table 57
The 2010 Census Coverage Measurement Person Followup Operation
Case Outcome Codes by Regional Census Center – Nationwide Cases: Unweighted

Regional Census Center	Complete		Partial		Noninterview		Total	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Total	**9,226**	**82.4**	**1,246**	**11.1**	**719**	**6.4**	**11,191**	**100.0**
Puerto Rico	541	95.6	7	1.2	18	3.2	566	100.0
U.S. Total	8,685	81.7	1,239	11.7	701	6.6	10,625	100.0
Boston	630	84.8	64	8.6	49	6.6	743	100.0
New York	415	86.3	50	10.4	16	3.3	481	100.0
Philadelphia	514	77.6	98	14.8	50	7.6	662	100.0
Detroit	586	86.8	77	11.4	12	1.8	675	100.0
Chicago	586	80.3	92	12.6	52	7.1	730	100.0
Kansas City	598	89.0	57	8.5	17	2.5	672	100.0
Seattle	722	86.5	85	10.2	28	3.4	835	100.0
Charlotte	650	70.5	156	16.9	116	12.6	922	100.0
Atlanta	837	81.1	171	16.6	24	2.3	1,032	100.0
Dallas	913	80.1	145	12.7	82	7.2	1,140	100.0
Denver	1,216	83.5	128	8.8	113	7.8	1,457	100.0
Los Angeles	1,018	79.8	116	9.1	142	11.1	1,276	100.0

*Percents may not sum to totals due to rounding.
Source: Keyed data + CMOCS

The average number of attempts needed to finish a PFU case was close to four. This number had very little variation among the RCCs from a low of 3.26 in Puerto Rico to a high of 4.74 in the stateside Boston RCC cases.

Table 58
The 2010 Census Coverage Measurement
Person Followup Operation
Average Number of Attempts by Regional Census Center: Unweighted

Regional Census Center	Average
Boston	4.74
New York	4.02
Philadelphia	4.05
Detroit	3.94
Chicago	3.95
Kansas City	3.58
Seattle	3.70
Charlotte	3.41
Atlanta	3.72
Dallas	3.92
Denver	3.84
Los Angeles	3.93
Puerto Rico	3.26

*Percents may not sum to totals due to rounding.
Source: Keyed data

In addition to case-level outcome codes, each followup person in a case received a person-level outcome code, this was a new process for the 2010 PFU and was used in the assignment of case-level outcome codes. All person-level outcomes in a case were required to be "Complete" before a case-level outcome could be coded as "Complete." Complete person-level outcomes include complete interviews for the followup person as well as followup persons that were duplicates within a case (so the data was collected in that case for another person with the same name) or people that were found to not exist in the block cluster by the interviewer (these may or may not have been accepted by the person matching staff as "fictitious" people). Partial interviews for a followup person do not have all required questions answered or have don't know or refusal answers for required questions. Puerto Rico followup persons were considered complete 96.30 percent of the time. Stateside people had large percentages of partial and noninterview person-level outcomes, so the stateside complete rate was only 79.26.

Table 59
The 2010 Census Coverage Measurement Person Followup Operation
Person-Level Outcome Codes: Unweighted

Workload	Complete*		Partial		Noninterview		Total	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Total	**90,335**	**80.05**	**15,508**	**13.74**	**6,589**	**5.84**	**112,853**	**100.00**
U.S.	85,336	79.26	15,398	14.30	6,509	6.05	107,662	100.00
Puerto Rico	4,999	96.30	110	2.12	80	1.54	5,191	100.00

*Complete includes Complete, Complete (Valid skip), and Complete (Unknown to Respondents) outcome codes.
*Percents may not sum to totals due to rounding.
779 people (778 stateside, 1 PR) with no data collected not included in table.
Source: PFU Keyed data files

Interviewers were told to interview by personal visit except in the following situations where a telephone attempt was permitted:

- Upon review of a completed questionnaire, the interviewer realized that one or two required questions were skipped or the interviewer needed clarification to an answer.
- When the respondent specifically requested a telephone interview rather than a personal visit interview.
- The interviewer needed to locate a specific respondent, verify an address, or make an appointment for a personal visit.
- When the CL instructed the interviewer to conduct a telephone interview in a special situation such as when a knowledgeable respondent was located outside the block cluster.

Because of these rules, telephone interviews should have been rare. Looking at the final attempt for each case, 23.99 percent of cases were completed by telephone. This suggests that interviewers did not have difficulty conducting interviews over the phone. Instructions for telephone interviews were not given to interviewers since these were expected to be rare. In future iterations of the PFU interview, telephone instructions should be given to interviewers to prepare them for this occurrence.

Table 60
The 2010 Census Coverage Measurement Person Followup Operation
Attempt Type: Unweighted

Attempt Type	Complete Cases					
	Total		U.S.		Puerto Rico	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Total	**46,338**	**100.00**	**43,820**	**100.00**	**2,518**	**100.00**
Personal Visit	34,997	75.53	32,925	75.14	2,072	82.29
Telephone	11,116	23.99	10,674	24.36	442	17.55

Percents may not add to 100 due to rounding and missing data.
Source: Keyed data

5.25 How many cases were sent for a nationwide followup interview?

Census people outside of the sample block cluster and surrounding blocks that are linked to either CCM or census people inside the sample block cluster during computer matching are referred to as nationwide matches/duplicates. These cases are sent to followup independently from the linked people inside the sample block cluster. These cases outside of the sample block cluster and surrounding blocks are referred to as nationwide cases.

Prior to the start of Person Matching, we had very little data to predict the magnitude of the nationwide cases so we estimated that nationwide cases would account for five percent of the PFU workload. With a total of 59,402 PFU cases, this would have been about 2,970 cases. Instead the nationwide workload was much larger than anticipated, 11,191 cases or about 19 percent of the total PFU workload.

When nationwide cases are identified during the PFU universe creation, the PerMaRCS assigns them to the in-sample cluster for matching purposes. This makes it complicated to deliver to the field and assign to interviewers for personal visit interviews since we have no way of knowing in which cluster the case is physically located. For this reason, and since we expected a small number of these cases, it was suggested to the RCCs that they use supervisors or other specialized staff to conduct these interviews. When the size of the workload was discovered, the use of the supervisors was no longer the most efficient way to interview these cases.

Table 61 shows the number of nationwide cases and the number of nationwide persons by RCC. By definition, all nationwide followup persons are census persons.

Table 61
The 2010 Census Coverage Measurement Person Followup Operation
Nationwide Workload by Cases and Persons: Unweighted

Workload	Cases		Census Persons	
	Count	Percent of Total	Count	Percent of Total
Total	**11,191**	**100.00**	**15,968**	**100.00**
Puerto Rico	566	5.06	812	5.09
U.S. Total	10,625	94.94	15,156	94.91
Boston	743	6.64	979	6.13
New York	481	4.30	683	4.28
Philadelphia	662	5.92	892	5.59
Detroit	675	6.03	940	5.89
Chicago	730	6.52	1,026	6.43
Kansas City	672	6.00	939	5.88
Seattle	835	7.46	1,177	7.37
Charlotte	922	8.24	1,349	8.45
Atlanta	1,032	9.22	1,457	9.12
Dallas	1,140	10.19	1,623	10.16
Denver	1,457	13.02	2,273	14.23
Los Angeles	1,276	11.40	1,818	11.39

*Percents may not sum to totals due to rounding.
Source: PFU Case File, Census person DIFs

Table 62 shows the number of followup people per case for the nationwide PFU cases. The majority of the nationwide cases had only one followup person though one case had 20 followup people. In general, the nationwide cases had fewer followup people than the regular nonnationwide cases (average 1.43 followup people for nationwide cases vs. 1.9 followup people for nonnationwide cases).

Table 62
The 2010 Census Coverage Measurement Person Followup Operation
Number of Nationwide Followup Persons: Unweighted

Number	Count	Percent of Total
One	8,411	75.2
Two	1,649	14.7
Three	609	5.4
Four	321	2.9
Five or more	201	1.8
Total	**11,191**	**100.0**

*Percents may not sum to totals due to rounding.
Source: Census person DIF, PFU case file

5.26 How many people did not go to Person Followup as a result of interviewing census-only units in Person Interview?

There were some census addresses located in a CCM sample block cluster that were determined during Initial Housing Unit operations to be valid housing units, but had been missed by the CCM IL. There were also some units that were actually located outside the CCM sample block cluster (in a surrounding block) that census had geocoded in the CCM sample block cluster. Both of these types of housing units were sent to PI as "census-only units." There were 8,070 census-only housing units included in the PI. Out of those, Person Matching was able to match 9,507 census persons that would have otherwise been coded as nonmatches and sent to PFU.

Table 63
The 2010 Census Coverage Measurement Person Followup Operation Census Persons Who Did Not Go to Followup due to Census-Only Cases: Unweighted

Regional Census Center	Census Persons	
	Count	Percent of Total
Total	**9,507**	**100.00**
Puerto Rico	782	8.23
U.S. Total	8,725	91.77
Boston	556	5.85
New York	427	4.49
Philadelphia	736	7.74
Detroit	423	4.45
Chicago	329	3.46
Kansas City	214	2.25
Seattle	435	4.58
Charlotte	1,085	11.41
Atlanta	948	9.97
Dallas	1,243	13.07
Denver	1,403	14.76
Los Angeles	926	9.74

*Percents may not sum to totals due to rounding.
Source: Cluster Control File, PM Census person, PM PI person

5.27 What are the missing data rates for key questions in the Person Followup?

The main residence questions in the PFU are the most important items for resolving residence or enumeration status. The following tables show the missing data rates for these questions. The tables are grouped by stateside English data, stateside Spanish data, and Puerto Rico. *Stateside English and stateside Spanish tables include only those persons who had any recorded data of that type – 778 stateside people did not have any recorded person data so are not included in these tables.* Stateside people may be included in both English and Spanish tables. *Only one person in Puerto*

Rico did not have any recorded person data; that person is excluded from some of the Puerto Rico tables. Questions about college, military, and job addresses were only asked of certain age ranges similar to the PI instrument, though these types of addresses could have been reported in questions about other address types. College address - age 16 to 30 or unknown, Military address – age 18 to 65 or unknown, Job address - age 16 to 70 or unknown.

The following table displays the data for the main residence questions collected stateside. For this table English and Spanish responses have been combined. The majority of stateside followup people lived or stayed at the address where they were collected in either the PI or the census enumeration (82.37). Most alternate addresses were collected in Question 2 (Did *NAME* live anywhere else in 2010?) - 47,950), or 44.22 percent. The college question had yes responses for 15.68 percent of cases and staying with relatives had 5.13 yes responses. Questions 3 through 9 all had missing rates around 24 percent.

Table 64
The 2010 Census Coverage Measurement Person Followup Operation
Missing Data – Stateside Persons: Unweighted

Address Questions	Yes		No		Don't Know /Refused/Missing		Total Eligible Persons	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Live or stay at sample address in 2010? (Q1)	89,317	82.37	6,188	5.71	12,935	11.93	**108,440**	**100.00**
Live anywhere else in 2010? (Q2)	47,950	44.22	41,290	38.08	19,200	17.71	**108,440**	**100.00**
During 2010, attend college?(Q3)**	6,897	15.68	26,220	59.62	10,859	24.70	**43,976**	**100.00**
During 2010, stay with another relative?(Q4)	5,564	5.13	76,127	70.20	26,749	24.67	**108,440**	**100.00**
During 2010, live or stay someplace else because of military service?(Q5)**	498	0.67	55,975	74.75	18,410	24.59	**74,883**	**100.00**
During 2010, live or stay someplace because of a job?(Q6)**	1,549	1.94	58,509	73.12	19,958	24.94	**80,016**	**100.00**
During 2010, have a seasonal home?(Q7)	2,831	2.61	80,063	73.83	25,546	23.56	**108,440**	**100.00**
Any other place stayed often?(Q8)	3,039	2.80	78,631	72.51	26,770	24.69	**108,440**	**100.00**
Group quarters around April 1?(Q9)	1,452	1.34	81,198	74.88	25,790	23.78	**108,440**	**100.00**

*Percents may not sum to totals due to rounding.
**Restricted to certain age ranges based on question
Source: keyed data

The average number of alternate addresses reported in the main questions per person for stateside is 0.70 addresses. For people with at least one alternate address reported in the main questions, the average number of addresses reported was 1.34 addresses.

Table 65 shows on average, 52.09 percent of people in PFU indicated having one or more alternate addresses. Most, 37.12 percent, only had one alternate address and 12.33 percent reported two alternate addresses. Only 0.32 percent had more than three alternate addresses with the maximum

number of alternate addresses reported being six.

By age, those 18-24 reported the largest percentages of alternate addresses, including 35.91 percent reporting one, 22.72 percent reporting two, and 6.40 reporting three alternate addresses. 14.32 percent of people age 61 or older also reported having two alternate addresses. Children ages 0-17 years reported having one alternate address 40.04 percent of the time.

Table 65
The 2010 Census Coverage Measurement Person Followup Operation
Number of Times Responded "Yes" to Alternate Address Questions by Age – U.S. : Unweighted

Age	Zero		One		Two		Three		Four - Six	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Total	**51,947**	**47.90**	**40,253**	**37.12**	**13,369**	**12.33**	**2,521**	**2.32**	**350**	**0.32**
Missing Age	5824	49.49	4237	36.01	1393	11.84	259	2.20	54	0.46
0-17 years	13031	48.99	10650	40.04	2597	9.76	303	1.14	19	0.07
18-24 years	5909	33.87	6266	35.91	3964	22.72	1117	6.40	191	1.09
25-60 years	22009	51.50	16002	37.45	3998	9.36	656	1.54	69	0.16
61+ years	5174	52.30	3098	31.32	1417	14.32	186	1.88	17	0.17

*Percents may not sum to totals due to rounding.
Source: Keyed data+DIFs

On Table 66, we report that for stateside respondents, people who reported an address were likely to give at least one piece of information about the address. This could be an entire mailing address or only a state. Only 1.31 percent of people reporting a college address could not give any identifying information. 14.58 percent of people reporting an address at Question 2 could not give any identifying address information. Question 2 addresses are often "Move From" or "Move To" addresses.

Table 66
The 2010 Census Coverage Measurement Person Followup Operation
Missing Address (Q1,2,3,9) – Stateside English: Unweighted

Address Questions	Missing Address (no part of address given)		Total Persons with Address Type	
	Count	Percent of Total	Count	Percent of Total
Other than Sample Address (Q1)	805	13.22	**6,089**	**100.00**
Live Anywhere Else (Q2)	6,878	14.58	**47,164**	**100.00**
College Address (Q3)	90	1.31	**6,869**	**100.00**
Group Quarters (Q9)	100	6.96	**1,437**	**100.00**

*Percents may not sum to totals due to rounding.
Source: keyed data

Questions 4 through 8 were displayed on the same page of the questionnaire. These included questions about a relative's address, military service, a job away from home, seasonal homes, and any other place the followup person stayed often. So, there were five different types of addresses

that could be reported on this page but, there was only space available to record details about two of them on this page. It was decided that this should be sufficient for the majority of cases and an interviewer should use Notes spaces when address details were needed for more than two addresses. Table 67 shows the number of alternate address types reported per person on the stateside English pages and the number of address details given.

There were few cases that reported on this page of the questionnaire. Most (99.57 percent) only reported two types of places, so the decision on formatting the questionnaire was appropriate.

Table 67
The 2010 Census Coverage Measurement Person Followup Operation
Missing Address (Q4-8) – Stateside English: Unweighted

Number of Alternate Address Types	Zero Alternate Addresses Given		One Alternate Address Given		Two Alternate Addresses Given		Total	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Zero	93,953	99.85	131	0.14	11	0.01	**94,095**	**100.00**
One	676	6.20	10,050	92.17	178	1.63	**10,904**	**100.00**
Two	29	2.51	107	9.26	1,020	88.24	**1,156**	**100.00**
Three	2	4.00	5	10.00	43	86.00	**50**	**100.00**
Four	0	0.00	1	100.00	0	0.00	**1**	**100.00**
Five	1	100.00	0	0.00	0	0.00	**1**	**100.00**

Source: PFU Keyed data files
12112 people with at least one address type
NOTE: Address types are: Relative, Military, Job, Seasonal, Other

For each alternate address reported, respondents were asked to give information about landmarks or cross streets close to that place, cohabitants that lived with the followup person at that place, and any neighbors that lived close to the alternate address (Question 9 about GQs did not ask about cohabitants or neighbors). Neighbors were rarely reported. While this information can be very useful during Person Clerical Matching when geocoding an address with few details, few respondents know this information. As reported on Table 68, the percent of landmarks and cohabitants missing varies widely based on the address type.

Table 68
The 2010 Census Coverage Measurement Person Followup Operation
Missing Data for Additional Information Collected on Alternate Addresses: Unweighted

Address Questions	Landmarks, Cross Streets Missing		Cohabitants Missing		Neighbors Missing		Total Persons with Address Type	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Live or stay at sample address in 2010? (Q1)	2,839	46.63	2,278	37.41	5,033	82.66	6,089	100.00
Live anywhere else in 2010? (Q2)	28,699	60.85	24,432	51.80	43,517	92.27	47,164	100.00
During 2010, attend college?** (Q3)	5,224	76.05	5,474	79.69	6,665	97.03	6,869	100.00
Another relative, military, service, job, seasonal home, other? **Address Row 1**	8,830	72.90	7,520	62.09	11,278	93.11	12,112	100.00
Another relative, military, service, job, seasonal home, other? **Address Row 2**	11,337	93.60	11,071	91.41	11,931	98.51	12,112	100.00
Group quarters around April 1? (Q9)	682	47.46	N/A	N/A	N/A	N/A	1,437	100.00

**Restricted to certain age ranges based on question
*Percents may not sum to totals due to rounding.
Source: keyed data

Type of place is needed to classify whether followup people were eligible to be included in the P sample or E sample since people living in GQs are excluded from CCM. The data on Table 69 shows that most people (90.05) who reported staying at a GQ in Question 9 did give a type of place that is considered a GQ. Assisted Living facilities were a response option to this question even though they are not considered a GQ by the Census Bureau. This accounts for the 5.92 percent of Question 9 addresses that were considered housing units.

Table 69
The 2010 Census Coverage Measurement Person Followup Operation
Type of Place – Stateside English: Unweighted

Address Questions	Housing Unit		Group Quarters**		Don't Know/Refused/ Missing		Total Persons with Address Type	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Live or stay at sample address in 2010? (Q1)	4,690	77.02	325	5.34	1,074	17.64	6,089	100.00
Live anywhere else in 2010? (Q2)	27,962	59.29	2,190	4.64	17,012	36.07	47,164	100.00
During 2010, attend college? (Q3)	1,843	26.83	945	13.76	4,081	59.41	6,869	100.00
Another relative, military, service, job, seasonal home, other? **Address Row 1**	5,332	44.02	715	5.90	6,065	50.07	12,112	100.00
Another relative, military, service, job, seasonal home, other? **Address Row 2**	1,299	10.72	231	1.91	10,582	87.37	12,112	100.00
Group quarters around April 1? (Q9)	85	5.92	1,294	90.05	58	4.04	1,437	100.00

**Group quarters includes "Other"
*Percents may not sum to totals due to rounding.
Source: keyed data

The stateside Spanish pages on the PFU questionnaire were used only rarely. Data for these pages may duplicate or contradict the data in the preceding four tables for a particular person in a particular case. For this reason, the data on English pages were analyzed independently from the Spanish page data. Stateside Spanish and Puerto Rico tables can be found in Appendix A.

5.28 How many interviews used the Spanish Person Followup questionnaire pages?

As shown on Table 70, the majority of stateside PFU interviews were conducted in English (94.59 percent), while almost all Puerto Rico interviews were in Spanish (96.77 percent). Less than one percent of all interviews were conducted in languages other than English or Spanish (0.47 percent).

Table 70
The 2010 Census Coverage Measurement Person Followup Operation
Language of Interview: Unweighted

Language	Complete Cases					
	Total		U.S.		Puerto Rico	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Total	**59,402**	**100.00**	**56,706**	**100.00**	**2,696**	**100.00**
English	53,646	90.31	53,637	94.59	9	0.33
Spanish	4,200	7.07	1,591	2.81	2,609	96.77
Other	281	0.47	280	0.49	1	0.04
Missing	1,275	2.15	1,198	2.11	77	2.86

*Percents may not sum to totals due to rounding.
Source: Keyed data

Stateside PFU questionnaires were printed in English on the front side of the pages and in Spanish on the back side of each of the pages other than the front and back cover (double-sided printing). This doubled the cost of printing the stateside PFU questionnaires. Puerto Rico PFU questionnaires were printed only in Spanish and single-sided.

Table 71 shows the number of times the Spanish-language pages were used in stateside interviews. In cases where there were data on both the English-language and Spanish-language pages, the data on one side may duplicate or contradict the other side.

Table 71
The 2010 Census Coverage Measurement Person Followup Operation
Spanish-language Pages Used - Stateside: Unweighted

Stateside Cases	English-language Pages Only		Spanish-language Pages Only		Both		Total Eligible	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Section D (Conflicting Households)	1,961	94.96	22	1.07	30	1.45	2,065	100.00
Section E (Geocoding Check)	3,401	98.47	14	0.41	15	0.43	3,454	100.00
Section B (Possible Match/Duplicate)	1,227	93.17	50	3.80	13	0.99	1,317	100.00
Any Person-level records (Section As and Cs)	104,656	96.51	1,455	1.34	1,550	1.43	108,440	100.00

*Section B and E rows can include multiple pages per case.
*Percents may not sum to totals due to rounding.
Source: Keyed data

6 RELATED EVALUATIONS, EXPERIMENTS, AND/OR ASSESSMENTS

Information on the other CCM Operations can be found in the following Assessments:

- Assessment for the 2010 Census Coverage Measurement Initial Housing Unit Independent Listing, Matching, and Followup Operations
- Assessment for the 2010 Census Coverage Measurement Person Interview Operation
- Assessment for the 2010 Census Coverage Measurement Final Housing Unit Matching and Followup Operations

7 LESSONS LEARNED, CONCLUSIONS, AND RECOMMENDATIONS

7.1 Lessons Learned

This section compiles the key lessons learned from the PMF operations based on observations by Census Bureau Headquarters and NPC staff during the field operations, debriefing sessions of office and field staff held in each RCC, feedback provided by technicians and analysts during clerical operations, and discussions with Census Bureau Headquarters, NPC, and Gunnison staff that worked on the operations. (Johnson and Cantu, 2012; Gunnison, 2011; and Sanchez, 2011)

7.1.1 Person Computer Matching and Preprocessing

- Clerical review was required to resolve many of the cases that could not be resolved in the automated geocoding and automated residence status coding operations. Automated geocoding was unable to geocode nearly 35 percent of the PI respondent-provided addresses. Automated residence status coding was unable to resolve the residence status for nearly 20 percent of the people rostered in the PI. There was no automated geocoding or automated residence status coding for information collected on the paper PFU forms, thus all the respondent-provided addresses and residence information collected during the PFU interviews were clerically reviewed.

- The final person matching results show that the computer did well in linking records together, especially when inmover or alternate addresses were obtained from the PI to confirm links beyond the sample search area.

- Telephone numbers played a large, successful role in the 2010 CCM computer matching operation, as every year, more and more people obtain cell phone numbers and keep those numbers when they move.

- During the 2010 PI, if a respondent provided an alternate address, we asked if the respondent moved or went back and forth to this address. The answers were then summarized in a PerMaRCS PI Report for the benefit of clerical matchers. However, sometimes the summary did not make sense, resulting in some cases being coded unresolved or unclassified (in which case, followup may have been needed to resolve the case). It is unclear if the PerMaRCS summarization logic was faulty, or if the way the PI collected its data was faulty.

- While PerMaRCS mostly did a good job of handling duplicates found in computer matching, it was not designed to handle triplicates very well.

7.1.2 Person Clerical Matching

- In order to meet the quality assurance standards, the expert clerical matching staff (analysts) had to verify a majority of the work conducted by the first-level matchers (technicians). The percentage of cases reviewed by analysts for quality assurance purposes was 77.0 percent for the Clerical Geocoding Phase, 68.3 percent for the Residence Status Coding Phase, 78.2 percent for the Before Followup Matching Phase, and 60.0 percent for the After Followup Matching Phase.

- The amount of cases requiring clerical review following automated coding and the high analyst verification rates for quality assurance purposes created a bottleneck between the technician and analyst review stages of clerical matching. This resulted in the need for additional resources (Census Bureau headquarters staff and overtime) as well as a short delay in the completion of the clerical matching activities.

- As demonstrated by the high analyst verification rates, the clerical matching tasks for the 2010 CCM may have been too difficult for the newly-hired, first-level clerical matching staff (technicians) to learn in the timeframe given. Based on observations and debriefings, many technicians repeated mistakes because they simply did not realize they were doing anything wrong. We were able to identify technicians who needed retraining by observation (e.g., Were the technicians asking questions that indicated they were learning the material? Were they able to answer questions trainers asked them? Were their error rates improving?).

- For the 2010 CCM, in addition to the PerMaRCS and C&P reports, we created many adhoc SAS programs during production to monitor the clerical matching operations.

- The 2010 PFU was conducted on paper forms, thus the data collected could not be used until the forms were shipped back from the field and then all data collected was clerically reviewed at NPC to assign final codes. Thus, there was no automated geocoding or residence status coding of PFU data and there was no computer matching using PFU data.

7.1.3 Person Followup

- Duplicates should **not** have been included when creating the PFU address followup flags since duplicates are included at the address of the person to whom they are linked. This caused additional cases to be created that included no people to interview.

- Duplicates are often found at a third address linked to the original PI and/or census addresses. Addresses should have be included on the PerMaRCS person input files for all people.

- The PerMaRCS system was developed assuming that each Nationwide person would link to one and only one PI or E-sample person. This was not the case. At the start of Person AFU Matching, additional programming was needed to deal with Nationwide cases that had one nationwide person to more than one PI and/or E-sample person and for many nationwide people that linked to the same PI or E-sample person.

- The legal-sized, landscape questionnaire caused some difficulties. Due to the legal-size and landscape orientation, the Docuprint could only staple the questionnaire in an inconvenient location. The questionnaires did not fit well in the census bags that the interviewers were provided. Interviewers had difficulty managing the questionnaires, maps, letters, Notices of Visits, etc.

- Make sure all data to be keyed is appropriately labeled on the paper questionnaire.

- Question 1A worked as designed to help interviewers find a knowledgeable respondent.

- The way Question 3 of Section C "Did this person attend college?" was worded made the interview longer in many cases.

- Weather caused many delays, especially during interviewer training and during person matching.

- Several RCCs sent out nationwide cases with the associated in-cluster case. This was not the suggested procedure for interviewing nationwide cases due to concerns that the data would be biased.

- The output record was so long (14,162 characters in length for Case file, 12,701 characters for Person files) that it was very difficult to research a problem in the output record.

7.2 Conclusions

The 2010 CCM was designed to evaluate the 2010 Census by providing estimates of net coverage error and components of census coverage (i.e., census omissions and erroneous enumerations, including duplicates, in addition to the correct enumerations) while addressing problems identified with the Census 2000 A.C.E. Program. During the 2000 A.C.E., the PI and PFU interviews were ineffective in determining a person's Census Day residence. This resulted in the A.C.E. not being able to adequately identify erroneous enumerations, many of which were found to be duplicates in the census (see Kostanich et al., 2004b). The 2010 CCM Program expanded upon the 2000 A.C.E. by collecting additional respondent-provided addresses where people lived or stayed around Census Day, conducting nationwide matching to identify duplication in the census, and estimating the components of census coverage.

To understand some of the complexities that resulted from the expansion of the 2010 CCM program, this section provides conclusions based on unweighted summary data from the CCM PMF Operations. These are given from an operational standpoint; they do <u>not</u> reflect the final CCM estimates of person coverage.

7.2.1 Person Computer and Clerical Matching

The respondent-provided addresses from PI had to be geocoded to determine where the addresses were located in order to develop the search areas to look for matches and duplicates for people with these addresses. GEO performed automated geocoding and then addresses that were not successfully geocoded were reviewed clerically. PFU also asked respondents to provide additional places where a person could have been counted. All PFU respondent-provided addresses were clerically geocoded during AFU Clerical Matching (there was no automated geocoding process for these addresses). Table 72 shows how many respondent-provided addresses were successfully geocoded to identify search areas for matching.

Table 72
The 2010 Census Coverage Measurement Person Matching
Geocoding Results for Automated and Clerical Geocoding Operations – Unweighted Percents*

	Person Interview Respondent-Provided Addresses		**Person Followup Respondent-Provided Addresses**
	Automated Coding	**After Followup**	**After Followup**
Total United States (excluding Puerto Rico)	**51,980**	**51,474**	**27,059**
Search Area Identified	65.41	79.19	75.44
Geocoded to Master Address File Identifier	47.24	47.86	52.11
Geocoded to Block	18.17	31.33	23.33
No Search Area Identified	34.59	20.81	24.56
Geocoded to County	23.63	12.39	17.45
Geocoded to State	2.31	2.14	2.81
Ungeocoded	8.65	6.28	4.31
In-Scope – U.S. Address	4.20	1.86	1.57
Out-of-Scope – Puerto Rico Address	0.12	0.11	0.06
Out-of-Scope – Other Country	4.32	4.31	2.68
Total Puerto Rico	**2,097**	**2,079**	**1,104**
Search Area Identified	41.25	73.69	75.18
Geocoded to Master Address File Identifier	2.96	19.53	44.29
Geocoded to Block	38.29	54.16	30.89
No Search Area Identified	58.75	26.31	24.82
Geocoded to County	41.73	10.05	13.32
Geocoded to State	1.34	1.01	0.72
Ungeocoded	15.69	15.25	10.78
In-Scope – Puerto Rico Address	0.43	0.34	2.72
Out-of-Scope – U.S. Address	12.30	11.93	6.70
Out-of-Scope – Other Country	2.96	2.98	1.36

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: pm_other_address and pm_other_address_geocode

There were 51,980 inmover and alternate addresses collected in the PI in the U.S. (excluding Puerto Rico). There were an additional 27,059 respondent-provided addresses obtained from PFU. Based on the results of automated geocoding, search areas were identified for 65.41 percent of the PI respondent-provided addresses (i.e., geocoded to a specific address on the MAF or geocoded to one or more blocks). Upon completion of AFU Clerical Matching, 79.19 percent of the addresses from

PI and 75.44 percent of the addresses from PFU were successfully geocoded. For PI respondent-provided addresses, a search area was identified for more of the addresses following final clerical review (79.19 percent) compared to automated geocoding (65.41 percent).

The PI was designed to cast a wide net when collecting rosters of people living or staying at the sample address. A residence status code was assigned to each PI person indicating whether or not the person should be included in the P sample. To be included in the P sample, the person must have been rostered in a housing unit that was eligible and selected for the P sample (i.e., listed during IL) and assigned a P-sample residence status code. Using the additional residence information collected during the PI and PFU interviews, Table 73 shows how many people rostered during the PI should have been included in the P sample.

Table 73
The 2010 Census Coverage Measurement Person Matching
Person Interview Residence Status Code Results for Automated and Clerical Residence Status Coding Operations – Unweighted Percents*

	Person Interview People in Independent Listing Housing Units		
	Automated Coding	**Before Followup**	**After Followup**
Total United States (excluding Puerto Rico)	**392,711**	**392,711**	**392,711**
P-Sample	98.53	94.32	92.51
Nonmover	77.91	82.24	82.89
Inmover	0.86	6.32	6.85
P-sample Outmover	0.15	0.27	0.36
Unclassified	0.69	5.48	2.42
Clerical Review Needed	18.92	n/a	n/a
Non P-Sample	1.47	5.68	7.49
Out-of-Scope	0.76	1.91	2.23
Non P-Sample Outmover	0.71	1.42	2.03
Unclassified Outmover	n/a	0.08	0.16
Never Resident	n/a	2.28	3.07
Total Puerto Rico	**17,039**	**17,039**	**17,039**
P-Sample	98.81	92.66	91.58
Nonmover	82.08	85.51	85.96
Inmover	0.48	4.21	4.10
P-sample Outmover	0.43	0.70	0.80
Unclassified	0.38	2.24	0.72
Clerical Review Needed	15.45	n/a	n/a
Non P-Sample	1.19	7.34	8.42
Out-of-Scope	0.45	2.70	2.84
Non P-Sample Outmover	0.74	1.80	2.10
Unclassified Outmover	n/a	0.04	0.04
Never Resident	n/a	2.81	3.45

*Percents may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pi_person and vw_pm_pi_coding_history

Upon completion of AFU Clerical Matching, 92.51 percent of the 392,711 PI people rostered in P-sample housing units in the U.S. were assigned P-sample residence status codes: 82.89 percent were nonmovers, 6.85 percent were inmovers, 0.36 percent were P-sample outmovers, and 2.42 percent had unclassified residence status. There were fewer people for whom the residence status could not be determined after clerical review and followup (2.42 percent unclassified following AFU) compared to the results of automated residence status coding (0.69 percent unclassified and 18.92 percent needing clerical review) and the results of clerical review prior to followup (5.48 percent unclassified). The AFU Clerical Matching results show that 7.49 percent of the people rostered in P-sample housing units were assigned non P-sample residence status codes (which is more than in previous stages: 5.68 percent prior to PFU and 1.47 percent based on automated residence status coding).

Computer matching linked PI people to census people throughout the country and also searched for duplicates between E-sample people and other census enumerations throughout the country. In addition to searching around the sample address (as was done for the 2000 A.C.E.), the 2010 CCM also conducted searches around any inmover or alternate addresses provided by the PI or PFU respondents and conducted nationwide computer matching to identify matches and duplicates. During BFU Clerical Matching, the clerical matching staff reviewed the computer matching results, searched for additional matches and duplicates in each search area (around the sample address, around any inmover or alternate addresses, and within the nationwide address), and updated links and codes as warranted by their review. During AFU Clerical Matching, the matching staff reviewed PFU forms to geocode respondent-provided addresses and assign final match codes and/or residence status codes. The match codes assigned indicated the person's status as a match, possible match, nonmatch, or duplicate. Table 74 shows how many PI people were matched to census enumeration and in which search area these links were found. Table 75 shows how many E-sample people were matched to PI people, how many E-sample people were determined to be duplicates of other census enumerations, and in which search area these links were found.

Table 74
The 2010 Census Coverage Measurement Person Matching
Person Interview Match Code Results for Person Computer and Clerical Matching Operations – Unweighted Percents*

	Person Interview People in Independent Listing Housing Units					
	P-Sample Residence Status			Non P-Sample Residence Status		
	Computer Matching	Before Followup	After Followup	Computer Matching	Before Followup	After Followup
Total United States (excluding Puerto Rico)	**370,853**	**370,389**	**363,290**	**21,858**	**22,322**	**29,421**
Matches	84.55	90.50	91.49	61.93	69.24	69.56
Sample Search Area	79.14	84.41	85.41	28.04	28.20	29.78
Inmover Search Area	3.74	4.52	5.10	22.38	28.43	22.82
Alternate Search Area	0.35	0.49	0.76	6.96	10.10	15.96
Nationwide Search Area	1.33	1.09	0.23	4.55	2.51	0.99
Possible Matches	1.42	0.32	0.09	2.63	0.45	0.29
Sample Search Area	1.21	0.25	0.02	1.30	0.15	0.04
Inmover Search Area	0.04	0.03	0.02	0.30	0.12	0.07
Alternate Search Area	0.00	0.01	0.00	0.18	0.11	0.08
Nationwide Search Area	0.16	0.04	0.04	0.84	0.07	0.09
Nonmatches	13.57	8.66	7.89	34.69	29.37	29.24
Duplicates	0.43	0.51	0.53	0.55	0.94	0.91
Possible Duplicates	0.03	0.01	0.00	0.21	0.00	0.00
Total Puerto Rico	**15,955**	**15,789**	**15,604**	**1,084**	**1,250**	**1,435**
Matches	84.98	89.77	90.72	47.23	52.56	53.03
Sample Search Area	82.12	86.26	87.34	29.61	29.84	27.39
Inmover Search Area	1.78	2.22	2.58	10.89	14.08	13.03
Alternate Search Area	0.22	0.32	0.66	3.41	5.04	11.43
Nationwide Search Area	0.85	0.96	0.15	3.32	3.60	1.18
Possible Matches	1.77	0.37	0.08	5.63	0.72	0.49
Sample Search Area	1.38	0.26	0.01	2.03	0.32	0.14
Inmover Search Area	0.13	0.03	0.03	2.03	0.32	0.28
Alternate Search Area	0.03	0.03	0.02	0.74	0.08	0.07
Nationwide Search Area	0.23	0.06	0.03	0.83	0.00	0.00
Nonmatches	12.31	8.89	8.22	45.76	45.04	44.95
Duplicates	0.88	0.96	0.97	1.20	1.68	1.53
Possible Duplicates	0.06	0.00	0.01	0.18	0.00	0.00

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person, vw_pm_pi_coding_history, vw_pm_census_person, and vw_pm_census_coding_history

Upon completion of AFU Clerical Matching, 91.49 percent of the 363,290 P-sample people in the U.S. were classified as matches, 0.09 percent were possible matches, 7.89 percent were nonmatches, and 0.53 percent were duplicates or possible duplicates of other PI records. After clerical review and followup, there were fewer nonmatches, possible matches, and possible duplicates than after computer matching. The majority of the P-sample people (85.41 percent) were matches in the sample search area and a smaller percentage were matches in an inmover search area (5.10 percent), an alternate search area (0.76 percent), or some other nationwide location that was not in an inmover or alternate search area (0.23 percent).

Comparing the match code distributions for PI people assigned non P-sample residence status codes to the match codes assigned to P-sample people, there were relatively fewer matches (69.56 percent) and more nonmatches (29.24 percent) for the people assigned non P-sample codes. Non P-sample people include outmovers and people who we determined to be non-residents or out-of-scope. Even though we searched for these people around their alternate addresses (if an address was provided by a respondent and we are able to geocode the address), we did not find as many matches for the non P-sample people.

Table 75
The 2010 Census Coverage Measurement Person Matching
E-sample Match Code Results for Person Computer and Clerical Matching Operations – Unweighted Percents*

	E-sample People		
	Computer Matching	**Before Followup**	**After Followup**
Total United States (excluding Puerto Rico)	**383,537**	**383,537**	**383,537**
Matches (Sample Search Area)	78.50	83.49	83.51
Possible Matches (Sample Search Area)	1.21	0.23	0.02
Nonmatches	18.76	14.31	13.50
Duplicates	1.25	1.92	2.96
Sample Search Area	1.25	1.91	2.40
Inmover Search Area	n/a	0.00	0.01
Alternate Search Area	n/a	0.00	0.47
Nationwide Search Area	0.00	0.01	0.08
Possible Duplicates	0.28	0.05	0.01
Sample Search Area	0.28	0.05	0.01
Inmover Search Area	n/a	0.00	0.00
Alternate Search Area	n/a	0.00	0.00
Nationwide Search Area	0.00	0.00	0.00
Total Puerto Rico	**17,584**	**17,584**	**17,584**
Matches (Sample Search Area)	75.02	79.03	79.08
Possible Matches (Sample Search Area)	1.21	0.18	0.01
Nonmatches	19.56	16.18	15.11
Duplicates	3.55	4.51	5.79
Sample Search Area	3.55	4.51	5.30
Inmover Search Area	n/a	0.00	0.01
Alternate Search Area	n/a	0.00	0.44
Nationwide Search Area	0.00	0.00	0.05
Possible Duplicates	0.66	0.10	0.01
Sample Search Area	0.66	0.09	0.00
Inmover Search Area	n/a	0.00	0.00
Alternate Search Area	n/a	0.00	0.00
Nationwide Search Area	0.00	0.01	0.01

*Percents may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pm_census_person and vw_pm_census_coding_history

Upon completion of AFU Clerical matching, 83.51 percent of the 383,537 E-sample people in the U.S. were classified as matches, 0.02 percent were possible matches, 13.50 percent were nonmatches, and 2.97 percent were duplicates or possible duplicates. As was seen in the PI match code results, there were fewer nonmatches, possible matches, and possible duplicates after clerical review and followup than after computer matching. There were also more E-sample duplicates as a result of the AFU clerical review (2.96 percent following AFU compared to 1.92 percent prior to followup and 1.25 percent after computer matching).

Recall that for the 2010 CCM, computer matching was expanded to include nationwide searches for matches and duplicates. Census people outside of the sample block cluster and surrounding blocks that were linked to either PI or census people inside the sample block cluster during computer matching were referred to as nationwide links (or nationwide cases). After field followup and clerical review, if it was determined that the nationwide address corresponded to a respondent-provided address, then that served as confirmation that the two person records in distant locations (the record in the sample and the nationwide record) actually did refer to the same person. Table 76 shows how many of the computer matching nationwide links were confirmed based on respondent-provided addresses from PI or PFU.

Table 76
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of Census People Beyond Surrounding Blocks by Computer Match Code and Search Area and Final Disposition: Unweighted

Computer Matching		After Followup			
Beyond Surrounding Blocks		Total	Confirmed	Not Confirmed (Unlinked)	Undetermined
	Count	Percent*	Percent*	Percent*	Percent*
Total U.S. (excluding Puerto Rico)	**46,423**	**100.00**	**82.30**	**11.12**	**6.59**
Matches	28,450	100.00	95.26	0.45	4.29
Inmover/Alternate Search Area	22,269	100.00	99.81	0.08	0.11
Nationwide Search Area	6,181	100.00	78.85	1.80	19.35
Possible Matches	1,085	100.00	51.06	33.18	15.76
Inmover/Alternate Search Area	266	100.00	93.98	3.01	3.01
Nationwide Search Area	819	100.00	37.12	42.98	19.90
Nonmatches	6	100.00	66.67	0.00	33.33
Duplicates	6,613	100.00	86.21	6.68	7.11
Inmover/Alternate Search Area	1,961	100.00	99.08	0.61	0.31
Nationwide Search Area	4,652	100.00	80.78	9.24	9.97
Possible Duplicates	10,269	100.00	47.17	41.20	11.63
Inmover/Alternate Search Area	199	100.00	94.97	3.52	1.51
Nationwide Search Area	10,070	100.00	46.23	41.95	11.83
Total Puerto Rico	**1,543**	**100.00**	**79.07**	**10.82**	**10.11**
Matches	692	100.00	94.08	1.30	4.62
Inmover/Alternate Search Area	507	100.00	99.41	0.59	0.00
Nationwide Search Area	185	100.00	79.46	3.24	17.30
Possible Matches	108	100.00	77.78	10.19	12.04
Inmover/Alternate Search Area	60	100.00	100.00	0.00	0.00
Nationwide Search Area	48	100.00	50.00	22.92	27.08
Nonmatches	0	100.00	0.00	0.00	0.00
Duplicates	251	100.00	89.24	5.98	4.78
Inmover/Alternate Search Area	61	100.00	93.44	4.92	1.64
Nationwide Search Area	190	100.00	87.89	6.32	5.79
Possible Duplicates	492	100.00	53.05	26.83	20.12
Inmover/Alternate Search Area	18	100.00	94.44	0.00	5.56
Nationwide Search Area	474	100.00	51.48	27.85	20.68

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pm_census_person, vw_pm_census_coding_history, vw_pi_person, and vw_pm_pi_coding_history

Computer matching identified 46,423 nationwide links (i.e., a census person beyond the sample search area was matched (or possibly matched) to a PI person or was part of a census duplicate (or possible duplicate) pair). Of those original nationwide links, 82.30 percent were confirmed (i.e., the nationwide census record corresponded to an inmover or alternate location for the person). Nearly all of the matches and duplicates from the nationwide computer matching were confirmed when there was a PI respondent-provided address indicating that the person in the sample also lived or stayed at the nationwide address. After final clerical review, 11.12 percent of the original nationwide links were unlinked and not confirmed (i.e., it was determined that the records did not

actually refer to the same person). The final disposition remained undetermined for 6.59 percent of the original nationwide links (i.e., CCM was unable to determine whether the two records actually referred to the same person).

In addition to the match status, an enumeration status was determined for each E-sample person. The enumeration status indicated whether an E-sample person should have been counted in the census based on the 2010 Census Residence Rule. Table 77 shows how many E-sample people were determined to be correctly or erroneously enumerated in the census based on the 2010 CCM Person Matching and Followup Operations (which included conducting nationwide searches to identify census duplication and collecting additional information to determine where people should have been counted on Census Day).

Table 77
The 2010 Census Coverage Measurement Person Matching E-sample Enumeration Status Results for Person Computer and Clerical Matching Operations – Unweighted Percents*

		E-sample People		
		Computer Matching	**Before Followup**	**After Followup**
Total United States (excluding Puerto Rico)		**383,537**	**383,537**	**383,537**
Correct Enumeration		75.74	79.72	89.52
Erroneous Enumeration		1.97	2.61	4.48
	Duplicate	1.25	1.92	2.96
	Fictitious	n/a	0.02	0.09
	Geocoding Error	n/a	0.01	0.09
	Other	0.71	0.66	1.34
Unresolved Enumeration		22.29	17.67	6.00
Total Puerto Rico		**17,584**	**17,584**	**17,584**
Correct Enumeration		73.44	77.00	89.81
Erroneous Enumeration		4.51	5.51	8.08
	Duplicate	3.55	4.51	5.79
	Fictitious	n/a	0.01	0.17
	Geocoding Error	n/a	0.00	0.23
	Other	0.96	1.00	1.89
Unresolved Enumeration		22.05	17.49	2.12

*Percents may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pm_census_person, vw_pm_census_coding_history, vw_pi_person, and vw_pm_pi_coding_history

Upon completion of AFU Clerical Matching, 89.52 percent of the 383,537 E-sample people in the U.S. were correct enumerations, 4.48 percent were erroneous enumerations, and 6.00 percent were unresolved. There were fewer people with unresolved enumeration status after clerical review and followup (6.00 percent following AFU) than prior to followup (17.67 percent) and after computer matching (22.29 percent).

The clerical geocoding and residence status coding activities were completed on or before the planned dates, however the BFU Clerical Matching was completed five calendar days later than planned. This resulted in a delay of the completion of PFU and AFU Clerical Matching (finishing one week later than planned). Additional resources (Census Bureau Headquarters staff in addition to the planned NPC staff and overtime for Census Bureau Headquarters and NPC staff) were also required for each phase of clerical matching (geocoding, residence status coding, and BFU and AFU Clerical Matching). Due to all of the complexities associated with the expansion of the 2010 CCM program to collect respondent-provided inmover and alternate addresses, conduct nationwide matching, and measure components of census coverage, the clerical operations were more demanding than originally planned. Many of the CCM operations were cut from the 2008 Census Dress Rehearsal due to budgetary restrictions, thus these operations were not tested in a production environment prior to implementing them for the 2010 CCM Program. Further, predicting the impacts of nationwide matching based on site tests like those conducted for the 2006 Census Test and the 2008 Census Dress Rehearsal was problematic. Thus, it was difficult to estimate the amount and complexity of the 2010 CCM Person Matching and Followup workloads.

7.2.2 Person Followup

PFU was scheduled from January 28, 2011 through March 19, 2011. The PFU operation started as scheduled and finished March 26, 2011. PFU RI was scheduled from February 4, 2011 through March 26, 2011. The PFU RI operation started as scheduled and finished April 2, 2011.

The baseline finish dates for PFU and PFU RI were extended due to delays in the Person BFU Clerical Matching. Since PFU cases were created following matching, the delay in matching also delayed the forms reaching the field, which gave interviewers less time to complete the cases, however, the workload was smaller than anticipated, so only one additional week was necessary to complete the fieldwork.

The PFU was estimated to cost $21,287,848 with PFU Production estimated at $15,356,052 and PFU RI estimated at $5,931,796. Overall training cost was estimated at $2,656,808, wages for hourly field workers was estimated at $13,092,537, and the cost of mileage reimbursement was estimated at $2,614,832.

Overall, the 2010 CCM PFU operation was under budget by $6,370,758 (29.93 percent). PFU was under budget by $3,466,759 (22.58 percent) and PFU RI was under budget by $2,903,999 (48.96 percent).

During PFU, 6.79 hours were used to complete a case. During PFU RI, 9.44 hours were used to complete a case.

The PFU workload was identified from the Person Matching BFU activities and there were 59,402 cases which required an interview about one or more people living at a PI address and/or a census address —this was 80.98 percent of the anticipated workload of 73,357 cases. The actual PFU RI workload was 8,447 cases—this was 76.76 percent of the anticipated workload of 11,004 cases.

Of the 6,416 block clusters included in the PI workload, 5,666 (88.3 percent) block clusters had housing units that were included in PFU. There were 113,632 total people selected for followup, 34,774 CCM people and 78,858 census people (including nationwide matches and duplicates). There was an average of 1.9 followup people per case with 1,048 cases having zero followup people (505 of these cases needed only a geocoding check, the others were sent to PFU in error mainly due to an oversight in the universe logic).

The largest category of P-sample people selected for followup had unresolved residence status (49.01 percent) while the majority of E-sample people selected for followup were nonmatched people (85.30 percent).

For the 2010 PFU, a knowledgeable respondent was someone who knew the followup person well enough to answer questions about where the followup person was living throughout 2010 and other places where he or she stayed. These knowledgeable respondents could be either nonproxy respondents (people who had been rostered at the followup address during either PI or census operations) or proxy respondents. 86.2 percent of cases were completed with a single respondent, either a nonproxy or a proxy respondent, while only 13.8 percent of cases required multiple knowledgeable respondents in order to complete the case. Puerto Rico PFU cases were likely to have been completed with a single nonproxy respondent.

The noninterview rate for non-nationwide PFU cases was 6.1 percent. This varied widely by RCC from a low of 1.9 percent for the Detroit RCC to a high of 11.4 for the Charlotte RCC. The 2000 A.C.E. PFU had a noninterview rate of 0.2 percent (Balutis, 2011). There are many possible reasons for the increase in noninterviews including the increased time since Census Day, changes in the assigning of outcome codes from the 2000 PFU to the 2010 PFU, increased census fatigue, and overall declining survey responses over the last decade. The noninterview rate for nationwide cases was 6.4 percent, similar to the non-nationwide cases. These varied from a low of 1.8 percent for the Detroit RCC to 12.6 percent for the Charlotte RCC. While the noninterview rates are similar for nationwide and non-nationwide cases, the partial rate is lower for nationwide cases (17.0 percent for non-nationwide cases vs. 11.1 percent for nationwide). This may be due to a lower number of people per case for nationwide cases.

In addition to case-level outcome codes, each followup person in a case received a person-level outcome code. Puerto Rico followup persons were considered complete 96.30 percent of the time. Stateside people had large percentages of partial and noninterview person-level outcomes, so the stateside complete rate was only 79.26.

Telephone interviews should have been rare based on the interviewer procedures. Looking at the final attempt for each case, 23.99 percent of cases were completed by telephone. This suggests that interviewers did not have difficulty conducting interviews over the phone. Instructions for telephone interviews were not given to interviewers since these were expected to be rare. In future iterations of the PFU interview, telephone instructions should be given to interviewers to prepare them for this occurrence.

Census people outside of the sample block cluster and surrounding blocks that are linked to either CCM or census people inside the sample block cluster during computer matching are referred to as

nationwide matches/duplicates. These cases are sent to followup independently from the linked people inside the sample block cluster. These cases outside of the sample block cluster and surrounding blocks are referred to as nationwide cases.

Prior to the start of Person Matching, we had very little data to predict the magnitude of the nationwide cases so we estimated that nationwide cases would account for five percent of the PFU workload. With a total of 59,402 PFU cases, this would have been about 2,970 cases. Instead the nationwide workload was much larger than anticipated, 11,191 cases or about 19 percent of the total PFU workload. The majority of the nationwide cases had only one followup person though one case had 20 followup people. In general, the nationwide cases had fewer followup people than the regular nonnationwide cases (average 1.4 followup people for nationwide cases vs. 1.9 followup people for nonnationwide cases).

There were some census addresses located in a CCM sample block cluster that were determined during IHU operations to be valid housing units, but had been missed by the CCM IL. There were also some units that were actually located outside the CCM sample block cluster (in a surrounding block) that census had geocoded in the CCM sample block cluster. Both of these types of housing units were sent to PI as "census-only units." There were 8,070 census-only housing units included in the PI. Out of those, Person Matching was able to match 9,507 census persons that would have otherwise been coded as nonmatches and sent to PFU.

The main residence questions in the PFU are the most important items for resolving residence or enumeration status. The majority of stateside followup people lived or stayed at the address where they were collected in either the PI or the census enumeration (82.37 percent). Most alternate addresses were collected in Question 2 (Did *NAME* live anywhere else in 2010?) - 47,950, or 44.22 percent. The college question had yes responses for 15.68 percent of cases and staying with relatives had 5.13 yes responses. Questions 3 through 9 all had missing rates around 24 percent.

The average number of alternate addresses reported in the main questions per person for stateside is 0.70 addresses. For people with at least one alternate address reported in the main questions, the average number of addresses reported was 1.34 addresses.

52.09 percent of people in PFU indicated having one or more alternate addresses. Most, 37.12 percent, only had one alternate address and 12.33 percent reported two alternate addresses. By age, those aged 18-24 reported the largest percentages of alternate addresses, including 35.91 percent reporting one, 22.72 percent reporting two, and 22.72 reporting three alternate addresses. 14.32 percent of people age 61 or older also reported having two alternate addresses.

Questions 4 through 8 were displayed on the same page of the questionnaire. These included questions about a relative's address, military service, a job away from home, seasonal homes, and any other place the followup person stayed often. So, there were five different types of addresses that could be reported on this page but, there was only space available to record details about two of them on this page. It was decided that this should be sufficient for the majority of cases and an interviewer should use Notes spaces when address details were needed for more than two addresses. There were few cases that reported on this page of the questionnaire. Most (99.57 percent) only reported two types of places, so the decision on formatting the questionnaire was appropriate.

Type of place is needed to classify whether followup people were eligible to be included in the P sample or E sample since people living in GQs are excluded from CCM. Most people (90.05) who reported staying at a GQ in Question 9 did give a type of place that is considered a GQ.

The majority of stateside PFU interviews were conducted in English (94.59 percent), while almost all Puerto Rico interviews were in Spanish (96.77 percent). Less than one percent of all interviews were conducted in languages other than English or Spanish (0.47 percent).

7.3 Recommendations

In this section, we provide the recommendations for improving future CCM Programs gathered either through lessons learned or through the results presented in this assessment.

7.3.1 Person Computer Matching and Preprocessing

- Continue conducting nationwide searches for matches and duplicates as well as targeted searches around respondent-provided inmover and alternate addresses.

- Since telephone numbers played a critical role in the 2010 CCM computer matching operation, we should make sure we have access to telephone numbers for the 2020 CCM as well.

- Determine if there is a timely way to incorporate the results of any clerical geocoding of PI respondent-provided addresses into the computer matching search areas. Further, investigate if there is a timely way to incorporate computer matching using search areas identified by geocoding of PFU respondent-provided addresses.

- Continue research to improve person computer matching and automated coding techniques. This research should address the quality (in terms of accuracy) of suggested improvements and the expected impact on reducing the clerical coding workload.

- During the 2010 CCM, there was some confusion resulting from the way the PI collects data about cycle patterns for people that go back and forth between addresses and the PerMaRCS preprocessing logic that summarizes the PI data. For the 2020 CCM, both the PI collection methods and the PerMaRCS preprocessing logic for cyclers should be reexamined. For the sake of person matching, it is also recommended that the PI follow the PFU model of cycle questioning, which is simpler and only asked three questions: Did you move, or go back and forth? What periods were you there? And were you there on Census Day?

- For the 2020 CCM person matching, we should be sure to define primary/duplicate rules that hold for as many duplicates as a primary is allowed to have.

- Clerical review was required to resolve many of the cases that could not be resolved in the automated geocoding and automated residence status coding operations. To increase the amount and accuracy of automated coding, further research should be conducted to ensure

that the data collected in the field (during PI and PFU) can be easily and reliably used in post-data collection coding. In other words, the PI and PFU instruments should be designed not only to facilitate data collection, but also to facilitate use of that data in automated coding operations.

7.3.2 Person Clerical Matching

- The amount of cases requiring clerical review following automated coding and the high analyst verification rates for quality assurance purposes resulted in the need for additional resources as well as a short delay in the completion of the clerical matching activities. This demonstrates the need to reduce the initial clerical workload (by improving the automated coding and computer matching activities) and the need to simplify the clerical matching activities so that less expert review is required.

- To increase the proficiency of the first-level clerical matching staff (technicians) and reduce the amount of cases requiring expert review for the 2020 CCM person matching:
  - Hire technicians earlier in the decennial cycle so that they may be trained for a longer period of time.
  - Develop training that breaks down tasks into simpler, more straightforward tasks. This would require more development time for the automated systems than was scheduled for the 2010 CCM.
  - Ensure that a thorough training database is built early in the training design process so that we have a wide variety of training situations that are appropriate and available for each operation.
  - Develop a way to provide individual feedback for technicians to identify specific mistakes they are making so that they do not repeat the same types of errors.
  - Investigate ways to simplify the required tasks.

- Some suggestions for simplifying the clerical matching tasks that should be considered are:
  - Explore moving away from a single match/residence status code system to more discrete concepts using a series of codes to capture the concepts of interest. This research should determine how the system, behind the scenes, could use that information to determine which codes to apply to the person.
  - Investigate an interactive visualization of how people within CCM and census units interrelate.
  - Consider an interactive visualization using a graphical timeline to indicate where a person was living or staying at certain times.
  - Consider integrating a web-based map viewing system into our clerical matching software.

- Instead of relying on observation techniques, we should systematically identify technicians who need retraining for the 2020 CCM clerical person matching operations. We should create a method of selection for retraining that is consistent, such as a closed-book exam or prequalifying for production on a practice database. After retraining, there should be a way to handle technicians who are still unable to perform the required tasks.

- For the 2020 CCM person matching operations, we should investigate the capability to auto-generate test or training data (e.g., data generated by a program that could be used to create different testing and training scenarios).

- For the 2010 CCM, residence status and match status were two different codes for PI persons. However, enumeration status was incorporated into the match code for census persons. For the 2020 CCM, we should consider separating enumeration status from the match code for census persons, so that census person coding is more consistent with PI person coding.

- For more flexibility in the monitoring of the 2020 CCM person clerical matching operations, more dynamic reporting ability should be incorporated into PerMaRCS using database views so that new reports can be created and sorted as needed by managers. These reports could include graphs and charts for better visual analysis. In addition, using something like SAS Business Intelligence (BI) to create a portal and graphical front end for technicians, analysts, and managers to use would greatly improve adhoc reporting and operational monitoring.

- For the 2020 CCM, moving PFU to an electronic instrument to collect and transfer data, much in the way PI does, would have a multitude of positive uses for matching and other processing.
  - Check-in and check-out of "forms" would be almost immediate, giving matching quicker and easier access to followup data.
  - Having the PFU data quicker and in electronic format would allow the potential to conduct automated geocoding, automate residence status coding, and/or additional computer matching using the PFU data.
  - Matching operations could more easily be conducted in multiple locations.

7.3.3 Person Followup

- Automate the PFU instrument. This would reduce the time needed to get a case to the field, interview, and return to NPC. It would also simplify skip patterns for interviewers and respondents, making the interview process easier.

- If PFU is not automated, do not print a Spanish-language translation for every stateside case. This will reduce printing costs and reduce the complexity of the Docuprint programming and testing. This will also simplify the data capture process and make the output files easier to interpret. Targeted Spanish-language printing or Spanish-language job aids are some potential options to consider.

- Clarify the knowledgeable respondent definition – either the process of identifying a knowledgeable respondent needs to be simplified or the definition needs to be emphasized more in interviewer training. Interviewers had trouble determining when it would be appropriate to use a respondent who was not knowledgeable (such as when a followup person has moved and a knowledgeable respondent can not be found) and how to get as much info from a non-knowledgeable respondent while continuing to search for a knowledgeable

respondent. This may be easier in an automated environment where multiple paths could be programmed for different types of respondents.

- Allow PFU to be conducted via telephone. Either a telephone phase should be implemented or interviewers should be given training and procedures for how to conduct an interview over the telephone.

- Possible matches should be included in the hierarchy when forming PFU cases to ensure that both sides of a possible match are included in the same case. Checks should also be performed on the data to ensure that all people selected for followup are associated with a PFU case.

- Interviewers need more training on outcome codes, maybe a flashcard with the codes explained would be useful. Also it may be helpful to have additional case outcome codes (such as Type C noninterview codes) to differentiate cases that could never be interviewed (prisons, insufficient names) from cases where the household moved and a knowledgeable respondent could not be found. This would make it easier to determine the "true" noninterview rate. More practice scenarios with noninterviews should be included in the training.

- Telephone numbers should continue to be included with the PFU cases. More training on when to use these numbers should be included in the interviewer training. Training could also include examples of movers who keep their phone numbers and cell phone-only households. Training should also include discussion on the use of cell phones by both the interviewers and respondents. Future reinterview programs should also be designed to accommodate both personal visit and telephone options for maximum flexibility.

- The way Question 3 of Section C "Did this person attend college?" was worded made the interview longer in many cases. Suggested wording change to, "Did NAME live somewhere else while attending college?"

- Additional time should be added for any operations planned during the January-March time frame.

- Assuming a significant nationwide workload and half the number of field Regional Offices by 2020, we need to rethink the assignment and procedures for nationwide cases in the census.

- Rules and procedures for GQ cases should be determined prior to the start of the operation. If certain GQs (or all) should be excluded from PFU, this should be included in the PFU universe creation process.

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Appendix A – Additional Tables

Person Matching

This appendix includes additional tables. This appendix also presents the results for the United States and Puerto Rico combined (as they are tabulated separately in the results sections of the assessment).

The Person Interview (PI) workload had two components: those housing units eligible for and selected to be in the Population sample (P sample) and those housing units not eligible to be in the P sample. These latter units were referred to as "census-only" units. Census-only units were listed by census in the Census Coverage Measurement (CCM) sample block clusters but not by the CCM Independent Listing (IL), and were determined to be valid housing units either missed in the IL or actually located outside the sample block cluster. Since these units were not listed in the IL, they were not eligible for the P sample.

The census workload consisted of Enumeration-sample (E-sample) people and non-E-sample people (within the sample block cluster and surrounding blocks or beyond).[32] We were primarily interested in searching for matches and duplicates for E-sample people. However, census people in other housing units and group quarters (GQs) in the sample, alternate, inmover, and nationwide search areas were available for matching.

[32] An E-sample person is a census person in housing unit that is in the sample block cluster and selected for the E sample. Non-E-sample people include census people in GQs, people in housing units subsampled out of the E sample, and people in housing units that are not in the sample block cluster.

Table 78
The 2010 Census Coverage Measurement Person Computer Matching Operation
Number of Person Interview People by Match Code, Search Area, and Sample Indicator: Unweighted

	Person Interview People in Independent Listing Housing Units				Person Interview People in Census-Only Housing Units	
	P-sample Residence Status		Non P-sample Residence Status			
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)	**370,853**	**100.00**	**21,858**	**100.00**	**12,720**	**100.00**
Matches	313,561	84.55	13,536	61.93	10,005	78.66
Sample Search Area	293,477	79.14	6,128	28.04	9,047	71.12
Inmover Search Area	13,876	3.74	4,892	22.38	598	4.70
Alternate Search Area	1,281	0.35	1,521	6.96	101	0.79
Nationwide Search Area	4,927	1.33	995	4.55	259	2.04
Possible Matches	5,250	1.42	574	2.63	224	1.76
Sample Search Area	4,497	1.21	285	1.30	181	1.42
Inmover Search Area	140	0.04	66	0.30	8	0.06
Alternate Search Area	11	0.00	40	0.18	1	0.01
Nationwide Search Area	602	0.16	183	0.84	34	0.27
Nonmatches	50,318	13.57	7,582	34.69	2,328	18.30
Duplicates	1,599	0.43	120	0.55	157	1.23
Possible Duplicates	125	0.03	46	0.21	6	0.05
Total Puerto Rico	**15,955**	**100.00**	**1,084**	**100.00**	**1,086**	**100.00**
Matches	13,558	84.98	512	47.23	880	81.03
Sample Search Area	13,103	82.12	321	29.61	834	76.80
Inmover Search Area	284	1.78	118	10.89	31	2.85
Alternate Search Area	35	0.22	37	3.41	2	0.18
Nationwide Search Area	136	0.85	36	3.32	13	1.20
Possible Matches	283	1.77	61	5.63	20	1.84
Sample Search Area	220	1.38	22	2.03	14	1.29
Inmover Search Area	21	0.13	22	2.03	3	0.28
Alternate Search Area	5	0.03	8	0.74	1	0.09
Nationwide Search Area	37	0.23	9	0.83	2	0.18
Nonmatches	1,964	12.31	496	45.76	183	16.85
Duplicates	140	0.88	13	1.20	2	0.18
Possible Duplicates	10	0.06	2	0.18	1	0.09

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Table 78 (Continued)
The 2010 Census Coverage Measurement Person Computer Matching Operation
Number of Person Interview People by Match Code, Search Area, and Sample Indicator: Unweighted

	Person Interview People in Independent Listing Housing Units				Person Interview People in Census-Only Housing Units	
	P-sample Residence Status		Non P-sample Residence Status			
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. and Puerto Rico	**386,808**	**100.00**	**22,942**	**100.00**	**13,806**	**100.00**
Matches	327,119	84.57	14,048	61.23	10,885	78.84
Sample Search Area	306,580	79.26	6,449	28.11	9,881	71.57
Inmover Search Area	14,160	3.66	5,010	21.84	629	4.56
Alternate Search Area	1,316	0.34	1,558	6.79	103	0.75
Nationwide Search Area	5,063	1.31	1,031	4.49	272	1.97
Possible Matches	5,533	1.43	635	2.77	244	1.77
Sample Search Area	4,717	1.22	307	1.34	195	1.41
Inmover Search Area	161	0.04	88	0.38	11	0.08
Alternate Search Area	16	0.00	48	0.21	2	0.01
Nationwide Search Area	639	0.17	192	0.84	36	0.26
Nonmatches	52,282	13.52	8,078	35.21	2,511	18.19
Duplicates	1,739	0.45	133	0.58	159	1.15
Possible Duplicates	135	0.03	48	0.21	7	0.05

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person, vw_pm_pi_coding_history, vw_pm_census_person, and vw_pm_census_coding_history

Table 79
The 2010 Census Coverage Measurement Person Computer Matching Operation
Number of Census People by Match Code, Search Area, and Sample Indicator: Unweighted

	E-sample People		Non E-sample People[33]			
			Cluster/Surrounding Blocks		Beyond Surrounding Blocks	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**	**12,873**	**100.00**	**46,423**	**100.00**
Matches	301,064	78.50	7,588	58.95	28,450	61.28
Sample Search Area	301,064	78.50	7,588	58.95	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	19,366	41.72
Alternate Search Area	n/a	n/a	n/a	n/a	2,903	6.25
Nationwide Search Area	n/a	n/a	n/a	n/a	6,181	13.31
Possible Matches	4,633	1.21	330	2.56	1,085	2.34
Sample Search Area	4,633	1.21	330	2.56	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	214	0.46
Alternate Search Area	n/a	n/a	n/a	n/a	52	0.11
Nationwide Search Area	n/a	n/a	n/a	n/a	819	1.76
Nonmatches	71,963	18.76	27	0.21	6	0.01
Duplicates	4,802	1.25	2,048	15.91	6,613	14.25
Sample Search Area	4,802	1.25	2,048	15.91	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	469	1.01
Alternate Search Area	n/a	n/a	n/a	n/a	1,492	3.21
Nationwide Search Area	0	0.00	n/a	n/a	4,652	10.02
Possible Duplicates	1,075	0.28	2,880	22.37	10,269	22.12
Sample Search Area	1,063	0.28	2,880	22.37	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	65	0.14
Alternate Search Area	n/a	n/a	n/a	n/a	134	0.29
Nationwide Search Area	12	0.00	n/a	n/a	10,070	21.69

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[33] All non E-sample results presented in this assessment only include non E-sample people that were linked to PI people or who were part of a census duplicate link (as the primary or duplicate record). Two census records that were believed to refer to the same person were linked together as a duplicate link. In each pair, there was a primary and a duplicate record. The primary record was a Match, Possible Match, or Nonmatch. The duplicate record had a Duplicate or Possible Duplicate match code.

Table 79 (Continued)
The 2010 Census Coverage Measurement Person Computer Matching Operation
Number of Census People by Match Code, Search Area, and Sample Indicator: Unweighted

	E-sample People		Non E-sample People			
			Cluster/Surrounding Blocks		Beyond Surrounding Blocks	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total Puerto Rico	**17,584**	**100.00**	**2,394**	**100.00**	**1,543**	**100.00**
Matches	13,191	75.02	1,067	44.57	692	44.85
Sample Search Area	13,191	75.02	1,067	44.57	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	433	28.06
Alternate Search Area	n/a	n/a	n/a	n/a	74	4.80
Nationwide Search Area	n/a	n/a	n/a	n/a	185	11.99
Possible Matches	213	1.21	43	1.80	108	7.00
Sample Search Area	213	1.21	43	1.80	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	46	2.98
Alternate Search Area	n/a	n/a	n/a	n/a	14	0.91
Nationwide Search Area	n/a	n/a	n/a	n/a	48	3.11
Nonmatches	3,439	19.56	9	0.38	0	0.00
Duplicates	625	3.55	580	24.23	251	16.27
Sample Search Area	625	3.55	580	24.23	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	19	1.23
Alternate Search Area	n/a	n/a	n/a	n/a	42	2.72
Nationwide Search Area	0	0.00	n/a	n/a	190	12.31
Possible Duplicates	116	0.66	695	29.03	492	31.89
Sample Search Area	116	0.66	695	29.03	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	4	0.26
Alternate Search Area	n/a	n/a	n/a	n/a	14	0.91
Nationwide Search Area	0	0.00	n/a	n/a	474	30.72

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Table 79 (Continued)
The 2010 Census Coverage Measurement Person Computer Matching Operation
Number of Census People by Match Code, Search Area, and Sample Indicator: Unweighted

	E-sample People		Non E-sample People			
			Cluster/Surrounding Blocks		Beyond Surrounding Blocks	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. and Puerto Rico	**401,121**	**100.00**	**15,267**	**100.00**	**47,966**	**100.00**
Matches	314,255	78.34	8,655	56.69	29,142	60.76
Sample Search Area	314,255	78.34	8,655	56.69	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	19,799	41.28
Alternate Search Area	n/a	n/a	n/a	n/a	2,977	6.21
Nationwide Search Area	n/a	n/a	n/a	n/a	6,366	13.27
Possible Matches	4,846	1.21	373	2.44	1,193	2.49
Sample Search Area	4,846	1.21	373	2.44	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	260	0.54
Alternate Search Area	n/a	n/a	n/a	n/a	66	0.14
Nationwide Search Area	n/a	n/a	n/a	n/a	867	1.81
Nonmatches	75,402	18.80	36	0.24	6	0.01
Duplicates	5,427	1.35	2,628	17.21	6,864	14.31
Sample Search Area	5,427	1.35	2,628	17.21	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	488	1.02
Alternate Search Area	n/a	n/a	n/a	n/a	1,534	3.20
Nationwide Search Area	0	0.00	n/a	n/a	4,842	10.09
Possible Duplicates	1,191	0.30	3,575	23.42	10,761	22.43
Sample Search Area	1,179	0.29	3,575	23.42	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	69	0.14
Alternate Search Area	n/a	n/a	n/a	n/a	148	0.31
Nationwide Search Area	12	0.00	n/a	n/a	10,544	21.98

*Percents may not sum to totals due to rounding.
n/a stands is for not applicable.
Source: PerMaRCS tables: vw_pm_census_person and vw_pm_census_coding_history

Table 80
The 2010 Census Coverage Measurement Person Computer Matching Operation
Number of Census People by Number of Duplicates or Possible Duplicates Per Person and Sample Indicator: Unweighted

	E-sample People		Non E-sample People			
			Cluster/Surrounding Blocks		Beyond Surrounding Blocks	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**	**12,873**	**100.00**	**46,423**	**100.00**
No Duplicates or Possible Duplicates	360,209	93.92	12,322	95.72	44,084	94.96
1 Duplicate or Possible Duplicate	22,174	5.78	535	4.16	2,244	4.83
2 Duplicates or Possible Duplicates	1,040	0.27	12	0.09	88	0.19
3 or More Duplicates or Possible Duplicates	114	0.03	4	0.03	7	0.02
Total Puerto Rico	**17,584**	**100.00**	**2,394**	**100.00**	**1,543**	**100.00**
No Duplicates or Possible Duplicates	15,334	87.20	2,157	90.10	1,467	95.07
1 Duplicate or Possible Duplicate	2,095	11.91	218	9.11	73	4.73
2 Duplicates or Possible Duplicates	138	0.78	18	0.75	3	0.19
3 or More Duplicates or Possible Duplicates	17	0.10	1	0.04	0	0.00
Total U.S. and Puerto Rico	**401,121**	**100.00**	**15,267**	**100.00**	**47,966**	**100.00**
No Duplicates or Possible Duplicates	375,543	93.62	14,479	94.84	45,551	94.97
One Duplicate or Possible Duplicate	24,269	6.05	753	4.93	2,317	4.83
Two Duplicates or Possible Duplicates	1,178	0.29	30	0.20	91	0.19
Three or More Duplicates or Possible Duplicates	131	0.03	5	0.03	7	0.01

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pm_census_person and vw_pm_census_coding_history

Table 81
The 2010 Census Coverage Measurement Person Automated Residence Status Coding Operation
Number of Person Interview People by Residence Status Code and Sample Indicator: Unweighted

	Person Interview People in Independent Listing Housing Units		Person Interview People in Census-Only Housing Units	
	Count	**Percent of Total***	**Count**	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**392,711**	**100.00**	**12,720**	**100.00**
P-Sample	386,924	98.53	12,535	98.55
Nonmover	305,953	77.91	9,642	75.80
Inmover	3,365	0.86	131	1.03
P-sample Outmover	599	0.15	23	0.18
Unclassified	2,716	0.69	126	0.99
Clerical Review Needed	74,291	18.92	2,613	20.54
Non P-Sample	5,787	1.47	185	1.45
Out-of-Scope	2,992	0.76	96	0.75
Non P-Sample Outmover	2,795	0.71	89	0.70
Unclassified Outmover	n/a	n/a	n/a	n/a
Never Resident	n/a	n/a	n/a	n/a
Total Puerto Rico	**17,039**	**100.00**	**1,086**	**100.00**
P-Sample	16,837	98.81	1,075	98.99
Nonmover	13,986	82.08	868	79.93
Inmover	81	0.48	2	0.18
P-sample Outmover	73	0.43	0	0.00
Unclassified	64	0.38	11	1.01
Clerical Review Needed	2,633	15.45	194	17.86
Non P-Sample	202	1.19	11	1.01
Out-of-Scope	76	0.45	4	0.37
Non P-Sample Outmover	126	0.74	7	0.64
Unclassified Outmover	n/a	n/a	n/a	n/a
Never Resident	n/a	n/a	n/a	n/a
Total U.S. and Puerto Rico	**409,750**	**100.00**	**13,806**	**100.00**
P-Sample	403,761	98.54	13,610	98.58
Nonmover	319,939	78.08	10,510	76.13
Inmover	3,446	0.84	133	0.96
P-sample Outmover	672	0.16	23	0.17
Unclassified	2,780	0.68	137	0.99
Clerical Review Needed	76,924	18.77	2,807	20.33
Non P-Sample	5,989	1.46	196	1.42
Out-of-Scope	3,068	0.75	100	0.72
Non P-Sample Outmover	2,921	0.71	96	0.70
Unclassified Outmover	n/a	n/a	n/a	n/a
Never Resident	n/a	n/a	n/a	n/a

*Percents may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pi_person and vw_pm_pi_coding_history

Table 82
The 2010 Census Coverage Measurement Person Computer Matching Operation
Number of E-sample People by Enumeration Status and Sample Indicator: Unweighted

	E-sample People	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**
Correct Enumeration	290,491	75.74
Erroneous Enumeration	7,540	1.97
Duplicate	4,802	1.25
Fictitious	n/a	n/a
Geocoding Error	n/a	n/a
Other	2,738	0.71
Unresolved Enumeration	85,506	22.29
Total Puerto Rico	**17,584**	**100.00**
Correct Enumeration	12,914	73.44
Erroneous Enumeration	793	4.51
Duplicate	625	3.55
Fictitious	n/a	n/a
Geocoding Error	n/a	n/a
Other	168	0.96
Unresolved Enumeration	3,877	22.05
Total U.S. and Puerto Rico	**401,121**	**100.00**
Correct Enumeration	303,405	75.64
Erroneous Enumeration	8,333	2.08
Duplicate	5,427	1.35
Fictitious	n/a	n/a
Geocoding Error	n/a	n/a
Other	2,906	0.72
Unresolved Enumeration	89,383	22.28

*Percents may not sum to totals due to rounding.
n/a stands for not applicable
Source: PerMaRCS tables: vw_pm_census_person, vw_pm_census_coding_history, vw_pi_person, and vw_pm_pi_coding_history

Table 83
The 2010 Census Coverage Measurement Automated Geocoding Operation
Number of Person Interview Respondent-Provided Addresses by Level of Geocoding: Unweighted

			Person Interview Respondent-Provided Addresses	
			Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)			**51,980**	**100.00**
Search Area Identified			34,000	65.41
	Geocoded to Master Address File Identifier		24,554	47.24
	Geocoded to Block		9,446	18.17
No Search Area Identified			17,980	34.59
	Geocoded to County		12,285	23.63
	Geocoded to State		1,201	2.31
	Ungeocoded		4,494	8.65
		In-scope – U.S. Address	2,184	4.20
		Out-of-Scope - Puerto Rico Address	63	0.12
		Out-of-Scope - Other Country	2,247	4.32
Total Puerto Rico			**2,097**	**100.00**
Search Area Identified			865	41.25
	Geocoded to Master Address File Identifier		62	2.96
	Geocoded to Block		803	38.29
No Search Area Identified			1,232	58.75
	Geocoded to County		875	41.73
	Geocoded to State		28	1.34
	Ungeocoded		329	15.69
		In-scope – Puerto Rico Address	9	0.43
		Out-of-Scope - U.S. Address	258	12.30
		Out-of-Scope - Other Country	62	2.96
Total U.S. and Puerto Rico			**54,077**	**100.00**
Search Area Identified			34,865	64.47
	Geocoded to Master Address File Identifier		24,616	45.52
	Geocoded to Block		10,249	18.95
No Search Area Identified			19,212	35.53
	Geocoded to County		13,160	24.34
	Geocoded to State		1,229	2.27
	Ungeocoded		4,823	8.92
		In-scope	2,193	4.06
		Out-of-Scope - Puerto Rico Address	63	0.12
		Out-of-Scope - U.S. Address	258	0.48
		Out-of-Scope - Other Country	2,309	4.27

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_other_address_person, pm_other_address, and pm_other_address_geocode

Table 84
The 2010 Census Coverage Measurement Automated Geocoding and Residence Status Coding Operations
Number of Person Interview People by Respondent-Provided Addresses Per Person and Sample Indicator: Unweighted

	Person Interview People in Independent Listing Housing Units				Person Interview People in Census-Only Housing Units	
	P-sample Residence Status		Non P-sample Residence Status			
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)	**386,924**	**100.00**	**5,787**	**100.00**	**12,720**	**100.00**
No Respondent- Addresses	321,052	82.98	1,373	23.73	10,308	81.04
One Respondent-Provided Address	60,517	15.64	4,412	76.24	2,215	17.41
Two Respondent-Provided Address	5,080	1.31	2	0.03	188	1.48
Three or More Respondent-Provided Addresses	275	0.07	0	0.00	9	0.07
Total Puerto Rico	**16,837**	**100.00**	**202**	**100.00**	**1,086**	**100.00**
No Respondent-Provided Addresses	14,277	84.80	50	24.75	896	82.50
One Respondent-Provided Address	2,359	14.01	152	75.25	176	16.21
Two Respondent-Provided Address	185	1.10	0	0.00	14	1.29
Three or More Respondent-Provided Addresses	16	0.10	0	0.00	0	0.00
Total U.S. and Puerto Rico	**403,761**	**100.00**	**5,989**	**100.00**	**13,806**	**100.00**
No Respondent-Provided Addresses	335,329	83.05	1,423	23.76	11,204	81.15
One Respondent-Provided Address	62,876	15.57	4,564	76.21	2,391	17.32
Two Respondent-Provided Address	5,265	1.30	2	0.03	202	1.46
Three or More Respondent-Provided Addresses	291	0.07	0	0.00	9	0.07

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person, vw_pm_pi_coding_history, vw_pi_other_address_person, and pm_other_address

Table 85
The 2010 Census Coverage Measurement Person Before Followup Matching Operation
Number of Person Interview People by Match Code, Search Area, and Sample Indicator: Unweighted

	Person Interview People in Independent Listing Housing Units				Person Interview People in Census-Only Housing Units	
	P-sample Residence Status		Non P-sample Residence Status			
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)	**370,389**	**100.00**	**22,322**	**100.00**	**12,720**	**100.00**
Matches	335,194	90.50	15,456	69.24	10,922	85.86
Sample Search Area	312,628	84.41	6,294	28.20	9,812	77.14
Inmover Search Area	16,733	4.52	6,346	28.43	742	5.83
Alternate Search Area	1,802	0.49	2,255	10.10	147	1.16
Nationwide Search Area	4,031	1.09	561	2.51	221	1.74
Possible Matches	1,190	0.32	101	0.45	49	0.39
Sample Search Area	922	0.25	34	0.15	38	0.30
Inmover Search Area	103	0.03	26	0.12	3	0.02
Alternate Search Area	26	0.01	25	0.11	2	0.02
Nationwide Search Area	139	0.04	16	0.07	6	0.05
Nonmatches	32,070	8.66	6,555	29.37	1,540	12.11
Duplicates	1,893	0.51	209	0.94	207	1.63
Possible Duplicates	42	0.01	1	0.00	2	0.02
Total Puerto Rico	**15,789**	**100.00**	**1,250**	**100.00**	**1,086**	**100.00**
Matches	14,174	89.77	657	52.56	953	87.75
Sample Search Area	13,620	86.26	373	29.84	892	82.14
Inmover Search Area	351	2.22	176	14.08	39	3.59
Alternate Search Area	51	0.32	63	5.04	5	0.46
Nationwide Search Area	152	0.96	45	3.60	17	1.57
Possible Matches	59	0.37	9	0.72	2	0.18
Sample Search Area	41	0.26	4	0.32	0	0.00
Inmover Search Area	5	0.03	4	0.32	1	0.09
Alternate Search Area	4	0.03	1	0.08	1	0.09
Nationwide Search Area	9	0.06	0	0.00	0	0.00
Nonmatches	1,404	8.89	563	45.04	128	11.79
Duplicates	152	0.96	21	1.68	3	0.28
Possible Duplicates	0	0.00	0	0.00	0	0.00

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Table 85 (Continued)
The 2010 Census Coverage Measurement Person Before Followup Matching Operation
Number of Person Interview People by Match Code, Search Area, and Sample Indicator: Unweighted

	Person Interview People in Independent Listing Housing Units				Person Interview People in Census-Only Housing Units	
	P-sample Residence Status		Non P-sample Residence Status			
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. and Puerto Rico	**386,178**	**100.00**	**23,572**	**100.00**	**13,806**	**100.00**
Matches	349,368	90.47	16,113	68.36	11,875	86.01
Sample Search Area	326,248	84.48	6,667	28.28	10,704	77.53
Inmover Search Area	17,084	4.42	6,522	27.67	781	5.66
Alternate Search Area	1,853	0.48	2,318	9.83	152	1.10
Nationwide Search Area	4,183	1.08	606	2.57	238	1.72
Possible Matches	1,249	0.32	110	0.47	51	0.37
Sample Search Area	963	0.25	38	0.16	38	0.28
Inmover Search Area	108	0.03	30	0.13	4	0.03
Alternate Search Area	30	0.01	26	0.11	3	0.02
Nationwide Search Area	148	0.04	16	0.07	6	0.04
Nonmatches	33,474	8.67	7,118	30.20	1,668	12.08
Duplicates	2,045	0.53	230	0.98	210	1.52
Possible Duplicates	42	0.01	1	0.00	2	0.01

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person, vw_pm_pi_coding_history, vw_pm_census_person, and vw_pm_census_coding_history

Table 86
The 2010 Census Coverage Measurement Person Before Followup Matching Operation
Number of Census People by Match Code, Search Area, and Sample Indicator: Unweighted

	E-sample People		Non E-sample People			
			Cluster/Surrounding Blocks		Beyond Surrounding Blocks	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**	**14,397**	**100.00**	**46,655**	**100.00**
Matches	320,198	83.49	8,536	59.29	32,838	70.38
Sample Search Area	320,198	83.49	8,536	59.29	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	23,821	51.06
Alternate Search Area	n/a	n/a	n/a	n/a	4,204	9.01
Nationwide Search Area	n/a	n/a	n/a	n/a	4,813	10.32
Possible Matches	883	0.23	111	0.77	346	0.74
Sample Search Area	883	0.23	111	0.77	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	132	0.28
Alternate Search Area	n/a	n/a	n/a	n/a	53	0.11
Nationwide Search Area	n/a	n/a	n/a	n/a	161	0.35
Nonmatches	54,887	14.31	597	4.15	142	0.30
Duplicates	7,379	1.92	4,863	33.78	11,849	25.40
Sample Search Area	7,317	1.91	4,859	33.75	n/a	n/a
Inmover Search Area	0	0.00	0	0.00	654	1.40
Alternate Search Area	5	0.00	2	0.01	2,400	5.14
Nationwide Search Area	57	0.01	2	0.01	8,795	18.85
Possible Duplicates	190	0.05	290	2.01	1,480	3.17
Sample Search Area	183	0.05	290	2.01	n/a	n/a
Inmover Search Area	0	0.00	0	0.00	20	0.04
Alternate Search Area	2	0.00	0	0.00	33	0.07
Nationwide Search Area	5	0.00	0	0.00	1,427	3.06

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Table 86 (continued)
The 2010 Census Coverage Measurement Person Before Followup Matching Operation
Number of Census People by Match Code, Search Area, and Sample Indicator: Unweighted

	E-sample People		Non E-sample People			
			Cluster/Surrounding Blocks		Beyond Surrounding Blocks	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total Puerto Rico	**17,584**	**100.00**	**2,363**	**100.00**	**1,636**	**100.00**
Matches	13,897	79.03	988	41.81	899	54.95
Sample Search Area	13,897	79.03	988	41.81	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	566	34.60
Alternate Search Area	n/a	n/a	n/a	n/a	119	7.27
Nationwide Search Area	n/a	n/a	n/a	n/a	214	13.08
Possible Matches	32	0.18	13	0.55	25	1.53
Sample Search Area	32	0.18	13	0.55	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	10	0.61
Alternate Search Area	n/a	n/a	n/a	n/a	6	0.37
Nationwide Search Area	n/a	n/a	n/a	n/a	9	0.55
Nonmatches	2,845	16.18	70	2.96	8	0.49
Duplicates	793	4.51	1,220	51.63	605	36.98
Sample Search Area	793	4.51	1,220	51.63	n/a	n/a
Inmover Search Area	0	0.00	0	0.00	27	1.65
Alternate Search Area	0	0.00	0	0.00	78	4.77
Nationwide Search Area	0	0.00	0	0.00	500	30.56
Possible Duplicates	17	0.10	72	3.05	99	6.05
Sample Search Area	15	0.09	72	3.05	n/a	n/a
Inmover Search Area	0	0.00	0	0.00	1	0.06
Alternate Search Area	0	0.00	0	0.00	7	0.43
Nationwide Search Area	2	0.01	0	0.00	91	5.56

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Table 86 (Continued)
The 2010 Census Coverage Measurement Person Before Followup Matching Operation
Number of Census People by Match Code, Search Area, and Sample Indicator: Unweighted

	E-sample People		Non E-sample People			
			Cluster/Surrounding Blocks		Beyond Surrounding Blocks	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. and Puerto Rico	**401,121**	**100.00**	**16,760**	**100.00**	**48,291**	**100.00**
Matches	334,095	83.29	9,524	56.83	33,737	69.86
Sample Search Area	334,095	83.29	9,524	56.83	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	24,387	50.50
Alternate Search Area	n/a	n/a	n/a	n/a	4,323	8.95
Nationwide Search Area	n/a	n/a	n/a	n/a	5,027	10.41
Possible Matches	915	0.23	124	0.74	371	0.77
Sample Search Area	915	0.23	124	0.74	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	142	0.29
Alternate Search Area	n/a	n/a	n/a	n/a	59	0.12
Nationwide Search Area	n/a	n/a	n/a	n/a	170	0.35
Nonmatches	57,732	14.39	667	3.98	150	0.31
Duplicates	8,172	2.04	6,083	36.29	12,454	25.79
Sample Search Area	8,110	2.02	6,079	36.27	n/a	n/a
Inmover Search Area	0	0.00	0	0.00	681	1.41
Alternate Search Area	5	0.00	2	0.01	2,478	5.13
Nationwide Search Area	57	0.01	2	0.01	9,295	19.25
Possible Duplicates	207	0.05	362	2.16	1,579	3.27
Sample Search Area	198	0.05	362	2.16	n/a	n/a
Inmover Search Area	0	0.00	0	0.00	21	0.04
Alternate Search Area	2	0.00	0	0.00	40	0.08
Nationwide Search Area	7	0.00	0	0.00	1,518	3.14

*Percents may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pm_census_person and vw_pm_census_coding_history

Table 87
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of Person Interview People by Match Code, Search Area, and Sample Indicator: Unweighted

	Person Interview People in Independent Listing Housing Units				Person Interview People in Census-Only Housing Units	
	P-sample Residence Status		Non P-sample Residence Status			
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)	**363,290**	**100.00**	**29,421**	**100.00**	**12,720**	**100.00**
Matches	332,389	91.49	20,465	69.56	10,935	85.97
Sample Search Area	310,280	85.41	8,762	29.78	9,805	77.08
Inmover Search Area	18,520	5.10	6,715	22.82	775	6.09
Alternate Search Area	2,744	0.76	4,696	15.96	229	1.80
Nationwide Search Area	845	0.23	292	0.99	126	0.99
Possible Matches	321	0.09	84	0.29	32	0.25
Sample Search Area	77	0.02	11	0.04	13	0.10
Inmover Search Area	79	0.02	22	0.07	3	0.02
Alternate Search Area	14	0.00	24	0.08	2	0.02
Nationwide Search Area	151	0.04	27	0.09	14	0.11
Nonmatches	28,654	7.89	8,603	29.24	1,546	12.15
Duplicates	1,922	0.53	268	0.91	205	1.61
Possible Duplicates	4	0.00	1	0.00	2	0.02
Total Puerto Rico	**15,604**	**100.00**	**1,435**	**100.00**	**1,086**	**100.00**
Matches	14,156	90.72	761	53.03	952	87.66
Sample Search Area	13,628	87.34	393	27.39	888	81.77
Inmover Search Area	402	2.58	187	13.03	49	4.51
Alternate Search Area	103	0.66	164	11.43	9	0.83
Nationwide Search Area	23	0.15	17	1.18	6	0.55
Possible Matches	13	0.08	7	0.49	2	0.18
Sample Search Area	2	0.01	2	0.14	0	0.00
Inmover Search Area	4	0.03	4	0.28	1	0.09
Alternate Search Area	3	0.02	1	0.07	1	0.09
Nationwide Search Area	4	0.03	0	0.00	0	0.00
Nonmatches	1,283	8.22	645	44.95	129	11.88
Duplicates	151	0.97	22	1.53	3	0.28
Possible Duplicates	1	0.01	0	0.00	0	0.00

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Table 87 (Continued)
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of Person Interview People by Match Code, Search Area, and Sample Indicator: Unweighted

	Person Interview People in Independent Listing Housing Units				Person Interview People in Census-Only Housing Units	
	P-sample Residence Status		Non P-sample Residence Status			
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. and Puerto Rico	**378,894**	**100.00**	**30,856**	**100.00**	**13,806**	**100.00**
Matches	346,545	91.46	21,226	68.79	11,887	86.10
Sample Search Area	323,908	85.49	9,155	29.67	10,693	77.45
Inmover Search Area	18,922	4.99	6,902	22.37	824	5.97
Alternate Search Area	2,847	0.75	4,860	15.75	238	1.72
Nationwide Search Area	868	0.23	309	1.00	132	0.96
Possible Matches	334	0.09	91	0.29	34	0.25
Sample Search Area	79	0.02	13	0.04	13	0.09
Inmover Search Area	83	0.02	26	0.08	4	0.03
Alternate Search Area	17	0.00	25	0.08	3	0.02
Nationwide Search Area	155	0.04	27	0.09	14	0.10
Nonmatches	29,937	7.90	9,248	29.97	1,675	12.13
Duplicates	2,073	0.55	290	0.94	208	1.51
Possible Duplicates	5	0.00	1	0.00	2	0.01

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person, vw_pm_pi_coding_history, vw_pm_census_person, and vw_pm_census_coding_history

Table 88
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of Census People by Match Code, Search Area, and Sample Indicator: Unweighted

	E-sample People		Non E-sample People			
			Cluster/Surrounding Blocks		Beyond Surrounding Blocks	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**	**14,400**	**100.00**	**48,035**	**100.00**
Matches	320,273	83.51	8,574	59.54	34,942	72.74
Sample Search Area	320,273	83.51	8,574	59.54	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	26,010	54.15
Alternate Search Area	n/a	n/a	n/a	n/a	7,669	15.97
Nationwide Search Area	n/a	n/a	n/a	n/a	1,263	2.63
Possible Matches	72	0.02	29	0.20	336	0.70
Sample Search Area	72	0.02	29	0.20	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	104	0.22
Alternate Search Area	n/a	n/a	n/a	n/a	40	0.08
Nationwide Search Area	n/a	n/a	n/a	n/a	192	0.40
Nonmatches	51,780	13.50	1,258	8.74	2,270	4.73
Duplicates	11,357	2.96	4,498	31.24	8,874	18.47
Sample Search Area	9,224	2.40	4,479	31.10	n/a	n/a
Inmover Search Area	56	0.01	0	0.00	823	1.71
Alternate Search Area	1,786	0.47	19	0.13	6,707	13.96
Nationwide Search Area	291	0.08	0	0.00	1,344	2.80
Possible Duplicates	55	0.01	41	0.28	1,613	3.36
Sample Search Area	32	0.01	41	0.28	n/a	n/a
Inmover Search Area	0	0.00	0	0.00	23	0.05
Alternate Search Area	8	0.00	0	0.00	104	0.22
Nationwide Search Area	15	0.00	0	0.00	1,486	3.09

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Table 88 (Continued)
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of Census People by Match Code, Search Area, and Sample Indicator: Unweighted

	E-sample People		Non E-sample People			
			Cluster/Surrounding Blocks		Beyond Surrounding Blocks	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total Puerto Rico	**17,584**	**100.00**	**2,372**	**100.00**	**1,620**	**100.00**
Matches	13,905	79.08	1,004	42.33	960	59.26
Sample Search Area	13,905	79.08	1,004	42.33	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	638	39.38
Alternate Search Area	n/a	n/a	n/a	n/a	276	17.04
Nationwide Search Area	n/a	n/a	n/a	n/a	46	2.84
Possible Matches	2	0.01	2	0.08	18	1.11
Sample Search Area	2	0.01	2	0.08	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	9	0.56
Alternate Search Area	n/a	n/a	n/a	n/a	5	0.31
Nationwide Search Area	n/a	n/a	n/a	n/a	4	0.25
Nonmatches	2,657	15.11	151	6.37	97	5.99
Duplicates	1,018	5.79	1,206	50.84	440	27.16
Sample Search Area	932	5.30	1,199	50.55	n/a	n/a
Inmover Search Area	1	0.01	0	0.00	45	2.78
Alternate Search Area	77	0.44	7	0.30	315	19.44
Nationwide Search Area	8	0.05	0	0.00	80	4.94
Possible Duplicates	2	0.01	9	0.38	105	6.48
Sample Search Area	0	0.00	9	0.38	n/a	n/a
Inmover Search Area	0	0.00	0	0.00	1	0.06
Alternate Search Area	0	0.00	0	0.00	28	1.73
Nationwide Search Area	2	0.01	0	0.00	76	4.69

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Table 88 (Continued)
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of Census People by Match Code, Search Area, and Sample Indicator: Unweighted

	E-sample People		Non E-sample People			
			Cluster/Surrounding Blocks		Beyond Surrounding Blocks	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. and Puerto Rico	**401,121**	**100.00**	**16,772**	**100.00**	**49,655**	**100.00**
Matches	334,178	83.31	9,578	57.11	35,902	72.30
Sample Search Area	334,178	83.31	9,578	57.11	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	26,648	53.67
Alternate Search Area	n/a	n/a	n/a	n/a	7,945	16.00
Nationwide Search Area	n/a	n/a	n/a	n/a	1,309	2.64
Possible Matches	74	0.02	31	0.18	354	0.71
Sample Search Area	74	0.02	31	0.18	n/a	n/a
Inmover Search Area	n/a	n/a	n/a	n/a	113	0.23
Alternate Search Area	n/a	n/a	n/a	n/a	45	0.09
Nationwide Search Area	n/a	n/a	n/a	n/a	196	0.39
Nonmatches	54,437	13.57	1,409	8.40	2,367	4.77
Duplicates	12,375	3.09	5,704	34.01	9,314	18.76
Sample Search Area	10,156	2.53	5,678	33.85	n/a	n/a
Inmover Search Area	57	0.01	0	0.00	868	1.75
Alternate Search Area	1,863	0.46	26	0.16	7,022	14.14
Nationwide Search Area	299	0.07	0	0.00	1,424	2.87
Possible Duplicates	57	0.01	50	0.30	1,718	3.46
Sample Search Area	32	0.01	50	0.30	n/a	n/a
Inmover Search Area	0	0.00	0	0.00	24	0.05
Alternate Search Area	8	0.00	0	0.00	132	0.27
Nationwide Search Area	17	0.00	0	0.00	1,562	3.15

*Percents may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pm_census_person and vw_pm_census_coding_history

Table 89
The 2010 Census Coverage Measurement Person Before Followup Matching Operation
Number of Census People by Number of Duplicates or Possible Duplicates Per Person and Sample Indicator: Unweighted

	E-sample People		Non E-sample People			
			Cluster/Surrounding Blocks		Beyond Surrounding Blocks	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**	**14,397**	**100.00**	**46,655**	**100.00**
No Duplicates or Possible Duplicates	362,582	94.54	13,221	91.83	43,686	93.64
One Duplicate or Possible Duplicate	20,212	5.27	1,133	7.87	2,875	6.16
Two Duplicates or Possible Duplicates	698	0.18	40	0.28	89	0.19
Three or More Duplicates or Possible Duplicates	45	0.01	3	0.02	5	0.01
Total Puerto Rico	**17,584**	**100.00**	**2,363**	**100.00**	**1,636**	**100.00**
No Duplicates or Possible Duplicates	15,287	86.94	2,128	90.06	1,535	93.83
One Duplicate or Possible Duplicate	2,152	12.24	219	9.27	99	6.05
Two Duplicates or Possible Duplicates	135	0.77	16	0.68	2	0.12
Three or More Duplicates or Possible Duplicates	10	0.06	0	0.00	0	0.00
Total U.S. and Puerto Rico	**401,121**	**100.00**	**16,760**	**100.00**	**48,291**	**100.00**
No Duplicates or Possible Duplicates	377,869	94.20	15,349	91.58	45,221	93.64
One Duplicate or Possible Duplicate	22,364	5.58	1,352	8.07	2,974	6.16
Two Duplicates or Possible Duplicates	833	0.21	56	0.33	91	0.19
Three or More Duplicates or Possible Duplicates	55	0.01	3	0.02	5	0.01

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pm_census_person and vw_pm_census_coding_history

Table 90
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of Census People by Number of Duplicates or Possible Duplicates Per Person and Sample Indicator: Unweighted

	E-sample People		Non E-sample People			
			Cluster/Surrounding Blocks		Beyond Surrounding Blocks	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**	**14,400**	**100.00**	**48,035**	**100.00**
No Duplicates or Possible Duplicates	366,056	95.44	12,603	87.52	41,861	87.15
One Duplicate or Possible Duplicate	16,886	4.40	1,733	12.03	5,920	12.32
Two Duplicates or Possible Duplicates	552	0.14	61	0.42	245	0.51
Three or More Duplicates or Possible Duplicates	43	0.01	3	0.02	9	0.02
Total Puerto Rico	**17,584**	**100.00**	**2,372**	**100.00**	**1,620**	**100.00**
No Duplicates or Possible Duplicates	15,518	88.25	2,059	86.80	1,387	85.62
One Duplicate or Possible Duplicate	1,947	11.07	294	12.39	214	13.21
Two Duplicates or Possible Duplicates	108	0.61	19	0.80	19	1.17
Three or More Duplicates or Possible Duplicates	11	0.06	0	0.00	0	0.00
Total U.S. and Puerto Rico	**401,121**	**100.00**	**16,772**	**100.00**	**49,655**	**100.00**
No Duplicates or Possible Duplicates	381,574	95.13	14,662	87.42	43,248	87.10
One Duplicate or Possible Duplicate	18,833	4.70	2,027	12.09	6,134	12.35
Two Duplicates or Possible Duplicates	660	0.16	80	0.48	264	0.53
Three or More Duplicates or Possible Duplicates	54	0.01	3	0.02	9	0.02

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pm_census_person and vw_pm_census_coding_history

Table 91
The 2010 Census Coverage Measurement Person Before Followup Matching Operation
Number of Person Interview People by Residence Status Code and Sample Indicator: Unweighted

	Person Interview People in Independent Listing Housing Units		Person Interview People in Census-Only Housing Units	
	Count	**Percent of Total***	**Count**	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**392,711**	**100.00**	**12,720**	**100.00**
P-Sample	370,389	94.32	11,975	94.14
Nonmover	322,974	82.24	10,163	79.90
Inmover	24,821	6.32	898	7.06
P-sample Outmover	1,074	0.27	54	0.42
Unclassified	21,520	5.48	860	6.76
Clerical Review Needed	n/a	n/a	n/a	n/a
Non P-Sample	22,322	5.68	745	5.86
Out-of-Scope	7,487	1.91	248	1.95
Non P-Sample Outmover	5,573	1.42	184	1.45
Unclassified Outmover	313	0.08	3	0.02
Never Resident	8,949	2.28	310	2.44
Total Puerto Rico	**17,039**	**100.00**	**1,086**	**100.00**
P-Sample	15,789	92.66	1,022	94.11
Nonmover	14,570	85.51	940	86.56
Inmover	717	4.21	40	3.68
P-sample Outmover	120	0.70	1	0.09
Unclassified	382	2.24	41	3.78
Clerical Review Needed	n/a	n/a	n/a	n/a
Non P-Sample	1,250	7.34	64	5.89
Out-of-Scope	460	2.70	23	2.12
Non P-Sample Outmover	306	1.80	15	1.38
Unclassified Outmover	6	0.04	0	0.00
Never Resident	478	2.81	26	2.39
Total U.S. and Puerto Rico	**409,750**	**100.00**	**13,806**	**100.00**
P-Sample	386,178	94.25	12,997	94.14
Nonmover	337,544	82.38	11,103	80.42
Inmover	25,538	6.23	938	6.79
P-sample Outmover	1,194	0.29	55	0.40
Unclassified	21,902	5.35	901	6.53
Clerical Review Needed	n/a	n/a	n/a	n/a
Non P-Sample	23,572	5.75	809	5.86
Out-of-Scope	7,947	1.94	271	1.96
Non P-Sample Outmover	5,879	1.43	199	1.44
Unclassified Outmover	319	0.08	3	0.02
Never Resident	9,427	2.30	336	2.43

*Percents may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pi_person and vw_pm_pi_coding_history

Table 92
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of Person Interview People by Residence Status Code and Sample Indicator: Unweighted

	Person Interview People in Independent Listing Housing Units		Person Interview People in Census-Only Housing Units	
	Count	**Percent of Total***	**Count**	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**392,711**	**100.00**	**12,720**	**100.00**
P-Sample	363,290	92.51	11,846	93.13
Nonmover	325,505	82.89	10,308	81.04
Inmover	26,884	6.85	925	7.27
P-sample Outmover	1,413	0.36	63	0.50
Unclassified	9,488	2.42	550	4.32
Clerical Review Needed	n/a	n/a	n/a	n/a
Non P-Sample	29,421	7.49	874	6.87
Out-of-Scope	8,753	2.23	261	2.05
Non P-Sample Outmover	7,972	2.03	235	1.85
Unclassified Outmover	624	0.16	15	0.12
Never Resident	12,072	3.07	363	2.85
Total Puerto Rico	**17,039**	**100.00**	**1,086**	**100.00**
P-Sample	15,604	91.58	1,019	93.83
Nonmover	14,646	85.96	947	87.20
Inmover	698	4.10	42	3.87
P-sample Outmover	137	0.80	3	0.28
Unclassified	123	0.72	27	2.49
Clerical Review Needed	n/a	n/a	n/a	n/a
Non P-Sample	1,435	8.42	67	6.17
Out-of-Scope	484	2.84	22	2.03
Non P-Sample Outmover	357	2.10	17	1.57
Unclassified Outmover	7	0.04	0	0.00
Never Resident	587	3.45	28	2.58
Total U.S. and Puerto Rico	**409,750**	**100.00**	**13,806**	**100.00**
P-Sample	378,894	92.47	12,865	93.18
Nonmover	340,151	83.01	11,255	81.52
Inmover	27,582	6.73	967	7.00
P-sample Outmover	1,550	0.38	66	0.48
Unclassified	9,611	2.35	577	4.18
Clerical Review Needed	n/a	n/a	n/a	n/a
Non P-Sample	30,856	7.53	941	6.82
Out-of-Scope	9,237	2.25	283	2.05
Non P-Sample Outmover	8,329	2.03	252	1.83
Unclassified Outmover	631	0.15	15	0.11
Never Resident	12,659	3.09	391	2.83

*Percents may not sum to totals due to rounding.
n/a stands for not applicable.
Source: PerMaRCS tables: vw_pi_person and vw_pm_pi_coding_history

Table 93
The 2010 Census Coverage Measurement Person Before Followup Matching Operation
Number of E-sample People by Enumeration Status: Unweighted

	E-sample People	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**
Correct Enumeration	305,749	79.72
Erroneous Enumeration	9,999	2.61
Duplicate	7,379	1.92
Fictitious	59	0.02
Geocoding Error	28	0.01
Other	2,533	0.66
Unresolved Enumeration	67,789	17.67
Total Puerto Rico	**17,584**	**100.00**
Correct Enumeration	13,540	77.00
Erroneous Enumeration	969	5.51
Duplicate	793	4.51
Fictitious	1	0.01
Geocoding Error	0	0.00
Other	175	1.00
Unresolved Enumeration	3,075	17.49
Total U.S. and Puerto Rico	**401,121**	**100.00**
Correct Enumeration	319,289	79.60
Erroneous Enumeration	10,968	2.73
Duplicate	8,172	2.04
Fictitious	60	0.01
Geocoding Error	28	0.01
Other	2,708	0.68
Unresolved Enumeration	70,864	17.67

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pm_census_person, vw_pm_census_coding_history, vw_pi_person, and vw_pm_pi_coding_history

Table 94
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of Census People by Enumeration Status: Unweighted

	E-sample People	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**
Correct Enumeration	343,334	89.52
Erroneous Enumeration	17,191	4.48
Duplicate	11,357	2.96
Fictitious	351	0.09
Geocoding Error	360	0.09
Other	5,123	1.34
Unresolved Enumeration	23,012	6.00
Total Puerto Rico	**17,584**	**100.00**
Correct Enumeration	15,792	89.81
Erroneous Enumeration	1,420	8.08
Duplicate	1,018	5.79
Fictitious	30	0.17
Geocoding Error	40	0.23
Other	332	1.89
Unresolved Enumeration	372	2.12
Total U.S. and Puerto Rico	**401,121**	**100.00**
Correct Enumeration	359,126	89.53
Erroneous Enumeration	18,611	4.64
Duplicate	12,375	3.09
Fictitious	381	0.09
Geocoding Error	400	0.10
Other	5,455	1.36
Unresolved Enumeration	23,384	5.83

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pm_census_person, vw_pm_census_coding_history, vw_pi_person, and vw_pm_pi_coding_history

Table 95
The 2010 Census Coverage Measurement Before Followup Matching Operation
Number of Person Followup Notes by Person Record Type: Unweighted

	Person Followup Notes	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**94**	**100.00**
Unlinked Person Interview Person	32	34.04
Linked Person Interview and Census Persons	48	51.06
Unlinked E-sample Person	11	11.70
Unlinked Census Nationwide Person	3	3.19
Total Puerto Rico	**2**	**100.00**
Unlinked Person Interview Person	1	50.00
Linked Person Interview and Census Persons	1	50.00
Unlinked E-sample Person	0	0.00
Unlinked Census Nationwide Person	0	0.00
Total U.S. and Puerto Rico	**96**	**100.00**
Unlinked Person Interview Person	33	34.38
Linked Person Interview and Census Persons	49	51.04
Unlinked E-sample Person	11	11.46
Unlinked Census Nationwide Person	3	3.13

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person, vw_pm_pi_coding_history, vw_pm_census_person, and vw_pm_census_coding_history

Table 96
The 2010 Census Coverage Measurement After Followup Matching Operation
Number of Clusters by Outlier Review Category: Unweighted

	Census Coverage Measurement Clusters	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**6,148**	**100.00**
Sent to Outlier Review	390	6.34
Forced to Review For Specific Issue	53	0.86
Selected Based on Priority Calculation	337	5.48
No Outlier Review	5,758	93.66
Total Puerto Rico	**268**	**100.00**
Sent to Outlier Review	6	2.24
Forced to Review For Specific Issue	0	0.00
Selected Based on Priority Calculation	6	2.24
No Outlier Review	262	97.76
Total U.S. and Puerto Rico	**6,416**	**100.00**
Sent to Outlier Review	396	6.17
Forced to Review For Specific Issue	53	0.83
Selected Based on Priority Calculation	343	5.35
No Outlier Review	6,020	93.83

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: pm_cluster and pm_cluster_stage

Table 97 The 2010 Census Coverage Measurement Person After Followup Matching Operation Number of Person Interview People with Insufficient Information for Followup by Match Code and Sample Indicator: Unweighted

	Person Interview People in Independent Listing Housing Units				Person Interview People in Census-Only Housing Units	
	P-sample Residence Status		Non P-sample Residence Status			
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)	**8,699**	**100.00**	**985**	**100.00**	**363**	**100.00**
Matches	5,206	59.85	621	63.05	212	58.40
Possible Matches	18	0.21	3	0.30	1	0.28
Nonmatches	3,394	39.02	346	35.13	145	39.94
Duplicates	81	0.93	14	1.42	5	1.38
Possible Duplicates	0	0.00	1	0.10	0	0.00
Total Puerto Rico	**156**	**100.00**	**64**	**100.00**	**29**	**100.00**
Matches	92	58.97	42	65.63	22	75.86
Possible Matches	0	0.00	0	0.00	0	0.00
Nonmatches	63	40.38	21	32.81	7	24.14
Duplicates	1	0.64	1	1.56	0	0.00
Possible Duplicates	0	0.00	0	0.00	0	0.00
Total U.S. and Puerto Rico	**8,855**	**100.00**	**1,049**	**100.00**	**392**	**100.00**
Matches	5,298	59.83	663	63.20	234	59.69
Possible Matches	18	0.20	3	0.29	1	0.26
Nonmatches	3,457	39.04	367	34.99	152	38.78
Duplicates	82	0.93	15	1.43	5	1.28
Possible Duplicates	0	0.00	1	0.10	0	0.00

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person and vw_pm_pi_coding_history

Table 98
The 2010 Census Coverage Measurement Person After Followup Matching Operation Number of E-sample People with Insufficient Information for Followup by Match Code and Sample Indicator: Unweighted

	E-sample People	
	Count	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**8,769**	**100.00**
Matches	4,590	52.34
Possible Matches	12	0.14
Nonmatches	3,874	44.18
Duplicates	272	3.10
Possible Duplicates	21	0.24
Total Puerto Rico	**227**	**100.00**
Matches	93	40.97
Possible Matches	0	0.00
Nonmatches	109	48.02
Duplicates	25	11.01
Possible Duplicates	0	0.00
Total U.S. and Puerto Rico	**8,996**	**100.00**
Matches	4,683	52.06
Possible Matches	12	0.13
Nonmatches	3,983	44.28
Duplicates	297	3.30
Possible Duplicates	21	0.23

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pm_census_person and vw_pm_census_coding_history

Table 99
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of Respondent-Provided Addresses by Level of Geocoding and Source: Unweighted

	Person Interview Respondent-Provided Addresses		Person Followup Respondent-Provided Addresses	
	Count	**Percent of Total***	**Count**	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**51,474**	**100.00**	**27,059**	**100.00**
Search Area Identified	40,763	79.19	20,412	75.44
Geocoded to Master Address File Identifier	24,634	47.86	14,100	52.11
Geocoded to Block	16,129	31.33	6,312	23.33
No Search Area Identified	10,711	20.81	6,647	24.56
Geocoded to County	6,377	12.39	4,721	17.45
Geocoded to State	1,100	2.14	760	2.81
Ungeocoded	3,234	6.28	1,166	4.31
In-scope – U.S. Address	957	1.86	424	1.57
Out-of-Scope - Puerto Rico Address	59	0.11	16	0.06
Out-of-Scope - Other Country	2,218	4.31	726	2.68
Total Puerto Rico	**2,079**	**100.00**	**1,104**	**100.00**
Search Area Identified	1,532	73.69	830	75.18
Geocoded to Master Address File Identifier	406	19.53	489	44.29
Geocoded to Block	1,126	54.16	341	30.89
No Search Area Identified	547	26.31	274	24.82
Geocoded to County	209	10.05	147	13.32
Geocoded to State	21	1.01	8	0.72
Ungeocoded	317	15.25	119	10.78
In-scope – Puerto Rico Address	7	0.34	30	2.72
Out-of-Scope - U.S. Address	248	11.93	74	6.70
Out-of-Scope - Other Country	62	2.98	15	1.36
Total U.S. and Puerto Rico	**53,553**	**100.00**	**28,163**	**100.00**
Search Area Identified	42,295	78.98	21,242	75.43
Geocoded to Master Address File Identifier	25,040	46.76	14,589	51.80
Geocoded to Block	17,255	32.22	6,653	23.62
No Search Area Identified	11,258	21.02	6,921	24.57
Geocoded to County	6,586	12.30	4,868	17.29
Geocoded to State	1,121	2.09	768	2.73
Ungeocoded	3,551	6.63	1,285	4.56
In-scope	964	1.80	454	1.61
Out-of-Scope - Puerto Rico Address	59	0.11	16	0.06
Out-of-Scope - U.S. Address	248	0.46	74	0.26
Out-of-Scope - Other Country	2,280	4.26	741	2.63

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: pm_other_address and pm_other_address_geocode

Table 100
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of P-sample Inmover Addresses by Confidence in Search Area and Source: Unweighted

	Person Interview Inmover Addresses		Person Followup Inmover Addresses	
	Count	**Percent of Total***	**Count**	**Percent of Total***
Total U.S. (excluding Puerto Rico)	**12,855**	**100.00**	**1,662**	**100.00**
Confident Identified Search Area is Correct	11,927	92.78	1,339	80.57
Not Sure if Identified Search Area is Correct	488	3.80	152	9.15
Could Not Identify a Search Area	440	3.42	171	10.29
Total Puerto Rico	**324**	**100.00**	**48**	**100.00**
Confident Identified Search Area is Correct	283	87.35	42	87.50
Not Sure if Identified Search Area is Correct	32	9.88	5	10.42
Could Not Identify a Search Area	9	2.78	1	2.08
Total U.S. and Puerto Rico	**13,179**	**100.00**	**1,710**	**100.00**
Confident Identified Search Area is Correct	12,210	92.65	1,381	80.76
Not Sure if Identified Search Area is Correct	520	3.95	157	9.18
Could Not Identify a Search Area	449	3.41	172	10.06

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person, vw_pm_pi_coding_history, vw_pi_other_address_person, pm_other_address, and pm_other_address_geocode

Table 101 The 2010 Census Coverage Measurement After Followup Matching Operation
Number of Person Interview People by Other Addresses per Person and Sample Indicator: Unweighted

	Person Interview People in Independent Listing Housing Units				Person Interview People in Census-Only Housing Units	
	P-sample Residence Status		Non P-sample Residence Status			
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)	**363,290**	**100.00**	**29,421**	**100.00**	**12,720**	**100.00**
No Respondent- Addresses	307,686	84.69	3,085	10.49	10,104	79.43
One Respondent-Provided Address	48,928	13.47	21,709	73.79	2,293	18.03
Two Respondent-Provided Address	5,474	1.51	3,836	13.04	289	2.27
Three or More Respondent-Provided Addresses	1,202	0.33	791	2.69	34	0.27
Total Puerto Rico	**15,604**	**100.00**	**1,435**	**100.00**	**1,086**	**100.00**
No Respondent- Addresses	13,682	87.68	241	16.79	878	80.85
One Respondent-Provided Address	1,667	10.68	1,037	72.26	178	16.39
Two Respondent-Provided Address	213	1.37	130	9.06	24	2.21
Three or More Respondent-Provided Addresses	42	0.27	27	1.88	6	0.55
Total U.S. and Puerto Rico	**378,894**	**100.00**	**30,856**	**100.00**	**13,806**	**100.00**
No Respondent- Addresses	321,368	84.82	3,326	10.78	10,982	79.55
One Respondent-Provided Address	50,595	13.35	22,746	73.72	2,471	17.90
Two Respondent-Provided Address	5,687	1.50	3,966	12.85	313	2.27
Three or More Respondent-Provided Addresses	1,244	0.33	818	2.65	40	0.29

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pi_person, vw_pm_pi_coding_history, vw_pi_other_address_person, and vw_pm_census_other_address_per

Table 102 The 2010 Census Coverage Measurement After Followup Matching Operation
Number of Census People by Other Addresses per Person and Sample Indicator: Unweighted

	E-sample People		Non E-sample People			
			Cluster/Surrounding Blocks		Beyond Surrounding Blocks	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)	**383,537**	**100.00**	**14,400**	**100.00**	**48,035**	**100.00**
No Respondent- Addresses	334,262	87.15	11,482	79.74	9,380	19.53
One Respondent-Provided Address	44,001	11.47	2,593	18.01	31,924	66.46
Two Respondent-Provided Address	4,524	1.18	273	1.90	5,427	11.30
Three or More Respondent-Provided Addresses	750	0.20	52	0.36	1,304	2.71
Total Puerto Rico	**17,584**	**100.00**	**2,372**	**100.00**	**1,620**	**100.00**
No Respondent- Addresses	15,366	87.39	2,176	91.74	589	36.36
One Respondent-Provided Address	2,029	11.54	174	7.34	815	50.31
Two Respondent-Provided Address	169	0.96	20	0.84	174	10.74
Three or More Respondent-Provided Addresses	20	0.11	2	0.08	42	2.59
Total U.S. and Puerto Rico	**401,121**	**100.00**	**16,772**	**100.00**	**49,655**	**100.00**
No Respondent- Addresses	349,628	87.16	13,658	81.43	9,969	20.08
One Respondent-Provided Address	46,030	11.48	2,767	16.50	32,739	65.93
Two Respondent-Provided Address	4,693	1.17	293	1.75	5,601	11.28
Three or More Respondent-Provided Addresses	770	0.19	54	0.32	1,346	2.71

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_census_person, vw_pm_census_coding_history, vw_pm_census_other_address_per, and vw_pi_other_address_person

Table 103
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of Census People Beyond Surrounding Blocks by Computer Match Code and Search Area and Final Disposition: Unweighted

Computer Matching		After Followup			
Beyond Surrounding Blocks		Total	Confirmed	Not Confirmed (Unlinked)	Undetermined
	Count	Percent*	Percent*	Percent*	Percent*
Total U.S. (excluding Puerto Rico)	**46,423**	**100.00**	**82.30**	**11.12**	**6.59**
Matches	28,450	100.00	95.26	0.45	4.29
Inmover/Alternate Search Area	22,269	100.00	99.81	0.08	0.11
Nationwide Search Area	6,181	100.00	78.85	1.80	19.35
Possible Matches	1,085	100.00	51.06	33.18	15.76
Inmover/Alternate Search Area	266	100.00	93.98	3.01	3.01
Nationwide Search Area	819	100.00	37.12	42.98	19.90
Nonmatches	6	100.00	66.67	0.00	33.33
Duplicates	6,613	100.00	86.21	6.68	7.11
Inmover/Alternate Search Area	1,961	100.00	99.08	0.61	0.31
Nationwide Search Area	4,652	100.00	80.78	9.24	9.97
Possible Duplicates	10,269	100.00	47.17	41.20	11.63
Inmover/Alternate Search Area	199	100.00	94.97	3.52	1.51
Nationwide Search Area	10,070	100.00	46.23	41.95	11.83
Total Puerto Rico	**1,543**	**100.00**	**79.07**	**10.82**	**10.11**
Matches	692	100.00	94.08	1.30	4.62
Inmover/Alternate Search Area	507	100.00	99.41	0.59	0.00
Nationwide Search Area	185	100.00	79.46	3.24	17.30
Possible Matches	108	100.00	77.78	10.19	12.04
Inmover/Alternate Search Area	60	100.00	100.00	0.00	0.00
Nationwide Search Area	48	100.00	50.00	22.92	27.08
Nonmatches	0	100.00	0.00	0.00	0.00
Duplicates	251	100.00	89.24	5.98	4.78
Inmover/Alternate Search Area	61	100.00	93.44	4.92	1.64
Nationwide Search Area	190	100.00	87.89	6.32	5.79
Possible Duplicates	492	100.00	53.05	26.83	20.12
Inmover/Alternate Search Area	18	100.00	94.44	0.00	5.56
Nationwide Search Area	474	100.00	51.48	27.85	20.68

(Continued on next page)

Table 103 (Continued)
The 2010 Census Coverage Measurement Person After Followup Matching Operation
Number of Census People Beyond Surrounding Blocks by Computer Match Code and Search Area and Final Disposition: Unweighted

Computer Matching		After Followup			
Beyond Surrounding Blocks		Total	Confirmed	Not Confirmed (Unlinked)	Undetermined
	Count	Percent*	Percent*	Percent*	Percent*
Total U.S. and Puerto Rico	**47,966**	**100.00**	**82.32**	**11.11**	**6.70**
Matches	29,142	100.00	95.23	0.47	4.30
Inmover/Alternate Search Area	22,776	100.00	99.80	0.09	0.11
Nationwide Search Area	6,366	100.00	78.87	1.84	19.29
Possible Matches	1,193	100.00	53.48	31.10	15.42
Inmover/Alternate Search Area	326	100.00	95.09	2.45	2.45
Nationwide Search Area	867	100.00	37.83	41.87	20.30
Nonmatches	6	100.00	66.67	0.00	33.33
Duplicates	6,864	100.00	86.32	6.66	7.02
Inmover/Alternate Search Area	2,022	100.00	98.91	0.74	0.35
Nationwide Search Area	4,842	100.00	81.06	9.13	9.81
Possible Duplicates	10,761	100.00	47.44	40.54	12.02
Inmover/Alternate Search Area	217	100.00	94.93	3.23	1.84
Nationwide Search Area	10,544	100.00	46.46	41.31	12.22

*Percents may not sum to totals due to rounding.
Source: PerMaRCS tables: vw_pm_census_person, vw_pm_census_coding_history, vw_pi_person, and vw_pm_pi_coding_history

Person Followup

What are the missing data rates for key questions in the Person Followup? Stateside Spanish

On stateside Spanish-language pages, people who reported an address were likely to give at least one piece of information about an address. This could be an entire mailing address or only a state. Only 2.63 percent of people reporting a college address (see Table 104) could not give any identifying information. 13.00 percent of people reporting an address at Question 2 could not give any identifying address information. Question 2 addresses are often “Move From” or “Move To” addresses.

Table 104
The 2010 Census Coverage Measurement Person Followup Operation
Missing Address (Q1,2,3,9) – Stateside Spanish: Unweighted

Address Questions	Missing Address (no part of address given)		Total Persons with Address Type	
	Count	Percent of Total	Count	Percent of Total
Other than Sample Address (Q1)	18	14.17	**127**	**100.00**
Living Anywhere Else (Q2)	114	13.00	**877**	**100.00**
College Address (Q3)	1	2.63	**38**	**100.00**
Group Quarters (Q9)	6	40.00	**15**	**100.00**

Source: keyed data

Questions 4 through 8 were displayed on the same page of the questionnaire on the Spanish-language pages also. These data, reported on Table 105, included questions about a relative's address, military service, a job away from home, seasonal homes, and any other place the followup person stayed often. There was space available to record details about two addresses on this page. On the stateside Spanish-language pages, only one followup person had more than two alternate address types among these five questions. The following table shows the number of alternate address types reported per person on the stateside Spanish-language pages and the number of address details given. These are similar to the distribution on the English-language pages.

Table 105
The 2010 Census Coverage Measurement Person Followup Operation
Missing Address (Q4-8) – Stateside Spanish: Unweighted

Number of Alternate Address Types	Zero Alternate Addresses Given		One Alternate Address Given		Two Alternate Addresses Given		Total	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Zero	2,897	99.83	5	0.17	0	0.00	**2,902**	**100.00**
One	22	23.66	69	74.19	2	2.15	**93**	**100.00**
Two	1	11.11	0	0.00	8	88.89	**9**	**100.00**
Three	0	0.00	0	0.00	1	100.00	**1**	**100.00**

Source: keyed data

For each alternate address reported, respondents were asked to give information about landmarks or cross streets close to that place, cohabitants that lived with the followup person at that place, and any neighbors that lived close to the alternate address (Question 9 about GQs did not ask about cohabitants or neighbors). The data in Table 106 is similar to English-language pages, neighbors were rarely reported on the Spanish-language pages. The percent of landmarks and cohabitants missing varies widely based on the address type.

Table 106
The 2010 Census Coverage Measurement Person Followup Operation
Missing Data – Stateside Spanish Additional Information Collected on Alternate Addresses: Unweighted

Address Questions	Landmarks, cross streets Missing		Cohabitants Missing		Neighbors Missing		Total Persons with Address Type	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Live or stay at sample address in 2010? (Q1)	50	39.37	63	49.61	98	77.17	**127**	**100.00**
Live anywhere else in 2010? (Q2)	585	66.70	505	57.58	836	95.32	**877**	**100.00**
During 2010, attend college?* (Q3)	34	89.47	35	92.11	38	100.00	**38**	**100.00**
Another relative, military, service, job, seasonal home, other? Address Row 1	80	77.67	64	62.14	97	94.17	**103**	**100.00**
Another relative, military, service, job, seasonal home, other? Address Row 2	100	97.09	96	93.20	102	99.03	**103**	**100.00**
Group quarters around April 1st? (Q9)	14	93.33	N/A	N/A	N/A	N/A	**15**	**100.00**

*Restricted to certain age ranges based on question
Source: keyed data

Type of place is needed to classify whether followup people were eligible to be included in the P sample or E sample since people living in GQs are excluded from CCM. Table 107 shows that most people (86.67 percent) who reported staying at a GQ in Question 9 did give a type of place that is considered a GQ by census. 84.21 percent of college addresses reported were missing type of place information. This is larger for the stateside Spanish-language pages then for the English-language pages. This could be due to a problem in the translation for this particular question or it may be a factor of the small sample size (only 38 followup people).

Table 107
The 2010 Census Coverage Measurement Person Followup Operation
Type of Place – Stateside Spanish: Unweighted

Address Questions	Housing Unit		Group Quarters*		Don't Know/Refused/ Missing		Total Persons with Address Type	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Live or stay at sample address in 2010? (Q1)	99	77.95	2	1.57	26	20.47	**127**	**100.00**
Live anywhere else in 2010? (Q2)	523	59.64	8	0.91	346	39.45	**877**	**100.00**
During 2010, attend college? (Q3)	4	10.53	2	5.26	32	84.21	**38**	**100.00**
Another relative, military, service, job, seasonal home, other? Address Row 1	53	51.46	2	1.94	48	46.60	**103**	**100.00**
Another relative, military, service, job, seasonal home, other? Address Row 2	11	10.68	1	0.97	91	88.35	**103**	**100.00**
Group quarters around April 1st? (Q9)	0	0.00	13	86.67	2	13.33	**15**	**100.00**

*Group quarters includes "Other"
Source: keyed data

Puerto Rico

Table 108 displays the data for the main residence questions collected in Puerto Rico. The Puerto Rico questionnaire was printed only on one side of the questionnaire in the Spanish language. The majority of Puerto Rico followup people lived or stayed at the address where they were collected in either the PI or the census enumeration (82.82). Most alternate addresses were collected in Question 2 (Did *NAME* live anywhere else in 2010?) – 1,735 or Question 3 (During 2010, did NAME attend college?) – 379. All residence questions had missing rates between eight and eleven percent. This is much lower than stateside missing rates for these questions.

Table 108
The 2010 Census Coverage Measurement Person Followup Operation
Missing Data – Puerto Rico Persons: Unweighted

Address Questions	Yes		No		Don't Know /Refused/Missing		Total Eligible Persons	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Live or stay at sample address in 2010? (Q1)	4,300	82.82	467	8.99	425	8.19	5,192	100.00
Live anywhere else in 2010? (Q2)	1,735	33.42	2,984	57.47	473	9.11	5,192	100.00
During 2010, attend college? (Q3)*	379	24.26	1,009	64.60	174	11.14	1,562	100.00
During 2010, stay with another relative? (Q4)	338	6.51	4,331	83.42	523	10.07	5,192	100.00
During 2010, live or stay someplace else because of military service? (Q5)*	14	0.42	2,997	89.20	349	10.38	3,360	100.00
During 2010, live or stay someplace because of a job? (Q6)*	27	0.73	3,285	88.86	385	10.41	3,697	100.00
During 2010, have a seasonal home? (Q7)	92	1.77	4,584	88.29	516	9.94	5,192	100.00
Any other place stayed often? (Q8)	76	1.46	4,594	88.48	522	10.05	5,192	100.00
Group quarters around April 1st? (Q9)	39	0.75	4,635	89.27	518	9.97	5,192	100.00

*Restricted to certain age ranges based on question
***Rounding…
Source: keyed data

Table 109 shows that the average number of alternate addresses reported in the main questions per person for Puerto Rico is 0.61 addresses. For people with at least one alternate address reported in the main questions, the average number is 1.33 addresses. 45.78 percent of Puerto Rico followup people had alternate addresses, and only 0.19 percent had more than three alternate addresses. Regardless of age, over 25 percent of followup people reported at least one alternate address. 21.68 of those aged 18-24 reported two alternate addresses.

Table 109
The 2010 Census Coverage Measurement Person Followup Operation
Number of Times Yes to Alternate Address Questions by Age – Puerto Rico: Unweighted

Age	Zero		One		Two		Three		Four	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Total	**2,815**	**54.22**	**1,734**	**33.40**	**506**	**9.75**	**127**	**2.45**	**10**	**0.19**
Missing Age	105	47.51	80	36.20	28	12.67	8	3.62	0	0.00
0-17 years	742	53.15	499	35.74	135	9.67	20	1.43	0	0.00
18-24 years	217	31.36	250	36.13	150	21.68	68	9.83	7	1.01
25-60 years	1,309	58.75	739	33.17	152	6.82	25	1.12	3	0.13
61+ years	442	67.48	166	25.34	41	6.26	6	0.92	0	0.00

Source: keyed data

On Puerto Rico PFU questionnaires, people who reported an address were likely to give at least one piece of information about an address. This could be an entire mailing address or only a state. Only 0.79 percent of people reporting a college address could not give any identifying information. 3.69 percent of people reporting an address at Question 2 could not give any identifying address information. Question 2 addresses are often "Move From" or "Move To" addresses.

Table 110
The 2010 Census Coverage Measurement Person Followup Operation
Missing Data – PR: Unweighted

Address Questions	Missing Address (no part of address given)		Total Persons with Address Type	
	Count	Percent of Total	Count	Percent of Total
Other than Sample Address (Q1)	5	1.07	**468**	**100.00**
Living Anywhere Else (Q2)	64	3.69	**1,735**	**100.00**
College Address (Q3)*	3	0.79	**379**	**100.00**
Group Quarters (Q9)	0	0.00	**39**	**100.00**

*Restricted to certain age ranges based on question
Source: keyed data

Questions 4 through 8 were displayed on the same page of the questionnaire. These included questions about a relative's address, military service, a job away from home, seasonal homes, and any other place the followup person stayed often. There was space available to record details about two addresses on this page. It was decided that this should be sufficient for the majority of cases and an interviewer should use Notes spaces when addresses details were needed for more than two addresses. Table 111 shows the number of alternate address types reported per person on the Puerto Rico questionnaires and the number of address details given.

Table 111
The 2010 Census Coverage Measurement Person Followup Operation
Missing Data – PR: Unweighted

Number of Alternate Address Types	Zero Alternate Addresses Given		One Alternate Address Given		Two Alternate Addresses Given		Total	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Zero	4,675	99.91	4	0.09	0	0.00	**4,679**	**100.00**
One	5	1.04	463	96.66	11	2.30	**479**	**100.00**
Two	1	3.23	0	0.00	30	96.77	**31**	**100.00**
Three	0	0.00	0	0.00	2	100.00	**2**	**100.00**

512 With at least 1 address given
Source: keyed data

For each alternate address reported, respondents were asked to give information about landmarks or cross streets close to that place, cohabitants that lived with the followup person at that place, and any neighbors that lived close to the alternate address (Question 9 about GQs did not ask about cohabitants or neighbors). See Table 112. Neighbors were rarely reported. While this information can be very useful during Person Clerical Matching when geocoding an address with few details, few respondents know this information. The percent of landmarks and cohabitants missing varies widely based on the address type.

Table 112
The 2010 Census Coverage Measurement Person Followup Operation
Missing Data – Puerto Rico: Unweighted

Address Questions	Landmarks, Cross Streets Missing		Cohabitants Missing		Neighbors Missing		Total Persons with Address Type	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Live or stay at sample address in 2010? (Q1)	79	16.88	40	8.55	169	36.11	**468**	**100.00**
Live anywhere else in 2010? (Q2)	842	48.53	690	39.77	1406	81.04	**1,735**	**100.00**
During 2010, attend college?* (Q3)	300	79.16	309	81.53	362	95.51	**379**	**100.00**
Another relative, military, service, job, seasonal home, other? Address Row 1	315	61.52	259	50.59	430	83.98	**512**	**100.00**
Another relative, military, service, job, seasonal home, other? Address Row 2	487	95.12	478	93.36	501	97.85	**512**	**100.00**
Group quarters around April 1st? (Q9)	14	35.90	N/A	N/A	N/A	N/A	**39**	**100.00**

*Restricted to certain age ranges based on question
Source: keyed data

Type of place is needed to classify whether followup people were eligible to be included in the P sample or E sample since people living in GQs are excluded from CCM. As shown on Table 113, most Puerto Rico people (94.87) who reported a stay at a GQ in Question 9 did give a type of place that is considered a GQ by the Census Bureau. Assisted Living facilities were a response option to this question even though they are not considered a GQ. This accounts for the 5.13 percent of Question 9 addresses that were considered housing units.

Table 113
The 2010 Census Coverage Measurement Person Followup Operation
Type of Place – Puerto Rico: Unweighted

Address Questions	Housing Unit		Group Quarters*		Don't Know/Refused/ Missing		Total Persons with Address Type	
	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total	Count	Percent of Total
Live or stay at sample address in 2010? (Q1)	454	97.01	5	1.07	9	1.92	**468**	**100.00**
Live anywhere else in 2010? (Q2)	1199	69.11	42	2.42	494	28.47	**1,735**	**100.00**
During 2010, attend college? (Q3)	94	24.80	20	5.28	265	69.92	**379**	**100.00**
Another relative, military, service, job, seasonal home, other? Address Row 1	273	53.32	18	3.52	221	43.16	**512**	**100.00**
Another relative, military, service, job, seasonal home, other? Address Row 2	41	8.01	2	0.39	469	91.60	**512**	**100.00**
Group quarters around April 1st?	2	5.13	37	94.87	0	0.00	**39**	**100.00**

*Group quarters includes "Other"
Source: keyed data

Appendix B - List of Acronyms

Acronym	Definition
A.C.E.	Accuracy and Coverage Evaluation
AFO	After Followup Outlier
AFU	After Followup
AOQL	Average Outgoing Quality Limit
ATAC	Automated Tracking and Control
BFU	Before Followup
C&P	Cost and Progress
CCM	Census Coverage Measurement
CCMS	Census Coverage Measurement Section
CGC	Clerical Geocoding
CL	Crew Leader
CLA	Crew Leader Assistant
CMOCS	Coverage Measurement Operations Control System
CPS	Current Population Survey
CR	Change Request
DAPPS	Decennial Applicant, Personnel and Payroll System
DMD	Decennial Management Division
DSB	Document Services Branch
DSSD	Decennial Statistical Studies Division
E sample	Enumeration sample
FDCA	Field Data Collection Automation
FLD	Field Division
FOS	Field Operations Supervisor
GEO	Geography Division
GQ	Group Quarters
IHU	Initial Housing Unit
IL	Independent Listing
LCO	Local Census Office
MAF	Master Address File
MAFID	Master Address File Identifier
MAS	Master Activity Schedule
M&IE	Meals and Incidental Expenses
MVS	Map Viewing System
NPC	National Processing Center
PerMaRCS	Person Matching, Review and Coding System
PFU	Person Followup
PFU RI	Person Followup Reinterview
PI	Person Interview
PMF	Person Matching and Followup
P sample	Population sample
PSDB	Processing Systems Development Branch

Acronym	Definition
QA	Quality Assurance
QC	Quality Control
RCC	Regional Census Center
RI	Reinterview
RSC	Residence Status Coding
SAS BI	SAS Business Intelligence
SUMO	Search Utility Mapping Objects
TMO	Technologies Management Office
UAT	User Acceptance Testing

Appendix C – Person Matching and Followup Systems Testing

Coverage Measurement Operations Control System

For the 2010 Census, the Technologies Management Office (TMO) developed, for Census Coverage Measurement (CCM), the Person Followup (PFU) Operation software to be used in the Regional Census Centers (RCCs).

TMO development was responsible for:

- developing the software for the PFU operation for the office staff Coverage Measurement Operations Control System (CMOCS)
- developing the software for the PFU Reinterview (RI) operation
- establishing interfaces between several different Census Bureau systems such as Decennial Applicant, Personnel and Payroll System (DAPPS), Cost & Progress (C&P), Person Matching, Review and Coding System (PerMaRCS), and the National Processing Center (NPC) to exchange input and output data
- ensuring all software met security guidelines established by the Census Bureau
- loading the CMOCS with block cluster and geographical information files supplied by the Geography Division (GEO)
- testing CMOCS and its interfaces to ensure that the software functioned as expected and the data captured were accurate.

TMO conducted software demos of the CMOCS during the development process to allow stakeholders to see the system and provide feedback, if necessary, to ensure we were meeting their expectations. TMO also established a change control process to manage changes to or new requirements and worked closely with the Census Bureau stakeholders to refine them.

The TMO testing effort was to verify all software and system requirements. This testing included, but was not limited to, testing the following:

- Field staff geography set-up/Crew formation
- Employee functions
- Assignment preparation
- Assignment management
- Role based testing for each staff type
- Report accuracy
- Closeout functionality

Unit Testing

The TMO Development Team conducted unit testing to ensure that each developed code module met its particular business needs and requirements. Unit testing was conducted in the development environment.

The objective of the unit testing was to verify that the component correctly implemented the designed specifications. Unit testing validates that business rules, create/read/update/delete functions, data validations, file creation, and similar "low-level" functions operated as defined. Unit testing included tests for field ranges, values and lengths, functions, data validation, data dependencies, and any special processing contained in the module. Modules were developed and available for testing independently of other modules. The developer responsible for the module performed the unit test and documented any errors or issues related to the independent operation of the program using the Unit Test Checklist.

The developers did not provide metrics on the results of unit testing. As is common in software testing practice, metrics were provided once formal testing began.

Integration Testing

The TMO Software Testing Team conducted integration testing to ensure the developed code modules met their particular business need and the defined requirements. Integration testing proves that all areas of the system interface with each other correctly, and that there were no gaps in the data flow. Integration testing was conducted in the testing environment.

The integration test cases were updated if changes occurred to the requirements and/or the detailed design specifications. There was no formal test report from this phase of testing, although testers did generate trouble tickets.

Systems Testing

Systems testing is the first of the two formal rounds of testing (verification testing is the second). TMO's Software Testing Team, along with the stakeholders conducted this testing. The testing looked at the CMOCS, the backend database, and external interfaces. System testing concentrates on requirements and business processes, and ensures that system requirements and business needs have been met. System testing tested the components and interfaces working together as a complete, integrated solution. System testing was designed to concentrate on typical scenarios, combining multiple features, and simulating typical use cases and multi-user scenarios.

The Test Team created and executed the test cases. The test cases for this phase were developed using the basic, alternate, and exception flows described in the specification documents. Field Division (FLD) Coverage Measurement Branch was responsible for reviewing the test cases and used them to test from during the systems test. Decennial Statistical Studies Division (DSSD) also participated, when available, in the testing.

For systems testing, TMO reported on issues reported from the FLD Coverage Measurement Branch only. Software testing for PFU was completed on October 26, 2010 and a total of 26 defects were identified.

Verification Testing

Verification testing was the second and last round of testing before the system was deployed. The goal of verification testing was to ensure that the CMOCS application was ready for production implementation.

Verification testing was conducted in the test environment. A set of predefined test cases were leveraged from system tests to execute in verification testing. The test cases used for verification testing were approved in advance by the FLD Coverage Measurement Branch. At the end of the verification testing period, relevant issues were identified and documented in Team Track and, when necessary, submitted through change control.

Similarly to systems testing, verification testing issues reported are from the FLD Coverage Measurement Branch only. Verification testing for PFU was completed on 12/3/10 with 12 defects reported.

Regression Testing

Regression testing occurred during the software testing and verification testing as well as for any changes to the system baseline during production.

Automated Tracking and Control System

Person Followup Questionnaires

The Automated Tracking and Control (ATAC) was the application used to track the movement of the PFU questionnaires throughout data capture at NPC. The Census Coverage Measurement Section (CCMS) Control Staff used the ATAC system to separately check-in the U.S. and Puerto Rico PFU questionnaires by wanding the barcodes that were on each page of the PFU questionnaire and to batch PFU questionnaires for data capture.

User Acceptance Testing (UAT) was conducted on the ATAC system for a small universe, 45 cases (28 for U.S. and 17 for Puerto Rico). Changes were identified during the testing, which were implemented with very little additional testing needed.

Testing between the systems ATAC would communicate with during production was also conducted. Test files were transferred between PerMaRCS and ATAC to test the data sent to and received from these systems.

Person Followup Reinterview Forms

The ATAC was the application used to track the movement of the PFU RI forms throughout data capture at NPC. ATAC was used during the PFU operation at NPC to batch PFU RI forms for data capture.

The CCMS staff used the ATAC system to separately check-in the English-language and Spanish-language PFU RI forms by wanding the barcodes affixed to the front page of the PFU RI forms.

The PFU RI Universe File included all PFU RI cases, which were generated when the CMOCS selected a PFU case for RI, and was transmitted from the CMOCS to the ATAC system nightly.

UAT was conducted on the ATAC system for a small universe, 50 PFU RI cases (30 English-language and 20 Spanish-language). Changes were identified during the testing, which were implemented with very little additional testing needed.

Testing between the systems ATAC would communicate with during production was also conducted. Test files were transferred between CMOCS and ATAC to test the data sent to and received from these systems. For the UAT, a test PFU RI Universe File was transmitted to the ATAC system.

Person Followup Observation Checklists

The ATAC was the application used to track the movement of the PFU Observation Checklists throughout data capture at NPC. ATAC was used during the PFU operation at NPC to batch PFU Observation Checklists for data capture.

The CCMs staff used the ATAC system to separately check-in the U.S. and Puerto Rico Observation Checklists by wanding the barcodes affixed to the front page of the Observation Checklists. The Observation Checklist Universe File was created by the ATAC system when the Observation Checklist labels were generated by NPC.

UAT was conducted on the ATAC system for a small universe, 60 Observation Checklists (30 U.S. Initial forms, five U.S. Extra forms, 20 Puerto Rico Initial forms, and five Puerto Rico Extra forms). Changes were identified during the testing, which were implemented with very little additional testing needed. For the UAT, the test Observation Checklist Universe File was created when the labels were generated.

Keying Software

Person Followup Keying Software

The PFU Keying Software was used at NPC to conduct initial keying, verification keying, and classification of discrepancies between initial and verification keying data. Two versions of the software were developed, one for the U.S. forms and one for Puerto Rico forms.

Initial keying consisted of capturing data from the PFU questionnaire.

The same PFU questionnaire was then re-keyed during the verification step by a different keyer. The same procedures were used by the initial and verification keyers.

The software then compared the output from initial and verification keying and a classifier (usually a keying supervisor) determined which keyed data was used, or, in rare cases, rejected both outputs, which required a repeat of the complete process.

UAT and Beta testing was conducted on the PFU Keying Software. For the keying UAT, DSSD staff developed 45 cases (28 for U.S. and 17 for Puerto Rico) containing dummy data representing various scenarios. The NPC keyers conducted initial keying and verification keying on the test cases. Most of the issues identified during the UAT were corrected and retested prior to Beta testing.

Beta testing was conducted at Census Bureau Headquarters, where Beta testers had access to the keying software and keyed several of the cases that were used during the UAT.

Person Followup Reinterview Keying Software

The PFU Reinterview Keying Software was used at NPC to conduct initial keying, verification keying, and classification of discrepancies between initial and verification keying data. Two versions of the software were developed, one for English-language forms and one for Spanish-language forms.

Initial keying consisted of capturing data from the PFU RI form.

The same PFU RI form was then re-keyed during the verification step by a different keyer. The same procedures were used by the initial and verification keyers.

The software then compared the output from initial and verification keying and a classifier (usually a keying supervisor) determined which keyed data was used, or, in rare cases, rejected both outputs, which required a repeat of the complete process.

UAT and Beta testing was conducted on the PFU RI Keying Software. For the keying UAT, DSSD staff developed 50 cases (30 English-language and 20 Spanish-language) containing dummy data representing various scenarios. The NPC keyers conducted initial keying and verification keying on the test cases. Most of the issues identified during the UAT were corrected and retested prior to Beta testing.

Beta testing was conducted at Census Bureau Headquarters, where Beta testers had access to the keying software and keyed several of the cases that were used during the UAT.

Person Followup Observation Checklist Keying Software

The PFU Observation Checklist Keying Software was used at NPC to conduct initial keying, verification keying, and classification of discrepancies between initial and verification keying data. Two versions of the software were developed, one for stateside English-language questionnaires and one for Puerto Rico Spanish-language questionnaires.

Initial keying consisted of capturing data from the PFU Observation Checklist.

The same PFU Observation Checklist was then re-keyed during the verification step by a different keyer. The same procedures were used by the initial and verification keyers.

The software then compared the output from initial and verification keying and a classifier (usually a keying supervisor) determined which keyed data was used, or, in rare cases, rejected both outputs, which required a repeat of the complete process.

UAT and Beta testing was conducted on the PFU Observation Checklist Keying Software. For the keying UAT, DSSD staff developed 60 Observation Checklists (30 U.S. Initial forms, five U.S. Extra forms, 20 Puerto Rico Initial forms, and five Puerto Rico Extra forms) containing dummy data representing various scenarios. The NPC keyers conducted initial keying and verification keying on the test cases. Most of the issues identified during the UAT were corrected and retested prior to Beta testing.

Beta testing was conducted at Census Bureau Headquarters, where Beta testers had access to the keying software and keyed several of the cases that were used during the UAT.

Note: The keying of the PFU Questionnaire, PFU RI Form, and Observation Checklists underwent 100-percent independent verification and adjudication in NPC using their standard "QA Plan for the Visual Basic Data Entry Operation and Keying QA Procedures."

PFU Keying Output File Pickup Software

The PFU Keying Output File Pickup Software was capable of retrieving and delivering the daily output from the U.S. and Puerto Rico PFU keying operation, including case-level data, person-level data, and pair-level data for possible matches or duplicates. Nationwide and non-nationwide cases were not treated differently during keying.

A test deck containing various test scenarios was data captured. Its output was provided to Processing Systems development Branch (PSDB). PSDB used the test file to test Keying Output File Pickup. The test files were reviewed and verified by the CCM Person Followup Team to ensure that the system delivered the keyed data correctly. The software also went through beta testing.

Person Matching, Review, and Coding Software Testing

PerMaRCS was used at NPC by clerical matchers.

The primary PerMaRCS preprocessing functions are listed below. These functions were done at Census Bureau Headquarters by contract personnel.

- Accept and validate the data inputs listed below.
  - Census address and person data
  - PI data – case, housing unit, and person
  - Geocoding results
  - Computer matching results

    - Cluster control data
    - Sample design data
    - Cluster block and surrounding block data
- Recode data to enhance human readability and matching
- Determine best links from computer matching
- Set links based on computer matching
- Set duplicate referencing based on computer matching
- Create data for various search areas for clerical matching
- Set match codes on all PI and census person records
- Flag records requiring matching and coding
- Set up block clusters for matching by NPC technicians and analysts

The primary PerMaRCS online functions are listed below (this includes available user functionality and system processes undertaken based on the users' actions).

PerMaRCS User Functionality

- Selecting and checking out an appropriate block cluster for clerical review and/or matching
- Providing simple functions to lead a user through review and enhancement of geocodes for Person Interview (PI) inmover and alternate addresses prior to the commencement of matching
- Providing an integrated tool to search addresses in the Master Address File (MAF) that includes easy-to-use functions to add geocodes for inmover and alternate addresses
- Providing simple functions to lead a user through review and adjustment of PI Residence Status Codes prior to the commencement of matching
- Allowing users to view census forms online from a repository of census forms created by PerMaRCS after receiving files from the Decennial Response Integration System Allowing a user to update certain PI and census data fields
- Searching for matching records within specified search areas
- Linking and unlinking PI and census person records
- Creating PI and census duplicate references
- Match coding PI and census person records
- Entering notes
- Flagging cases for review or followup
- Checking PFU forms out from NPC
- Checking PFU forms back into NPC
- Allowing authorized users to force block clusters into Outlier Review
- Monitoring the proficiency of all PerMaRCS users

PerMaRCS System Functions

- Recording the history of matching for each block cluster, including which user performed each stage, the start and end dates and times, etc.
- Compiling all relevant data elements captured in the PI, and formatting the fields into an easily readable PI Report (including case notes, residency questions, inmover address questions, alternate address questions, group quarters questions, and other topics)

- Automatically resetting codes and links as appropriate when a user updates certain fields
- Closing out block clusters at each stage of matching (after confirming that all required processing has been completed)
- Sending block clusters through an Outlier Review process based on the automated calculation of an Outlier Priority
- Ensuring that all matching results adhere to quality standards

The primary management reports provided by PerMaRCS are listed below.

- A detailed report of the status of all block clusters in Before Followup (BFU) matching
- A summary report of the counts of all block clusters by stage in BFU matching
- A detailed report of the status of all block clusters and/or batch in After Followup (AFU) matching
- A summary report of the counts of all block clusters by stage in AFU matching
- A report of the history of matching for each block cluster and/or batch, showing the user who performed each stage of matching for each block cluster and/or batch
- A report of the production status of clerical matching, showing the flow of work through the various stages of matching
- A report of summary results from the Quality Control (QC) functions

The primary PerMaRCS non-preprocessing batch functions are listed below.

- Identify the PFU universe
- Create data outputs for PFU (for Docuprint, case management, and data capture)
- Create final results files when block clusters have completed all required stages

In addition to the base functionality described above, there is also a companion application that allows the clerical matchers to access and view images of census and CCM maps to support the clerical matching. This software includes functions for creating a repository of maps for the 2010 Census, and allowing users to view the maps online. The Map Viewing System (MVS) provides access to Census block cluster maps, CCM block cluster maps, and Census block maps for surrounding blocks. PerMaRCS includes easy-to-use functions for accessing a list of all maps available for a particular search area. The user is able to request any map from the list, and the map is displayed on the user's monitor. The map display software includes functions for panning, zooming, scrolling, rotating, and printing maps.

Alpha Testing and Regression Testing were both conducted on the PerMaRCS system and all related components according to the business, system and user requirements gathered by the Subject Matter Experts and software development team. Testing was conducted in increments of the pre-determined software phases (preprocessing, clerical geocoding, clerical residence status coding,

MVS, PI Report, Form Viewer, BFU, PFU processing, Checkin/Checkout, AFU, and results files) using both black box and white box methodologies[34]. Most of the testing techniques required tailored data sets created by the Development Team. Regression Testing was conducted to assure that no new issues were introduced into the system during incremental releases. Mercury Quality Center[35] was used for documenting and resolving issues during each release.

Once the Alpha Test Team[36] completed their testing cycle, all defects were accounted for and the software was released to Beta for additional testing before releasing to the user for production.

PerMaRCS users and other systems also participated in Integration Testing to ensure that the systems and interfaces worked together as a complete, integrated solution. This testing was designed to concentrate on typical scenarios, combining multiple features, and simulating typical use cases and multi-user scenarios.

Person Followup Docuprinting

Nightly, at the conclusion of the Person BFU Clerical Matching operation, PerMaRCS generated a set of data files including data from each block cluster that completed BFU that day with cases requiring followup. There were separate files for PFU case information, PI person data, PI address data, census person data, and census address data. These five file types contained all data necessary to customize each PFU questionnaire for each case and each person within the case that required followup. The data files were placed on a server that the Document Services Branch (DSB) could access. The data files were copied to the DSB system and coded for printing. The questionnaire for each case was then printed using a high-speed laser printer.

To test the docuprinting of the PFU questionnaires, files from the cases identified for followup during the testing of PerMaRCS were made available to DSB. The PFU questionnaires were printed and staff at Census Bureau headquarters reviewed Portable Document Format (pdf) files as well as printed questionnaires to make sure they were printed as specified. Any problems identified were corrected.

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[34] Commonly used software testing techniques; in white box testing there must be explicit knowledge of programming code. In black box testing, known as functional testing, there is no knowledge of inner workings, only inputs and expected outcomes.
[35] Mercury Quality Center is a software management tool used to manage application quality (requirements traceability) and conduct software testing (defect reporting).
[36] The Alpha Test team consists of both government employees and contractors managed by DSSD staff.