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MEMORANDUM FOR The Distribution List

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

Subject: 2010 Census Coverage Measurement Initial Housing Unit Independent Listing, Matching, and Followup Operations Assessment Report

Attached is the revised 2010 Census Coverage Measurement Initial Housing Unit Independent Listing, Matching, and Followup Operations Assessment Report. This report is being reissued due to revisions that were made to remove all references to weighted data, as well as any comparisons between U.S. data and Puerto Rico data. The Quality Process for the 2010 Census Test Evaluations, Experiments, and Assessments was applied to the methodology development and review process.

If you have questions or comments about this document, please contact Graciela Contreras at (301) 763-5284, Diane Cronkite at (301) 763-2537, Lora Rosenberger at (301) 763-3447, or Anne Wakim at (301) 763-4296.

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August 9, 2012

Assessment for the 2010 Census Coverage Measurement Initial Housing Unit Independent Listing, 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 results of the 2010 Census Coverage Measurement Initial Housing Unit Independent Listing, Matching, and Followup Operations. The results are from an operational standpoint and are not the final Census Coverage Measurement estimates of coverage. These Census Coverage Measurement Operations built the address list later used for the Census Coverage Measurement Person and Final Housing Unit operations and provided initial data for housing unit estimation. The 2010 Census Coverage Measurement survey operations were conducted in the survey sample areas in the United States, including Puerto Rico, but excluding Remote Alaska. The only living quarters in scope for the survey operations were housing units; that is, group quarters were excluded. There are four components to the Census Coverage Measurement Initial Housing Unit Independent Listing, Matching, and Followup Operations – Independent Listing, Initial Housing Unit Computer Matching, Initial Housing Unit Clerical Matching, and Initial Housing Unit Followup.

During Independent Listing, conducted in the United States and Puerto Rico in the fall of 2009, listers canvassed each block cluster assigned, which consists of one or more contiguous census blocks, and independently listed all housing units and units that could become housing units by Census Coverage Measurement Person Interview Day in August of 2010. Listers also map spotted each unit they listed and updated maps by adding and deleting streets on paper maps, when necessary. Once the listing was complete, Dependent Quality Control listers recanvassed a sample of addresses in each block cluster during the Dependent Quality Control operation to check the listers' work. The data collected were keyed at the National Processing Center in Indiana.

In September 2009, the Census Bureau launched an initiative to reduce nonsampling error in the Census Coverage Measurement program. In order to do so, the sample size for operations *after* the Independent Listing was decreased and resulting surplus funds from the reduced workload were put towards approaches to reduce the nonsampling error. Independent Listing was in the field at the time discussions about this initiative started, therefore no change was made to the Independent Listing sample.

As a result of the sample reduction, in addition to the pre-specified subsampling of small block clusters which occurred before Initial Housing Unit Computer Matching, the sample clusters were reduced from 12,364 to 6,416 block clusters. During Initial Housing Unit Computer Matching, the housing unit addresses in these 6,416 block clusters were computer matched against the housing units and group quarters addresses in the 2010 Census Universe Control and Management file within each remaining in-sample block cluster and one ring of surrounding blocks[1]. The results of computer matching were preprocessed with clerical matching software to assign initial match codes to the Census Coverage Measurement and census addresses. Addresses were assigned one of four initial/computer match codes: match, possible match, nonmatch, and duplicate.

[1] Surrounding blocks include all blocks that are in the first ring of census collection blocks surrounding a block cluster. (Blocks in the first ring share one or more geographic points with the block cluster.) Any land block completely enclosed by blocks that are in the first ring, is also considered to be a surrounding block.

During Initial Housing Unit Before Followup Clerical Matching, the National Processing Center matching staff used computer-assisted clerical matching techniques, along with Census Coverage Measurement and census maps, to attempt to match addresses presented to them after preprocessing[2] of the Initial Housing Unit Computer Matching results. In addition, the matching staff searched for possible duplicate addresses in the census or Census Coverage Measurement files. A technician first coded each case flagged for review and then a sample of the cases was reworked for quality control by the matching analysts (a higher level of matching staff). Analysts also worked more difficult cases referred to them by the technicians. Cases that remained unresolved were eligible for Initial Housing Unit Followup. The Initial Housing Unit Followup operation attempted to collect additional information to resolve discrepancies between the survey and census listings, and between census or survey possible duplicates. In Initial Housing Unit After Followup Clerical Matching, the matching staff reviewed the followup data to make several important decisions, including: determining if records were duplicated; determining whether or not the address was a housing unit at the time of Initial Housing Unit Followup; identifying addresses that were incorrectly geocoded; verifying possible matches; and identifying additional matches. The results of this operation were files containing the final Initial Housing Unit match codes for Census Coverage Measurement and census housing units in the sample block clusters.

All Census Coverage Measurement field operations were managed from the 12 Regional Census Centers. Overall the field and matching operations for the 2010 Census Coverage Measurement Initial Housing Unit Independent Listing, Matching, and Followup operations were on schedule, although some special arrangements had to be made to complete the translation of materials for Puerto Rico operations and finish the followup field work in Puerto Rico. These special arrangements did not negatively affect any later operations.

Independent Listing

The Independent Listing operation was estimated to cost $19,181,077. The actual cost of the operation was $15,161,406 that is, it was under budget by $4,019,671 (20.96 percent). Independent Listing Production was under budget by $4,545,247 (29.16 percent) and Independent Listing Dependent Quality Control was overspent by $525,576 (14.62 percent).

During Independent Listing production, 2.50 housing units were listed per production hour. For the Dependent Quality Control operation, the rate was higher at 2.90 housing units listed per hour. This was 1.46 more housing units per hour than expected (1.44 per hour). So, although the Dependent Quality Control operation was over budget on an operational cost level, the operation itself was more efficient than expected. The cost overruns were the result of higher than anticipated Quality Control workload.

For Independent Listing, the Field Division decided that there was a need for more Crew Leaders and Field Operations Supervisors and fewer interviewers and Quality Control Checkers than originally planned. This change was deemed cost neutral and therefore implemented for the

[2] The results of computer matching which had linked and non-linked addresses were preprocessed for clerical matching and assigned one of the four initial match codes – match, possible match, nonmatch, and duplicate.

operation. Therefore, for Independent Listing, the number of Production and Quality Control Field Operations Supervisors and Quality Control Crew Leaders trained was about twice the authorized amounts (215.56 percent, 192.00 percent, and 210.77 percent, respectively).

The total initial Independent Listing workload was 12,364 block clusters with an expected number of housing units to list of 960,041 housing units. The United States workload was 11,835 block clusters or 95.72 percent of the block clusters and 906,139 expected housing units or 94.39 percent of the expected number of housing units to list. The Puerto Rico workload was 529 block clusters or 4.28 percent of the block clusters and 53,902 expected housing units or 5.61 percent of the expected number of housing units.

The 12 Regional Census Centers and Puerto Rico received the 2010 Independent Listing workload on June 30, 2009 as a one-time delivery, about eight weeks before production started. Each Regional Census Center was instructed to complete the Independent Listing in three overlapping six-week waves. Regional Census Centers were given guidance to assign approximately 40 percent of the workload to the first two waves each and the remaining 20 percent of the workload to the third wave.

A total of 892,976 housing units were listed across the United States and Puerto Rico; 58,753 in Puerto Rico and 834,223 in the rest of the United States. Over half, 503,503 (56.38 percent), of these housing units listed were single family homes. We listed 342,008 (38.30 percent) individual multiunit/apartment units, 23,202 (2.60 percent) mobile homes not in a park, 23,544 (2.64 percent) mobile homes in a park and (less than one percent) other units (occupied camper, tent, van, boat, etc.). Only 1,335 (10.80 percent) of the listed block clusters changed from their expected size category.

While in 2010 Census Coverage Measurement we listed 892,976 housing units in 12,364 block clusters, in the 2000 Accuracy and Coverage Evaluation (the comparable survey to Census Coverage Measurement in Census 2000) we listed more than double that, a total of 2,039,488 housing units in 29,695 block clusters. The difference of listing approximately one million additional housing units in 2000 is that the initial plans for Census 2000 were to use the results of the coverage evaluation to adjust the census results. However, in January 1999 the Supreme Court made a declaration which changed the scope of the coverage measurement program and resulted in a sample reduction for all Accuracy and Coverage Evaluation Operations after the 2000 listing operation had already taken place (U.S. Census Bureau, 2004). Consequently, the initial 2010 Census Coverage Measurement sample size requirements were set to similar levels as the reduced 2000 sample size. The 2010 sample size was later further reduced when implementing non-sampling error reductions for 2010 Census Coverage Measurement.

Additional results from the 2010 Independent Listing operations follow. During the 2010 Independent Listing, listers were to ask the respondent at each single-unit house and mobile home or trailer not in a park with a unit status of *'occupied or vacant and intended for occupancy'* if there were any hidden housing units at the address. They were to ask, "At <*address*>, are there any basement or garage apartments, trailers, or other residences, even if no one is living there now?" An additional 4,350 potential units were listed by this question.

A total of 15,061 Independent Listing Books were used by the listers to list all the housing units in the nationwide sample. Over 70 percent of the block clusters needed only one Independent Listing Book to cover the workload.

A total of 551,820 basic street addresses were recorded in the United States. A basic street address is the house number and street name or road name portion of an address. A structure identifier was collected when two or more buildings shared the same basic street address in order to distinguish them from each other. The use of structure identifier was more prevalent in noncity-style areas. A total of 29,430 or 5.80 percent of the addresses in city-style areas and 7,802 or 17.54 percent of addresses in noncity-style areas had a structure identifier reported. As expected, the use of the house number and street name address features was more prevalent in city-style areas. A total of 493,575 or 97.29 percent of the United States addresses in city-style areas contained a house number and street name while only 33,140 or 74.51 percent of addresses in noncity-style areas had this address style.

Of the addresses with a unit status indicated by a lister for the United States and Puerto Rico, 863,242 or 96.73 percent had a unit status of "*Occupied or vacant and intended for occupancy.*" Future construction units are captured during Independent Listing to try to capture additional housing units that may exist on Census Day or by the time of the Census Coverage Measurement Person Interview takes place that would otherwise be missed. Future construction was indicated as the unit status of 10,756 housing units, accounting for 1.21 percent of units listed.

Overall, household members provided the information for 47.47 percent or 271,337 of the housing units listed, proxies provided the information for 29.26 percent or 167,252 housing units, and managers provided information for 6.48 percent or 37,024 housing units. At multiunits, listers were instructed to contact an apartment manager when available to get the housing unit information and if no manager was available, to contact as few household members as possible to gather the information for all units within the multiunit. For multiunits, 36.68 percent had information collected from managers, 34.03 percent had information collected from household members, and 18.74 percent had information collected from proxies.

Initial Housing Unit Computer Matching

Addresses from the Census Coverage Measurement Independent Listing and the census addresses from the Universe Control and Management file were linked in the Initial Housing Unit Computer Matching operation. However, only those addresses that could be standardized were eligible for computer matching.

Of all Census Coverage Measurement housing units within the United States (including Puerto Rico), there were 1,421 (0.27 percent) addresses that could not be standardized for computer matching.

As for the census housing unit addresses in the survey sample areas, the percent that could not be standardized was higher. There were 5,403 (1.05 percent) addresses that could not be standardized for computer matching.

The computer matching link results were processed by the Housing Unit Matching, Review, and Coding System to assign match codes to the Census Coverage Measurement and census addresses. The match codes indicate that the units are matches, possible matches, nonmatches, or duplicates. The addresses that could not be standardized were coded as nonmatches.

A summary of the processed computer matching results in the survey sample areas is given below. **Note: All counts are unweighted and presented for the United States (including Puerto Rico). Statements based on these unweighted data should be interpreted purely as an assessment of the Census Coverage Measurement operations. No statistical testing was done, nor any inferences to the general population are intended.**

Overall, of the 521,649 Census Coverage Measurement housing units, 62.82 percent are computer matches; 14.01 percent are possible matches; 22.90 percent are nonmatches; and 0.27 percent are duplicate housing units.

Of the 513,813 census housing units in the survey sample areas, 62.53 percent are computer matches; 13.10 percent are possible matches; 24.22 percent are nonmatches; and 0.15 percent are duplicates.

For this assessment, census housing units were tabulated by the number of duplicates found per address. The unweighted results for the U.S. (including Puerto Rico) show that of the 513,813 census housing units in the survey sample areas, 99.67 percent have no duplicates and 0.32 percent have one duplicate, after computer matching. The remaining addresses, with more than one duplicate, are 0.01 percent of all census housing units.

Initial Housing Unit Clerical Matching

A summary of the clerical matching results for the Census Coverage Measurement and census housing units is given below. All counts are unweighted[3] and presented for the United States (including Puerto Rico).

Clerical matching has two phases: Before Followup Clerical Matching was performed before the field Housing Unit Followup operation and After Followup Clerical Matching was performed after field followup. During Before Followup Clerical Matching, National Processing Center staff reviewed the match codes resulting from computer matching and recoded housing units as appropriate.

Clerical matchers could enter followup notes to be included as special questions on the Initial Housing Unit Followup forms. A total of 6,937 notes was entered for Census Coverage Measurement cases. There were only 107 notes entered for census cases sent to followup. (The large difference between the numbers of followup notes for Census Coverage Measurement addresses compared with census addresses is explained by the fact that followup notes for linked census and Census Coverage Measurement addresses were always entered and stored on the Census Coverage Measurement address record.)

[3] Refer to the bolded note given above.

During After Followup Clerical Matching, National Processing Center staff reviewed the information from field followup and recoded housing units as appropriate. Clerical matchers also identified possible duplicate housing units that were not confirmed during Initial Housing Unit Followup. These duplicates were later sent to Final Housing Unit Followup for confirmation; 20 were possible Census Coverage Measurement duplicate housing units and 436 were possible census duplicates.

A summary of the progression of resolving the Census Coverage Measurement and census addresses, from computer matching to Before Followup Clerical Matching to After Followup Clerical Matching, is provided in the table below. The percentages are based on unweighted[4] counts of the Census Coverage Measurement housing units and the census housing units in the survey sample areas. As shown, the clerical matching operations helped resolve many discrepancies between housing units in the two programs. In particular, the percent of matched census records increased substantially by nearly 30 percentage points, from 62.53 percent as a result of computer matching to 91.64 percent at the conclusion of After Followup Clerical Matching. However, only 4.98 percentage points were realized in the percent of matches[5] as a result of the Initial Housing Unit Followup and the use of those results in the After Followup Clerical Matching. On the other hand, given that a major goal of Census Coverage Measurement was to detect census duplicates, we observed the percent of duplicates among census records in the survey sample areas increased from 0.15 percent in computer matching to 0.34 percent in Before Followup Clerical Matching and up to 1.06 percent in After Followup Clerical Matching. Therefore, we need to consider these results in planning for 2020 Census Coverage Measurement operations.

Results of Computer and Clerical Matching for Census Coverage Measurement and Census Addresses – Unweighted Percentages

United States Results (including Puerto Rico)	Census Coverage Measurement			Census		
	Computer Matching	Clerical Matching		Computer Matching	Clerical Matching	
		Before Followup	After Followup		Before Followup	After Followup
Matches	62.82	87.10	92.16	62.53	86.66	91.64
Possible Matches	14.01	5.43	Not Applicable	13.10	5.34	Not Applicable
Nonmatches	22.90	7.38	4.49	24.22	7.66	3.94
Duplicates	0.27	0.09	0.09	0.15	0.34	1.06
Not a Housing Unit[6]	Not Applicable	0.00	3.25	Not Applicable	Not Applicable	3.35

We also tabulated unweighted counts of census housing units by the number of duplicates per address. Upon completion of Initial Housing Unit Clerical Matching, of the 513,813 census housing units in the survey sample areas within the U.S and Puerto Rico, 99.01 percent have no

[4] Refer to bolded note on page xvii.

[5] This does not include matches that were found for Census Coverage Measurement and census units that are classified as "not a housing unit."

[6] The classification "not a housing unit" was given to a very small number of Census Coverage Measurement units (those with erroneous map spot numbers) in Before Followup Clerical Matching. The classification "not a housing unit" did not apply to census units in Before Followup Clerical Matching. Recall that census group quarters from the Universe Control and Management file were excluded from this evaluation.

duplicates and 0.94 percent have one duplicate. The remaining census addresses, with more than one duplicate, account for 0.05 percent of all census housing units.

In addition to the tabulations by match code, we tabulated results by the housing unit status of the Census Coverage Measurement addresses and the enumeration status of the census addresses. Each Census Coverage Measurement unit from the Independent Listing was classified as either a housing unit, potential housing unit[7], not a housing unit, a duplicate, geocoding error or unresolved, based on the match code assigned to the unit at the end of After Followup Clerical Matching. Each census unit listed on the Universe Control and Management file as a housing unit within the Census Coverage Measurement sample block clusters was given an enumeration status of correct enumeration, erroneous enumeration, a duplicate, geocoding error, or unresolved, based on the match code assigned to the unit at the end of After Followup Clerical Matching. A unit was classified as unresolved if clerical matching could not confirm the unit's status as a housing unit or potential housing unit or could not confirm that it was located in the sample block cluster.

A summary of the housing unit status for Census Coverage Measurement and enumeration status for census addresses at the end of Initial Housing Unit operations is given below. The percent of census units classified as correct enumerations is very high, as was the percent of Census Coverage Measurement units classified as housing units. Both are over 95 percent.

Of the 521,649 Census Coverage Measurement addresses, 95.24 percent are housing units; 1.10 percent are not housing units; 0.09 percent are duplicates; 1.22 percent are geocoding errors; 2.14 percent are potential housing units; and 0.20 percent are unresolved housing units.

Of the 513,813 census addresses in the survey sample areas, 95.24 percent are correct enumerations; 3.30 percent are erroneous enumerations; 1.06 percent are duplicates; 0.05 percent are geocoding errors; and 0.34 percent are unresolved enumerations.

In addition to the census duplicates located in the sample areas, a relatively large number of census duplicates were found in the surrounding blocks to the sample areas. Upon completion of Initial Housing Unit Clerical Matching, an unweighted total of 2,221census duplicates were in the surrounding blocks compared to 5,472 census duplicates in the sample areas.

Initial Housing Unit Followup

The Initial Housing Unit Followup was estimated to cost $20,688,471. The actual cost of the operation was significantly under budget by $11,826,857 (57.17 percent), costing only $8,861,614. The Initial Housing Unit Followup and quality control operations were under budget by $4,689,114 (47.50 percent) and $7,137,743 (65.98 percent), respectively. These figures do require some context because of workload uncertainty prior to matching. The Decennial Statistical Studies Division workload estimate prior to matching was 222,690, the final Initial Housing Unit Followup workload was 125,192. Budget estimates were based on the Decennial Statistical Studies Division workload estimate which was ultimately 43.78 percent less

[7] A potential Census Coverage Measurement housing unit is a unit/location that could become a housing unit by Census Coverage Measurement Person Interview day, for example under construction or future construction.

than the actual workload. For this reason it is helpful to focus on the cost per case estimate compared to actual cost per case. An Initial Housing Unit Followup case was expected to cost $44.33 per case and actually cost $41.39 which is a 6.33 percent difference.

During Initial Housing Unit Followup, 0.74 cases were completed per hour and 0.41 cases for the quality control operation. Both of these rates were very close to the expected rates.

For Initial Housing Unit Followup, the sample reduction had already been implemented as well as small block cluster subsampling, therefore the workload included only the 6,416 block clusters that remained in sample. Consequently, the ratio of trained staff to authorized staff for Initial Housing Unit Followup was only 68.15 percent. Less than half, 39.07 percent of the authorized Crew Leader Assistants were trained for Initial Housing Unit Followup and production Crew Leaders were increased by a third (130.74 percent).

Of the 6,416 block clusters, only 4,932 block clusters required Initial Housing Unit Followup. The total workload of 125,192 cases was delivered to the 12 Regional Census Centers and Puerto Rico on a flow basis starting on February 23, 2010 as block clusters completed Before Followup Clerical Matching. The workload for Initial Housing Unit Followup was determined from the Initial Housing Unit Matching activities.

There was a lower percentage of followup block clusters in the United States city-style block clusters, 74.22 percent (or 3,975 block clusters), than in the United States noncity-style block clusters, 89.27 percent (or 707 block clusters).

Puerto Rico had 35,800, or 20.15 percent, of all addresses requiring followup. This may be related to the difficulty of matching Puerto Rico addresses.

Each Initial Housing Unit Followup case form could contain one or more addresses to be followed up. Of the 177,630 addresses requiring Initial Housing Unit Followup, 86,260 or 48.56 percent were Census Coverage Measurement addresses; 78,448 , or 44.16 percent, were census addresses in the block clusters; 252 or 0.14 percent were census group quarters in the block clusters; and 12,670 or 7.13 percent were census housing units in surrounding blocks.

Counting both Census Coverage Measurement and census housing units, a total of 46,652 addresses were updated during clerical matching. As expected, most of the address corrections happened during After Followup Clerical Matching (89.13 percent or 41,581 addresses were corrected in After Followup Clerical Matching) because Initial Housing Unit Followup interviewers had indicated the address corrections on the Initial Housing Unit Followup Forms. There were 23.12 percent (10,788) of the addresses corrected in Puerto Rico, and the rest, 76.88 percent (35,864) of address corrections were in the United States. Note that these address changes/updates were only made in the clerical matching software. No changes were made to any official census data.

There were a total of 39 followup form types available that contained questions tailored to resolve the specific discrepancy in the address list. Overall, most (93.66 percent) of the followup cases required one of five major form types. The Census Coverage Measurement Nonmatched

Address Form accounted for 38,489 cases or 30.74 percent of all followup forms; 30.60 percent of the cases required the Census Nonmatched Address Form; 20.12 percent required the Possible Census Coverage Measurement-Census Match Form; 7.06 percent required the Surrounding Block Match Form; and 5.14 percent required the Unit Status Update Form.

Recommendations

Independent Listing

Based on information from interviewer debriefings and Headquarters observations, the collection of respondent name and phone number in the 2010 Independent Listing Operation made the respondents reluctant to respond. Therefore, unless it were to be used as a matching variable if both census and Census Coverage Measurement collected this information in 2020, we need to consider deleting this requirement for Census Coverage Measurement in the future.

The Independent Listing Books proved to be very bulky and cumbersome. The program should investigate a smaller, notebook-size listing page or an automated instrument. All the processing, editing, and keying of the Independent Listing Books could be eliminated if Independent Listing was automated. An automated instrument could also eliminate or reduce missing data and eliminate the requirement to key data.

As Census Coverage Measurement staff had to report to Census Bureau Executive Staff by the three waves of data collection, it is recommended that if waves are used in future Census Coverage Measurement operations, then they should be part of the automated tracking system and should be defined in future software requirements.

Initial Housing Unit Computer Matching

In the future, for those addresses that fail standardization for computer matching, consider looking at the location description fields. A lister may have entered a house number and street name in the location description fields. Using those fields may give us another chance for a match or possible match outcome.

Initial Housing Unit Clerical Matching

If we have an automated listing instrument in the future, we should consider moving matching and followup operations closer to the listing operation. That is, as soon as a block cluster clears listing, match it, and get it back out to followup (or wait for followup until Census Day if that is needed for estimation purposes).

We should consider a new approach for clerical matching that puts more reliance on decisions made by the automated matching system instead of the clerical matchers. For example, ask the clerical matchers questions like “Are the linked addresses housing units or group quarters?”, “What’s the housing unit status of the linked addresses?”, “What block are the linked addresses located in?” and design the system to use this information to assign the appropriate match, duplicate, or housing unit status code.

Initial Housing Unit Followup

In the future, we should plan to have more of the workload available at the start of the followup operation. This will require a larger schedule gap between the start of the Before Followup Clerical Matching Operation and the Initial Housing Unit Followup Operation.

During Initial Housing Unit Followup Quality Control we may want to reconsider street-type errors as critical errors. This could increase the quality control error rate, but when streets are very close and have similar names, minor changes could cause significant error.

Paper maps proved difficult to use. Future discussions are encouraged to solicit ideas for making the various types of maps more manageable in size and number and more recognizable from one another. However, if the questionnaire were to be automated, the maps should also be automated, hopefully resolving this concern.

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) Initial Housing Unit (IHU) operations and provide information on how well the staff implemented the 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 IHU operations and impacts to the 2010 CCM Survey.

This assessment documents final volumes/rates and lessons learned for all aspects of the IHU Operations, including field work data collection and processing (keying questionnaires and scanning maps at the National Processing Center (NPC)), Computer Matching, Clerical Matching at the NPC, Cost and Progress (C&P) Reporting, and the software used for IHU operations, including Coverage Measurement Operations Control System (CMOCS), IHU Data Output, and the Housing Unit Matching, Review, and Coding System (HUMaRCS).

1.2 Intended Audience

This document is intended to be a review of the 2010 CCM IHU operations and should be used by anyone wanting to know about the 2010 IHU operations successes and issues. The program managers and staff responsible for planning the 2020 CCM should use this assessment for guidance on operational development for the 2020 IHU operations.

2. BACKGROUND

The purpose of the 2010 CCM program is to evaluate coverage error in the 2010 Census in order to improve future censuses, meaning 2020 and beyond. The CCM is designed to measure the coverage of housing units and persons in the United States (U.S.) and Puerto Rico, excluding Remote Alaska; and also excluding group quarters (GQs) and persons residing in GQs. The CCM provides estimates of the net coverage error and the components of coverage error, including omissions and erroneous enumerations. Since the CCM is an evaluation, its results will not affect the 2010 Census.

The 2010 CCM is a large, complex survey conducted independently of the census. The CCM includes 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. population as of April 1, 2010. There are seven separate operation and system plans that describe the entire CCM process:

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

The CCM IHU Operations built the address list for further CCM operations and provided data for housing unit estimation. There are four components to the CCM IHU Operations – Independent Listing (IL), IHU Computer Matching, IHU Clerical Matching, and Initial Housing Unit Followup (IHUFU).

During IL, scheduled from August 28, 2009 to December 12, 2009 and conducted in the United States and Puerto Rico, listers canvassed each block cluster assigned, and independently listed in paper Independent Listing Books (ILBs) all housing units and units that could become housing units by the time of the CCM Person Interview (PI) scheduled from August 14, 2010 to October 16, 2010. Listers also map spotted each unit they listed and updated CCM maps by adding and deleting streets on paper maps. Once the listing was complete, Dependent Quality Control (DQC) listers recanvassed a sample of addresses in each block cluster during the DQC operation to check the listers' work. If the block cluster failed the DQC, it was completely reworked. The ILBs and maps also had office edits and Crew Leader (CL) edits conducted before they were sent to the NPC for keying and scanning.

During IHU Computer Matching, conducted by the Decennial Statistical Studies Division (DSSD), the file of housing unit addresses listed by CCM was computer matched against the list of housing units and GQ addresses in the 2010 Census Universe Control and Management (UC&M) file within each sample block cluster and one ring of surrounding blocks. The results of computer matching were preprocessed with clerical matching software to assign initial match codes to the CCM and census addresses. Addresses were assigned one of four initial/computer match codes during computer matching: match, possible match, nonmatch, and duplicate. Also,

under the auspices of computer matching, the Geography Division (GEO) identified the blocks surrounding all block clusters and delivered those to the various areas that needed them for later processing.

During CCM IHU Before Followup (BFU) Clerical Matching, the NPC matching staff used computer-assisted clerical matching techniques, along with CCM and census maps, to attempt to match addresses presented to them from the IHU Computer Matching. In addition, the NPC matching staff also searched for duplicate addresses in the census or CCM files. Cases that remained unresolved following this operation were eligible for IHUFU. In CCM IHU After Followup (AFU) Clerical Matching, the NPC matching staff used the results of the IHUFU (using the completed paper questionnaires) to attempt to code addresses needing additional information. The result of this operation was files containing match codes for CCM and census housing units in the sample block clusters. The computer-assisted clerical matching used the HUMaRCS computer-assisted software.

During CCM IHUFU, interviewers collected additional information for addresses unresolved after the IHU Computer and BFU Clerical Matching operations. The CCM IHUFU operation attempted to collect additional information that might allow a resolution of match codes for any differences between the IL results and the Census UC&M file and also to resolve potential duplicates. The IHUFU data collection forms were created via Docuprint technology. The questions included for each followup case varied depending upon the reason the case was being sent to followup.

2.1 CCM Sampling

The CCM primary sampling unit is a block cluster, which consists of one or more geographically contiguous census blocks. Block clusters were formed to balance statistical and operational efficiencies. A stratified sample of block clusters was selected for each state or state equivalent. An independent address list was created for each CCM sample block cluster. This was expected to result in listing approximately one million addresses for the U.S. and Puerto Rico. A double-sampling design was used for small block clusters. This entailed selecting a larger sample of small block clusters for which an independent address list was created, and then later selecting a subsample of these block clusters to remain in sample based on additional information. After a confirmed set of potential housing units was determined through the IHU Matching and Followup, the P-sample housing units were identified. In block clusters with a large number of housing units, a subsample of contiguous housing units was selected for the P sample. This achieved manageable field workloads for the CCM PI and Person Followup (PFU) without having a big impact on reliability.

The source of the E-sample housing units was the Census Unedited File. In block clusters with a large number of census units, a subsample of contiguous census housing units was selected, attempting to geographically overlap the P and E samples.

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

In September 2009, we 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 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 the two relatively small race 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.

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

Higher field work Quality Control (QC) rates for IHUFU – By increasing the QC rate, a higher quality product can be expected. Initially the sample size for QC was approximately 10.0 percent of all sample case forms over all block clusters, with an average outgoing quality limit (AOQL) of 6.7 percent on a case form basis. The revised plan had a sample size for QC of approximately 15.9 percent of all sample case forms over all block clusters, with an expected AOQL of 4.0 percent on a case form basis.

From the results in the IHUFU Quality Profile, the calculated incoming sample error rate estimates that 8.83 percent of the total followup cases contained one or more critical errors before the QC check with a 90 percent confidence interval (8.58 percent, 9.09 percent). The calculated outgoing error rate estimates that 0.28 percent of the total followup cases remained in error after the QC Check and rectification with a 90 percent confidence interval (0.18 percent, 0.38 percent). This estimated outgoing error rate is well below the desired AOQL of 4.0 percent (Cecchi, 2011).

Extra Observations for IHUFU Interviewers – An extra observation was to be conducted on each interviewer approximately two weeks after the Initial Observation. Initial Observations were a continuation of training, rather than a test of the interviewer's ability. The CLs or Crew Leader Assistants (CLAs) observed each interviewer perform all or part of the interviewing of a block cluster to ensure interviewers (both production and QC) knew how to complete the IHUFU cases correctly and provide individual feedback to interviewers to correct erroneous actions and continue correct actions.

Operationally, implementing the extra observations did not work well, because most regions ran out of work before they could get the extra observation done. This was probably due to the smaller workload and short duration of IHUFU.

Higher clerical matching review rates and analyst spot checks for IHU Matching – This increased the review rates of technicians' work by the analysts for clerical matching operations and added a review of the work of the less experienced analysts to ensure higher quality data. The initial plan included a Sample Dependent Verification of technician's work, where an analyst would rework the address records in one of six block clusters (revised to one of four block clusters) making up a batch having an AOQL of approximately 4.0 percent (revised to 3.5 percent) on an address record basis for each of the IHU Clerical Matching operations. In actual production, the batching included three clusters instead of four (per DSSD manager's decision) and analysts reworked one of three block clusters to ensure even better quality.

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

It is difficult to measure if this actually helped improve quality, but based on feedback from regional managers, 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 difficult.

Paired interviewers for the IHUFU operation – IHUFU was a difficult task for the interviewers. Although there was a questionnaire with scripted interactions with the respondents, there was a large amount of spatial work to be done in reconciling the two lists of addresses (CCM and census) using the pairs of maps. In addition, locating units could have been difficult since the interviewers were often following up on difficult units. The paired interviewers worked together in locating units and reconciling the addresses with the spatial data. This was used optionally, especially in unsafe areas and on tribal areas. When used, regional managers seemed to think it was beneficial.

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

2.3 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 could be compromised. Also, CCM staff cannot work for CCM in areas where they

had previously worked in other similar census operations. For example, a lister in IL could not work in the same block cluster they worked during Census Address Canvassing.

All Regional Census Center (RCC) CCM staff had access to CCM sample information. However, once they had access to the sample information, 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. Please see Monaghan, 2008 for more information on the independence rules. The rules listed in this memorandum also include 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 lister could not work IL and IL DQC in the same area.)

2.4 2010 Census Cycle Testing

2.4.1 2006 Census Test for Coverage Measurement

CCM operations were not part of the 2004 or 2005 Census Tests. Testing for CCM began in the 2006 Census Test and continued with the 2008 Dress Rehearsal; however the amount of testing was limited. The sole purpose of coverage measurement in 2006 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 survey for the 2006 Census Test was not designed to evaluate the coverage of the 2006 Census Test.

2.4.2 2008 Census Dress Rehearsal Census Coverage Measurement Independent Listing

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 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 (FDCA) 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 CCM PI and Reinterview automated data collection instruments (see Angueira 2008). The only CCM operations included in the 2008 testing 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.

2.4.3 2008 Census Coverage Measurement Initial Housing Unit Computer and Before Followup Clerical Matching

The CCM IHU Computer and BFU Clerical Matching operations were also tested for the first time in the 2010 Census life cycle as part of the 2008 Census Dress Rehearsal during the spring of 2008. During CCM IHU Computer Matching, the keyed file of housing unit addresses developed during CCM IL was computer matched against the Dress Rehearsal UC&M file of census housing unit addresses within each sample block cluster and one ring of surrounding blocks. Addresses were assigned one of three possible outcome codes during computer matching: matched, possibly matched, and not matched.

During CCM IHU BFU Clerical Matching, the NPC matching staff used computer-assisted clerical matching techniques, along with CCM and census maps, to attempt to match addresses presented to them from the IHU Computer Matching. In addition, the NPC matching staff also searched for duplicate addresses. Cases that remained unresolved following this operation were eligible for IHUFU. The computer-assisted clerical matching used the HUMaRCS. It should be noted that due to budgetary constraints, matching staff for the Dress Rehearsal only consisted of analysts, rather than technicians and analysts as was previously designed and implemented for the 2010 Census.

2.4.4 2008 Census Coverage Measurement Initial Housing Unit Followup and After Followup Matching Mini-Operational Test

The IHUFU operation had not been previously tested in the 2010 Census lifecycle. The CCM Housing Unit data collection and matching activities for the 2010 Census was to be conducted in the 2008 Census Dress Rehearsal, but since this was also descoped from Dress Rehearsal, DSSD sponsored a reduced-scope field test for IHUFU instead. This mini-IHUFU test was conducted to assess the appropriateness of the questionnaire changes from 2000 and to determine if any additional changes were required for the 2010 Census IHUFU questionnaire or for the 2010 IHUFU interviewer training and procedures.

The mini-IHUFU field test was conducted from June 9, 2008 through June 20, 2008 in the Dress Rehearsal sites: San Joaquin County, California, and South Central North Carolina. In North Carolina, eight interviewers completed 29 block clusters and partially completed two block clusters. In California, seven interviewers completed 29 block clusters and partially completed two block clusters. Due to time constraints, only 15 of the 29 completed block clusters in North Carolina and 19 of the 29 completed block clusters in California underwent QC. The block clusters selected for the mini-IHUFU operational test were block clusters that would have gone for IHUFU had the operation occurred. However, the block clusters containing the following types of housing units were targeted for this test as they contained cases for which the most changes had been done to the questionnaire since 2000:

- Possible GQs
- Two duplicate addresses (CCM and/or census)
- Possible matches
- Analyst special question
- Matches to a surrounding block requiring confirmation

CCM Regional Managers traveled to Headquarters and the NPC to train Headquarters and the NPC staff to be interviewers for the mini-IHUFU and QC operations. Support staff or employees unfamiliar with the IHUFU operation were recruited to be interviewers. A qualitative interviewer, that is, someone familiar with the IHUFU questionnaire and the goals of the operation, including staff from DSSD, Decennial Management Division (DMD), and Field Division (FLD), accompanied each interviewer. The qualitative interviewers observed the operations, reported on what went well, and identified any areas of concern with the instrument, training, or materials. In addition, interviewers conducted QC of other interviewer's work to test changes incorporated for the IHUFU QC since 2000. The changes included a modification to the QC sampling so every block cluster was quality checked, and the QC interviewer had to make a determination on whether a block cluster passed or failed QC.

Note that although the test followed essentially interviewer field operations as planned for the canceled Dress Rehearsal (and 2010) IHUFU, we did not have the field data collection control systems in place. Therefore, no field test of these control systems was undertaken. Neither was the work of other field staff (CLs, CLAs, etc.) reviewed. Following the completion of the field test, the completed forms were keyed into a spreadsheet and scanned at the NPC for analysis. In addition, the forms were used to conduct a mini-operational test of the IHU AFU Clerical Matching Operation in July 2008. In the CCM IHU AFU Clerical Matching, the NPC matching staff used the results of the IHUFU (using the completed paper questionnaires) to attempt to match unresolved addresses. The result of this operation was a file containing match codes for CCM and census housing units in the sample block clusters. For more information on the findings of the IHUFU mini-operation test, see Donnalley, 2008a.

Please see Appendix C for information on the Software and Systems used during IL, IHU clerical matching, and IHUFU.

3. METHODOLOGY

3.1 Questions to be answered

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

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 (MAS) were used to assess how the IHU operations actual dates compared to planned dates.

3.1.2 Costs – Were the field operations over or under budget?

The C&P system was used to assess how the actual field operational costs compared to the budgeted costs.

3.1.3 What was the single unit of work production rate (either housing units listed or followup cases completed per hour)?

C&P data were used to analyze the effort required to complete a single unit of work (either a housing unit listed or followup case completed) 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.

Independent Listing

3.1.5 What was the Independent Listing initial workload?

Using information from the CCM National Sample Block Cluster Data File, we present the block clusters, collection blocks, and expected housing unit workloads for Independent Listing.

3.1.6 How was the Independent Listing workload distributed?

Using information from the cover page of ILBs which showed when a case was assigned and completed, we will look at the distribution of when block clusters were completed and the duration of time to complete.

3.1.7 What was the total number of block clusters listed, by number of units listed in each block cluster and number of expected units per block cluster?

The CCM sample was selected based on an expected housing unit size for each block cluster. Using data from the IL Verified Data File and the CCM Sample Design file (version 3) we show how the actual listing of housing units compared to the expected housing unit count.

3.1.8 How many total units, multiunits, and mobile home parks were listed in each block cluster?

The CCM Verified Data File was used to show how many of each type of housing unit were collected in the CCM block clusters.

3.1.9 How many housing units and block clusters were listed in the 2010 Census and Census 2000?

Data from the 2010 CCM IL Verified Data File and the 2000 A.C.E. Sample Design File Version 5 were used to compare the 2000 and 2010 IL Operation results.

3.1.10 What were the responses to the Independent Listing coverage question?

CCM attempts to collect hidden housing units by asking a respondent at each housing unit, "At <address>, are there any basement or garage apartments, trailers, or other residences, even if no one is living there now?" Using the responses to this question from the IL Verified File, we present the number of potential additional addresses collected by CCM.

3.1.11 For U.S. addresses, how often was the structure identifier used, how many addresses were listed with a house number/street name, and how many were listed without a house number/street name?

The intent of the IL Operation was to collect as much address information as available for a housing unit to enable an interviewer to return to that housing unit during the PI operation. Some addresses, especially in rural areas, do not have typical house number and street number address structure. The structure identifier was added as an address component for the 2010 CCM to help distinguish between two housing units sharing the same address. The 2010 CCM IL Verified File was used to show the number of addresses that had structure identifier completed and the number of housing units with and without house number and street name.

3.1.12 How often was each of the Puerto Rico specific address fields used?

Puerto Rico addresses have additional features compared to U.S. addresses. This question will look at the Puerto Rico address components collected to determine how well CCM collected complete addresses in Puerto Rico.

3.1.13 How many block maps were multi-sheeted?

Listers were given block maps to map spot each housing unit within a block cluster. Due to size of some areas, these maps had to be multi-sheeted, being burdensome to interviewers. We present the number of times maps were multi-sheeted.

3.1.14 How many maps were scanned, by type of map (block map, index sheet, sketch map, etc.)?

After the IL operation, maps were scanned at the NPC. This question presents how many block maps, index maps, and sketch maps were scanned.

3.1.15 How many Independent Listing Books were used?

Data from the 2010 CCM IL Verified Data File were analyzed to show the distribution of number of listing books needed to list each block cluster.

3.1.16 What was the housing unit status distribution?

Listers were required to indicate one of eight possible unit statuses at each housing unit listed. The unit statuses were:

1 – Occupied or vacant and intended for occupancy
2 – Under Construction
3 – Future Construction
4 – Unfit for habitation
5 – Boarded up
6 – Storage of household goods
7 – Empty trailer lot/site
8 – Other

We show the distribution of unit status for the housing units listed.

3.1.17 What was the respondent type distribution?

For each housing unit listed, listers were required to indicate if they received the housing unit information from a household member, proxy, manager, or by observation. We present the distribution.

3.1.18 What is the distribution of the block clusters with zero housing units?

Some block clusters contain more than one block. We present the number of single-block clusters that had zero housing units listed, as well as the number of blocks within multiple-block clusters that had zero housing units listed.

3.1.19 Initial Housing Unit Computer Matching

Data from the following file were used to analyze all IHU Computer Matching questions: 2010 CCM Sample Design File (Version 3). This file contained one record for each block cluster in the original CCM sample which reflects the sampling results through the selection of the PI sample housing units after the sample reduction. Record count: 12,364

We indicate for each question below what other information was used.

(a) How many units were computer matched, possibly matched, or remained nonmatched between the Census Coverage Measurement Independent Listing and the Universe Control and Management[8] file?
How many duplicates did the computer find within the Census Coverage Measurement Independent Listing, within block cluster?
How many duplicates did the computer find within the Universe Control and Management file?

Data from the following files were used to analyze these questions: 2010 HUMaRCS database tables – IL Address, Census Address, IL Coding History, and Census Coding History.

The results are given by type of structure for both CCM and census for matches, possible matches, nonmatches, and duplicates.

(b) What is the distribution of duplicates found by computer matching per Census address?

Data from the following files were used to analyze this question: 2010 HUMaRCS database tables – Census Address and Census Coding History.

The results are given for census duplicates by total, none, one, two, or three or more duplicates.

(c) How many addresses could not be standardized for computer matching?

Data from the following files were used to analyze this question: 2010 HUMaRCS database tables – Cluster Control, IL Address, and Census Address, and 2010 CCM and Census Files sent to the computer matcher.

The results are given by type of structure for both CCM and census.

[8] CCM IHU Matching uses the Census UC&M file as it stands at the time of computer matching. This document will refer to the extract of the file as the "UC&M."

3.1.20 Initial Housing Unit Clerical Matching

Data from the following file were used to analyze all IHU Clerical Matching questions: 2010 CCM Sample Design File (Version 3). This file contained one record for each block cluster in the original CCM sample which reflects the sampling results through the selection of the PI sample housing units after the sample reduction. Record count: 12,364

We indicate for each question below what other information was used.

(a) How many units were clerically matched, possibly matched, or remained nonmatched between the Census Coverage Measurement Independent Listing and the Universe Control and Management file?
How many duplicates did the clerical matchers find within the Census Coverage Measurement Independent Listing, within block cluster?
How many duplicates did the clerical matchers find within the Universe Control and Management file, by whether the duplicate is located within the block cluster or the surrounding blocks?

Data from the following files were used to analyze these questions: 2010 HUMaRCS database tables – IL Address, Census Address, IL Coding History, and Census Coding History.

The BFU and AFU results are given by type of structure for both CCM and census for matches, nonmatches, duplicates, and not a housing unit. BFU results are also given for possible matches.

(b) What is the distribution of duplicates found per census address?

Data from the following file were used to analyze this question: 2010 HUMaRCS database tables – Census Address.

The results are given for census duplicates by total, none, one, two, or three or more duplicates.

(c) What is the housing unit status assigned for each unit (e.g., housing unit, potential housing unit, erroneous enumeration, duplicate, geocoding error, unresolved)?

Data from the following files were used to analyze this question: 2010 HUMaRCS database tables – IL Address and Census Address.

The results are given by type of structure for both CCM and census for housing units, potential housing units, not a housing unit, geocoding errors, unresolved housing units, and duplicates.

(d) How many block clusters skipped Before Followup Clerical Matching, by size of block cluster?

Data from the following files were used to analyze this question: 2010 HUMaRCS database tables – Cluster Control and Cluster Stage.

The results are given by block cluster size for the number of block clusters that skipped BFU Clerical Matching and went to IHUFU or skipped BFU Clerical Matching and went to AFU Clerical Matching.

(e) How many block clusters skipped all matching, by size of block cluster?

Data from the following files were used to analyze this question: 2010 HUMaRCS database tables – Cluster Control and Cluster Stage.

The results are given by block cluster size for the number of block clusters that skipped all matching.

(f) How many followup notes did clerical matchers enter?

Data from the following files were used to analyze this question: 2010 HUMaRCS database tables – Cluster Control and Followup note.

The results are given for both CCM and census.

(g) How many block clusters went to outlier review?

Data from the following files were used to analyze this question: 2010 HUMaRCS database tables – Cluster Control and Cluster Stage.

The results are given by counts of block clusters that went to outlier review.

(h) How many duplicates were found in After Followup Clerical Matching that need to be reviewed in final housing unit operations?

Data from the following files were used to analyze this question: 2010 HUMaRCS database tables – IL address and Census.

The results are given for both CCM and census.

Initial Housing Unit Followup

3.1.21 How was the Initial Housing Unit Followup workload distributed?

Using information from the HUMaRCS block cluster control file on when cases were checked out and checked in at the NPC, we will look at the distribution of when block clusters were completed and the duration of time to complete.

3.1.22 How many block clusters and units were sent to Initial Housing Unit Followup?

Block clusters and addresses needing followup were determined in BFU Clerical Matching. Using data from the HUMaRCS cluster control and IHUFU forms list history table, we will provide the counts and distributions of block clusters and addresses that went to followup.

3.1.23 How many units required an address correction during Initial Housing Unit Clerical Matching?

Using data from the IL Address and Census Address Tables, we will provide addresses that required updates in either BFU or AFU Matching.

3.1.24 How many Initial Housing Unit Followup case forms were created?

Addresses requiring followup were sent to followup on one of 39 forms containing questions tailored to resolve the discrepancies in the address list. Using data from the IHUFU forms list history table, we present the distribution of cases by type of followup form.

3.2 Methods

The assessment questions listed in Section 3.1 were answered by gathering and/or tallying information from the IHU operations production files, C&P reports, Decennial MAS data, Staffing tallies, Lessons Learned, and debriefings. All results are based on unweighted data and should be interpreted solely as an assessment of the CCM operations. No weighted data are included in this report. No statistical testing was done, nor any inferences to the general population are intended. The results from the CCM matching operations do not represent the final CCM estimates of coverage.

The data are presented as totals and shown by Stateside and Puerto Rico. Some Stateside statistics are also shown by RCC totals. When appropriate, results are presented by type of structure (single unit, multiunit, trailers within and outside of a park, other); Address Type Cluster Group Recode; size of structure; stage of clerical matching (BFU and AFU); whether IHUFU was needed or not for a unit; and CCM units compared with census units. The address type cluster group recode consists of either city-style addresses or noncity-style addresses. A U.S. block cluster was coded as noncity-style where at least one collection block (1) is contained within a remote update/enumerate type of enumeration area (TEA), (2) contains rural route addresses, (3) contains location descriptions and incomplete records, (4) comes from mixed address areas with some delivery sequence file (DSF)[9] coverage, (5) is 100 percent city-style but with no DSF coverage, (6) and/or contains business addresses with no DSF coverage (Whitford, 2009a). The remaining U.S. block clusters were coded as city-style. All Puerto Rico block clusters were coded as noncity-style. A summary of the data used is provided in this section.

[9] The DSF is a computerized file containing all delivery point addresses serviced by the United States Postal Service (Cross Country Computer, 2002).

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

C&P data were pulled from different systems at different times. 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 the 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 Sections 3.2.1.1 and 3.2.4.1.

The Decennial MAS data were used to compare actual start dates to planned dates.
Since IL and IHUFU were both paper-based operations, automation implementation dealt with the systems used to track and process the questionnaires. Details on these systems are provided in Appendix C.

3.2.1 Independent Listing

The IL summary statistics presented in this report to answer the IL assessment questions are based on the analysis of IL C&P Reports and four IL production files: the 2010 CCM IL Verified Data File, the 2010 CCM Sample Design File (version 3), 2010 CCM National Sample Block Cluster Data File, and the A.C.E. Sample Design File (version 5). Each table in the Results Section, Section 5, has a data source listed in a footnote.

3.2.1.1 Independent Listing Cost and Progress Reports

CCM IL had fourteen reports and two graphs within the C&P system. The following reports were used to answer questions in this assessment:

- *Preliminary Total Cost*
- *Current Employee Cost – Training*
- *Current Employee Cost – Field Work*

3.2.1.2 The 2010 Census Coverage Measurement Independent Listing Verified Data File

After receiving the completed ILBs, the NPC keyed and verified the data for each form. Each of the 12,364 block clusters had at least one ILB. There were a total of 15,061 ILBs keyed and

verified. The data were then sent to Headquarters for editing and processing for IHU Computer Matching. This file contains one record for each ILB record keyed; the record passed the specified edits from the Cover Page, Basic Street Address (BSA)[10] in Section 4, Multiunit records from Section 5, and mobile home addresses listed in Section 6. During the analysis of the data, a few unexpected results were found. We list below how these were handled for production and assessment purposes:

- There were 38 blocks (from 30 block clusters) that did not have a keyed record from the ILB. We reviewed each of the block maps to see if any of these did contain any housing units or the note, "No Living Quarters." Thirty-five of these blocks did not contain any housing units, thus the ILBs contained no living quarters. The remaining three blocks did contain housing units (as seen on the block maps) and were sent out on followup forms during IHUFU as census-only units, to verify the existence of the housing unit.

- The verified keyed data file contained five block records that were listed as having no living quarters or housing unit records. For this assessment, these records were dropped from the calculations of 'No living quarter blocks' because they did contain listed housing unit records. These were probably due to lister error.

- There were 37 multiunit records that only had one unit (apartment) listed. For this assessment, these units were treated as single units.

- There was one record found in the Listing Page that had a mobile home park listed, but there were no individual mobile homes or trailers listed in the Mobile Home Park Page. There were no edits in place during keying to check for this discrepancy. This record was not sent onto the housing unit matching software, because only the individual mobile homes and trailer records listed in the Mobile Home Park Pages are included in the matching. Thus, this mobile home park record was dropped from the count of housing units listed.

- Since there were no edits set up between the Listing Page and Mobile Home Park Pages, the calculation of the number of mobile home parks in the U.S. and Puerto Rico had to be revised during processing. At first, the number of mobile home parks was calculated by totaling the number of mobile home parks with a Type of Address of 4 (for mobile home or trailer, in a park) in Section 4, Listing Page. After more investigation, the listing of mobile home parks was matched up to a park in Section 6, Mobile Home Park Page. In doing this, it was discovered that there were four additional mobile home parks for the block cluster in question that did not have a corresponding record in the Listing Page. Thus the total number of mobile home parks increased to 760, all in the U.S. The missing mobile home parks in the Listing Page can be attributed to either lister error, transcription error, keyer error, or an error through the editing process. However, this correction took care of the issue.

[10] A Basic Street Address (BSA) is the house number (including any letters and fractions) and street name or road name portion of an address. In a multiunit, where the apartment or unit designation comes after the street name, such as 11 Main Street Apt. A, 11 Main Street Apt. B, and 11 Main Street Apt. C, all individual housing units share the same BSA, 11 Main Street.

- When listing addresses, interviewers were required to indicate the unit status of the housing unit. They were to indicate if the unit was: occupied or vacant and intended for occupancy, under construction, future construction, unfit for habitation, boarded up, storage of household goods, or other. If the interviewer indicated the housing unit was future construction they were to indicate all the reasons (a sign indicating future construction is planned, a building permit, stakes in the ground, a zoning change sign from commercial use to residential use, or other, which required a write-in entry specifying the reason). Interviewers who checked future construction/other did not always write a reason. For this assessment, counts of housing units marked as 'future construction/other' are provided for those listed both with and without explanation for the code assigned.

- One Puerto Rico block cluster had three ILBs indicated as being used to list the block cluster. However, it was determined only one ILB was used. The number of books variable for this block cluster was reset to one for this assessment.

3.2.1.3 The 2010 Census Coverage Measurement Sample Design File (version 3)

Several versions of the Sample Design File track the path that each selected block cluster traveled during the CCM sampling operations. Version 3 of this file contains one record for each block cluster in the CCM sample that reflects the sampling results up to the selection of the PI sample housing units after the sample reduction. The variables on the file indicate geographic and sampling information for each block cluster.

3.2.1.4 The 2010 Census Coverage Measurement National Sample Block Cluster Data File

The CCM National Sample Block Cluster Data File contains geographic and sampling information for each block in the original CCM sample (U.S. and Puerto Rico).

3.2.1.5 Accuracy and Coverage Evaluation Sample Design File (version 5)

Version 5 of the A.C.E. Sample Design File contains one record for each block cluster in the original 2000 A.C.E. sample which reflects the following A.C.E. sampling operations: listing sampling selection, A.C.E. sample reduction, small block cluster subsampling, housing unit subsampling within large block clusters, and Targeted Extended Search (Kostanich, 2000). Targeted Extended Search was the operation concerned with locating and matching the persons in the areas surrounding the A.C.E. selected block clusters (U.S. Census Bureau, 2004).

3.2.2 Initial Housing Unit Computer Matching

Several files were used to answer the IHU Computer Matching assessment questions. Each table in the IHU Computer Matching Results section has a data source listed in the footnote. A description of each of the data sources is given below.

- 2010 CCM Sample Design File (Version 3) – This file contained one record for each block cluster in the original CCM sample which reflects the sampling results through the selection of the PI sample housing units after the sample reduction. Record count: 12,364
- 2010 HUMaRCS database tables – Cluster Control, IL Address, Census Address, IL Coding History, and Census Coding History.
- 2010 CCM and Census Files sent to computer matching.

3.2.3 Initial Housing Unit Clerical Matching

Several files were used to answer the IHU Clerical Matching assessment questions. Each table in the clerical matching results section has a data source listed in the footnote. A description of each of the data sources is given below.

- 2010 CCM Sample Design File (Version 3) – One record for each block cluster in the original CCM sample which reflects the sampling results through the selection of the PI sample housing units after the sample reduction. Record count: 12,364
- 2010 HUMaRCS database tables – Cluster Control, Cluster Stage, Followup Note, IL Address, Census Address, IL Coding History, and Census Coding History.

3.2.4 Initial Housing Unit Followup

The IHUFU summary statistics presented in this report to answer the IHUFU assessment questions are based on the analysis of the IHUFU C&P Reports and four output files: the IHU Clerical Matching IL Output File, the IHU Clerical Matching Census Address Output File, the IHU Clerical Matching Cluster Control Output File, and the HUMaRCS IHUFU Forms List History File. Each table in the Results Section has a data source listed in a footnote.

3.2.4.1 Initial Housing Unit Followup Cost and Progress Reports

The C&P system included eleven CCM IHUFU reports and one graph. The following reports were used to answer the questions in this assessment:

- *Preliminary Total Cost*
- *Current Employee Cost – Training*
- *Current Employee Cost – Field Work*

Expected FLD progress goals in the C&P reports for CCM IHUFU were based on weekly estimates of work to be completed for each Friday during the operation. There was confusion on most days as to whether progress was meeting, exceeding, or failing to meet the goals because actual progress was updated daily while expected progress goals were updated only once per week. It was decided that all future CCM operations would require daily expected data because this was a constant source of confusion.

3.2.4.2 Initial Housing Unit Clerical Matching Independent Listing Address Output File

This file contains one record for each IL address, with original data from IL keying verification plus the matching and linking outcomes, and updated address details from clerical matching.

3.2.4.3 Initial Housing Unit Clerical Matching Census Address Output File

This file contains one record for each census address within the CCM sample, with original data from the UC&M file at the time of computer matching plus clerical matching and linking outcomes.

3.2.4.4 Initial Housing Unit Clerical Matching Cluster Control Output File

This file contains one record per block cluster in the original sample, with original block cluster data plus matching status, i.e., whether in computer matching or any of the four phases/stages of housing unit clerical matching, or the IHUFU status and counts of followup cases for the block cluster.

3.2.4.5 Initial Housing Unit Clerical Matching Initial Housing Unit Followup Forms List History File

This file contains one record for each IHUFU case form generated by HUMaRCS. It provides information on the case form such as: the time the form was generated, type of form generated, original block cluster data, case address data, and followup status.

A problem was discovered during the first night IHUFU forms were generated, causing most forms generated that day to be unusable. All forms for that day were regenerated. Since the HUMaRCS IHUFU Forms List History File was a cumulative file, two records were created for each of the regenerated forms. The date and time variables were used to unduplicate the file so only one record existed for each IHUFU form.

4. LIMITATIONS

This section discusses the assumptions and limitations for this report.

- The study plan for this assessment stated results would be provided by TEA, however we used the Address Type Cluster (ATC) group recode, which is a grouping of the TEAs into city-style and noncity-style address areas. ATC group recode was used to show results when appropriate rather than TEA. See Section 3.2 for more on ATC codes.

- The study plan for this assessment stated results would be provided by sampling stratum (small, medium, large, American Indian Reservation, or military), however in assessing the data it was decided not to present the data by sampling strata. These data are available and can be provided upon request, but the CCM sampling strata did not include military, and would be excluded from the categories.

4.1 Independent Listing

- Additional address information was collected for Puerto Rico addresses which included Urbanization, Condominium, Arterial Roads (ramal), Kilometer, Hectometer, Subdivision Types (Barrio or Sector), Secondary Subdivision Types (Barriadas, Sectores, Parcelas, or Communidades), complex designation, and unit designation for all addresses listed in the single and multiunit sections of the ILB. The additional address items were not collected for addresses listed in the mobile home park section of the ILB, because very few mobile homes were known to exist in Puerto Rico when developing the ILB and space in this section was limited. Therefore, in this assessment, when answering the question on how often were each of the Puerto Rico-specific address fields used in Section 5.11, the analysis does not contain mobile homes in park information.

- The question "How often did the Independent Listing coverage question result in the addition of a unit and what was the disposition of that unit in the final CCM?[11]" was modified from the original study plan to "What were the responses to the Independent Listing coverage question?"

- The different respondent types for each mobile home in a park were not calculated for Table 42. As mentioned earlier in Section 3.2.1.2 under the fifth bullet, there were no edits in place between the Section 4, Listing Page and Section 6, Mobile Home Park Page, thus a link between these sections did not exist as in Section 4 and Section 5, Multiunit Address Page.

[11] The coverage question, "At (address), are there any basement or garage apartments, trailers, or other residences, even if no one is living there now?" is asked as part of CCM IL about each housing unit listed to determine if there are any housing units that may otherwise be missed at the housing unit.

4.2 Initial Housing Unit Computer Matching

When matching CCM addresses to census addresses, we included census addresses in both the sample block cluster and the surrounding blocks. For purposes of this assessment, our census numbers are only those addresses that are listed as housing units located in the sample block clusters on the UC&M file because those are the addresses that are considered in sample at the time of the operation. This is the same for results in both IHU Computer Matching and IHU Clerical Matching. However, when answering the question "How many duplicates did the clerical matchers find within the Universe Control and Management file, by whether the duplicate is located within the block cluster or the surrounding blocks?", results are provided for the census addresses in surrounding blocks that are duplicates to the census addresses in the CCM sample areas.

4.3 Initial Housing Unit Clerical Matching

One question that we could not answer for the assessment is “How many units were coded insufficient information for followup in the census?” For a census address to be coded this way in computer matching, the address would have had all the following data missing: map spot number and suffix, house number, street name, physical location, Post Office (PO) Box, rural route number and box, and ZIP code. There were zero census addresses in the CCM sample block clusters meeting this description. In BFU, we decided that we would not allow clerical matchers to code a census address as insufficient for followup because we wanted to give all census addresses a chance to be found during the field followup operation.

4.4 Initial Housing Unit Followup

The IHUFU forms were not data captured because most data were captured in HUMaRCS during the AFU matching. However, the respondent type for the case and whether a unit could not be located by an interviewer from the IHUFU form were not captured in HUMaRCS. Therefore we cannot answer the following assessment questions:

1. What is the respondent type for each unit?
2. How many units could the interviewer not locate?

5. RESULTS

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

5.1.1 Independent Listing Schedule

The IL operation was managed from the 12 RCCs. Similar to Census 2000, for reasons of weather-related issues and management of field work, the operation was conducted as planned in three overlapping six-week periods, called waves, from August 28, 2009 through December 5, 2009, across the United States. Puerto Rico conducted the IL operation, in two waves, as planned three weeks after the stateside listing began (the first wave starting on September 18, 2009), because the additional three weeks were needed for translation and printing of training materials. The IL operation in Puerto Rico ended on November 6, 2009 due to an operational concern from the Boston RCC and the Puerto Rico Area Office CCM staff that most of the island would be shut down for the holidays. The completion of work by wave was managed outside the Decennial MAS, which contained only one activity spanning the full duration of the operation, Conduct CCM IL.

Table 1 shows the scheduled start and end dates for each wave by Production and QC and the training start dates. All waves started and ended on time for the IL Operation.

Table 1
The 2010 Census Coverage Measurement Independent Listing Operation
Production, Quality Control, and Training Schedules

Wave	Production		Quality Control		FOS Training Start	Lister Training Start
	Start	End	Start	End		
Wave 1- Puerto Rico	9/18/2009	10/23/2009	9/25/2009	10/30/2009	8/31/2009	9/14/2009
Wave 2- Puerto Rico	10/02/2009	11/06/2009	10/09/2009	11/13/2009	9/14/2009	9/28/2009
Wave 1 - U.S.	8/28/2009	10/9/2009	09/04/2009	10/16/2009	7/29/2009	8/24/2009
Wave 2 – U.S.	9/25/2009	11/6/2009	10/2/2009	11/13/2009	8/25/2009	9/21/2009
Wave 3 – U.S.	10/23/2009	12/5/2009	10/30/2009	12/12/2009	9/23/2009	10/19/2009

Source: Decennial Master Activity Schedule

The CMOCS deployed to all RCCs and Puerto Rico on June 30, 2009 (a day after scheduled).

Large format maps were used by office staff for assignment purposes. The initial plan was to have these printed in the RCCs between May 12, 2009 and June 19, 2009; however, they were not actually available to be printed until June 5, 2009 and printing concluded on June 26, 2009. The small format maps used by FLD staff to locate block clusters and record the map spots, were planned to be printed in the RCCs from June 2, 2009 through July 31, 2009. The actual printing began three days late in the RCCs on June 5, 2009, but completed as planned on July 31, 2009.

The ILB keying software used at the NPC deployed as planned on September 8, 2009. The ILBs were scheduled to be keyed at the NPC from September 14, 2009 through January 4, 2010. Keying began on time and finished early on December 29, 2009. The ILB Pickup and Verification Software was planned for use between September 22, 2009 and January 7, 2010 to verify the keyed data from the ILBs. The software was deployed on time, and due to receipt of all data a few days early, completed early on December 30, 2009.

The IL operation had seven schedule change requests (CRs) implemented within the Decennial MAS. The CRs included date changes, logic corrections, and removal of activity lines. Activity lines affected by the CRs were those of C&P, training, and the quality profile. There were no known issues or risks associated with implementing these CRs.

5.1.2 Initial Housing Unit Matching Schedule

The CCM IHU Computer Matching was planned to begin on January 25, 2010 and end on March 1, 2010. The Computer Matching began a day late on January 26, 2010, but ended early on February 23, 2010, lasting four instead of five weeks. The CCM IHU Clerical Matching operations were conducted as planned, shown in Table 2.

Table 2
The 2010 Census Coverage Measurement Initial Housing Unit Clerical Matching Operations
Initial Housing Unit Clerical Matching Schedule – Conducted as Planned

Clerical Matching Operation	Training		Production	
	Start	End	Start	End
Initial Housing Unit Before Followup Matching	1/25/2010	2/12/2010	2/16/2010	3/26/2010
Initial Housing Unit After Followup Matching	3/18/2010	4/6/2010	3/29/2010	5/19/2010

Source: Decennial Master Activity Schedule

The HUMaRCS was deployed and maintained as planned for the clerical matching operations from January 19, 2010 through May 20, 2010.

5.1.3 Initial Housing Unit Followup Schedule

The IHUFU was planned from March 4, 2010 through April 23, 2010. The operation began and finished on time in the U.S. Puerto Rico began on time, but due to a large amount of work sent to followup at the end of IHU BFU Matching for Puerto Rico, we obtained approval from the 2010 Census Integration Group to have the field operation for Puerto Rico extended until May 2, 2010. The QC was planned to end on April 30, 2010 and finished on schedule in the U.S., but not until May 5, 2010 in Puerto Rico. Please see Table 3 for the planned and actual dates the field training was conducted.

Table 3
The 2010 Census Coverage Measurement Initial Housing Unit Followup Operation Production and Quality Control Training Schedule

Training	Planned		Actual	
	Start	End	Start	End
Field Operations Supervisors	2/10/2010	2/16/2010	2/1/2010	2/16/2010
Crew Leaders	2/22/2010	2/25/2010	2/17/2010	2/25/2010
Interviewers	3/2/2010	3/3/2010	3/1/2010	3/2/2010
Quality Control Checkers	2/12/2010	3/4/2010	2/19/2010	2/19/2010

Source: Decennial Master Activity Schedule

The IHUFU operation had 16 schedule CRs implemented within the Decennial MAS. The CRs included date changes and logic corrections. Activity lines affected by the CRs were those of C&P, the quality profile, HUMaRCS, and assessments. Also affected were kitting, materials, training, maps, and questionnaires. There were no known issues or risks associated with implementing these CRs.

5.2 Costs – Were the field operations 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 IL and IHUFU operations were under budget. The operational 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 Meals and Incidental Expenses (M&IE), lodging cost, telephone costs and other expenses incurred during field work and training travel.

As one can see from the above equation, 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 were not available or do not exist.

The Actual IL DQC workload was determined using adjudicated QC data. The ILBs were sent to the NPC to be keyed, verified, and adjudicated. The QC data for 20 block clusters were missing and had to be edited by Headquarters by looking at the original Section 3 of the ILB to determine the correct data. The QC workload was then determined by estimating the average number of HUs per BSA for each block cluster using the information recorded on the cover of the ILB, then adding the number of estimated HUs checked in the DQC (number of BSAs included in the DQC multiplied by the average number of HUs per BSA) for block clusters that did not have any critical errors recorded in the DQC Sub-section of the ILB and the total estimated number of HUs for any block clusters that had one or more critical errors recorded in the DQC Sub-section of the ILB.

The Actual IHUFU QC workload was determined using adjudicated QC data. Field Office Staff keyed IHUFU QC results into CMOCS, the IHUFU QC forms were then sent to NPC where the results were re-keyed, and then the CMOCS and NPC keyed data were compared. Discrepancies between the CMOCS and NPC keyed data were then adjudicated at Headquarters by looking at the original IHUFU QC form to determine the correct data. The QC workload was determined by adding the number of followup cases included in the QC Check for block clusters that passed the QC check and the total number of cases in IHUFU for any block clusters that failed the QC check.

Data may vary slightly from sources due to rounding differences that may have occurred during calculations.

5.2.1 Census Coverage Measurement Independent Listing 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 budget and actual costs by position for both IL and IL DQC. The overspending during IL DQC was the result of a much higher than anticipated workload. Nevertheless, in Tables 7 and Table 18, provided later, it will be evident that the cost per case and time required per case were much less than expected.

Table 4
The 2010 Census Coverage Measurement Independent Listing Operation
Total Cost by Position

Position	Budgeted Total Cost	Actual Total Cost	Difference of Budget to Actual Cost	Percent Over or Under Budget[1]
Total	**$19,181,077**	**$15,161,406**	**$4,019,671**	**20.96%**
Census Coverage Measurement Independent Listing Production				
Subtotal-IL	**$15,586,152**	**$11,040,905**	**$4,545,247**	**29.16%**
Lister	$12,126,833	$6,539,054	$5,587,779	46.08%
Crew Leader Assistant	$1,150,979	$920,134	$230,845	20.06%
Crew Leader	$1,943,264	$2,439,677	($496,413)	(25.55%)
Field Operations Supervisor	$365,076	$1,142,040	($776,964)	(212.82%)
Census Coverage Measurement Independent Listing Dependent Quality Control				
Subtotal-IL DQC	**$3,594,925**	**$4,120,501**	**($525,576)**	**(14.62%)**
Lister	$2,668,667	$2,099,021	$569,646	21.35%
Crew Leader Assistant	$310,390	$348,470	($38,080)	(12.27%)
Crew Leader	$516,188	$1,107,901	($591,713)	(114.63%)
Field Operations Supervisor	$99,680	$565,109	($465,429)	(466.92%)

[1]Values in parentheses denote values over budget
Source: Independent Listing C&P Report: Preliminary Total Cost

Total Cost Summary

Overall, the 2010 CCM IL operation was under budget by $4,019,671(20.96 percent). IL was under budget by $4,545,247 (29.16 percent) while IL DQC was overspent by $525,576 (14.62 percent).

Total Cost by Position

IL Lister expenses were significantly under budget, while CL and FOS expenses were substantially over budget. Cost for IL Listers was under budget by $5,587,779 (46.08 percent) and cost for IL DQC Listers was under budget by $569,646 (21.35 percent). Cost for IL CLAs was also under budget by $230,845 (20.06 percent); however cost for IL DQC CLAs was overspent by $38,080 (12.27 percent).

CL and DQC CL costs were overspent by $496,413 (25.55 percent) and $591,713 (114.63 percent), respectively. FOS and DQC FOS costs were very much overspent for IL by $776,964 (212.82 percent) and $465,429 (466.92 percent), respectively.

5.2.1.1 Cost per Case

In this section, cost per case is defined as the total cost incurred for each housing unit listed.

Table 5 provides the budget and actual cost per case by position for both IL and IL DQC. The actual IL workload was 892,976 housing units; this is 12.04 percent less than the expected workload of 1,015,190 housing units. Although the IL workload was lower than expected, the actual IL DQC workload was 2.70 times higher than expected (360,723 actual housing units compared with 133,620 housing units expected).

Table 5
The 2010 Census Coverage Measurement Independent Listing Operation
Cost Per Case by Position

Position	Budgeted Total Cost	Actual Total Cost	Budgeted Total Cost per Case[1]	Actual Cost per Case[2]	Difference of Budget to Actual Cost per Case	Percent Over or Under Budget[3]
Census Coverage Measurement Independent Listing Production						
Subtotal-IL	**$15,586,152**	**$11,040,905**	**$15.35**	**$12.36**	**$2.99**	**19.48%**
Lister	$12,126,833	$6,539,054	$11.95	$7.32	$4.62	38.66%
Crew Leader Assistant	$1,150,979	$920,134	$1.13	$1.03	$0.10	8.85%
Crew Leader	$1,943,264	$2,439,677	$1.91	$2.73	($0.82)	(42.93%)
Field Operations Supervisor	$365,076	$1,142,040	$0.36	$1.28	($0.92)	(255.56%)
Census Coverage Measurement Independent Listing Dependent Quality Control						
Subtotal-IL DQC	**$3,594,925**	**$4,120,501**	**$26.90**	**$11.42**	**$15.48**	**57.55%**
Lister	$2,668,667	$2,099,021	$19.97	$5.82	$14.15	70.86%
Crew Leader Assistant	$310,390	$348,470	$2.32	$0.97	$1.36	58.62%
Crew Leader	$516,188	$1,107,901	$3.86	$3.07	$0.79	20.47%
Field Operations Supervisor	$99,680	$565,109	$0.75	$1.57	($0.82)	(109.33%)

[1] Budgeted Total Independent Listing Production Housing Unit Workload was 1,015,190 and Budgeted Total Independent Listing Dependent Quality Control Housing Unit Workload was 133,620.
[2] Actual Total Independent Listing Production Housing Unit Workload was 892,976 and Estimated Total (Calculated) Independent Listing Dependent Quality Control Housing Unit Workload was 360,723.
[3]Values in parentheses denote values over budget
Source: Independent Listing C&P Report: Preliminary Total Cost

Note: Budget projection based on preliminary workload of 1,015,190 and 133,620 for IL Production and IL DQC, respectively. The cost analysis uses preliminary workloads since budget went unchanged once official expected workloads of 960,041 and 126,361, respectively, were released.

Cost Per Case Summary

On a per case basis, IL and IL DQC costs were similar. IL actual cost per case was $12.36. This is $2.99 (19.48 percent) per case less than expected. The IL DQC actual cost per case was $11.42. This is $15.48 (57.55 percent) per case less than expected. This shows that the IL DQC deficit outlined earlier was a direct result of a workload 2.70 times greater than expected.

Cost Per Case by Position

During both IL and DQC, Listers and CLAs were observed to have lower marginal costs per case than expected. IL Lister costs were under budget by $4.62 per case (38.66 percent) and $14.15 per case (70.86 percent) for IL DQC, while CLA costs were under budget by $0.10 per case (8.85 percent) and $1.36 per case (58.62 percent), respectively.

Conversely, CLs and FOSs were observed to have much higher marginal costs per case than expected. The cost for IL CLs was over budget by $0.82 (42.93 percent) per case; while the cost for IL DQC CLs was under budget by $0.79 (20.47 percent) per case. Costs for IL and IL DQC FOSs were far over budget by $0.92 per case (255.56 percent) and $0.82 per case (109.33 percent), respectively.

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 budget and actual field work costs by position for both IL and IL DQC.

Table 6
The 2010 Census Coverage Measurement Independent Listing Operation
Field Work Cost by Position

Position	Budgeted Field Work Hours Cost	Actual Field Work Hours Cost	Difference of Budget to Actual Cost	Percent Over or Under Budget[1]
Total	**$8,163,690**	**$7,927,473**	**$236,217**	**2.89%**
Census Coverage Measurement Independent Listing Production				
Subtotal-IL	**$6,449,641**	**$5,857,519**	**$592,122**	**9.18%**
Lister	$3,944,764	$3,417,912	$526,852	13.36%
Crew Leader Assistant*	$930,430	$477,793	$452,637	48.65%
Crew Leader	$1,312,121	$1,342,823	($30,702)	(2.34%)
Field Operations Supervisor	$262,326	$618,991	($356,665)	(135.96%)
Census Coverage Measurement Independent Listing Dependent Quality Control				
Subtotal-IL DQC	**$1,714,049**	**$2,069,954**	**($355,905)**	**(20.76%)**
Lister	$1,065,145	$955,043	$110,102	10.34%
Crew Leader Assistant*	$250,039	$167,923	$82,116	32.84%
Crew Leader	$330,209	$617,677	($287,468)	(87.06%)
Field Operations Supervisor	$68,656	$329,311	($260,655)	(379.65%)

[1]Values in parentheses denote values over budget
*Crew Leaders Assistants were trained as Listers.
Source: Independent Listing C&P Report: Current Employee Cost – Field Work

Field Work Cost Summary

Overall, the cost for field work associated with the 2010 CCM IL operation was under budget by $236,217 (2.89 percent). IL field work cost was under budget by $592,122 (9.18 percent) while IL DQC field work cost was overspent by $355,905 (20.76 percent).

Field Work Cost by Position

Field work costs for CCM IL and IL DQC Listers and CLAs were under budget. Lister field work costs for IL and IL DQC were under budget by $526,852 (13.36 percent) and $110,102 (10.34 percent), respectively. CLA field work costs for IL and IL DQC were under budget by $452,637 (48.65 percent) and $82,116 (32.84 percent), respectively.

While Lister and CLA field work costs were under budget, costs for IL and IL DQC CLs and FOSs were over budget. CL field work costs for IL and IL DQC were over budget by $30,702 (2.34 percent) and $287,468 (87.06 percent), respectively. FOS field work costs for IL and IL DQC were substantially over budget by $356,665 (135.96 percent) and $260,655 (379.65 percent), respectively.

5.2.1.3 Field Training Costs

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

Table 7 provides the overall training cost and actual training cost by position for both IL and IL DQC.

Table 7
The 2010 Census Coverage Measurement Independent Listing Operation
Training Cost by Position

Position	Budgeted Training Hours Cost	Actual Training Hours Cost	Difference of Budget to Actual Cost	Percent Over or Under Budget[1]
Total	**$2,649,317**	**$2,460,774**	**$188,543**	**7.12%**
Census Coverage Measurement Independent Listing Production				
Subtotal-IL	**$2,003,644**	**$1,904,945**	**$98,699**	**4.93%**
Lister	$1,659,793	$1,275,052	$384,741	23.18%
Crew Leader Assistant*	$0	$119,656	($119,656)	Not Applicable
Crew Leader	$297,666	$362,776	($65,110)	(21.87%)
Field Operations Supervisor	$46,185	$147,461	($101,276)	(219.28%)
Census Coverage Measurement Independent Listing Dependent Quality Control				
Subtotal-IL DQC	**$645,673**	**$555,829**	**$89,844**	**13.91%**
Lister	$538,218	$342,441	$195,777	36.38%
Crew Leader Assistant*	$0	$42,765	($42,765)	Not Applicable
Crew Leader	$92,015	$117,025	($25,010)	(27.18%)
Field Operations Supervisor	$15,440	$53,598	($38,158)	(247.14%)

[1]Values in parentheses denote values over budget
*Crew Leaders Assistants were trained as Listers.
Source: Independent Listing C&P Report: Current Employee Cost – Training

Training Cost Summary
Overall, the cost for training associated with the 2010 CCM IL operation was under budget by $188,543 (7.12 percent). IL training cost was under budget by $98,699 (4.93 percent) and IL DQC training cost was under budget by $89,844 (13.91 percent).

Training Cost by Position
Training costs for Listers were under budget for both IL and IL DQC by $384,741 (23.18 percent) and $195,777 (36.38 percent), respectively. CLAs were expected to be trained as

Listers and then promoted in the field to CLAs; therefore there was no budget allocated for CLA training.

While training costs for Listers were under budget, costs for CLs and FOSs were again greatly over budget for both IL and IL DQC. CL training costs for IL and IL DQC were over budget by $65,110 (21.87 percent) and $25,010 (27.18 percent), respectively. FOS training costs for IL and IL DQC were very much over budget by $101,276 (219.28 percent) and $38,158 (247.14 percent), respectively.

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 IL, field staff was reimbursed at a rate of $0.55 per mile.

Table 8 provides the budget and actual mileage costs by position for both IL and IL DQC.

Table 8
The 2010 Census Coverage Measurement Independent Listing Operation
Mileage Cost by Position

Position	Budgeted Miles Cost**	Actual Miles Cost**	Difference of Budget to Actual Cost	Percent Over or Under Budget[1]
Total	**$8,368,070**	**$3,996,396**	**$4,371,674**	**52.24%**
Census Coverage Measurement Independent Listing Production				
Subtotal-IL	**$7,132,867**	**$2,736,071**	**$4,396,796**	**61.64%**
Lister	$6,522,276	$1,608,284	$4,913,992	75.34%
Crew Leader Assistant*	$220,549	$268,468	($47,919)	(21.72%)
Crew Leader	$333,477	$605,290	($271,813)	(81.51%)
Field Operations Supervisor	$56,565	$254,029	($197,464)	(349.09%)
Census Coverage Measurement Independent Listing Dependent Quality Control				
Subtotal-IL DQC	**$1,235,203**	**$1,260,325**	**($25,122)**	**(2.03%)**
Lister	$1,065,304	$702,281	$363,023	34.08%
Crew Leader Assistant*	$60,351	$112,884	($52,533)	(87.05%)
Crew Leader	$93,964	$314,042	($220,078)	(234.22%)
Field Operations Supervisor	$15,584	$131,118	($115,534)	(741.36%)

[1]Values in parentheses denote values over budget
*Crew Leaders Assistants were trained as Listers.
**Mileage reflects miles cost for both field work and training.
Source: Independent Listing C&P Report: Current Employee Cost – Field Work

Mileage Cost Summary

Overall, the mileage cost for the 2010 CCM IL operation was substantially under budget by $4,371,674 (52.24 percent). Mileage cost for IL was under budget by $4,396,796 (61.64 percent) while mileage cost for IL DQC was slightly overspent by $25,122 (2.03 percent).

Mileage Cost by Position

Mileage costs for Listers were the ones that were under budget for both IL and IL DQC by $4,913,992 (75.34 percent) and $363,023 (34.08 percent), respectively. However mileage costs for all other positions were substantially over budget. Mileage costs for IL and IL DQC CLAs were over budget by $47,919 (21.72 percent) and $52,533 (87.05 percent), respectively. CL mileage costs were over budget for IL and IL DQC by $271,813 (81.51 percent) and $220,078 (234.22 percent), respectively. Mileage costs for IL and IL DQC FOSs were also over budget by $197,464 (349.09 percent) and $115,534 (741.36 percent), respectively.

5.2.1.5 Per Diem Costs

In this section, per diem and other costs are defined as the 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 budget and actual per diem and other costs by position for both IL and IL DQC.

Table 9
The 2010 Census Coverage Measurement Independent Listing Operation
Per Diem and Other Costs by Position

Position	Budgeted Per Diem Reimbursement	Actual Per Diem** Reimbursement	Difference of Budget to Actual Cost	Percent Over or Under Budget[1]
Total	**$0**	**$776,763**	**($776,763)**	**Not Applicable**
Census Coverage Measurement Independent Listing Production				
Subtotal-IL	**$0**	**$542,370**	**($542,370)**	**Not Applicable**
Lister	**$0**	$237,806	($237,806)	Not applicable
Crew Leader Assistant*	**$0**	$54,217	($54,217)	Not applicable
Crew Leader	**$0**	$128,788	($128,788)	Not applicable
Field Operations Supervisor	**$0**	$121,559	($121,559)	Not applicable
Census Coverage Measurement Independent Listing Dependent Quality Control				
Subtotal-IL DQC	**$0**	**$234,393**	**($234,393)**	**Not Applicable**
Lister	**$0**	$99,256	($99,256)	Not applicable
Crew Leader Assistant*	**$0**	$24,898	($24,898)	Not applicable
Crew Leader	**$0**	$59,157	($59,157)	Not applicable
Field Operations Supervisor	**$0**	$51,082	($51,082)	Not applicable

[1]Values in parentheses denote values over budget
*Crew Leaders Assistants were trained as Listers.
**Per diem reflects per diem costs for both field work and training.
Source: Independent Listing C&P Reports: Current Employee Cost – Training; Current Employee Cost – Field Work; Preliminary Total Cost

Per Diem Cost Summary

Overall, the 2010 CCM IL operation per diem cost was over budget by $776,763 due to no per diem budget allocation for this operation. IL and IL DQC per diem costs were $542,370 and $234,393, respectively.

5.2.2 Census Coverage Measurement Initial Housing Unit Followup

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 10 provides the total budget and actual cost by position for both IHUFU and IHUFU QC.

Table 10
The 2010 Census Coverage Measurement Initial Housing Unit Followup Operation Cost by Position

Position	Budgeted Total Cost	Actual Total Cost	Difference of Budget to Actual Cost	Percent Over or Under Budget[1]
Total	**$20,688,471**	**$8,861,614**	**$11,826,857**	**57.17%**
Census Coverage Measurement Initial Housing Unit Followup Production				
Subtotal-IHUFU	**$9,871,093**	**$5,181,979**	**$4,689,114**	**47.50%**
Interviewer	$5,973,350	$2,471,880	$3,501,470	58.62%
Crew Leader Assistant	$1,488,772	$371,044	$1,117,728	75.08%
Crew Leader	$1,799,923	$1,575,164	$224,759	12.49%
Field Operations Supervisor	$609,048	$763,891	($154,843)	(25.42%)
Census Coverage Measurement Initial Housing Unit Followup Quality Control				
Subtotal-IHUFU QC	**$10,817,378**	**$3,679,635**	**$7,137,743**	**65.98%**
Interviewer	$4,734,324	$1,369,344	$3,364,980	71.08%
Crew Leader Assistant	$2,234,600	$248,236	$1,986,364	88.89%
Crew Leader	$2,305,369	$1,216,011	$1,089,358	47.25%
Field Operations Supervisor	$1,543,085	$846,044	$697,041	45.17%

[1]Values in parentheses denote values over budget
Source: Initial Housing Unit Followup C&P Report: Preliminary Total Cost; Budget Totals Spreadsheet

Total Cost Summary

Overall, the 2010 CCM IHUFU operation was under budget by $11,826,857 (57.17 percent). The IHUFU and IHUFU QC operations were under budget by $4,689,114 (47.50 percent) and $7,137,743 (65.98 percent), respectively. These figures do require some context because of workload uncertainty prior to matching. The DSSD workload estimate prior to matching was 222,690, while the final IHUFU workload was 125,192. Budget estimates were based on the DSSD workload estimate which was ultimately 43.78 percent less than the actual workload. For this reason it is helpful to focus on the cost per case estimate compared to actual cost per case. An IHUFU case was expected to cost $44.33 per case and actually cost $41.39 per case which is a 6.33 percent difference. Please refer to Cost per Case section 5.2.2.1 for more information.

Total Cost by Position

IHUFU Interviewer costs were under budget by $3,501,470 (58.62 percent), while IHUFU QC Interviewer costs were under budget by $3,364,980 (71.08 percent). Costs for IHUFU CLAs were under budget by $1,117,728 (75.08 percent), and costs for IHUFU QC CLAs were under budget by $1,986,364 (88.89 percent).

Costs for IHUFU CLs were closer to the budget. IHUFU CL costs were under budget by $224,759 (12.49 percent), while IHUFU QC CL costs were under budget by $1,089,358 (47.25 percent). However, IHUFU FOS costs were overspent by $154,843 (25.42 percent), while IHUFU QC costs were under budget by $697,041 (45.17 percent).

5.2.2.1 Cost per Case

In this section, cost per case is defined as the total cost incurred for each followup case completed.

Table 11 provides the budget and actual cost per case by position for both IHUFU and IHUFU QC.

Table 11
The 2010 Census Coverage Measurement Initial Housing Unit Followup Operation
Cost Per Case by Position

Position	Budgeted Total Cost	Actual Total Cost	Budgeted Cost per Case[1]	Actual Cost per Case[2]	Difference of Budget to Actual Cost per Case	Percent Over or Under Budget[3]
Census Coverage Measurement Initial Housing Unit Followup Production						
Subtotal-IHUFU	**$9,871,093**	**$5,181,979**	**$44.33**	**$41.39**	**$2.94**	**6.63%**
Interviewer	$5,973,350	$2,471,880	$26.82	$19.74	$7.08	26.40%
Crew Leader Assistant	$1,488,772	$371,044	$6.69	$2.96	$3.72	55.75%
Crew Leader	$1,799,923	$1,575,164	$8.08	$12.58	($4.50)	(55.69%)
Field Operations Supervisor	$609,048	$763,891	$2.73	$6.10	($3.37)	(123.44%)
Census Coverage Measurement Initial Housing Unit Followup Quality Control						
Subtotal-IHUFU QC	**$10,817,378**	**$3,679,635**	**$86.90**	**$84.47**	**$2.43**	**2.80%**
Interviewer	$4,734,324	$1,369,344	$38.03	$31.44	$6.59	17.33%
Crew Leader Assistant	$2,234,600	$248,236	$17.95	$5.70	$12.25	68.25%
Crew Leader	$2,305,369	$1,216,011	$18.52	$27.92	($9.40)	(50.76%)
Field Operations Supervisor	$1,543,085	$846,044	$12.40	$19.42	($7.02)	(56.61%)

[1]Budgeted Total Initial Housing Unit Followup Production Case Workload was 222,690 and Budgeted Total Initial Housing Unit Followup Quality Control Workload was 124,483.
[2]Actual Total Initial Housing Unit Followup Production Case Workload was 125,192 and Actual Total Initial Housing Unit Followup Quality Control Case Workload was 43,560.
[3]Values in parentheses denote values over budget
Source: Initial Housing Unit Followup C&P Report: Preliminary Total Cost; Budget Totals Spreadsheet

Cost Per Case Summary

On a per case basis, IHUFU and IHUFU QC costs were under budget. The actual cost per case for IHUFU was $41.39. This is $2.94 (6.63 percent) per case less than expected. The actual cost per case for IHUFU QC was $84.47. This is $2.43 (2.80 percent) per case less than expected.

Cost Per Case by Position

Costs per case for IHUFU and IHUFU QC Interviewers and CLAs were under budget. Interviewer costs were under budget by $7.08 (26.40 percent) per case for IHUFU and $6.59 (17.33 percent) per case for IHUFU QC. IHUFU and IHUFU QC CLA costs per case were under budget by $3.72 (55.75 percent) per case and $12.25 (68.25 percent) per case, respectively.

While costs per case for Interviewers and CLAs were under budget, costs per case for CLs and FOSs were greatly over budget for both IHUFU and IHUFU QC. CL costs were over budget by $4.50 (55.69 percent) per case and $9.40 (50.76 percent) per case, respectively. IHUFU and IHUFU QC FOS costs were over budget by $3.37 (123.44 percent) per case and $7.02 (56.61 percent) per case, respectively.

5.2.2.2 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 12 provides the budget and actual field work costs by position for both IHUFU and IHUFU QC.

Table 12
The 2010 Census Coverage Measurement Initial Housing Unit Followup Operation
Field Work Cost by Position

Position	Budgeted Field Work Hours Cost	Actual Field Work Hours Cost	Difference of Budget to Actual Cost	Percent Over or Under Budget[1]
Total	**$11,215,356**	**$4,617,917**	**$6,597,439**	**58.83%**
Census Coverage Measurement Initial Housing Unit Followup Production				
Subtotal-IHUFU	**$5,496,800**	**$2,747,844**	**$2,748,956**	**50.01%**
Interviewer	$3,235,543	$1,222,346	$2,013,197	62.22%
Crew Leader Assistant*	$796,559	$188,599	$607,960	76.32%
Crew Leader	$1,104,103	$898,002	$206,101	18.67%
Field Operations Supervisor	$360,595	$438,897	($78,302)	(21.71%)
Census Coverage Measurement Initial Housing Unit Followup Quality Control				
Subtotal-IHUFU QC	**$5,718,556**	**$1,870,072**	**$3,848,484**	**67.30%**
Interviewer	$2,533,622	$552,283	$1,981,339	78.20%
Crew Leader Assistant*	$987,945	$117,727	$870,218	88.08%
Crew Leader	$1,330,258	$694,767	$635,491	47.77%
Field Operations Supervisor	$866,731	$505,295	$361,436	41.70%

[1]Values in parentheses denote values over budget
*Crew Leaders Assistants were trained as Interviewers.
**The miles reflect miles cost for both field work and training.
Source: Initial Housing Unit Followup C&P Report: Current Employee Cost – Field Work

Field Work Cost Summary

Overall, the cost for field work associated with the 2010 IHUFU operation was substantially under budget by $6,597,439 (58.83 percent). IHUFU and IHUFU QC field work costs were under budget by $2,748,956 (50.01 percent) and $3,848,484 (67.30 percent), respectively.

Field Work Cost by Position

Field work costs for all positions were under budget for both IHUFU and IHUFU QC, except for IHUFU FOSs. IHUFU and IHUFU QC Interviewer field work costs were under budget by $2,013,197 (62.22 percent) and $1,981,339 (78.20 percent), respectively. IHUFU and IHUFU QC CLA field work costs were under budget by $607,960 (76.32 percent) and $870,218 (88.08 percent), respectively.

Field work costs for IHUFU and IHUFU QC CLs were under budget as well by $206,101 (18.67 percent) and $635,491 (47.77 percent), respectively. FOS field work cost for IHUFU QC was under budget by $361,436 (41.70 percent); however for IHUFU production, FOS field work cost was over budget by $78,302 (21.71 percent).

5.2.2.3 Training Costs

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

Table 13 provides the budget and actual training costs by position for both IHUFU and IHUFU QC.

Table 13
The 2010 Census Coverage Measurement Initial Housing Unit Followup Operation
Training Cost by Position

Position	Budgeted Training Hours Cost	Actual Training Hours Cost	Difference of Budget to Actual Cost	Percent Over or Under Budget[1]
Total	**$3,565,270**	**$1,462,889**	**$2,102,381**	**58.97%**
Census Coverage Measurement Initial Housing Unit Followup Production				
Subtotal-IHUFU	**$1,459,614**	**$823,055**	**$636,559**	**43.61%**
Interviewer	$733,886	$488,996	$244,890	33.37%
Crew Leader Assistant*	$453,859	$44,222	$409,637	90.26%
Crew Leader	$208,474	$207,774	$700	0.34%
Field Operations Supervisor	$63,395	$82,063	($18,668)	(29.45%)
Census Coverage Measurement Initial Housing Unit Followup Quality Control				
Subtotal-IHUFU QC	**$2,105,656**	**$639,834**	**$1,465,822**	**69.61%**
Interviewer	$730,881	$372,252	$358,629	49.07%
Crew Leader Assistant*	$900,374	$29,332	$871,042	96.74%
Crew Leader	$298,431	$153,953	$144,478	48.41%
Field Operations Supervisor	$175,970	$84,298	$91,672	52.10%

[1]Values in parentheses denote values over budget
*Crew Leaders Assistants were trained as Interviewers.
**The miles reflect miles cost for both field work and training.
Source: Initial Housing Unit Followup C&P Report: Current Employee Cost – Training

Training Cost Summary
Overall, the cost for training associated with the 2010 CCM IHUFU operation was under budget by $2,102,381 (58.97 percent). IHUFU and IHUFU QC training costs were substantially under budget by $636,559 (43.61 percent) and $1,465,822 (69.61 percent), respectively.

Training Cost by Position
Training costs for IHUFU and IHUFU QC Interviewers and CLAs were substantially under budget. IHUFU and IHUFU QC Interviewer training costs were under budget by $244,890 (33.37 percent) and $358,629 (49.07 percent), respectively. IHUFU and IHUFU QC CLA training costs were very much under budget by $409,637 (90.26 percent) and $871,042 (96.74 percent), respectively.

Training cost for CLs was slightly under budget by $700 (0.34 percent) for IHUFU, while for IHUFU QC CLs training cost was under budget by $144,478 (48.41 percent). FOS training costs were over budget by $18,668 (29.45 percent) for IHUFU and under budget by $91,672 (52.10 percent) for IHUFU QC.

5.2.2.4 Mileage Costs

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

Table 14 provides the budget and actual mileage costs by position for both IHUFU and IHUFU QC.

Table 14
The 2010 Census Coverage Measurement Initial Housing Unit Followup Operation
Mileage Cost by Position

Position	Budgeted Miles Cost**	Actual Miles Cost**	Difference of Budget to Actual Cost	Percent Over or Under Budget[1]
Total	**$3,915,469**	**$2,165,502**	**$1,749,967**	**44.69%**
Census Coverage Measurement Initial Housing Unit Followup Production				
Subtotal-IHUFU	**$2,100,898**	**$1,257,494**	**$843,404**	**40.14%**
Interviewer	$1,553,741	$629,868	$923,873	59.46%
Crew Leader Assistant*	$238,354	$103,152	$135,202	56.72%
Crew Leader	$240,716	$363,166	($122,450)	(50.87%)
Field Operations Supervisor	$68,087	$161,309	($93,222)	(136.92%)
Census Coverage Measurement Initial Housing Unit Followup Quality Control				
Subtotal-IHUFU QC	**$1,814,571**	**$908,007**	**$906,564**	**49.96%**
Interviewer	$1,000,561	$371,138	$629,423	62.91%
Crew Leader Assistant*	$346,281	$74,013	$272,268	78.63%
Crew Leader	$299,445	$287,705	$11,740	3.92%
Field Operations Supervisor	$168,284	$175,152	($6,868)	(4.08%)

[1]Values in parentheses denote values over budget
*Crew Leaders Assistants were trained as Interviewers.
**Mileage reflects costs for both field work and training.
Source: Initial Housing Unit Followup C&P Report: Current Employee Cost – Field Work

Mileage Cost Summary

Overall, the mileage costs for the 2010 CCM IHUFU operation were under budget by $1,749,967 (44.69 percent). Mileage costs for IHUFU and IHUFU QC were under budget by $843,404 (40.14 percent) and $906,564 (49.96 percent), respectively.

Mileage Cost by Position

Mileage costs for IHUFU and IHUFU QC Interviewers and CLAs were under budget. Interviewer mileage costs for IHUFU and IHUFU QC were under budget by $923,873 (59.46 percent) and $629,423 (62.91 percent), respectively. IHUFU and IHUFU QC CLA mileage costs were under budget by $135,202 (56.72 percent) and $272,268 (78.63 percent), respectively.

CL mileage cost for IHUFU QC was also under budget by $11,740 (3.92 percent); however IHUFU Production mileage cost was over budget by $122,450 (50.87 percent). FOS mileage

costs were over budget for both IHUFU and IHUFU QC by $93,222 (136.92 percent) and $6,868 (4.08 percent), respectively.

5.2.2.5 Per Diem Costs

In this section, per diem and other costs are defined as the 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 15 provides the budget and actual per diem and other costs by position for both IHUFU and IHUFU QC.

Table 15
The 2010 Census Coverage Measurement Initial Housing Unit Followup Operation
Per Diem and Other Costs by Position

Position	Budgeted Per Diem** Reimbursement	Actual Per Diem** Reimbursement	Difference of Budget to Actual Cost	Percent Over or Under Budget[1]
Total	**$1,992,375**	**$615,306**	**$1,377,069**	**69.12%**
Census Coverage Measurement Initial Housing Unit Followup Production				
Subtotal-IHUFU	**$813,780**	**$353,586**	**$460,194**	**56.55%**
Interviewer	$450,180	$130,670	$319,510	70.97%
Crew Leader Assistant*	$0	$35,071	($35,071)	Not Applicable
Crew Leader	$246,630	$106,222	$140,408	56.93%
Field Operations Supervisor	$116,970	$81,622	$35,348	30.22%
Census Coverage Measurement Initial Housing Unit Followup Quality Control				
Subtotal-IHUFU QC	**$1,178,595**	**$261,722**	**$916,873**	**77.79%**
Interviewer	$469,260	$73,671	$395,589	84.30%
Crew Leader Assistant*	$0	$27,164	($27,164)	Not Applicable
Crew Leader	$377,235	$79,586	$297,649	78.90%
Field Operations Supervisor	$332,100	$81,299	$250,801	75.52%

[1]Values in parentheses denote values over budget
*Crew Leaders Assistants were trained as Interviewers.
**Per diem reflects per diem costs for both field work and training.
Source: Initial Housing Unit Followup C&P Reports: Current Employee Cost – Training; Current Employee Cost – Field Work; Preliminary Total Cost; Budget Totals Spreadsheet

Per Diem Cost Summary

Overall, the 2010 IHUFU operation per diem cost was substantially under budget by $1,377,069 (69.12 percent). The IHUFU and IHUFU QC were under budget by $460,194 (56.55 percent) and $916,873 (77.79 percent), respectively.

Per Diem Cost by Position

Per Diem costs for IHUFU and IHUFU QC Interviewers were under budget by $319,510 (70.97 percent) and $395,589 (84.30 percent), respectively. Since no budget allocations were made for IHUFU CLAs, costs were over budget by $35,071 and $27,164, respectively.

IHUFU and IHUFU QC CL per diem costs were under budget by $140,408 (56.93 percent) and $297,649 (78.90 percent), respectively. FOS per diem costs were also under budget for both IHUFU and IHUFU QC by $35,348 (30.22 percent) and $250,801 (75.52 percent), respectively.

5.3 What was the single unit of work production rate (either housing units listed or followup cases completed per hour)?

This section analyzes the effort required to complete a single unit of work (either a housing unit listed or followup case completed) in terms of field work (non-training) hours and mileage charged. In this section, cost per case is defined as the total cost incurred for each housing unit listed (IL) or followup case completed (IHUFU).

Data may vary slightly from sources due to rounding differences that may have occurred during calculations.

5.3.1 Census Coverage Measurement Independent Listing

5.3.1.1 Production Rates for Independent Listing

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 16 provides the budget and actual production rates by position for both IL and IL DQC.

Table 16
The 2010 Census Coverage Measurement Independent Listing Operation
Production Rate by Position

Position	Budgeted Field Work Hours	Actual Field Work Hours	Budgeted Cases per Production Hour[1]	Actual Cases per Production Hour[2]	Difference of Budget to Actual Cases per Production Hour	Percent More or Less Efficient[3]
Census Coverage Measurement Independent Listing Production						
Total-IL	**345,813**	**356,595**	**2.94**	**2.50**	**0.44**	**14.97%**
Lister	216,429	217,412	4.69	4.11	0.58	12.37%
Crew Leader Assistant	51,051	31,423	19.89	28.42	(8.53)	(42.89%)
Crew Leader	66,127	75,422	15.35	11.84	3.51	22.87%
Field Operations Supervisor	12,206	32,337	83.17	27.61	55.56	66.80%
Census Coverage Measurement Independent Listing Dependent Quality Control						
Total-IL DQC	**93,090**	**124,275**	**1.44**	**2.90**	**(1.46)**	**(101.39%)**
Lister	59,140	61,667	2.26	5.85	(3.59)	(158.85%)
Crew Leader Assistant	13,890	10,646	9.62	33.88	(24.26)	(252.18%)
Crew Leader	16,830	35,292	7.94	10.22	(2.28)	(28.72%)
Field Operations Supervisor	3,230	16,670	41.37	21.64	19.73	47.69%

[1] Budgeted Total Independent Listing Production Housing Unit Workload was 1,015,190 and Budgeted Total Independent Listing Dependent Quality Control Housing Unit Workload was 133,620.
[2] Actual Total Independent Listing Production Housing Unit Workload was 892,976 and Estimated Total (Calculated) Independent Listing Dependent Quality Control Housing Unit Workload was 360,723.
[3]Values in parentheses denote values over budget
Note: Budget projection based on preliminary workload of 1,015,190 and 133,620 for IL and IL DQC, respectively. The cost analysis uses preliminary workloads since budget went unchanged once official expected workloads of 960,041 and 126,361, respectively, were released.
Source: Independent Listing C&P Report: Current Employee Cost – Field Work

Production Rate Summary

During IL, 2.50 housing units were listed per hour. This is 0.44 (14.97 percent) housing units per hour less than expected. During IL DQC, 2.90 housing units were listed per hour. This is 1.46 (101.39 percent) more housing units per hour than expected. Although IL DQC was over budget on an operational cost level, IL DQC was more efficient than expected per case. Cost overruns were a result of greater than anticipated workload.

Production Rate by Position

IL production rate for Listers was less efficient than planned by 0.58 (12.37 percent) housing units per hour. The IL DQC production rate for Listers was more efficient than planned by 3.59 (158.85 percent) housing units per hour. Production rates for CLAs were also more efficient than planned for IL and IL DQC by 8.53 (42.89 percent) housing units per hour and 24.26 (252.18 percent) more housing units per hour, respectively.

Like Listers, IL production rates for CLs were less efficient than planned by 3.51 (22.87 percent) housing units per hour and more efficient than planned for IL DQC by 2.28 (28.72 percent) housing units per hour. However, production rates for FOSs were far less efficient than planned for both IL and IL DQC by 55.56 (66.80 percent) housing units per hour and 19.73 (47.69 percent) less housing units per hour, respectively.

5.3.1.2 Mileage Rates for Independent Listing

In this section, mileage rate is defined as the number of miles charged to complete a unit of work.

Table 17 provides the budget and actual mileage rates by position for both IL and IL DQC.

Table 17
The 2010 Census Coverage Measurement Independent Listing Operation
Mileage Rate by Position

Position	Budgeted Total Miles	Actual Total Miles	Budgeted Total Miles per Case[1]	Actual Miles per Case[2]	Difference of Budget to Actual Miles per Case	Percent More or Less Efficient[3]
Census Coverage Measurement Independent Listing Production						
Total-IL	**11,412,602**	**4,974,774**	**11.24**	**5.57**	**5.67**	**50.44%**
Lister	10,435,644	2,924,122	10.28	3.27	7.01	68.19%
Crew Leader Assistant	352,888	488,216	0.35	0.55	(0.20)	(57.14%)
Crew Leader	533,557	1,100,571	0.53	1.23	(0.70)	(132.08%)
Field Operations Supervisor	90,513	461,865	0.09	0.52	(0.43)	(477.78%)
Census Coverage Measurement Independent Listing Dependent Quality Control						
Total-IL DQC	**1,976,341**	**2,291,472**	**14.79**	**6.35**	**8.44**	**57.07%**
Lister	1,704,496	1,276,844	12.76	3.54	9.22	72.26%
Crew Leader Assistant	96,563	205,253	0.72	0.57	0.15	20.83%
Crew Leader	150,348	570,977	1.13	1.58	(0.45)	(39.82%)
Field Operations Supervisor	24,934	238,398	0.19	0.66	(0.47)	(247.37%)

[1] Budgeted Total Independent Listing Production Housing Unit Workload was 1,015,190 and Budgeted Total Independent Listing Dependent Quality Control Housing Unit Workload was 133,620.
[2]Actual Total Independent Listing Production Housing Unit Workload was 892,976 and Estimated Total (Calculated) Independent Listing Dependent Quality Control Housing Unit Workload was 360,723.
[3]Values in parentheses denote values over budget
Source: Independent Listing C&P Report: Current Employee Cost – Field Work

Note: Budget projection based on preliminary workload of 1,015,190 and 133,620 for IL and IL DQC, respectively. The cost analysis uses preliminary workloads since budget went unchanged once official expected workloads of 960,041 and 126,361, respectively, were released.

Mileage Rate Summary

During IL, 5.57 miles were charged per case. This is 5.67 (50.44 percent) miles per case less than expected. During IL DQC, 6.35 miles were charged per case. This is 8.44 (57.07 percent) miles per case less than expected. That is, the mileage usage was 50.44 percent more efficient than expected for IL and 57.07 percent more efficient for IL DQC.

Mileage Rate by Position

Mileage rates for Listers were much lower than expected for IL and IL DQC by 7.01 (68.19 percent) and 9.22 (72.26 percent) less miles per case, respectively. The mileage rate for CLAs was also lower than expected for IL DQC by 0.15 (20.83 percent) miles per case less; however greater than expected for IL by 0.20 (57.14 percent) miles per case more.

Mileage rates for both CLs and FOSs were greater than expected for both IL and IL DQC. Mileage rates for CLs were greater than expected by 0.70 (132.08 percent) and 0.45 (39.82 percent) miles per case more, respectively. Mileage rates for FOSs were greater than expected by 0.43 (477.78 percent) and 0.47 (247.37 percent) miles per case more, respectively.

5.3.2 Census Coverage Measurement Initial Housing Unit Followup

5.3.2.1 Production Rates of Completion for Initial Housing Unit Followup

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 18 provides the budget and actual production rates by position for both IHUFU and IHUFU QC.

Table 18
The 2010 Census Coverage Measurement Initial Housing Unit Followup Operation
Production Rate by Position

Position	Budgeted Field Work Hours	Actual Field Work Hours	Budgeted Cases per Production Hour[1]	Actual Cases per Production Hour[2]	Difference of Budget to Actual Cases per Hour	Percent More or Less Efficient[3]
Census Coverage Measurement Initial Housing Unit Followup Production						
Total-IHUFU	**330,935**	**169,657**	**0.67**	**0.74**	**(0.07)**	**(10.45%)**
Lister	201,049	82,639	1.11	1.51	(0.40)	(36.04%)
Crew Leader Assistant	49,254	12,690	4.52	9.87	(5.35)	(118.36%)
Crew Leader	62,046	51,692	3.59	2.42	1.17	32.59%
Field Operations Supervisor	18,586	22,636	11.98	5.53	6.45	53.83%
Census Coverage Measurement Initial Housing Unit Followup Quality Control						
Total-IHUFU QC	**339,065**	**109,142**	**0.37**	**0.40**	**(0.03)**	**(8.11%)**
Lister	158,061	35,641	0.79	1.22	(0.43)	(54.43%)
Crew Leader Assistant	61,137	7,788	2.04	5.59	(3.55)	(174.02%)
Crew Leader	75,039	39,561	1.66	1.10	0.56	33.73%
Field Operations Supervisor	44,828	26,153	2.78	1.67	1.11	39.93%

[1]Budgeted Total Initial Housing Unit Followup Production Case Workload was 222,690 and Budgeted Total Initial Housing Unit Followup Quality Control Case Workload was 124,483.
[2]Actual Total Initial Housing Unit Followup Production Case Workload was 125,192 and Actual Total Initial Housing Unit Followup Quality Control Case Workload was 43,560.
[3]Values in parentheses denote values over budget
Source: Initial Housing Unit Followup C&P Report: Current Employee Cost – Field Work

Production Rate Summary

During IHUFU, 0.74 cases were completed per hour. This is 0.07 (10.45 percent) cases per hour more than expected. During IHUFU QC, 0.40 cases were completed per hour. This is 0.03 (8.11 percent) cases per hour more than expected.

Production Rate by Position

Production rates for IHUFU and IHUFU QC for Listers and CLAs were far greater than expected. Listers were more efficient than planned by 0.40 (36.04 percent) cases per hour and 0.43 (54.43 percent) cases per hour for IHUFU and IHUFU QC, respectively. CLAs were more efficient than planned by 5.35 (118.36 percent) cases per hour and 3.55 (174.02 percent) more cases per hour for IHUFU and IHUFU QC, respectively.

Though production rates for Listers and CLAs were more efficient than expected, production rates for CL and FOS were less efficient for both IHUFU and IHUFU QC. CLs were less efficient then planned by 1.17 (32.59 percent) and 0.56 (33.73 percent) cases per hour for

IHUFU and IHUFU QC, respectively. FOSs were less efficient then planned by 6.45 (53.83 percent) and 1.11 (39.93 percent) cases per hour for IHUFU and IHUFU QC, respectively.

5.3.2.2 Mileage Rates for Initial Housing Unit Followup

In this section, mileage rate is defined as the number of miles charged to complete a unit of work.

Table 19 provides the budget and actual mileage rates by position for both IHUFU and IHUFU QC.

Table 19
The 2010 Census Coverage Measurement Initial Housing Unit Followup Operation
Mileage Rate by Position

Position	Budgeted Total Miles	Actual Total Miles	Budgeted Miles per Case[1]	Actual Miles per Case[2]	Difference of Budget to Actual Miles per Case	Percent More or Less Efficient[3]
Census Coverage Measurement Initial Housing Unit Followup Production						
Total-IHUFU	**4,201,792**	**2,514,989**	**18.87**	**20.09**	**(1.22)**	**(6.47%)**
Interviewer	3,107,482	1,259,737	13.95	10.06	3.89	27.91%
Crew Leader Assistant	476,713	206,303	2.14	1.65	0.49	22.92%
Crew Leader	481,425	726,331	2.16	5.80	(3.64)	(168.29%)
Field Operations Supervisor	136,172	322,618	.61	2.58	(1.97)	(321.92%)
Census Coverage Measurement Initial Housing Unit Followup Quality Control						
Total-IHUFU QC	**3,629,139**	**1,816,015**	**29.15**	**41.69**	**(12.54)**	**(43.02%)**
Interviewer	2,001,123	742,276	16.08	17.04	(0.96)	(5.97%)
Crew Leader Assistant	692,562	148,025	5.56	3.40	2.16	38.85%
Crew Leader	598,893	575,411	4.81	13.21	(8.40)	(174.64%)
Field Operations Supervisor	336,561	350,303	2.70	8.04	(5.34)	(197.78%)

[1]Budgeted Total Initial Housing Unit Followup Production Case Workload was 222,690 and Budgeted Total Initial Housing Unit Followup Quality Control Case Workload was 124,483.
[2]Actual Total Initial Housing Unit Followup Production Case Workload was 125,192 and Actual Total Initial Housing Unit Followup Quality Control Case Workload was 43,560.
[3]Values in parentheses denote values over budget
Source: Initial Housing Unit Followup C&P Report: Current Employee Cost – Field Work

Mileage Rate Summary

During IHUFU, 20.09 miles were charged per case. This is 1.22 (6.47 percent) more miles per case than expected. During IHUFU QC, 41.69 miles were charged per case. This is 12.54 (43.02 percent) more miles per case than expected.

Mileage Rate by Position

Mileage rates for Interviewers were less than expected for IHUFU by 3.89 (27.91 percent) miles per case; however it was higher for IHUFU QC by 0.96 (5.97 percent) miles per case. Mileage rates for CLAs were less per case than expected for both IHUFU and IHUFU QC by 0.49 (22.92 percent) less miles per case and 2.16 (38.85 percent) less miles per case, respectively.

Mileage rates for CLs and FOSs were greater than expected per case for both IHUFU and IHUFU QC. Mileage rates for CLs were greater by 3.64 (168.29 percent) more miles per case and 8.40 (174.64 percent) more miles per case, respectively. Mileage rates for FOSs were greater than expected by 1.97 (321.92 percent) and 5.34 (197.78 percent) more miles per case, respectively.

5.4 Staffing – What was the number of field staff authorized and trained?

The FLD provided a staffing authorization to each RCC. This authorization provided an upper limit for hiring in each RCC. RCC staff was able to hire for each position at their discretion based on their regional implementation plans for IL and IHUFU. For IL, staff was hired and trained before the start of each wave based on where people were needed geographically. Similarly for IHUFU, staff was trained based on where they would be needed. Cluster prioritization allowed RCCs to order when they would like to receive work for a block cluster in IHUFU and helped in training for IHUFU. For more details on guidelines RCCs were provided to prioritize block clusters, please see Section 5.30. Table 20 shows the staffing authorized and trained for IL and IHUFU production and QC by field position.

During IL, RCC staff together with FLD decided there was a need for more CLs and FOSs in production and QC, a few more CLAs in QC, and fewer interviewers and QC Checkers than originally planned. This change was deemed cost neutral and therefore implemented for the operation. For IL, the number of Production FOS, QC CLs, and QC FOSs trained was about twice the authorized amounts (215.56 percent, 210.77 percent, and 192.00 percent, respectively). Less than half, 39.07 percent, of the authorized CLAs were trained for IHUFU and production CLs were increased by a third (130.74 percent). For IHUFU operations, the sample reduction needed to implement the CCM nonsampling error reduction initiative had already been implemented as well as small block cluster subsampling. This reduced the sample from 12,364 to 6,416 block clusters, therefore reducing the originally expected workload for all remaining operations. Consequently, the ratio of trained staff to authorized staff for IHUFU is only 68.15 percent.

Regional Managers were not asked to track turnover throughout IL and IHUFU, but most noticed there was a low turnover for both operations.

Table 20
2010 Census Coverage Measurement Independent Listing and Initial Housing Unit Followup Operations
Field Staff Authorized and Trained

	Production Staff					QC Staff					Overall Staff Total
	Lister / Interviewer	Crew Leader Assistant	Crew Leader	Field Operations Supervisor	Total	Quality Control Checker	Crew Leader Assistant	Crew Leader	Field Operations Supervisor	Total	
Independent Listing											
Independent Listing Staff Authorized	3,245	340	270	45	3,900	780	80	65	25	950	4,850
Independent Listing Staff Trained	2,350	244	353	97	3,044	639	84	137	48	908	3,952
Percentage of Independent Listing Authorized Staff Trained	72.42	71.76	130.74	215.56	78.05	81.92	105.00	210.77	192.00	95.58	81.48
Initial Housing Unit Followup											
Initial Housing Unit Followup Staff Authorized	2,556	242	318	92	3,208	1,684	279	339	163	2,465	5,673
Initial Housing Unit Followup Staff Trained	1,757	195	312	86	2,350	1,026	109	261	120	1,516	3,866
Percentage of Initial Housing Unit Followup Authorized Staff Trained	68.74	80.58	98.11	93.48	73.25	60.93	39.07	76.99	73.62	61.50	68.15

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

To help plan future CCMs, Table 21 shows the ratio of Listers or Interviewers to CLs, CLAs to CLs, and CLs to FOSs for IL and IHUFU production and QC. After RCC staff received staffing authorizations, they were able to discuss with FLD staffing level changes in order to implement the field operations. Generally if the staffing level changes were cost neutral they were approved. For IHUFU, due to the recommendation to reduce nonsampling error in the 2010 CCM, fewer interviewers than were initially planned were assigned to each CL and fewer CLs were assigned to each 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/QC Checkers 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 supervised by each CL, four CLs supervised by each FOS, and two QC CLs supervised by each QC FOS.

Table 21
The 2010 Census Coverage Measurement Independent Listing and Initial Housing Unit Followup Operations Field Staffing Ratios

	Production Staff	QC Staff
Independent Listing		
Lister to Crew Leader	6.66	4.66
Crew Leader Assistant to Crew Leader	0.69	0.61
Crew Leader to Field Operations Supervisor	3.64	2.85
Initial Housing Unit Followup		
Lister to Crew Leader	5.63	3.93
Crew Leader Assistant to Crew Leader	0.63	0.42
Crew Leader to Field Operations Supervisor	3.63	2.18

Source: Weekly Staff Trained Reports from Assistant Regional Census Manager

Independent Listing Results

The following sections present the unweighted results from IL. No weighted data are included in this report. No statistical testing was done, nor any inferences to the general population are intended. Statements based on the unweighted data should be interpreted purely as an assessment of the CCM operations.

5.5 What was the Independent Listing initial workload?

Table 22 shows the actual IL Workload and Expected Housing Units by Block Cluster and Collection Blocks for the U.S., Puerto Rico, and by RCC.

Table 22
The 2010 Census Coverage Measurement Independent Listing Operation
Initial Block Cluster, Collection Block, and Expected Housing Unit Workload: Unweighted

Initial Workload	Block Clusters[1]		Collection Blocks[2]		Expected Housing Units	
	Count	Percent of Total[+]	Count	Percent of Total[+]	Count	Percent of Total[+]
U.S. Total……..…….…..	11,835	95.72	17,433	95.97	906,139	94.39
Boston ……..……..	799	6.46	1,059	5.83	56,980	5.94
New York……	434	3.51	526	2.90	61,399	6.40
Philadelphia……..…….....	789	6.38	1,137	6.26	65,183	6.79
Detroit……..…….	785	6.35	1,071	5.90	53,231	5.54
Chicago……..……..	816	6.60	1,206	6.64	53,766	5.60
Kansas City…….…….	1,032	8.35	1,892	10.42	44,871	4.67
Seattle……..…….	1,053	8.52	1,477	8.13	77,450	8.07
Charlotte……...	1,089	8.81	1,382	7.61	93,278	9.72
Atlanta……..……	1,197	9.68	1,593	8.77	128,638	13.40
Dallas……	1,245	10.07	1,777	9.78	93,245	9.71
Denver……..……	1,690	13.67	3,202	17.63	81,405	8.48
Los Angeles……..……	906	7.33	1,111	6.12	96,693	10.07
Puerto Rico…….……..	529	4.28	732	4.03	53,902	5.61
Total (U.S. and Puerto Rico) …….…….	**12,364**	**100.00**	**18,165**	**100.00**	**960,041**	**100.00**

+Percentages may not sum to totals due to rounding. [1] Block Cluster – A small geographic area consisting of a single census block or a group of census blocks. It is the basic unit for data collection by a single CCM lister or other field staff.
[2] Collection Block – A physical block enumerated as a single geographic area, regardless of any legal or statistical boundaries passing through it. (Note: State, county, American Indian area, and military base boundaries, as recorded in the TIGER® database at the time of assigning numbers to collection blocks, are always block boundaries.)
Source: 2010 Census Coverage Measurement National Sample Block Cluster Data File

The total initial IL workload was 12,364 block clusters. Each block cluster contains one or more contiguous census collection blocks. A census collection block is a physical block enumerated as a single geographic area, regardless of any legal or statistical boundaries passing through it. There were 18,165 collection blocks contained in the block clusters selected for IL with an expected number of housing units to list of 960,041 housing units. The U.S. workload was 11,835 block clusters or 95.72 percent of the block clusters and 906,139 expected housing units or 94.39 percent of the expected number of housing units to list. The Puerto Rico workload was 529 block clusters or 4.28 percent of the block clusters and 53,902 expected housing units or 5.61 percent of the expected number of housing units to list.

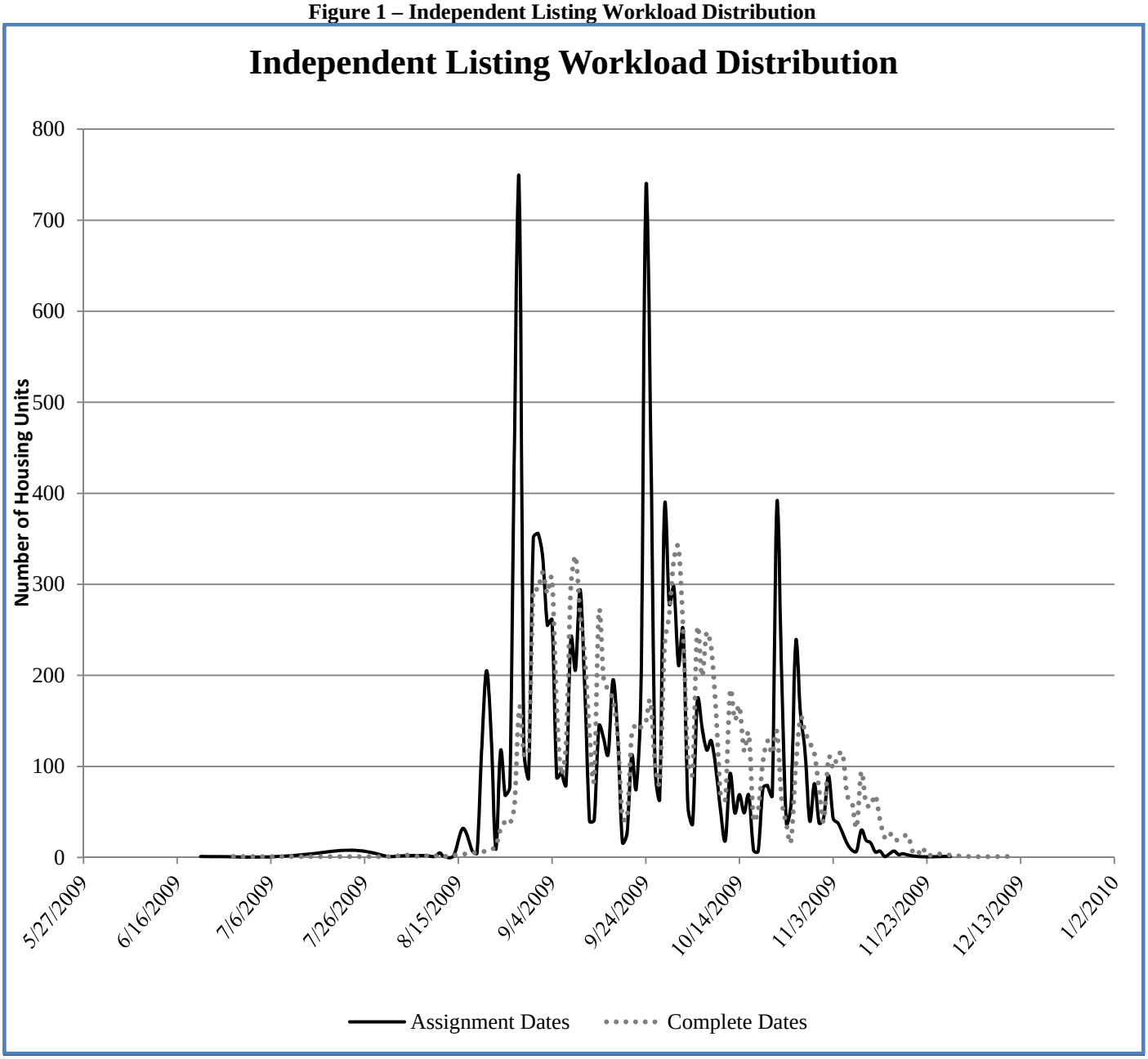
5.6 How was the Independent Listing workload distributed?

The 12 RCCs and Puerto Rico received the 2010 IL workload of 12,364 block clusters as a one-time delivery, about eight weeks before production started on June 30, 2009. As mentioned in Section 5.1.1, each RCC was instructed to complete the IL in three overlapping six-week waves (as in Table 1). RCCS were given guidance to assign approximately 40 percent of the workload to the first two waves each and the remaining 20 percent of the workload to the third wave. FOSs and CLs were trained before the start of the first wave. New listers received training before each of the waves. As part of the last day of training, interviewers went out to the field to list a block cluster, gaining hands on experience so they could discuss and share their experiences in the classroom. FOSs and CLs received staggered training so that they would receive training for all positions they supervise. For example, CLs received both interviewer and CL training. As such, CLs and FOSs also listed a block cluster as part of the last day of interviewer training.

On the cover page of the ILB, office staff wrote in when an ILB was assigned to a lister. Some ILBs required more than one lister to complete. Up to two lister assignments could be written on the cover page. Listers then filled in the completion date when they returned it to their CLs. When more than one date was available for a block cluster, the earliest assigned date and latest completion date was used.

Figure 1 shows the workload distribution based on assignment date and completion date. As expected we saw three spikes in the assignment dates at the start of each wave. Completion was more staggered throughout the operation.

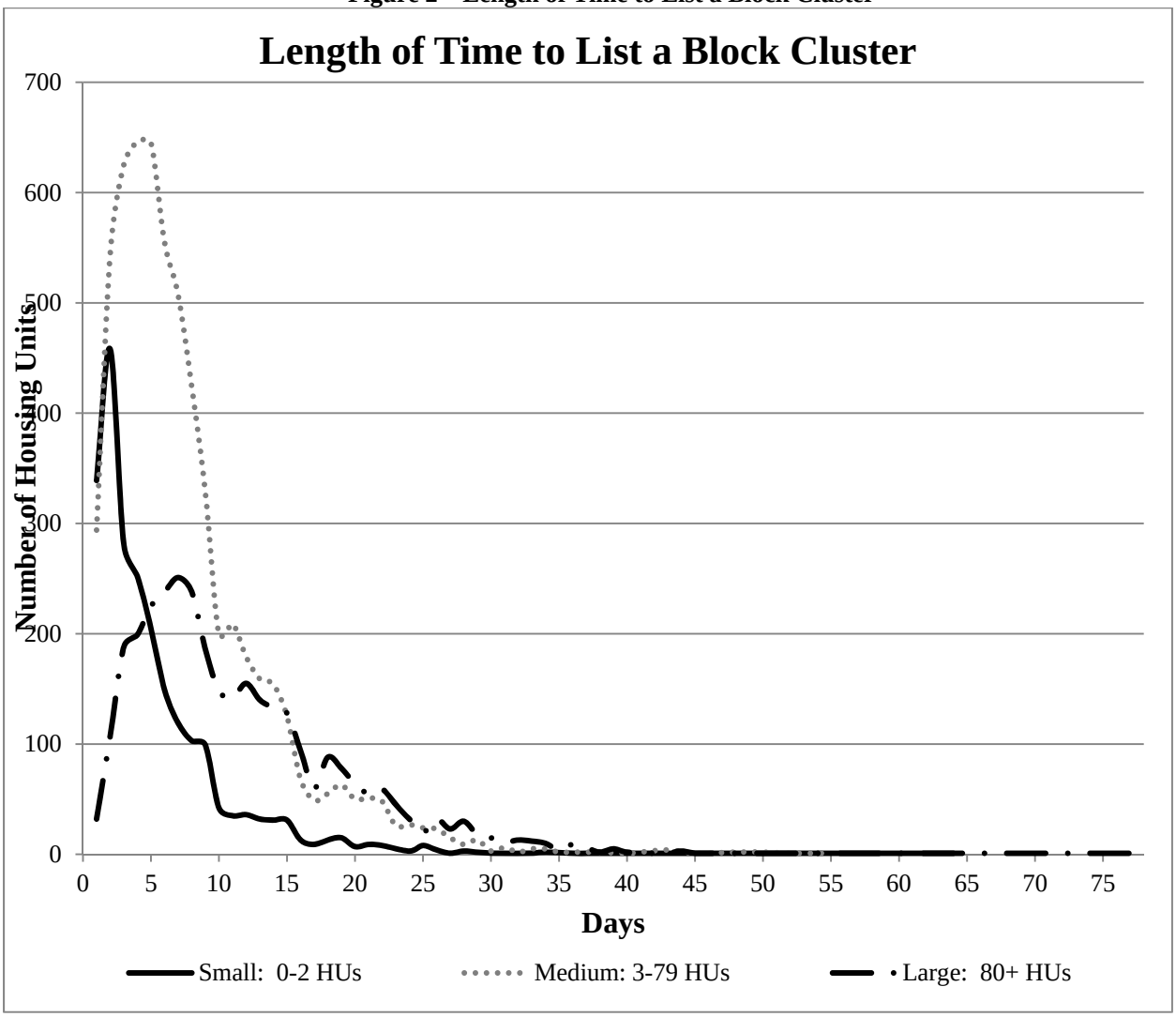
Figure 1 – Independent Listing Workload Distribution



Sources: 2010 Census Coverage Measurement Independent Listing Verified Data File

Figure 2 shows the length of time to list a block cluster.

Figure 2 – Length of Time to List a Block Cluster

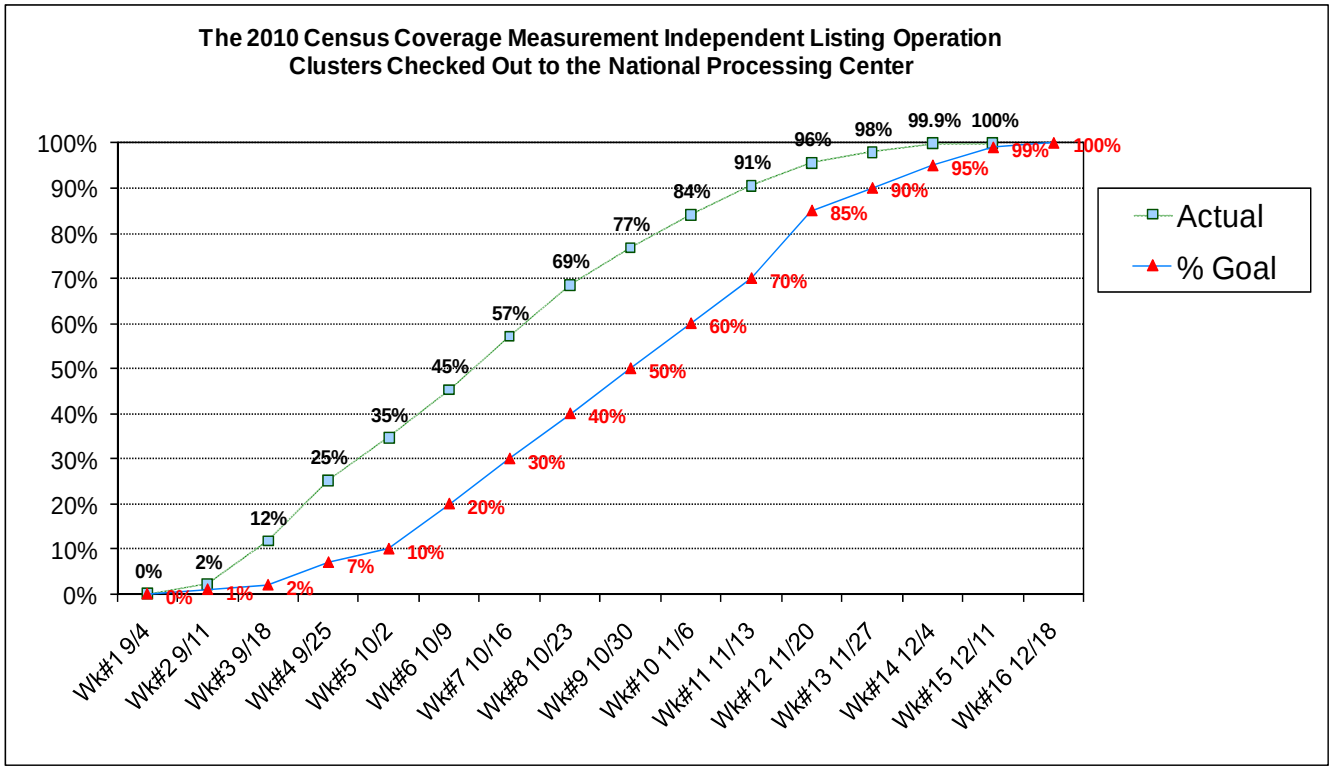


Sources: 2010 Census Coverage Measurement Independent Listing Verified Data File

As we expected, smaller block clusters generally took less time to list. We expected larger block clusters to take a longer time to list, as interviewers had to make up to two attempts to contact a respondent. The majority of the large block clusters were completed between five to ten days, not as long as we had expected. If the block cluster was really large, the RCC had the option of assigning more than one lister to list the block cluster. This could be a reason why some of the larger block clusters were completed in a shorter time. Also, at apartment buildings the listing procedure was to get the information from a manager, so these block clusters may have been completed quickly.

RCCs were provided weekly goals on the number of block clusters that should be checked out to the NPC, meaning the block cluster had completed field work (both IL and IL DQC). Figure 3 shows the National weekly goals compared with the actual block clusters checked out to the NPC. All weekly goals for the IL operation were either met or exceeded.

Figure 3 – The 2010 Census Coverage Measurement Independent Listing Operation – Block Clusters Checked Out to the National Processing Center



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

5.7 What was the total number of block clusters listed, by number of units listed in each block cluster and number of expected units per block cluster?

Table 23 shows the distribution of block clusters according to the expected and actual size based on number of units listed in the United States and Puerto Rico, as well as the ATC group recode (city-style or noncity-style) in each area. The ATC group recodes were assigned during block cluster delineation based on the address characteristic type code (Whitford, 2009).

Table 23
The 2010 Census Coverage Measurement Independent Listing Operation
Distribution of Housing Units Listed by Expected Size of the Block Cluster by Actual Number of Housing Units: Unweighted

Distribution of Total Housing Units Listed by Actual Block Cluster Size	Total		Expected Size of Block Cluster					
			0-2 Units		3-79 Units		80+ Units	
	Count	Percent of Subtotal by Actual Cluster Size+	Count	Row Percent+	Count	Row Percent+	Count*	Row Percent+
U.S. Total…….…….	11,835	100.00	2,500	21.12	5,543	46.84	3,792	32.04
0-2 Units……..	2,370	20.03	2,139	90.25	174	7.34	57	2.41
3-79 Units…….	6,233	52.67	348	5.58	5,285	84.79	600	9.63
80+ Units...…….	3,232	27.31	13	0.40	84	2.60	3,135	97.00
U.S. City-style Total……	10,554	100.00	2,209	20.93	4,773	45.22	3,572	33.84
0-2 Units……..…	2,115	20.04	1,936	91.54	126	5.96	53	2.51
3-79 Units……	5,374	50.92	260	4.84	4,579	85.21	535	9.96
80+ Units ……	3,065	29.04	13	0.42	68	2.22	2,984	97.36
U.S. Noncity-style Total.	1,281	100.00	291	22.72	770	60.11	220	17.17
0-2 Units……..…	255	19.91	203	79.61	48	18.82	4	1.57
3-79 Units……	859	67.06	88	10.24	706	82.19	65	7.57
80+ Units ……	167	13.04	0	0.00	16	9.58	151	90.42
Puerto Rico Total.……	529	100.00	100	18.90	203	38.37	226	42.72
0-2 Units……	76	14.37	71	93.42	4	5.26	1	1.32
3-79 Units……..	235	44.42	29	12.34	190	80.85	16	6.81
80+ Units……	218	41.21	0	0.00	9	4.13	209	95.87
Total…….……...…	**12,364**	**100.00**	**2,600**	**21.03**	**5,746**	**46.47**	**4,018**	**32.50**
0-2 Units……	**2,446**	**19.78**	**2,210**	**90.35**	**178**	**7.28**	**58**	**2.37**
3-79 Units……	**6,468**	**52.31**	**377**	**5.83**	**5,475**	**84.65**	**616**	**9.52**
80+ Units...……	**3,450**	**27.90**	**13**	**0.38**	**93**	**2.70**	**3,344**	**96.93**

+Percentages may not sum to totals due to rounding.
Sources: 2010 Census Coverage Measurement Independent Listing Verified Data File and 2010 Census Coverage Measurement Sample Design File (version 3)

CCM listed 2,210 small block clusters (90.35 percent) that contained zero to two housing units as expected; hence the housing unit count expected did not differ much from the actual number of housing units listed in the small block clusters. There were 5,475 medium block clusters (84.65 percent) that were listed as expected to contain 3 to 79 housing units and 3,344 large

block clusters (96.93 percent) that were listed as expected to contain 80 or more housing units. Therefore, only 1,335 (10.80 percent) of the listed block clusters changed from the expected size category. Most (15.35 percent) of the changes happened in the medium size, with 993 block clusters that moved into the medium category; 377 switched from the small to the medium category, while 616 switched from the large to the medium category.

5.8 How many total units, multiunits, and mobile home parks were listed in each block cluster?

Listers canvassed every street, road, or other place in their assigned block clusters where people might live and constructed a list of housing units or potential housing units. Potential housing units included units under construction or units/land where future construction was indicated because these units/areas had a potential of being housing units on Census Day, April 1, 2010. Listers contacted a member of each housing unit (or proxy or by observation, as a last resort) to ensure that all units at a given address were identified and this helped identify the type of housing unit. The housing units were classified as single family homes, individual units in a multiunit (apartment building), mobile homes or trailers not in a park, mobile homes or empty trailer lots/sites in a park, and a classification for other types of housing units. The other types of housing units could range from a school bus or tent to houseboats, etc. but had to be occupied by tenants at the time during listing. Listers identified the location of each housing unit by assigning it a map spot on the block maps provided with their assignment materials.

Table 24 shows the unweighted total number of housing units listed in each of the RCCs.

Table 24

The 2010 Census Coverage Measurement Independent Listing Operation

Distribution of Housing Units Listed by Regional Census Center and Type of Unit: Unweighted

Regional Census Center	Total Housing Units		Single Unit		Multiunit		Mobile Home Not in a Park		Mobile Home in a Park		Other[1]	
	Count	Percent of Total[+]	Count	Row Percent[+]	Count	Row Percent[+]	Count	Row Percent[+]	Count	Row Percent[+]	Count	Row Percent[+]
U.S. Total…….……	834,223	93.42	466,723	55.95	320,160	38.38	23,158	2.78	23,487	2.82	695	0.08
Boston ……..……..	49,688	5.56	30,820	62.03	17,596	35.41	713	1.43	545	1.10	14	0.03
New York……..……..	56,759	6.36	10,840	19.10	45,916	80.90	2	0.00	0	0.00	1	0.00
Philadelphia……	62,212	6.97	36,358	58.44	24,246	38.97	415	0.67	1,101	1.77	92	0.15
Detroit……...……..	50,711	5.68	35,899	70.79	12,677	25.00	851	1.68	1,251	2.47	33	0.07
Chicago……..…..	49,037	5.49	27,871	56.84	19,285	39.33	559	1.14	1,312	2.68	10	0.02
Kansas City……...….	43,865	4.91	29,033	66.19	11,703	26.68	1,590	3.62	1,493	3.40	46	0.10
Seattle……..	73,637	8.25	43,263	58.75	26,479	35.96	1,140	1.55	2,663	3.62	92	0.12
Charlotte…….……	82,033	9.19	54,445	66.37	18,780	22.89	6,003	7.32	2,729	3.33	76	0.09
Atlanta……..…..	115,669	12.95	63,935	55.27	41,975	36.29	4,205	3.64	5,470	4.73	84	0.07
Dallas…….….	88,252	9.88	47,672	54.02	33,849	38.35	4,626	5.24	1,990	2.25	115	0.13
Denver……..…..	74,842	8.38	43,221	57.75	25,693	34.33	2,693	3.60	3,128	4.18	107	0.14
Los Angeles……...……	87,518	9.80	43,366	49.55	41,961	47.95	361	0.41	1,805	2.06	25	0.03
Puerto Rico…….….	58,753	6.58	36,780	62.60	21,848	37.19	44	0.07	57	0.10	24	0.04
Total (U.S. and Puerto Rico)……..…	**892,976**	**100.00**	**503,503**	**56.38**	**342,008**	**38.30**	**23,202**	**2.60**	**23,544**	**2.64**	**719**	**0.08**

+Percentages may not sum to totals due to rounding. [1] A housing unit was listed as an other housing unit if a person was living in a camper, tent, van, boat, etc. at the time of listing

Source: 2010 Census Coverage Measurement Independent Listing Verified Data File

Total Units

A total of 892,976 housing units were listed across the U.S. and Puerto Rico. Over half, 503,503 (56.38 percent), of these housing units listed were single family homes. There were 342,008 (38.30 percent) individual multiunit/apartment units listed. A total of 23,202 (2.60 percent) mobile homes not in a park were listed, while 23,544 (2.64 percent) mobile homes in a park were listed. Lastly, there was less than one percent or 719 other (occupied camper, tent, van, boat, etc.) units listed.

The U.S. total housing units, excluding Puerto Rico were 834,223, with 55.95 percent (466,723) single units, 38.38 percent (320,160) multiunits, and 5.68 percent (47,340) mobile home or other categories. In Puerto Rico the distribution was 62.60 percent (36,780) single units, 37.19 percent (21,848) multiunits and 0.21 percent (125) mobile homes or other.

The Atlanta region had the most housing units listed of any RCC at 115,669 or 12.95 percent of all housing units listed. At 45,916 or 80.90 percent of the housing units listed in the region, the New York region had the most multiunit units listed within any region and had no mobile homes in a park listed.

Multiunit Structures and Mobile Homes

When listing multiunits, listers were required to record the BSA of each multiunit as well as record the individual units in each of the multiunit structures. A BSA is the house number (including any letters and fractions) and street name or road name portion of an address. In a multiunit, where the apartment or unit designation comes after the street name, such as 11 Main Street Apt. A, 11 Main Street Apt. B, and 11 Main Street Apt. C, all individual housing units share the same BSA, 11 Main Street. Listers were required to canvass the multiunit when they arrived to get a count of the number of units, and then work with the apartment manager to actually list the units in the ILB. If no apartment manager was available, the lister was instructed to contact as few apartments as needed to get all the needed information on units in the building. Size of the multiunit affects both the time the lister needs to work with the manager as well as respondent burden if no apartment manager is available. For this reason we report the size of multiunits listed in IL. We also report on Mobile Homes and Mobile Home Parks. Due to the layout of the listing book, at mobile home parks, listers collected information on the mobile home park and then recorded each mobile home within the park in Section 6 of the ILB. The distributions of multiunit Housing Units by Size of Multiunit and Mobile Home Parks, per RCC and Puerto Rico are displayed in Table 25.

Table 25

The 2010 Census Coverage Measurement Independent Listing Operation

Distribution of Multiunit Structures by Size of Multiunit and Mobile Home Parks by Regional Census Center: Unweighted

Regional Census Center	Total Multiunits		Multiunits										Mobile Home Parks		Mobile Home in a Park	
			2-4 units		5-9 units		10-19 units		20-49 units		50+ units					
	Count	Percent of Total+	Count	Row Percent+	Count	Row Percent+	Count	Row Percent+	Count	Row Percent+	Count	Row Percent+	Count	Percent of Total+	Count	Percent of Total+
U.S. Total…….	37,757	85.44	21,709	57.50	7,981	21.14	4,997	13.23	2,343	6.21	727	1.93	754	99.21	23,487	99.76
Boston …….	3,902	8.83	3,129	80.19	544	13.94	144	3.69	52	1.33	33	0.85	25	3.29	545	2.31
New York…….	5,967	13.50	4,562	76.45	705	11.81	251	4.21	269	4.51	180	3.02	0	0.00	0	0.00
Philadelphia……	2,975	6.73	1,772	59.56	469	15.76	566	19.03	116	3.90	52	1.75	28	3.68	1,101	4.68
Detroit……	1,658	3.75	953	57.48	376	22.68	242	14.60	65	3.92	22	1.33	41	5.39	1,251	5.31
Chicago……	3,193	7.23	2,300	72.03	593	18.57	210	6.58	48	1.50	42	1.32	34	4.47	1,312	5.57
Kansas City……	1,181	2.67	530	44.88	313	26.50	211	17.87	100	8.47	27	2.29	39	5.13	1,493	6.34
Seattle……	3,184	7.21	1,765	55.43	770	24.18	396	12.44	198	6.22	55	1.73	66	8.68	2,663	11.31
Charlotte……	2,090	4.73	943	45.12	611	29.23	397	19.00	106	5.07	33	1.58	138	18.16	2,729	11.59
Atlanta……	3,807	8.61	1,610	42.29	951	24.98	653	17.15	491	12.90	102	2.68	145	19.08	5,470	23.23
Dallas……	2,968	6.72	954	32.14	830	27.96	771	25.98	379	12.77	34	1.15	76	10.00	1,990	8.45
Denver……..…	2,507	5.67	1,126	44.19	566	22.58	528	21.06	253	10.09	34	1.36	117	15.39	3,128	13.29
Los Angeles……	4,325	9.79	2,065	47.75	1,253	28.97	628	14.52	266	6.15	113	2.61	45	5.92	1,805	7.67
Puerto Rico…….	6,434	14.56	5,739	89.20	423	6.57	220	3.42	30	0.47	22	0.34	6	0.79	57	0.24
Total (U.S. and Puerto Rico)	**44,191**	**100.00**	**27,448**	**62.11**	**8,404**	**19.02**	**5,217**	**11.81**	**2,373**	**5.37**	**749**	**1.69**	**760**	**100.00**	**23,544**	**100.00**

+Percentages may not sum to totals due to rounding.

Source: 2010 Census Coverage Measurement Independent Listing Verified Data File

There were a total of 44,191 multiunit BSAs listed in CCM; 6,434 (14.56 percent) in Puerto Rico and 37,757 (85.44 percent) in the U.S. Most of the U.S. multiunits were listed in the New York RCC at 13.50 percent, or 5,967 multiunits, while Kansas City had the least at 1,181 multiunits (2.67 percent). In the U.S, 57.50 percent or 21,709 of multiunit structures were listed as containing two to four units. In Puerto Rico, 89.20 percent or 5,739 of multiunit structures were listed as containing two to four units. Overall less than 2 percent (749) of the multiunits listed had 50 or more units listed.

As far as mobile homes in a park, most were listed in the Atlanta RCC with 5,470 or 23.23 percent. As expected very few mobile homes were listed in Puerto Rico and the New York RCC. Puerto Rico had six mobile home parks with 57 mobile homes in a park listed and New York had no mobile homes or mobile home parks listed.

Address Type Cluster Group Recode

As mentioned earlier, the ATC group recode consists of either city-style addresses or noncity-style addresses. A U.S. block cluster was coded as noncity-style where at least one collection block (1) is contained within a remote update/enumerate type of enumeration area (TEA), (2) contains rural route addresses, (3) contains location descriptions and incomplete records, (4) comes from mixed address areas with some DSF coverage, (5) is 100 percent city-style but with no DSF coverage, (6) and/or contains business addresses with no DSF coverage (Whitford, 2009a). The remaining block clusters were coded as city-style. All Puerto Rico block clusters were coded as noncity-style.

For IL, the ATC group recode was referred to as the TEA and was used to provide different instructions to the listers by TEA. When a lister was assigned a block cluster to list, they were instructed to look at the TEA to get an idea of what kind of addresses to anticipate. If a block cluster was city-style, they were to expect residential type of addresses that contain a house number and street name. If a block cluster was noncity-style, they were to expect addresses that contained PO Box numbers or rural route numbers. For these cases, they were instructed to provide additional information such as physical location description to locate the housing unit on the ground.

Similar to Table 24, Table 26 shows the distribution of unweighted housing units listed by the ATC group recodes for the United States and Puerto Rico, separately and combined. Similar to Table 24, the distribution of Multiunit Housing Units by Size of Multiunit and Mobile Home Parks by ATC Group Recode are displayed in Table 27.

Table 26

The 2010 Census Coverage Measurement Independent Listing Operation

Distribution of Housing Units Listed by Address Type Cluster Group Recode and Type of Unit: Unweighted

Address Type Cluster Group Recode	Total Housing Units		Single Units		Multiunits		Mobile Homes not in a Park		Mobile Homes in a Park		Other[1]	
	Count	Percent of Total[+]	Count	Row Percent [+]	Count	Row Percent [+]	Count	Row Percent [+]	Count	Row Percent [+]	Count	Row Percent [+]
U.S. Total Housing Units……	834,223	93.42	466,723	55.95	320,160	38.38	23,158	2.78	23,487	2.82	695	0.08
City-style…….....	787,434	88.18	432,934	54.98	317,212	40.28	15,796	2.01	21,157	2.69	335	0.04
Noncity-style…….….	46,789	5.24	33,789	72.22	2,948	6.30	7,362	15.73	2,330	4.98	360	0.77
Puerto Rico Total Housing Units [2]…..	58,753	6.58	36,780	62.60	21,848	37.19	44	0.07	57	0.10	24	0.04
**Total Housing Units……..... **	**892,976**	**100.00**	**503,503**	**56.38**	**342,008**	**38.30**	**23,202**	**2.60**	**23,544**	**2.64**	**719**	**0.08**
City-style……	**787,434**	**88.18**	**432,934**	**54.98**	**317,212**	**40.28**	**15,796**	**2.01**	**21,157**	**2.69**	**335**	**0.04**
**Noncity-style…….. **	**105,542**	**11.82**	**70,569**	**66.86**	**24,796**	**23.49**	**7,406**	**7.02**	**2,387**	**2.26**	**384**	**0.36**

+Percentages may not sum to totals due to rounding.

[1] A housing unit was listed as an other housing unit if a person was living in a camper, tent, van, boat, etc. at the time of listing

[2] All Puerto Rico housing units are counted as noncity-style

Source: 2010 Census Coverage Measurement Independent Listing Verified Data File and 2010 Census Coverage Measurement Sample Design File (Version 3)

Table 27

The 2010 Census Coverage Measurement Independent Listing Operation

Distribution of Multiunit Structure by Size of Structure and Mobile Home Parks by Address Type Cluster Group Recode: Unweighted

Address Type Cluster Group Recode	Total Multiunits		Multiunits										Mobile Home Parks		Mobile Homes in a Park	
			2-4 units		5-9 units		10-19 units		20-49 units		50+ units					
	Count	Percent of Total[+]	Count	Row Percent[+]	Count	Row Percent[+]	Count	Row Percent[+]	Count	Row Percent[+]	Count	Row Percent[+]	Count	Percent of Total[+]	Count	Percent of Total[+]
U.S. Total ……..……	37,757	85.44	21,709	57.50	7,981	21.14	4,997	13.23	2,343	6.21	727	1.93	754	99.21	23,487	99.76
City-style…….....	37,120	84.00	21,221	57.17	7,892	21.26	4,949	13.33	2,332	6.28	726	1.96	640	84.21	21,157	89.86
Noncity-style……..…	637	1.44	488	76.16	89	13.97	48	7.54	11	1.73	1	0.16	114	15.00	2,330	9.90
Puerto Rico Total [2]……..	6,434	14.56	5,739	89.20	423	6.57	220	3.42	30	0.47	22	0.34	6	0.79	57	0.24
Total (U.S. and Puerto Rico)..……...	**44,191**	**100.00**	**27,448**	**62.11**	**8,404**	**19.02**	**5,217**	**11.81**	**2,373**	**5.37**	**749**	**1.69**	**760**	**100.00**	**23,544**	**100.00**
City-style……	**37,120**	**84.00**	**21,221**	**57.17**	**7,892**	**21.26**	**4,949**	**13.33**	**2,332**	**6.28**	**726**	**1.96**	**640**	**84.21**	**21,157**	**89.86**
Noncity-style……	**7,071**	**16.00**	**6,227**	**88.06**	**512**	**7.24**	**268**	**3.79**	**41**	**0.58**	**23**	**0.33**	**120**	**15.79**	**2,387**	**10.14**

+Percentages may not sum to totals due to rounding.

Source: 2010 Census Coverage Measurement Independent Listing Verified Data File

From Table 26 we can see that of the total CCM listed housing units in the U.S. and Puerto Rico, 88.18 percent (787,434) were listed as city-style and 11.82 percent (105,542) as noncity-style. All Puerto Rico block clusters were noncity-style, accounting for 6.58 percent (58,753) of the total addresses listed. In the U.S. 88.18 percent (787,434) of the total addresses were listed as city-style and 5.24 percent (46,789) as noncity-style.

Of the total noncity-style housing units in the U.S., excluding Puerto Rico, 72.22 percent (33,789) were listed as single units, while 54.98 percent or 432,934 U.S. city-style housing units were listed as single family homes. Only 6.30 percent (2,948) of the noncity-style addresses in the U.S. were listed as multiunits, while 40.28 percent (317,212) of the city-style addresses were listed as multiunits.

Multiunit Structures and Mobile Homes by Address Type Cluster Group Recode

From Table 27 we can see there were 37,120 multiunit structures in the United States city-style block clusters and 637 in United States noncity-style block clusters. There are a total of 6,434 multiunit structures in Puerto Rico.

In the U.S. there were 640 and 114 mobile home parks listed in city-style and noncity-style block clusters, respectively. Listers were required to collect the mobile home park manager's office or home address, as well as record the individual mobile homes, trailers, or empty trailer lots/sites in the park. A total of 21,157 individual mobile homes are located in city-style block clusters, while 2,330 are located in noncity-style block clusters in the United States. There were six mobile home parks recorded in Puerto Rico, which contained 57 individual mobile homes.

5.9 How many housing units and block clusters were listed in the 2010 Census and Census 2000?

Table 28 displays the total number of housing units and block clusters listed in the 2000 A.C.E. and 2010 CCM, by RCC.

Table 28
The 2010 Census Coverage Measurement Independent Listing Operation
Comparison of Housing Units and Block Clusters Listed in 2000 and 2010: Unweighted

	2000 Accuracy and Coverage Evaluation				2010 Census Coverage Measurement			
	Housing Units Listed		Block Clusters Listed	Percent of Total+	Housing Units Listed		Block Clusters Listed	Percent of Total+
Regional Census Center	Count	Percent of Total+			Count	Percent of Total+		
U.S. Total……..	1,989,033	97.53	29,136	98.12	834,223	93.42	11,835	95.72
Boston …….....	180,235	8.84	2,847	9.59	49,688	5.56	799	6.46
New York…….....	128,583	6.30	984	3.31	56,759	6.36	434	3.51
Philadelphia……	183,799	9.01	2,176	7.33	62,212	6.97	789	6.38
Detroit……	73,224	3.59	1,346	4.53	50,711	5.68	785	6.35
Chicago…….	61,453	3.01	1,397	4.70	49,037	5.49	816	6.60
Kansas City……	126,764	6.22	2,920	9.83	43,865	4.91	1,032	8.35
Seattle…….	192,948	9.46	2,609	8.79	73,637	8.25	1,053	8.52
Charlotte…….	155,332	7.62	2,510	8.45	82,033	9.19	1,089	8.81
Atlanta……	121,103	5.94	1,682	5.66	115,669	12.95	1,197	9.68
Dallas…….	239,845	11.76	3,344	11.26	88,252	9.88	1,245	10.07
Denver…….....	304,432	14.93	5,132	17.28	74,842	8.38	1,690	13.67
Los Angeles……	221,315	10.85	2,189	7.37	87,518	9.80	906	7.33
Puerto Rico……	50,455	2.47	559	1.88	58,753	6.58	529	4.28
Total……..…..	**2,039,488**	**100.00**	**29,695**	**100.00**	**892,976**	**100.00**	**12,364**	**100.00**

+Percentages may not sum to totals due to rounding.
Sources: 2010 Census Coverage Measurement Independent Listing Verified Data File and Accuracy and Coverage Evaluation Sample Design File (Version 5)

In 2010, CCM listed a total of 892,976 housing units in 12,364 block clusters while the 2000 A.C.E. listed a total of 2,039,488 housing units in 29,695 block clusters. The difference of listing approximately one million additional housing units in 2000 can be attributed to a change in the scope of the CCM program. In January 1999 the Supreme Court made a declaration, which resulted in a sample reduction for all A.C.E. operations after listing (See Chapter 3 of U.S. Census Bureau 2004 for more details). Consequently, the 2010 CCM sample size requirements were also reduced.

The number of housing units listed has increased by 8,298 units in Puerto Rico, even though there were fewer block clusters listed from 2000 to 2010. Overall, there were fewer housing units listed in 2010 due to the reduction of the block cluster sample and the change in scope of the coverage measurement program between 2000 and 2010. In order to achieve reliability in Puerto Rico, the block cluster sample was selected in both 2000 and 2010 to list approximately

50,000 housing units in Puerto Rico. Similarly, 5 of the 12 RCCs had a higher proportion of the total CCM housing units listed in 2010, with the Atlanta RCC notably increasing from 5.94 percent to 12.95 percent. For more information on the IL sample and national block clustering, see the 2010 CCM: Operational Summary of the Sample Design (Davis 2012).

5.10 What were the responses to the Independent Listing coverage question?

During IL, listers were to ask the respondent at each single unit house and mobile home or trailer, not in a park with a unit status of occupied or vacant and intended for occupancy if there were any hidden housing units. They were to ask, "At <*address*>, are there any basement or garage apartments, trailers, or other residences, even if no one is living there now?" If the respondent answered "Yes," then the lister asked, "How many?" In addition to asking this question, the lister also asked if the additional housing units were attached or detached and for the number of additional housing units. With this item in the ILB, CCM aimed to capture those additional housing units that are not so clearly marked for the listers such as garage or basement apartments.

If the respondent answered there was an additional housing unit and it was attached, listing procedures had the lister change the type of address to multiunit and then list the additional unit(s) in the multiunit section of the ILB. The listing procedure did not clearly indicate if the lister should then erase the previous response to the IL coverage question, so a number of multiunits had a response to the IL coverage question. Of the 44,191 multiunit BSAs, 826 or 1.87 percent, had a "Yes" response to the IL coverage question with the number of additional units indicated as one or greater, accounting for potentially 1,089 multiunit units added. This included 877 possible additional attached units, 42 possible additional detached units, 28 possible additional units where both attached and detached was indicated, and 142 units where neither attached nor detached was indicated.

The listing procedure did not require the IL coverage question to be asked at mobile home parks or other (occupied camper, tent, van, boat, etc.) housing units or single unit or mobile homes or trailers, NOT in a park with a unit status other than occupied or vacant and intended for occupancy. Of the 1,479 mobile home parks or other housing units listed, ten had a "Yes" response to the IL coverage question, which may have been due to lister or keyer error. Of the 19,497 single unit or mobile homes or trailers, NOT in a park with a unit status other than occupied or vacant and intended for occupancy, 69 had a "Yes" response to the IL coverage question, which may have been due to lister or keyer error. Seventy-nine possible additional detached units were indicated and five possible additional units with neither attached nor detached were indicated by these (incorrect) entries.

Of the 507,208 BSAs listed as single unit or mobile homes or trailers, NOT in a park with a unit status of occupied or vacant and intended for occupancy, most responses were "No"; 502,397 or 99.05 percent. There were 838, or 0.17 percent, that did not complete the IL coverage question. However, 34 potential additional housing units were indicated with the "No" response and 53 potential additional units were indicated with the blank response, which may have been due to lister or keyer error. Entries were not expected in the additional residences field for these categories.

Note: The numbers in the previous paragraphs were computed by analyzing the 2010 CCM IL Verified data file and are not displayed in a table.

Table 29 shows the number of additional housing units possibly collected by CCM based on the "Yes" responses to the IL coverage question for occupied or vacant and intended for occupancy single units and mobile home or trailers, NOT in a park by TEA.

Table 29
The 2010 Census Coverage Measurement Independent Listing Operation
Responses to the Independent Listing Coverage Question for Occupied or Vacant and Intended for Occupancy Single units and Mobile homes or trailers, NOT in a Park to Identify Additional Housing Units

	Attached or Detached	Number of Additional Housing Units													
		Blank		1		2		3		4		5 or more		Total	
		Count	Row Percent	Count	Row Percent	Count	Row Percent	Count	Row Percent	Count	Row Percent	Count	Row Percent	Count	Percent of Total
U.S. City-Style	Yes – Attached	2	13.33	11	73.33	0	0.00	1	6.67	0	0.00	1	6.67	15	0.38
	Yes – Detached	32	1.24	2,254	87.47	198	7.68	61	2.37	23	0.89	9	0.35	2,577	64.86
	Yes – Attached and Detached	0	0.00	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00	1	0.03
	Yes – No Answer	68	40.48	84	50.00	11	6.55	1	0.60	2	1.19	2	1.19	168	4.23
	Subtotal	**102**	**3.69**	**2,349**	**85.08**	**210**	**7.61**	**63**	**2.28**	**25**	**0.91**	**12**	**0.43**	**2,761**	**69.49**
U.S. Noncity-Style	Yes – Attached	0	0.00	4	80.00	1	20.00	0	0.00	0	0.00	0	0.00	5	0.13
	Yes – Detached	9	1.20	625	83.33	90	12.00	13	1.73	5	0.67	8	1.07	750	18.88
	Yes – No Answer	10	16.95	41	69.49	4	6.78	2	3.39	1	1.69	1	1.69	59	1.49
	Subtotal	**19**	**2.33**	**670**	**82.31**	**95**	**11.67**	**15**	**1.84**	**6**	**0.74**	**9**	**1.11**	**814**	**20.49**
Puerto Rico	Yes – Attached	0	0.00	3	100.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.08
	Yes – Detached	12	3.16	311	81.84	44	11.58	10	2.63	1	0.26	2	0.53	380	9.56
	Yes – No Answer	8	53.33	5	33.33	1	6.67	1	6.67	0	0.00	0	0.00	15	0.38
	Subtotal	**20**	**5.03**	**319**	**80.15**	**45**	**11.31**	**11**	**2.76**	**1**	**0.25**	**2**	**0.50**	**398**	**10.02**
Total (U.S. and Puerto Rico)	**Yes – Attached**	**2**	**8.70**	**18**	**78.26**	**1**	**4.35**	**1**	**4.35**	**0**	**0.00**	**1**	**4.35**	**23**	**0.58**
	Yes – Detached	**53**	**1.43**	**3,190**	**86.05**	**332**	**8.96**	**84**	**2.27**	**29**	**0.78**	**19**	**0.51**	**3,707**	**93.30**
	Yes – Attached and Detached	**0**	**0.00**	**0**	**0.00**	**1**	**100.00**	**0**	**0.00**	**0**	**0.00**	**0**	**0.00**	**1**	**0.03**
	Yes – No Answer	**86**	**35.54**	**130**	**53.72**	**16**	**6.61**	**4**	**1.65**	**3**	**1.24**	**3**	**1.24**	**242**	**6.09**
	Total	**141**	**3.55**	**3,338**	**84.02**	**350**	**8.81**	**89**	**2.24**	**32**	**0.81**	**23**	**0.58**	**3,973**	**100.00**

Source: 2010 Census Coverage Measurement Independent Listing Verified Data File

A total of 4,621 potential additional housing units[12] were listed as a result of asking this question at single units and mobile homes not in a park. As expected and shown in Table 29, most of the responses were for detached housing units, 3,707 responses or 93.30 percent of the responses, which accounted for 4,350 of the possible additional housing units. We expected most responses to be 'detached', because the lister should have changed the type of address to multiunit if the additional unit was attached. In addition, 28 attached potential housing units were added while 241 were added with no indication if the unit was attached or detached and two units had both marked.

5.11 How often was the structure identifier used? How many addresses were listed with a house number/street name and how many were listed without a house number/street name?

A total of 551,820 BSAs were recorded in the U.S. during IL as seen in Table 30. The BSA for each mobile home in a park is included in this total. Table 30 also shows the distribution of each of the address items recorded. The listers collected several types of address information for each housing unit in the ILB such as house number, street name, rural route number, box number, PO Box number, and structure identifier. The structure identifier was a new address item added for the 2010 CCM. A structure identifier was collected when two or more buildings share the same BSA, to distinguish them from each other. For example, a multiunit structure consists of three buildings that are numbered 101-103 and all three buildings share the same BSA. In order to distinguish the three buildings, the lister recorded 101, 102, and 103 in the structure identifier field. There were 29,430 or 5.80 percent of the addresses in city-style areas and 7,802 or 17.54 percent of the addresses in noncity-style areas that had a structure identifier entry.

There were 493,575 or 97.29 percent of the U.S. addresses that contained a house number and street name in the city-style areas and 33,140 or 74.51 percent in noncity-style areas. In contrast, 1,904 or 4.28 percent of the noncity-style BSAs did not contain a house number or street name, while only 0.11 percent (569) of the city-style housing units did not have these fields. There were still quite a few U.S. addresses, (18,705 or 3.39 percent) with only street name and no house number. Note these categories are not mutually exclusive and not all combinations of the address items are included. Thus, the total of the individual categories will not sum to the total of BSAs.

[12] The possible additional housing units were computed by multiplying the number of additional housing units the respondent reported times the count for that response category in Table 29.

Table 30
The 2010 Census Coverage Measurement Independent Listing Operation
Basic Street Address Fields[1] for U.S. Addresses (excluding Puerto Rico): Unweighted

Address Feature	City-style		Noncity-style		U.S. Total	
	Count	Percent of Total[+]	Count	Percent of Total[+]	Count	Percent of Total[+]
House Number and Street Name…….	493,575	97.29	33,140	74.51	526,715	95.45
House Number only……	280	0.06	87	0.20	367	0.07
Street Name only…….	12,626	2.49	6,079	13.67	18,705	3.39
Neither House Number or Street Name	569	0.11	1,904	4.28	2,473	0.45
Rural Route and Box……..	88	0.02	1,827	4.11	1,915	0.35
Rural Route Only……	12	0.00	33	0.07	45	0.01
Box Only…….	27	0.01	71	0.16	98	0.02
PO Box Only……...	42	0.01	441	0.99	483	0.09
Structure Identifier…….	29,430	5.80	7,802	17.54	37,232	6.75
Total Basic Street Addresses[1]……...	507,342	100.00	44,478	100.00	551,820	100.00

+Percentages will not add to 100 since they are not mutually exclusive.
[1]Note these categories are not mutually exclusive and not all combinations of the address items are included and will not sum to the total of Basic Street Addresses.
Sources: 2010 Census Coverage Measurement Independent Listing Verified Data File and 2010 Census Coverage Measurement Sample Design File (Version 3)

5.12 How often was each of the Puerto Rico specific address fields used?

Table 31 shows how often seven address feature fields are listed for Puerto Rico addresses. A different ILB which contained the additional Puerto Rico specific address features was designed in Spanish for Puerto Rico. The additional address features collected for Puerto Rico were:

- Ramal
- Urbanization
- Kilometer (KM)
- Hectometer (HM)
- Barrio or sector (Area Name 1)
- Barriadas, sectores, parcelas, or comunidades (Area Name 2)
- Complex designation

Table 31
The 2010 Census Coverage Measurement Independent Listing Operation
Basic Street Addresses that used Puerto Rico Specific Address Fields: Unweighted

Address Feature	Count	Percent of Total[+]
Total Puerto Rico Basic Street Addresses …….....	**43,282**	**100.00**
Urbanization……..	16,112	37.23
Area Name 1…….	27,775	64.17
Area Name 2…….	16,770	38.75
Complex Designation…….……	1,456	3.36
Ramal…….	2,588	5.98
Kilometer……..……	13,569	31.35
Hectometer…….	13,169	30.43
Urbanization and Area Name 1.....	2,739	6.33
Urbanization and Area Name 2.....	418	0.97
Urbanization and Complex Designation.....	1,344	3.11
Urbanization and Ramal.....	82	0.19
Urbanization and Kilometer.....	918	2.12
Urbanization and Hectometer.....	915	2.11
Area Name 1 and Area Name 2.....	15,579	35.99
Area Name 1 and Complex Designation.....	264	0.61
Area Name 1 and Ramal.....	2,558	5.91
Area Name 1 and Kilometer.....	13,224	30.55
Area Name 1 and Hectometer.....	12,837	29.66
Area Name 2 and Complex Designation.....	67	0.15
Area Name 2 and Ramal.....	1,776	4.10
Area Name 2 and Kilometer.....	7,918	18.29
Area Name 2 and Hectometer.....	7,674	17.73
Complex Designation and Ramal.....	49	0.11
Complex Designation and Kilometer.....	110	0.25
Complex Designation and Hectometer.....	108	0.25
Ramal and Kilometer.....	1,917	4.43
Ramal and Hectometer.....	1,862	4.30
Kilometer and Hectometer.....	13,150	30.38

+Percentages will not add to 100 since categories are not mutually exclusive.
Source: 2010 Census Coverage Measurement Independent Listing Verified Data File

A total of 43,282 BSAs were listed in Puerto Rico. Mobile home park BSAs were excluded from the Puerto Rico BSA count because the additional Puerto Rico address features were not collected for mobile home parks, since it was known when planning that there were few mobile home parks in Puerto Rico. There were 27,775 or 64.17 percent of the Puerto Rico BSAs that contained a barrio or sector name (Area Name 1); 16,112 (37.23 percent) contained an urbanization field. As expected, Area Name 1 is generally reported with Area Name 2 for 15,579 Puerto Rico BSAs or 35.99 percent. Also as expected, KM and HM were usually reported together for 13,150 or 30.38 percent of the Puerto Rico BSAs. The following combination of address fields were used for less than one percent of the BSAs listed:

- urbanization and area name 2
- urbanization and ramal
- area name 1 and complex designation
- area name 2 and complex designation
- complex designation and ramal
- complex designation and KM
- complex designation and HM.

5.13 How many block maps were multi-sheeted?

Each lister received an ILB with maps of their assignment areas showing the block clusters and blocks in the area. Each block cluster contained one or more blocks. Listers received a block map for each block within their assigned block cluster to map spot all potential housing units. Depending on the land size of the block cluster or block, the map may have been multi-sheeted. If the map was multi-sheeted, it contained an index which showed how the pages fit together. It was generally easier to map spot on single-sheeted maps. The total number of maps created for IL for the U.S. and Puerto Rico are shown in Table 32.

Table 32
The 2010 Census Coverage Measurement Independent Listing Operation
Maps Created for Independent Listing

Map Type	Map Sheet Statistics	
	Count	Percent of Total[+]
Total (U.S. and Puerto Rico) Block Maps……	**18,165**	**100.00**
Single-Sheeted……..	17,333	95.42
Multi-Sheeted……..	832	4.58
2-5 sheets……	568	3.13
6-10 sheets…….	179	0.99
11-20 sheets……	65	0.36
20+ sheets[1]……	20	0.11
Total (U.S. and Puerto Rico) Block Cluster Maps…	**12,364**	**100.00**
Single-Sheeted……..	12,354	99.92
Multi-Sheeted[2]…….	10	0.08

[1]The maximum number of block map sheets was 50.
[2]The maximum number of block cluster map sheets is six.
+Percentages may not sum to totals due to rounding.
Source: Geography Division Cartographic Staff

There were 18,165 block maps created for the 12,364 block cluster maps, which was the workload for IL. There were 17,333 or 95.42 percent of the block maps and 12,354 or 99.92 percent of the block cluster maps that consisted of single sheets, while 832 or 4.58 percent of the block maps were multi-sheeted and 10 or 0.08 percent of the block cluster maps were multi-sheeted. Only 1.46 percent or 264 of the block maps required more than six sheets to display the assignment areas.

5.14 How many maps were scanned, by type of map (block map, index sheet, sketch map, etc.)?

When completed block cluster materials arrived at the NPC, the maps were edited with the ILBs and then sent to map scanning, so the images could be loaded into the Map Viewing System for use in later CCM operations. If there was not enough room on the block map to show all potential housing units, listers used a sketch map to draw out the area and map spot. Table 33 shows the number of Block Maps, Block Index Maps, and Sketch Maps scanned for the U.S. by ATC Group Recode and Puerto Rico.

Table 33
The 2010 Census Coverage Measurement Independent Listing Operation
Maps Scanned after Independent Listing

Map Types	Count	Percent of Total Map Type [+]
Block Maps……..……	**21,946**	**100.00**
U.S. Block Maps……..	20,854	95.02
City-style……	16,482	79.04
Noncity-style……	4,372	20.96
Puerto Rico Block Maps…...……..	1,092	4.98
Block Index Maps……..…….…	**854**	**100.00**
U.S. Block Index Maps……..	760	88.99
City-style……	537	70.66
Noncity-style……	223	29.34
Puerto Rico Block Index Maps……...……..	94	11.01
Sketch Maps……..……..…….	**4,487**	**100.00**
U.S. Sketch Maps……..……..	4,273	95.23
City-style……	3,798	88.88
Noncity-style……	475	11.12
Puerto Rico Sketch Maps…...……..……..	214	4.77

+Percentages may not sum to totals due to rounding. Source: HUMaRCS Map Viewing input files

During scanning some maps may have been scanned more than once because of poor imaging, but because only the last image was used in the Map Viewing System, the counts in Table 33 reflect only the last image. There were 21,946 Block Maps, 854 Block Index Maps, and 4,487 Sketch Maps scanned after IL. The numbers in Table 33 are higher than those in Table 32 because each sheet of a multi-sheeted block map counted as one scanned image.

5.15 How many Independent Listing Books were used?

Table 34 shows the number of ILBs used to list the block clusters during IL for the U.S. and Puerto Rico. A total of 15,061 ILBs[13] (14,266 ILBs for the U.S. and 795 ILBs for Puerto Rico) were used by the listers to list all the housing units in the nationwide sample. Over 70 percent of the block clusters were listed on one ILB; 10,413 block clusters in the U.S. and 400 block clusters in Puerto Rico. The Puerto Rico block clusters were listed on one to nine ILBs, with only one block cluster that required nine ILBs. The U.S. block clusters required one to 17 ILBs, but only 15 block clusters required nine or more ILBs to be listed.

[13] The total ILBs used was computed by multiplying the count of block clusters by the number of ILBs used in Table 34.

Table 34
The 2010 Census Coverage Measurement Independent Listing Operation
Independent Listing Books Used

Number of Independent Listing Books	Total Block Clusters		U.S. Block Clusters		Puerto Rico Block Clusters	
	Count	Percent of Total+	Count	Percent of Total+	Count	Percent of Total+
Total	**12,364**	**100.00**	**11,835**	**100.00**	**529**	**100.00**
1	10,813	87.46	10,413	72.99	400	50.31
2	1,024	8.28	949	6.65	75	9.43
3	270	2.18	252	1.77	18	2.26
4	113	0.91	98	0.69	15	1.89
5	57	0.46	49	0.34	8	1.01
6	34	0.27	28	0.20	6	0.75
7	22	0.20	20	0.14	2	0.25
8	15	0.12	11	0.08	4	0.50
9	5	0.04	4	0.03	1	0.13
10	5	0.04	5	0.04	0	0.00
11	1	0.01	1	0.01	0	0.00
12	1	0.01	1	0.01	0	0.00
13	2	0.02	2	0.01	0	0.00
14	1	0.01	1	0.01	0	0.00
15	0	0.00	0	0.00	0	0.00
16	0	0.00	0	0.00	0	0.00
17	1	0.01	1	0.01	0	0.00

+Percentages may not sum to totals due to rounding.
Source: 2010 Census Coverage Measurement Independent Listing Verified Data File

5.16 What was the Housing Unit Status Distribution?

Tables 35, 36, and 37 display the unit status distribution by type of address listed for the U.S. and Puerto Rico, U.S. only, and Puerto Rico only, respectively. There are eight possible unit statuses:

1 – Occupied or vacant and intended for occupancy
2 – Under construction
3 – Future construction
4 – Unfit for habitation
5 – Boarded up
6 – Storage of household goods
7 – Empty trailer lot/site
8 – Other

If a lister listed a single family unit or a mobile home or trailer not in a park, he or she could check off an additional type of status under "Future construction." The additional statuses are:

A – A sign indicating future construction is planned
B – A building permit
C – Stakes in the ground
D – A zoning change sign from commercial use to residential use
E – Other – Specify (Listers had to provide a description of the situation. This was coded in two categories: with and without (left blank) explanation.)

Table 35
The 2010 Census Coverage Measurement Independent Listing Operation
Type of Unit Status by Type of Address Listed (U.S. and Puerto Rico Combined): Unweighted

Unit Status	Total	Percent of Total+	Type of Address									
			Single Units		Multiunits		Mobile Homes not in a Park		Mobile Homes in a Park		Other	
			Count	Row Percent+	Count	Row Percent+	Count	Row Percent+	Count	Row Percent+	Count	Row Percent+
Total (U.S. and Puerto Rico)…….	**892,394**	**100.00**	**503,503**	**56.42**	**342,008**	**38.32**	**23,202**	**2.60**	**23,544**	**2.64**	**137**	**0.02**
1 – Occupied or vacant and intended for occupancy.....	863,242	96.73	485,114	56.20	335,119	38.82	22,121	2.56	20,783	2.41	105	0.01
2 – Under construction ……..…….....	6,427	0.72	3,328	51.78	3,069	47.75	29	0.45	0	0.00	1	0.02
3 – Future construction.....	10,756	1.21	9,808	91.19	913	8.49	23	0.21	0	0.00	12	0.11
a – A sign indicating future construction is planned.....	5,134	0.58	5,130	99.92	NA	NA	1	0.02	NA	NA	3	0.06
b – A building permit.....	233	0.03	228	97.85	NA	NA	4	1.72	NA	NA	1	0.43
c – Stakes in the ground.....	3,508	0.39	3,499	99.74	NA	NA	4	0.11	NA	NA	5	0.14
d – A zoning change sign from commercial to residential use	13	0.00	13	100.00	NA	NA	0	0.00	NA	NA	0	0.00
e – Other with explanation.....	4,042	0.45	4,018	99.41	NA	NA	14	0.06	NA	NA	10	7.30
e – Other without explanation.....	20	0.00	20	100.00	NA	NA	0	0.00	NA	NA	0	0.00
4 – Unfit for habitation.....	4,395	0.49	2,727	62.05	968	22.03	615	13.99	81	1.84	4	0.09
5 – Boarded up.....	2,901	0.33	1,772	61.08	997	34.37	101	3.48	31	1.07	0	0.00
6 – Storage of household goods.....	900	0.10	458	50.89	157	17.44	263	29.22	20	2.22	2	0.22
7 – Empty trailer lot/site.....	2,598	0.29	0	0.00	0	0.00	0	0.00	2,598	100.00	0	0.00
8 – Other.....	1,175	0.13	296	25.19	785	66.81	50	4.26	31	2.64	13	1.11

NA stands for Not Applicable
+Percentages may not sum to totals due to rounding.
Source: 2010 Census Coverage Measurement Independent Listing Verified Data File

Table 36
The 2010 Census Coverage Measurement Independent Listing Operation
Type of Unit Status by Type of Address Listed in the United States: Unweighted

Unit Status	Total	Percent of Total+	Type of Address									
			Single Units		Multiunits		Mobile Homes not in a Park		Mobile Homes in a Park		Other	
			Count	Row Percent+	Count	Row Percent+	Count	Row Percent+	Count	Row Percent+	Count	Row Percent+
U.S. Total…….....….....	**833,660**	**100.00**	**466,723**	**55.98**	**320,160**	**38.40**	**23,158**	**2.78**	**23,487**	**2.82**	**132**	**0.02**
1 – Occupied or vacant and intended for occupancy.....	807,838	96.90	450,192	55.73	314,720	38.96	22,080	2.73	20,742	2.57	104	0.01
2 – Under construction …….…….....	5,171	0.62	2,657	51.38	2,484	48.04	29	0.56	0	0.00	1	0.02
3 – Future construction.....	10,302	1.24	9,386	91.11	882	8.56	23	0.22	0	0.00	11	0.11
a – A sign indicating future construction is planned….....	4,828	0.58	4,825	99.94	NA	NA	1	0.02	NA	NA	2	0.04
b – A building permit.....	154	0.02	149	96.75	NA	NA	4	2.60	NA	NA	1	0.65
c – Stakes in the ground.....	3,488	0.42	3,479	99.74	NA	NA	4	0.11	NA	NA	5	0.14
d – A zoning change sign from commercial to residential use	13	0.00	13	100.00	NA	NA	0	0.00	NA	NA	. 0	0.00
e – Other with explanation.....	3,686	0.44	3,662	99.35	NA	NA	14	0.38	NA	NA	10	0.27
e – Other without explanation.....	18	0.00	18	100.00	NA	NA	0	0.00	NA	NA	0	0.00
4 – Unfit for habitation.....	3,794	0.46	2,218	58.46	876	23.09	615	16.21	81	2.13	4	0.11
5 – Boarded up.....	2,669	0.32	1,599	59.91	939	35.18	100	3.75	31	1.16	0	0.00
6 – Storage of household goods.....	827	0.10	423	51.15	119	14.39	263	31.80	20	2.42	2	0.24
7 – Empty trailer lot/site.....	2,582	0.31	0	0.00	0	0.00	0	0.00	2,582	100.00	0	0.00
8 – Other.....	477	0.06	248	51.99	140	29.35	48	10.06	31	6.50	10	2.10

NA stands for Not Applicable
+Percentages may not sum to totals due to rounding.
Source: 2010 Census Coverage Measurement Independent Listing Verified Data File

Table 37
The 2010 Census Coverage Measurement Independent Listing Operation
Type of Unit Status by Type of Address Listed in Puerto Rico: Unweighted

Unit Status	Total	Percent of Total+	Type of Addresses									
			Single Units		Multiunits		Mobile Homes not in a Park		Mobile Homes in a Park		Other	
			Count	Row Percent+	Count	Row Percent+	Count	Row Percent+	Count	Row Percent+	Count	Row Percent+
Puerto Rico Total.....	**58,734**	**100.00**	**36,780**	**62.62**	**21,848**	**37.20**	**44**	**0.07**	**57**	**0.10**	**5**	**0.01**
1 – Occupied or vacant and intended for occupancy.....	55,404	94.33	34,922	63.03	20,399	36.82	41	0.07	41	0.07	1	0.00
2 – Under construction…….....	1,256	2.14	671	53.42	585	46.58	0	0.00	0	0.00	0	0.00
3 – Future construction.....	454	0.77	422	92.95	31	6.83	0	0.00	0	0.00	1	0.22
a – A sign indicating future construction is planned.....	306	0.52	305	99.67	NA	NA	0	0.00	NA	NA	1	0.33
b – A building permit.....	79	0.13	79	100.00	NA	NA	0	0.00	NA	NA	0	0.00
c – Stakes in the ground.....	20	0.03	20	100.00	NA	NA	0	0.00	NA	NA	0	0.00
d – A zoning change sign from commercial to residential use	0	0.00	0	0.00	NA	NA	0	0.00	NA	NA	0	0.00
e – Other with explanation.....	356	0.61	356	100.00	NA	NA	0	0.00	NA	NA	0	0.00
e – Other without explanation.....	2	0.00	2	100.00	NA	NA	0	0.00	NA	NA	0	0.00
4 – Unfit for habitation.....	601	1.02	509	84.69	92	15.31	0	0.00	0	0.00	0	0.00
5 – Boarded up.....	232	0.40	173	74.57	58	25.00	1	0.43	0	0.00	0	0.00
6 – Storage of household goods.....	73	0.12	35	47.95	38	52.05	0	0.00	0	0.00	0	0.00
7 – Empty trailer lot/site.....	16	0.03	0	0.00	0	0.00	0	0.00	16	100.00	0	0.00
8 – Other.....	698	1.19	48	6.88	645	92.41	2	0.29	0	0.00	3	0.43

NA stands for Not Applicable
+Percentages may not sum to totals due to rounding.
Source: 2010 Census Coverage Measurement Independent Listing Verified Data File

Of the addresses with a unit status indicated by a lister for the U.S. and Puerto Rico, 863,242 or 96.73 percent had a unit status of "Occupied or vacant and intended for occupancy." When looking at the U.S. addresses and Puerto Rico addresses separately 807,838 or 96.90 percent of the U.S. addresses had a unit status of "Occupied or vacant and intended for occupancy," and Puerto Rico had 55,404 or 94.33 percent of the addresses in the same category.

The future construction unit status is specific to CCM, (i.e., Census does not indicate a unit to be future construction). Future construction units are captured during Independent Listing to try to identify additional housing units that may exist on Census Day or by the time the Census Coverage Measurement Person Interview takes place. Future construction was indicated as the unit status of 10,756 total housing units or 1.21 percent of units listed. For U.S. addresses, 10,302 or 1.24 percent of the housing units had a status of future construction, and for Puerto Rico housing units 454 or 0.77 percent had a unit status of future construction. The reason for future construction was usually a sign indicating future construction was planned.

Some of the listers incorrectly selected a unit status for the "other" type of housing units. For this type of unit, the skip instruction in the ILB instructed them to skip to the final question because for this type of unit to be listed, it had to be occupied at the time of listing. For this analysis, the unit status for these units was not disregarded. Out of the 719 other units listed, only 137 or 19.05 percent contained a unit status entry, of which 105 contained a unit status of "1 – Occupied or vacant and intended for occupancy." The remaining units had another type of unit status. These units may have been listed in error, but may have been sent out in IHUFU for followup to determine their status. Unit status of "7 – Empty trailer lot/site" was available only to mobile home parks. There were 2,598 empty trailer lots/sites listed in the U.S. and Puerto Rico.

5.17 What was the respondent type distribution?

Table 38 displays the type of respondent by type of address for the U.S. and Puerto Rico. For each type of housing unit, the lister was to record the respondent type, (i.e., whoever provided them information about the sample unit address or if they conducted the listing by observation, which is done as a last resort). There were three possible respondent types: household member, proxy, or manager. The lister could have left this item blank inadvertently or could have checked off multiple entries. Overall, household members provided the information for 47.47 percent or 271,337 of the housing units listed, proxies provided the information for 29.26 percent or 167,252 of the housing units listed, and managers provided information for 6.48 percent or 37,024 of the housing units listed. At multiunits, listers were instructed to contact an apartment manager when available to get the housing unit information and if no manager was available, to contact as few household members as possible to gather the information for all units within the multiunit. For multiunits, 36.68 percent or 16,209 of the housing unit information was collected from managers, 34.03 percent or 15,038 of the housing unit information was collected from household members, and 18.74 percent or 8,281 of the housing unit information was collected from proxies.

This table does not contain a column for the mobile homes or trailers in a park because these entries could not be calculated due to the lack of edits between Section 4, Listing Page and

Section 6, Mobile Home Park Page. For more information on this, please refer to the fifth bullet in Section 4.1, IL Limitations.

Table 38
The 2010 Census Coverage Measurement Independent Listing Operation
Type of Respondent by Type of Address: Unweighted

Respondent Type	Total Addresses		Type of Addresses							
			Single Units		Multiunits		Mobile Homes not in a Park		Other	
	Count	Percent of Total+	Count	Percent of Total+	Count	Percent of Total+	Count	Percent of Total+	Count	Percent of Total+
U.S. Total…….....	**528,333**	**100.00**	**466,723**	**100.00**	**37,757**	**100.00**	**23,158**	**100.00**	**695**	**100.00**
Household Member	256,308	48.51	233,048	49.93	12,331	32.66	10,784	46.57	145	20.86
Proxy	152,313	28.83	138,359	29.64	6,478	17.16	7,236	31.25	240	34.53
Manager	35,020	6.63	18,965	4.06	15,646	41.44	364	1.57	45	6.47
Observation	79,026	14.96	71,866	15.40	2,567	6.80	4,348	18.78	245	35.25
Multiple Entries	1,428	0.27	1,203	0.26	106	0.28	116	0.50	3	0.43
Blank	4,238	0.80	3,282	0.70	629	1.67	310	1.34	17	2.45
Puerto Rico…......	**43,282**	**100.00**	**36,780**	**100.00**	**6,434**	**100.00**	**44**	**100.00**	**24**	**100.00**
Household Member	15,029	34.72	12,307	33.46	2,707	42.07	13	29.55	2	8.33
Proxy	14,939	34.52	13,111	35.65	1,803	28.02	21	47.73	4	16.67
Manager	2,004	4.63	1,441	3.92	563	8.75	0	0.00	0	0.00
Observation	10,411	24.05	9,198	25.01	1,185	18.42	10	22.73	18	75.00
Multiple Entries	117	0.27	94	0.26	23	0.36	0	0.00	0	0.00
Blank	782	1.81	629	1.71	153	2.38	0	0.00	0	0.00
Total (U.S. and Puerto Rico)	**571,615**	**100.00**	**503,503**	**100.00**	**44,191**	**100.00**	**23,202**	**100.00**	**719**	**100.00**
Household Member	**271,337**	**47.47**	**245,355**	**48.73**	**15,038**	**34.03**	**10,797**	**46.53**	**147**	**20.45**
Proxy	**167,252**	**29.26**	**151,470**	**30.08**	**8,281**	**18.74**	**7,257**	**31.28**	**244**	**33.94**
Manager	**37,024**	**6.48**	**20,406**	**4.05**	**16,209**	**36.68**	**364**	**1.57**	**45**	**6.26**
Observation	**89,437**	**15.65**	**81,064**	**16.10**	**3,752**	**8.49**	**4,358**	**18.78**	**263**	**36.58**
Multiple Entries	**1,545**	**0.27**	**1,297**	**0.26**	**129**	**0.29**	**116**	**0.50**	**3**	**0.42**
Blank	**5,020**	**0.88**	**3,911**	**0.78**	**782**	**1.77**	**310**	**1.34**	**17**	**2.36**

+Percentages may not sum to totals due to rounding.
Source: 2010 Census Coverage Measurement Independent Listing Verified Data File

5.18 What is the distribution of the Block Clusters with Zero Housing Units?

Table 39 displays the distribution of the block clusters with zero housing units by the number of blocks in the block cluster.

Table 39
The 2010 Census Coverage Measurement Independent Listing Operation
Distribution of the Number of Blocks within Block Clusters Having Zero Housing Units: Unweighted

Number of blocks in block cluster	Total Block Clusters		All Blocks in Block Cluster Contain Housing Units		At Least One Block in the Block Cluster Contains No Housing Units	
	Count	Percent of Total[+]	Count	Row Percent[+]	Count	Row Percent[+]
1……...……..	9,838	79.57	8,188	83.23	1,650	16.77
2 – 5……...…….	2,273	18.38	1,384	60.89	889	39.11
6 – 10……...……	192	1.55	34	17.71	158	82.28
11 – 20……...…….	56	0.45	1	1.79	55	98.22
21+ ……...…….	5	0.04	0	0.00	5	100.00
Total……...……	**12,364**	**100.00**	**9,607**	**77.70**	**2,757**	**22.30**

+Percentages may not sum to totals due to rounding.
Source: 2010 Census Coverage Measurement Independent Listing Verified Data File

Table 39 shows that 2,757 of the 12,364 block clusters, or 22.30 percent of the sample block clusters, had at least one block with zero housing units. In addition, the table shows that the greater the number of blocks per block cluster, the higher the probability of having at least one block in the block cluster with no housing units. There were 8,188 single block clusters or 83.23 percent that contained housing units, while 1,650 or 16.77 percent had no housing units.

Results of Census Coverage Measurement to Census Matching Operations

The following sections present the unweighted results from computer and clerical matching. No weighted data are included in this report. No statistical testing was done, nor any inferences to the general population are intended. Statements based on the unweighted data should be interpreted purely as an assessment of the CCM operations.

Also note, as mentioned earlier, the initiative to reduce nonsampling error in the CCM program (as well as small block cluster subsampling) reduced the sample size for operations after CCM IL. The 12,364 block clusters in the initial sample were reduced to 6,416 block clusters before IHU Computer Matching.

Initial Housing Unit Computer Matching Results

The IHU computer matching results provided in this section include the post-processing of the DSSD computer matching results by HUMaRCS software to assign the four codes of match, possible match, nonmatch, and duplicate to the CCM and census address results from DSSD's CCM Computer Matching Operation. All results are based on unweighted data. Statements based on the unweighted data should be interpreted purely as an assessment of the CCM matching operations.

5.19 How many units were computer matched, possibly matched, or remained nonmatched between the Census Coverage Measurement Independent Listing and the Universe Control and Management file?
How many duplicates did the computer find within the Census Coverage Measurement Independent Listing, within block cluster?
How many duplicates did the computer find within the Universe Control and Management file?

The following tables present the unweighted computer matching results for the CCM and census housing units located in the CCM sample block clusters, after post-processing by HUMaRCS software to assign the four codes of match, possible match, nonmatch, and duplicate. Results are given by match code and type of structure. Units were tallied across block clusters in the U.S. (excluding Puerto Rico), Puerto Rico, and the U.S. (including Puerto Rico). Counts for the U.S. (excluding Puerto Rico) were further disaggregated into city-style and noncity-style block clusters, as indicated by the ATC group recode[14].

Table 40 shows the unweighted computer matching results for CCM housing units. Of the 489,592 CCM housing units in the U.S. (excluding Puerto Rico), 66.85 percent are matches; 14.07 percent are possible matches; 18.83 percent are nonmatches; and 0.26 percent are duplicates. The results by type of structure for the U.S. (excluding Puerto Rico) show that a higher percentage of single units were matched (80.19 percent) compared to other structure types. For multiunits, 52.37 percent matched. However, 22.59 percent of the multiunits are

[14] For a definition of the ATC group recode see the Methods Section 3.2.

possible matches, compared to 6.96 percent for single units. The results for multiunits are further split out by the number of units per structure. "Multiunits with "50+ units" have the highest percentage of matches at 68.10 percent, followed by "multiunits with 2 - 4 units" at 59.50 percent. The structure types "Other" and "Mobile Home in a Park" have the highest percentages of nonmatches at 70.74 percent and 49.67 percent, respectively. The percent of nonmatched mobile homes in a park was almost 20 percentage points higher than the percent of nonmatched mobile homes not in a park (30.21 percent). And most of the links for mobile homes in a park are possible matches (30.35 percent) rather than matches (19.81 percent).

Per Table 40, of the 32,057 CCM housing units in Puerto Rico, only 1.41 percent were matched. The two categories with the largest number of units (single units and multiunits with 2 - 4 units) account for 28,210 (88.00 percent) of the 32,057 housing units in Puerto Rico. These two categories also have the highest percentages of nonmatches except for "Mobile Home Not in a Park". For single units, 94.95 percent are nonmatches. For multiunits with 2 - 4 units, 86.94 percent are nonmatches. Multiunits with 10 - 19 units have the smallest proportion of nonmatches (17.38 percent). From Table 40, also note that the majority of computer links are possible matches rather matches. For each type of structure in Puerto Rico, the number of possible matches exceeds the number of matches.

Table 41 presents the unweighted CCM counts by type of structure for the U.S. (excluding Puerto Rico), shown by city-style and noncity-style block clusters. Within each type of structure, the percent of nonmatched housing units is much higher in noncity-style block clusters compared to city-style block clusters. For city-style block clusters the structure types with the lowest percentages of nonmatches are single units (9.87 percent), multiunits with 50+ units (19.46 percent), and mobile homes not in a park (22.47 percent). For the noncity-style block clusters, the structure types with the lowest percentages of nonmatches are single units (41.22 percent), mobile homes not in a park (45.54 percent), and multiunits with 2 - 4 units (53.96 percent).

Table 40

The 2010 Census Coverage Measurement Computer Matching Operation

Number of CCM Housing Units (HUs) by Match Code and Type of Structure: Unweighted

Computer Match Code	Total of All Types of Structures		Single Unit		All Multiunits		Multiunit										Mobile Home Not in a Park		Mobile Home in a Park		Other	
							2-4 units		5-9 units		10-19 units		20-49 units		50+ units							
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. HUs (excluding Puerto Rico)	**489,592**	**100.00**	**275,694**	**100.00**	**185,427**	**100.00**	**35,615**	**100.00**	**32,663**	**100.00**	**38,166**	**100.00**	**37,128**	**100.00**	**41,855**	**100.00**	**14,122**	**100.00**	**13,956**	**100.00**	**393**	**100.00**
Match	327,271	66.85	221,066	80.19	97,102	52.37	21,191	59.50	15,787	48.33	16,059	42.08	15,563	41.92	28,502	68.10	6,303	44.63	2,765	19.81	35	8.91
Possible Match	68,876	14.07	19,194	6.96	41,880	22.59	5,378	15.10	7,762	23.76	12,440	32.59	11,199	30.16	5,101	12.19	3,496	24.76	4,235	30.35	71	18.07
Nonmatch	92,168	18.83	34,512	12.52	46,180	24.90	8,871	24.91	9,076	27.79	9,631	25.23	10,360	27.90	8,242	19.69	4,266	30.21	6,932	49.67	278	70.74
Duplicate	1,277	0.26	922	0.33	265	0.14	175	0.49	38	0.12	36	0.09	6	0.02	10	0.02	57	0.40	24	0.17	9	2.29
Total Puerto Rico HUs	**32,057**	**100.00**	**20,934**	**100.00**	**11,094**	**100.00**	**7,276**	**100.00**	**1,907**	**100.00**	**1,162**	**100.00**	**130**	**100.00**	**619**	**100.00**	**27**	**100.00**	**0**	**0.00**	**2**	**100.00**
Match	451	1.41	382	1.82	69	0.62	69	0.95	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Possible Match	4,188	13.06	579	2.77	3,605	32.50	861	11.83	1,267	66.44	960	82.62	86	66.15	431	69.63	3	11.11	0	0.00	1	50.00
Nonmatch	27,302	85.17	19,877	94.95	7,400	66.70	6,326	86.94	640	33.56	202	17.38	44	33.85	188	30.37	24	88.89	0	0.00	1	50.00
Duplicate	116	0.36	96	0.46	20	0.18	20	0.27	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total U.S. HUs (including Puerto Rico)	**521,649**	**100.00**	**296,628**	**100.00**	**196,521**	**100.00**	**42,891**	**100.00**	**34,570**	**100.00**	**39,328**	**100.00**	**37,258**	**100.00**	**42,474**	**100.00**	**14,149**	**100.00**	**13,956**	**100.00**	**395**	**100.00**
Match	327,722	62.82	221,448	74.66	97,171	49.45	21,260	49.57	15,787	45.67	16,059	40.83	15,563	41.77	28,502	67.10	6,303	44.55	2,765	19.81	35	8.86
Possible Match	73,064	14.01	19,773	6.67	45,485	23.15	6,239	14.55	9,029	26.12	13,400	34.07	11,285	30.29	5,532	13.02	3,499	24.73	4,235	30.35	72	18.23
Nonmatch	119,470	22.90	54,389	18.34	53,580	27.26	15,197	35.43	9,716	28.11	9,833	25.00	10,404	27.92	8,430	19.85	4,290	30.32	6,932	49.67	279	70.63
Duplicate	1,393	0.27	1,018	0.34	285	0.15	195	0.45	38	0.11	36	0.09	6	0.02	10	0.02	57	0.40	24	0.17	9	2.28

*Percentages may not sum to totals due to rounding.
Source: Sample Design File version 3 and HUMaRCS dB tables: IL Coding History and IL Address

Table 41

The 2010 Census Coverage Measurement Computer Matching Operation

Number of CCM Housing Units by Address Type Cluster Group Recode, Match Code and Type of Structure: Unweighted

Computer Match Code	Total of All Types of Structures		Single Unit		All Multiunits		Multiunit										Mobile Home Not in a Park		Mobile Home in a Park		Other	
							2-4 units		5-9 units		10-19 units		20-49 units		50+ units							
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
U.S. City-style Total (excluding Puerto Rico)	**458,051**	**100.00**	**252,419**	**100.00**	**183,443**	**100.00**	**34,718**	**100.00**	**32,320**	**100.00**	**37,783**	**100.00**	**36,885**	**100.00**	**41,737**	**100.00**	**9,385**	**100.00**	**12,589**	**100.00**	**215**	**100.00**
Match	315,095	68.79	210,759	83.50	96,684	52.71	20,990	60.46	15,725	48.65	15,980	42.29	15,487	41.99	28,502	68.29	4,914	52.36	2,711	21.53	27	12.56
Possible Match	63,700	13.91	15,958	6.32	41,496	22.62	5,170	14.89	7,683	23.77	12,364	32.72	11,178	30.31	5,101	12.22	2,321	24.73	3,895	30.94	30	13.95
Nonmatch	78,145	17.06	24,919	9.87	45,003	24.53	8,387	24.16	8,875	27.46	9,403	24.89	10,214	27.69	8,124	19.46	2,109	22.47	5,959	47.33	155	72.09
Duplicate	1,111	0.24	783	0.31	260	0.14	171	0.49	37	0.11	36	0.10	6	0.02	10	0.02	41	0.44	24	0.19	3	1.40
U.S. Noncity-style Total (excluding Puerto Rico)	**31,541**	**100.00**	**23,275**	**100.00**	**1,984**	**100.00**	**897**	**100.00**	**343**	**100.00**	**383**	**100.00**	**243**	**100.00**	**118**	**100.00**	**4,737**	**100.00**	**1,367**	**100.00**	**178**	**100.00**
Match	12,176	38.60	10,307	44.28	418	21.07	201	22.41	62	18.08	79	20.63	76	31.28	0	0.00	1,389	29.32	54	3.95	8	4.49
Possible Match	5,176	16.41	3,236	13.90	384	19.35	208	23.19	79	23.03	76	19.84	21	8.64	0	0.00	1,175	24.80	340	24.87	41	23.03
Nonmatch	14,023	44.46	9,593	41.22	1,177	59.32	484	53.96	201	58.60	228	59.53	146	60.08	118	100.00	2,157	45.54	973	71.18	123	69.10
Duplicate	166	0.53	139	0.60	5	0.25	4	0.45	1	0.29	0	0.00	0	0.00	0	0.00	16	0.34	0	0.00	6	3.37

*Percentages may not sum to totals due to rounding.

Source: Sample Design File version 3 and HUMaRCS dB tables: IL Coding History and IL Address

The last two tables in this section contain unweighted results from computer matching for census housing units, shown by match code and type of structure.

Per Table 42, there are 513,813 census housing units in the CCM sample areas within the U.S. (including Puerto Rico). Of those, 62.53 percent are matches; 13.10 percent are possible matches; 24.22 percent are nonmatches; and 0.15 percent are duplicates. Single units have the highest percentage of matched housing units (75.03 percent) followed by multiunits (49.67 percent). The percentages of duplicates are highest in the "Missing" and "Other" categories at 0.38 percent and 0.34 percent, respectively.

Table 43 shows the unweighted results for census housing units in the CCM sample areas (excluding Puerto Rico) disaggregated into city-style and noncity-style block clusters. As was seen with the CCM housing units, there are proportionally more nonmatches in noncity-style block clusters than in city-style block clusters, within each structure type. Also shown in Table 43, the percentages of duplicates within each structure type are all under 1.00 percent with the exception of the "Missing" category for noncity-style block clusters, where 1.42 percent are duplicates.

Table 42

The 2010 Census Coverage Measurement Computer Matching Operation

Number of Census Housing Units (HUs) in CCM Sample Areas by Match Code and Type of Structure: Unweighted

Computer Match Code	Total of All Types of Structures		Single Unit		Multiunit		Mobile Home		Other		Missing	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. HUs (excluding Puerto Rico)	**484,150**	**100.00**	**260,928**	**100.00**	**177,460**	**100.00**	**25,835**	**100.00**	**584**	**100.00**	**19,343**	**100.00**
Match	320,948	66.29	210,428	80.65	92,867	52.33	8,475	32.80	67	11.47	9,111	47.10
Possible Match	64,734	13.37	17,681	6.78	36,408	20.52	6,698	25.93	76	13.01	3,871	20.01
Nonmatch	97,746	20.19	32,424	12.43	47,961	27.03	10,632	41.15	439	75.17	6,290	32.52
Duplicate	722	0.15	395	0.15	224	0.13	30	0.12	2	0.34	71	0.37
Total Puerto Rico HUs	**29,663**	**100.00**	**19,902**	**100.00**	**9,626**	**100.00**	**19**	**100.00**	**2**	**100.00**	**114**	**100.00**
Match	351	1.18	291	1.46	54	0.56	0	0.00	0	0.00	6	5.26
Possible Match	2,557	8.62	308	1.55	2,247	23.34	1	5.26	0	0.00	1	0.88
Nonmatch	26,696	90.00	19,257	96.76	7,314	75.98	18	94.74	2	100.00	105	92.11
Duplicate	59	0.20	46	0.23	11	0.11	0	0.00	0	0.00	2	1.75
Total U.S. HUs (including Puerto Rico)	**513,813**	**100.00**	**280,830**	**100.00**	**187,086**	**100.00**	**25,854**	**100.00**	**586**	**100.00**	**19,457**	**100.00**
Match	321,299	62.53	210,719	75.03	92,921	49.67	8,475	32.78	67	11.43	9,117	46.86
Possible Match	67,291	13.10	17,989	6.41	38,655	20.66	6,699	25.91	76	12.97	3,872	19.90
Nonmatch	124,442	24.22	51,681	18.40	55,275	29.55	10,650	41.19	441	75.26	6,395	32.87
Duplicate	781	0.15	441	0.16	235	0.13	30	0.12	2	0.34	73	0.38

*Percentages may not sum to totals due to rounding.

Source: Sample Design File version 3 and HUMaRCS dB tables: Census Coding History and Census Address

Table 43

The 2010 Census Coverage Measurement Computer Matching Operation

Number of Census Housing Units in CCM Sample Areas by Address Type Cluster Group Recode, Match Code and Type of Structure: Unweighted

Computer Match Code	Total of All Types of Structures		Single Unit		Multiunit		Mobile Home		Other		Missing	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
U.S. City-style Total (excluding Puerto Rico)	**453,532**	**100.00**	**237,788**	**100.00**	**176,108**	**100.00**	**20,213**	**100.00**	**291**	**100.00**	**19,132**	**100.00**
Match	309,200	68.18	200,490	84.31	92,466	52.51	7,116	35.21	54	18.56	9,074	47.43
Possible Match	60,789	13.40	15,141	6.37	36,135	20.52	5,622	27.81	46	15.81	3,845	20.10
Nonmatch	82,912	18.28	21,840	9.18	47,284	26.85	7,452	36.87	191	65.64	6,145	32.12
Duplicate	631	0.14	317	0.13	223	0.13	23	0.11	0	0.00	68	0.36
U.S. Noncity-style Total (excluding Puerto Rico)	**30,618**	**100.00**	**23,140**	**100.00**	**1,352**	**100.00**	**5,622**	**100.00**	**293**	**100.00**	**211**	**100.00**
Match	11,748	38.37	9,938	42.95	401	29.66	1,359	24.17	13	4.44	37	17.54
Possible Match	3,945	12.88	2,540	10.98	273	20.19	1,076	19.14	30	10.24	26	12.32
Nonmatch	14,834	48.45	10,584	45.74	677	50.07	3,180	56.56	248	84.64	145	68.72
Duplicate	91	0.30	78	0.34	1	0.07	7	0.12	2	0.68	3	1.42

*Percentages may not sum to totals due to rounding.

Source: Sample Design File version 3 and HUMaRCS dB tables: Census Coding History and Census Address

5.20 What is the distribution of duplicates found by computer matching per census address?

Table 44 shows the unweighted counts of how many census housing units were identified as having duplicate addresses by computer matching. The numbers in the table show how many census addresses in the U.S. (including Puerto Rico) have no duplicate, one duplicate, two duplicate, or three or more duplicate addresses found by computer matching. The duplicate addresses may be located in the sample block clusters or the surrounding blocks.

In the CCM sample areas, there are 512,128 (99.67 percent) census housing units that have no duplicate addresses found while computer matching. That is, less than 0.33 percent have one or more duplicate addresses found in computer matching.

Table 44

The 2010 Census Coverage Measurement Computer Matching Operation

Number of Census Housing Units in CCM Sample Areas by Count of Duplicates per Unit: Unweighted

Address Type Cluster Group Recode	Total HUs		No Duplicates		1 Duplicate		2 Duplicates		3 or More Duplicates	
	Count (Row %)	Column Percent*	Count (Row %)*	Column Percent*	Count (Row %)*	Column Percent*	Count (Row %)*	Column Percent*	Count (Row %)*	Column Percent*
Total U.S. Housing Units (including Puerto Rico)	**513,813 (100.00)**	**100.00**	**512,128 (99.67)**	**100.00**	**1,632 (0.32)**	**100.00**	**28 (0.01)**	**100.00**	**25 (0.00)**	**100.00**
U.S. City-style Total	453,532	88.27	452,060	88.27	1,465	89.77	5	17.86	2	8.00
U.S. Noncity-style Total	30,618	5.96	30,470	5.95	136	8.33	8	28.57	4	16.00
Puerto Rico Total	29,663	5.77	29,598	5.78	31	1.90	15	53.57	19	76.00

*Percentages may not sum to totals due to rounding.

Source: Sample Design File version 3 and HUMaRCS dB tables: Census Coding History and Census Address

5.21 How many addresses could not be standardized for computer matching?

Table 45 and Table 46 show how many CCM and census housing units, respectively for the U.S. (including Puerto Rico), had addresses that could not be standardized for computer matching.

Of the 521,649 CCM housing units, there are 1,421 (0.27 percent) CCM housing units with addresses that could not be standardized, as shown in Table 45. Of these, 40.32 percent are in Puerto Rico, 40.89 percent are in U.S. noncity-style block clusters, and 18.79 percent are in U.S. city-style block clusters. Most (85.93 percent) of the CCM addresses that could not be standardized are single units.

As shown in Table 46, of the 513,813 census housing units in the CCM sample areas, there are 5,403 (1.05 percent) census housing units with addresses that could not be standardized.

Table 45

The 2010 Census Coverage Measurement Computer Matching Operation

Number of CCM Housing Units with Addresses that Could Not Be Standardized by Type of Structure: Unweighted

Address Type Cluster Group Recode	All Housing Units		Single Unit		Multiunit		Mobile Home Not in a Park		Mobile Home in a Park		Other	
	Count (Row %)	Column Percent*	Count (Row %)*	Column Percent*	Count (Row %)*	Column Percent*	Count (Row %)*	Column Percent*	Count (Row %)*	Column Percent*	Count (Row %)*	Column Percent*
Total U.S. Housing Units (including Puerto Rico)	**1,421 (100.00)**	**100.00**	**1,221 (85.93)**	**100.00**	**0 (0.00)**	**0.00**	**70 (4.93)**	**100.00**	**123 (8.66)**	**100.00**	**7 (0.49)**	**100.00**
U.S. City-style Total	267	18.79	145	11.88	0	0.00	13	18.57	106	86.18	3	42.86
U.S. Noncity-style Total	581	40.89	503	41.20	0	0.00	57	81.43	17	13.82	4	57.14
Puerto Rico Total	573	40.32	573	46.93	0	0.00	0	0.00	0	0.00	0	0.00

*Percentages may not sum to totals due to rounding.
Source: HUMaRCS dB tables: Cluster Control and IL Address Tables, the Sample Design File version 3, and IL addresses sent to the computer matcher.

Table 46

The 2010 Census Coverage Measurement Computer Matching Operation

Number of Census Housing Units in CCM Sample Areas with Addresses that Could Not Be Standardized by Type of Structure: Unweighted

Address Type Cluster Group Recode	All Housing Units		Single Unit		Multiunit		Mobile Home		Other		Missing	
	Count (Row %)	Column Percent*	Count (Row %)*	Column Percent*	Count (Row %)*	Column Percent*	Count (Row %)*	Column Percent*	Count (Row %)*	Column Percent*	Count (Row %)*	Column Percent*
Total U.S. Housing Units (including Puerto Rico)	**5,403 (100.00)**	**100.00**	**4,708 (87.14)**	**100.00**	**304 (5.63)**	**100.00**	**308 (5.70)**	**100.00**	**18 (0.33)**	**100.00**	**65 (1.20)**	**100.00**
U.S. City-style Total	84	1.55	54	1.15	3	0.99	20	6.49	3	16.67	4	6.15
U.S. Noncity-style Total	1,440	26.65	1,107	23.51	2	0.66	285	92.53	15	83.33	31	47.69
Puerto Rico Total	3,879	71.79	3,547	75.34	299	98.36	3	0.97	0	0.00	30	46.15

*Percentages may not sum to totals due to rounding.
Source: HUMaRCS dB tables: Cluster Control and Census Address Tables, the Sample Design File version 3, and Census addresses sent to the computer matcher.

Initial Housing Unit Clerical Matching Results

All results are based on unweighted data. Statements based on the unweighted data should be interpreted purely as an assessment of the CCM matching operations. No statistical testing was done, nor any inferences to the general population are intended.

5.22 How many units were clerically matched, possibly matched, or remained nonmatched between the Census Coverage Measurement Independent Listing and the Universe Control and Management file?
How many duplicates did the clerical matchers find within the CCM Independent Listing, within block cluster?
How many duplicates did the clerical matchers find within the Universe Control and Management file, by whether the duplicate is located within the block cluster or the surrounding blocks?

The tables in this section present the unweighted clerical matching results separately for BFU and AFU Clerical Matching. Results are shown by type of structure. Counts of CCM and census housing units are totaled for the U.S. (excluding Puerto Rico), Puerto Rico, and the U.S. (including Puerto Rico). Counts for the U.S. (excluding Puerto Rico) are further disaggregated into city-style and noncity-style block clusters.

The first set of tables shows the unweighted matching results at the end of BFU Clerical Matching. The match code assigned to a housing unit may be unchanged from computer matching, or it may have been changed based on the BFU clerical review. During that review, clerical matchers looked for matches to the computer nonmatches. They also reviewed the matches, possible matches and duplicates from computer matching to determine if any coding corrections were needed. For example, possible matches may have been recoded as matches or duplicates may have been changed to nonmatches. Based on the match codes assigned to the units at the end of BFU Clerical Matching, addresses are classified as either matches, possible matches, nonmatches, duplicates, or "not a housing unit." "Not a housing unit" at this point in matching, refers to a CCM address for which the unit identifier contains an erroneous map spot number. These units were removed from further CCM processing. This is a rare occurrence, as indicated in the tables below[15].

Table 47 shows the unweighted clerical matching results for CCM housing units by type of structure. Of the 521,649 CCM housing units in the U.S. (including Puerto Rico), 87.10 percent are matches; 5.43 percent are possible matches; 7.38 percent are nonmatches; and 0.09 percent are duplicates. There are only 3 (0.00 percent) units classified as "not a housing unit." Of the 32,057 CCM housing units in Puerto Rico, 44.75 percent are matches and 33.06 percent are possible matches.

In Table 47, the unweighted results by type of structure for CCM housing units in the U.S. (excluding Puerto Rico) show that the percentage of matched single units (90.53 percent) and the

[15] This can occur if the map spot number was incorrectly entered on the Independent Listing book (e.g., house number was entered instead of the map spot number from the listing map).

percentage of matched multiunits (91.10 percent) do not differ greatly from each other. There is not much variation in the percent of matched multiunits by the number of units per structure, ranging from 86.07 of the multiunits with 2 - 4 units per structure to 93.16 percent for multiunits with 10 - 19 units per structure. The percent of matched mobile homes in a park (78.82 percent) is similar to the percent of matched mobile homes not in a park (73.71 percent). The match rate for the "other" category was low in computer matching (8.91 percent) and, although improved, remains relatively low in BFU Clerical Matching (23.92 percent).

The unweighted CCM results for Puerto Rico by type of structure, in Table 47, show that we matched 43.12 percent of the single units and 47.94 percent of the multiunits. The multiunits with 2 - 4 units, which comprise the majority of multiunits (65.59 percent), have a much lower percent of matches at only 29.55 percent.

Table 48 disaggregates the unweighted counts for CCM housing units in the U.S. (excluding Puerto Rico) into city-style and noncity-style block clusters. Of the 458,051 CCM housing units in city-style block clusters, 91.34 percent are matches. Of the 31,541 CCM housing units in noncity-style block clusters, 68.53 percent are matches. Within each type of structure, with the exception of "other", the percent of nonmatched housing units is higher in noncity-style block clusters compared to city-style block clusters. For city-style block clusters the structure types in order from the lowest percentage of nonmatches to the highest are: single units (5.10 percent); multiunits (6.28 percent); mobile homes not in a park (9.89 percent); mobile homes in a park (11.57 percent); and other (61.86 percent). For noncity-style block clusters the structure types in order from the lowest percentage of nonmatches to the highest are: single units (11.74 percent); mobile homes not in a park (15.18 percent); multiunits (26.36 percent); mobile homes in a park (33.43 percent); and other (48.88 percent).

Table 47

The 2010 Census Coverage Measurement Clerical Matching Operation

Number of CCM Housing Units (HUs) by Match Code and Type of Structure for the Before Followup Clerical Matching Operation: Unweighted

Clerical Match Code	Total of All Types of Structures		Single Unit		All Multiunits		Multiunit										Mobile Home Not in a Park		Mobile Home in a Park		Other	
							2-4 units		5-9 units		10-19 units		20-49 units		50+ units							
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. HUs (excluding Puerto Rico)	**489,592**	**100.00**	**275,694**	**100.00**	**185,427**	**100.00**	**35,615**	**100.00**	**32,663**	**100.00**	**38,166**	**100.00**	**37,128**	**100.00**	**41,855**	**100.00**	**14,122**	**100.00**	**13,956**	**100.00**	**393**	**100.00**
Match	440,015	89.87	249,579	90.53	168,933	91.10	30,654	86.07	30,246	92.60	35,557	93.16	34,045	91.70	38,431	91.82	10,409	73.71	11,000	78.82	94	23.92
Possible Match	17,730	3.62	10,230	3.71	4,370	2.36	1,593	4.47	949	2.91	965	2.53	491	1.32	372	0.89	2,039	14.44	1,014	7.27	77	19.59
Nonmatch	31,422	6.42	15,603	5.66	12,038	6.49	3,324	9.33	1,455	4.45	1,629	4.27	2,583	6.96	3,047	7.28	1,647	11.66	1,914	13.71	220	55.98
Duplicate	422	0.09	279	0.10	86	0.05	44	0.12	13	0.04	15	0.04	9	0.02	5	0.01	27	0.19	28	0.20	2	0.51
Not a Housing Unit	3	0.00	3	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total Puerto Rico HUs	**32,057**	**100.00**	**20,934**	**100.00**	**11,094**	**100.00**	**7,276**	**100.00**	**1,907**	**100.00**	**1,162**	**100.00**	**130**	**100.00**	**619**	**100.00**	**27**	**100.00**	**0**	**100.00**	**2**	**100.00**
Match	14,347	44.75	9,026	43.12	5,319	47.94	2,150	29.55	1,519	79.65	930	80.03	106	81.54	614	99.19	2	7.41	0	0.00	0	0.00
Possible Match	10,599	33.06	7,941	37.93	2,637	23.77	2,247	30.88	195	10.23	191	16.44	0	0.00	4	0.65	19	70.37	0	0.00	2	100.00
Nonmatch	7,088	22.11	3,949	18.86	3,133	28.24	2,874	39.50	193	10.12	41	3.53	24	18.46	1	0.16	6	22.22	0	0.00	0	0.00
Duplicate	23	0.07	18	0.09	5	0.05	5	0.07	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Not a Housing Unit	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total U.S. HUs (including Puerto Rico)	**521,649**	**100.00**	**296,628**	**100.00**	**196,521**	**100.00**	**42,891**	**100.00**	**34,570**	**100.00**	**39,328**	**100.00**	**37,258**	**100.00**	**42,474**	**100.00**	**14,149**	**100.00**	**13,956**	**100.00**	**395**	**100.00**
Match	454,362	87.10	258,605	87.18	174,252	88.67	32,804	76.48	31,765	91.89	36,487	92.78	34,151	91.66	39,045	91.93	10,411	73.58	11,000	78.82	94	23.80
Possible Match	28,329	5.43	18,171	6.13	7,007	3.57	3,840	8.95	1,144	3.31	1,156	2.94	491	1.32	376	0.89	2,058	14.55	1,014	7.27	79	20.00
Nonmatch	38,510	7.38	19,552	6.59	15,171	7.72	6,198	14.45	1,648	4.77	1,670	4.25	2,607	7.00	3,048	7.18	1,653	11.68	1,914	13.71	220	55.70
Duplicate	445	0.09	297	0.10	91	0.05	49	0.11	13	0.04	15	0.04	9	0.02	5	0.01	27	0.19	28	0.20	2	0.51
Not a Housing Unit	3	0.00	3	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00

*Percentages may not sum to totals due to rounding.
Source: Sample Design File version 3 and HUMaRCS dB tables: IL Coding History and IL Address

Table 48

The 2010 Census Coverage Measurement Clerical Matching Operation

Number of CCM Housing Units by Address Type Cluster Group Recode, Match Code and Type of Structure for the Before Followup Clerical Matching Operation: Unweighted

Clerical Match Code	Total of All Types of Structures		Single Unit		All Multiunits		Multiunit										Mobile Home Not in a Park		Mobile Home in a Park		Other	
							2-4 units		5-9 units		10-19 units		20-49 units		50+ units							
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
U.S. City-style Total (excluding Puerto Rico)	**458,051**	**100.00**	**252,419**	**100.00**	**183,443**	**100.00**	**34,718**	**100.00**	**32,320**	**100.00**	**37,783**	**100.00**	**36,885**	**100.00**	**41,737**	**100.00**	**9,385**	**100.00**	**12,589**	**100.00**	**215**	**100.00**
Match	418,400	91.34	233,083	92.34	167,606	91.37	30,097	86.69	29,963	92.71	35,230	93.24	33,885	91.87	38,431	92.08	7,513	80.05	10,155	80.67	43	20.00
Possible Match	12,362	2.70	6,214	2.46	4,236	2.31	1,472	4.24	937	2.90	965	2.55	490	1.33	372	0.89	923	9.83	950	7.55	39	18.14
Nonmatch	26,904	5.87	12,871	5.10	11,515	6.28	3,105	8.94	1,407	4.35	1,573	4.16	2,501	6.78	2,929	7.02	928	9.89	1,457	11.57	133	61.86
Duplicate	383	0.08	249	0.10	86	0.05	44	0.13	13	0.04	15	0.04	9	0.02	5	0.01	21	0.22	27	0.21	0	0.00
Not a Housing Unit	2	0.00	2	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
U.S. Noncity-style Total (excluding Puerto Rico)	**31,541**	**100.00**	**23,275**	**100.00**	**1,984**	**100.00**	**897**	**100.00**	**343**	**100.00**	**383**	**100.00**	**243**	**100.00**	**118**	**100.00**	**4,737**	**100.00**	**1,367**	**100.00**	**178**	**100.00**
Match	21,615	68.53	16,496	70.87	1,327	66.89	557	62.10	283	82.51	327	85.38	160	65.84	0	0.00	2,896	61.14	845	61.81	51	28.65
Possible Match	5,368	17.02	4,016	17.25	134	6.75	121	13.49	12	3.50	0	0.00	1	0.41	0	0.00	1,116	23.56	64	4.68	38	21.35
Nonmatch	4,518	14.32	2,732	11.74	523	26.36	219	24.41	48	13.99	56	14.62	82	33.74	118	100.00	719	15.18	457	33.43	87	48.88
Duplicate	39	0.12	30	0.13	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	6	0.13	1	0.07	2	1.12
Not a Housing Unit	1	0.00	1	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00

*Percentages may not sum to totals due to rounding.
Source: Sample Design File version 3 and HUMaRCS dB tables: IL Coding History and IL Address

The next two tables contain unweighted results from BFU Clerical Matching for census housing units in CCM sample areas, by type of structure.

As shown in Table 49, there are 513,813 census housing units in the CCM sample areas within the U.S. (including Puerto Rico), of which 86.66 percent are matches; 5.34 percent are possible matches; 7.66 percent are nonmatches; and 0.34 percent are duplicates. Note that there are no census addresses that are coded as "not a housing unit". At this point in matching, only GQs on the UC&M file were coded as "not a housing unit", and they are not counted in the tables below. (See the explanation of limitations in Section 4.2.) Looking at the results by structure type, Table 49 shows that single units have the highest percentage of matched housing units (88.40 percent) followed by multiunits (86.18 percent). Also note that the "missing" category has the highest percentage of duplicates at 1.70 percent.

Table 50 shows the unweighted results for the U.S. (excluding Puerto Rico) disaggregated into city-style and non-city style block clusters. Of the 453,532 census housing units in CCM city-style block clusters, 90.47 percent are matches. Compare this to the 30,618 census housing units in CCM noncity-style block clusters, of which 68.86 percent are matches. As seen with the CCM housing units, the percentage of nonmatches for each type of structure is higher in noncity-style block clusters than in city-style block clusters. The percentage of nonmatches is highest in the "other" category for both city-style block clusters (42.96 percent) and noncity-style block clusters (66.55 percent). Also note that the percentage of duplicates is higher, for each structure type, in noncity-style block clusters compared to city-style block clusters.

Table 49

The 2010 Census Coverage Measurement Clerical Matching Operation

Number of Census Housing Units (HUs) in CCM Sample Areas by Match Code and Type of Structure for the Before Followup Clerical Matching Operation: Unweighted

Clerical Match Code	Total of All Types of Structures		Single Unit		Multiunit		Mobile Home		Other		Missing	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. HUs (excluding Puerto Rico)	**484,150**	**100.00**	**260,928**	**100.00**	**177,460**	**100.00**	**25,835**	**100.00**	**584**	**100.00**	**19,343**	**100.00**
Match	431,390	89.10	239,553	91.81	156,021	87.92	20,272	78.47	180	30.82	15,364	79.43
Possible Match	16,999	3.51	9,240	3.54	4,666	2.63	2,704	10.47	81	13.87	308	1.59
Nonmatch	34,099	7.04	11,548	4.43	16,138	9.09	2,752	10.65	320	54.79	3,341	17.27
Duplicate	1,662	0.34	587	0.22	635	0.36	107	0.41	3	0.51	330	1.71
Total Puerto Rico HUs	**29,663**	**100.00**	**19,902**	**100.00**	**9,626**	**100.00**	**19**	**100.00**	**2**	**100.00**	**114**	**100.00**
Match	13,901	46.86	8,689	43.66	5,203	54.05	1	5.26	1	50.00	7	6.14
Possible Match	10,413	35.10	8,078	40.59	2,299	23.88	14	73.68	1	50.00	21	18.42
Nonmatch	5,257	17.72	3,092	15.54	2,076	21.57	4	21.05	0	0.00	85	74.56
Duplicate	92	0.31	43	0.22	48	0.50	0	0.00	0	0.00	1	0.88
Total U.S. HUs (including Puerto Rico)	**513,813**	**100.00**	**280,830**	**100.00**	**187,086**	**100.00**	**25,854**	**100.00**	**586**	**100.00**	**19,457**	**100.00**
Match	445,291	86.66	248,242	88.40	161,224	86.18	20,273	78.41	181	30.89	15,371	79.00
Possible Match	27,412	5.34	17,318	6.17	6,965	3.72	2,718	10.51	82	13.99	329	1.69
Nonmatch	39,356	7.66	14,640	5.21	18,214	9.74	2,756	10.66	320	54.61	3,426	17.61
Duplicate	1,754	0.34	630	0.22	683	0.37	107	0.41	3	0.51	331	1.70

*Percentages may not sum to totals due to rounding.

Source: Sample Design File version 3 and HUMaRCS dB tables: Census Coding History and Census Address

Table 50

The 2010 Census Coverage Measurement Clerical Matching Operation

Number of Census Housing Units in CCM Sample Areas by Address Type Cluster Group Recode, Match Code and Type of Structure for the Before Followup Clerical Matching Operation: Unweighted

Clerical Match Code	Total of All Types of Structures		Single Unit		Multiunit		Mobile Homes		Other		Missing	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
U.S. City-style Total (excluding Puerto Rico)	**453,532**	**100.00**	**237,788**	**100.00**	**176,108**	**100.00**	**20,213**	**100.00**	**291**	**100.00**	**19,132**	**100.00**
Match	410,307	90.47	223,189	93.86	154,952	87.99	16,737	82.80	122	41.92	15,307	80.01
Possible match	11,829	2.61	5,340	2.25	4,552	2.58	1,600	7.92	44	15.12	293	1.53
Nonmatch	29,952	6.60	8,799	3.70	15,983	9.08	1,811	8.96	125	42.96	3,234	16.90
Duplicate	1,444	0.32	460	0.19	621	0.35	65	0.32	0	0.00	298	1.56
Not a Housing Unit	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
U.S. Noncity-style Total (excluding Puerto Rico)	**30,618**	**100.00**	**23,140**	**100.00**	**1,352**	**100.00**	**5,622**	**100.00**	**293**	**100.00**	**211**	**100.00**
Match	21,083	68.86	16,364	70.72	1,069	79.07	3,535	62.88	58	19.80	57	27.01
Possible match	5,170	16.89	3,900	16.85	114	8.43	1,104	19.64	37	12.63	15	7.11
Nonmatch	4,147	13.54	2,749	11.88	155	11.46	941	16.74	195	66.55	107	50.71
Duplicate	218	0.71	127	0.55	14	1.04	42	0.75	3	1.02	32	15.17
Not a Housing Unit	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

*Percentages may not sum to totals due to rounding.
Source: Sample Design File version 3 and HUMaRCS dB tables: Census Coding History and Census Address

The clerical matchers searched for duplicate(s) to each census address located within the CCM sample block clusters. They looked among all addresses in the block cluster containing the census address as well as the surrounding blocks to the block cluster. Table 51 shows the unweighted counts of the census duplicates found in the surrounding blocks to the CCM sample block clusters. There are 2,853 census duplicates in the U.S. (excluding Puerto Rico) located in surrounding blocks, which is more than the 1,662 duplicates located in the sample block clusters. (See Table 49.) For Puerto Rico, there are 66 duplicates in the surrounding blocks, and 92 in the block clusters themselves.

Table 52 shows that for census addresses in city-style CCM sample block clusters in the U.S. (excluding Puerto Rico), 2,645 duplicates were found in the surrounding blocks. For census addresses in noncity-style CCM sample block clusters within the U.S. (excluding Puerto Rico), 208 duplicates were found in surrounding blocks.

Table 51

The 2010 Census Coverage Measurement Clerical Matching Operation

Number of Duplicate Census Housing Units (HUs) in Surrounding Blocks to CCM Sample Areas by Type of Structure for the Before Followup Clerical Matching Operation: Unweighted

Duplicates	Total of All Types of Structures		Single Unit		Multiunit		Mobile Home		Other		Missing	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. HUs (excluding Puerto Rico)	**2,853**	**100.00**	**841**	**29.48**	**1,779**	**62.36**	**170**	**5.96**	**3**	**0.11**	**60**	**2.10**
Total Puerto Rico HUs	**66**	**100.00**	**51**	**77.27**	**15**	**22.73**	**0**	**0.00**	**0**	**0.00**	**0**	**0.00**
Total U.S. HUs (including Puerto Rico)	**2,919**	**100.00**	**892**	**30.56**	**1,794**	**61.46**	**170**	**5.82**	**3**	**0.10**	**60**	**2.06**

*Percentages may not sum to totals due to rounding.
Source: Sample Design File version 3 and HUMaRCS dB tables: Census Coding History and Census Address

Table 52

The 2010 Census Coverage Measurement Clerical Matching Operation

Number of Duplicate Census Housing Units (HUs) in Surrounding Blocks to CCM Sample Areas by Address Type Cluster Group Recode and Type of Structure for the Before Followup Clerical Matching Operation: Unweighted

	Total of All Types of Structures		Single Unit		Multiunit		Mobile Homes		Other		Missing	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
U.S. City-style Total+ (excluding Puerto Rico)	**2,645**	**100.00**	**684**	**25.86**	**1,772**	**66.99**	**134**	**5.07**	**2**	**0.08**	**53**	**2.00**
U.S. Noncity-style Total+ (excluding Puerto Rico)	**208**	**100.00**	**157**	**75.48**	**7**	**3.37**	**36**	**17.31**	**1**	**0.48**	**7**	**3.37**

*Percentages may not sum to totals due to rounding.
+Classification as city-style or noncity-style is based on the Address Type Group Recode of the sample block cluster of the duplicate's primary unit, i.e., the unit to which it is a duplicate.
Source: Sample Design File version 3 and HUMaRCS dB tables: Census Coding History and Census Address

The remaining tables in this section show the unweighted clerical matching results at the end of AFU Clerical Matching for CCM and census housing units in the CCM sample areas

During AFU Clerical Matching, the results from IHUFU were reviewed, and the clerical matchers attempted to resolve the cases that went to followup. The CCM and census addresses were coded as matches, nonmatches, duplicates[16] or not housing units. Possible matches were not allowed in AFU matching. If a unit was identified as a possible match in an earlier operation but was not confirmed to be a match from the followup information, it was coded as unresolved and, for the purpose of this assessment question, counted as a nonmatch.

A unit is counted as "not a housing unit" if it did not exist as a housing unit at the time of IHUFU, regardless of whether it was matched or nonmatched. It could have been under construction, the site of future construction, unfit for habitation, demolished or burned down, an empty mobile home site, a business, a structure used for the storage of non-household goods, a unit that was merged with another housing unit, or a GQ. In addition, CCM units with erroneous map spot numbers (identified during BFU) are counted as "not a housing unit." And, for census units only, "not a housing unit" also includes geocoding errors. A geocoding error occurs when the census unit was listed on the UC&M file within a CCM sample block cluster, but was actually located in a block beyond the surrounding blocks to the block cluster. If the housing unit status of the unit could not be determined, it was coded as unresolved and, for purposes of this assessment question, tabulated as either a match or a nonmatch, as appropriate.

Per Table 53, of the 489,592 CCM units in the U.S. (excluding Puerto Rico), 92.91 percent are matches; 3.92 percent are nonmatches; 0.09 percent are duplicates; and 3.09 percent are not housing units. The percent of matched single units and combined multiunits are very close, at 93.72 percent and 93.30 percent, respectively. For multiunits, the percent of matched units by number of units per structure are between 91.06 percent (2 - 4 units per structure) and 95.66 percent (5 - 9 units per structure). For mobile homes not in a park, 86.19 percent are matches. For mobile homes in a park, we only matched 79.97 percent. Also note for mobile homes in a park, 14.60 percent are not housing units, whereas over all types of structures, the percentage of units that are not housing units is 3.09 percent. There are only 393 (0.08 percent) units classified as an "other" type of structure; large percentages of those are nonmatches (29.01 percent) or not housing units (33.59 percent).

Looking at the unweighted data for Puerto Rico in Table 53, of the 20,934 single units, we matched 83.82 percent. Of the 11,094 multiunits in Puerto Rico, we matched 75.15 percent. Most of the multiunits (7,276 units) in Puerto Rico are part of a structure with 2 - 4 units; only 66.07 percent of those are matches.

Table 54 disaggregates the counts for CCM units in the U.S. (excluding Puerto Rico) into city-style block clusters and noncity-style block clusters. It is interesting to note the differences in the match rates for CCM units in the U.S (excluding Puerto Rico) that are in city-style block clusters compared with noncity-style block clusters. Of the 458,051 CCM units in city-style block clusters, 93.60 percent are matches. Of the 31,541 CCM units in noncity-style block clusters, 82.84 percent are

[16] Duplicates are located in the CCM sample block clusters, unless noted otherwise.

matches. In the combined multiunit category, 93.52 percent of units in city-style block clusters are matches, compared to 73.34 percent of the units in noncity-style block clusters.

Table 53

The 2010 Census Coverage Measurement Clerical Matching Operation

Number of CCM Housing Units (HUs) by Match Code and Type of Structure for the After Followup Clerical Matching Operation: Unweighted

Clerical Match Code	Total of All Types of Structures		Single Unit		All Multiunits		Multiunit										Mobile Home Not in a Park		Mobile Home in a Park		Other	
							2-4 units		5-9 units		10-19 units		20-49 units		50+ units							
	Count (Row %)	Percent of Total*	Count (Row %)*	Percent of Total*	Count (Row %)*	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count (Row %)*	Percent of Total*	Count (Row %)*	Percent of Total*	Count (Row %)*	Percent of Total*
Total U.S. HUs (excluding Puerto Rico)	**489,592 (100.00)**	**100.00**	**275,694 (56.31)**	**100.00**	**185,427 (37.87)**	**100.00**	**35,615**	**100.00**	**32,663**	**100.00**	**38,166**	**100.00**	**37,128**	**100.00**	**41,855**	**100.00**	**14,122 (2.88)**	**100.00**	**13,956 (2.85)**	**100.00**	**393 (0.08)**	**100.00**
Match	454,872	92.91	258,388	93.72	173,006	93.30	32,432	91.06	31,244	95.66	36,487	95.60	34,460	92.81	38,383	91.70	12,172	86.19	11,161	79.97	145	36.90
Nonmatch	19,183	3.92	8,945	3.24	8,276	4.46	1,934	5.43	884	2.71	1,248	3.27	2,237	6.03	1,973	4.71	1,099	7.78	749	5.37	114	29.01
Duplicate	422	0.09	209	0.08	176	0.09	66	0.19	49	0.15	3	0.01	13	0.04	45	0.11	26	0.18	9	0.06	2	0.51
Not a HU	15,115	3.09	8,152	2.96	3,969	2.14	1,183	3.32	486	1.49	428	1.12	418	1.13	1,454	3.47	825	5.84	2,037	14.60	132	33.59
Total Puerto Rico HUs	**32,057 (100.00)**	**100.00**	**20,934 (65.30)**	**100.00**	**11,094 (34.61)**	**100.00**	**7,276**	**100.00**	**1,907**	**100.00**	**1,162**	**100.00**	**130**	**100.00**	**619**	**100.00**	**27 (0.08)**	**100.00**	**0 (0.00)**	**0.00**	**2 (0.01)**	**100.00**
Match	25,902	80.80	17,547	83.82	8,337	75.15	4,807	66.07	1,721	90.25	1,088	93.63	106	81.54	615	99.35	17	62.96	0	0.00	1	50.00
Nonmatch	4,254	13.27	2,299	10.98	1,952	17.60	1,829	25.14	90	4.72	32	2.75	0	0.00	1	0.16	3	11.11	0	0.00	0	0.00
Duplicate	69	0.22	48	0.23	21	0.19	16	0.22	5	0.26	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Not a HU	1,832	5.71	1,040	4.97	784	7.07	624	8.58	91	4.77	42	3.61	24	18.46	3	0.48	7	25.93	0	0.00	1	50.00
Total U.S. HUs (including Puerto Rico)	**521,649 (100.0)**	**100.00**	**296,628 (56.86)**	**100.00**	**196,521 (37.67)**	**100.00**	**42,891**	**100.00**	**34,570**	**100.00**	**39,328**	**100.00**	**37,258**	**100.00**	**42,474**	**100.00**	**14,149 (2.71)**	**100.00**	**13,956 (2.68)**	**100.00**	**395 (0.08)**	**100.00**
Match	480,774	92.16	275,935	93.02	181,343	92.28	37,239	86.82	32,965	95.36	37,575	95.54	34,566	92.77	38,998	91.82	12,189	86.15	11,161	79.97	146	36.96
Nonmatch	23,437	4.49	11,244	3.79	10,228	5.20	3,763	8.77	974	2.82	1,280	3.25	2,237	6.00	1,974	4.65	1,102	7.79	749	5.37	114	28.86
Duplicate	491	0.09	257	0.09	197	0.10	82	0.19	54	0.16	3	0.01	13	0.03	45	0.11	26	0.18	9	0.06	2	0.51
Not a HU	16,947	3.25	9,192	3.10	4,753	2.42	1,807	4.21	577	1.67	470	1.20	442	1.19	1,457	3.43	832	5.88	2,037	14.60	133	33.67

*Percentages may not sum to totals due to rounding.
Source: Sample Design File version 3 and HUMaRCS dB table: IL Address

Table 54

The 2010 Census Coverage Measurement Clerical Matching Operation

Number of CCM Housing Units by Address Type Cluster Group Recode, Match Code and Type of Structure for the After Followup Clerical Matching Operation: Unweighted

Clerical Match Code	Total of All Types of Structures		Single Unit		All Multiunits		Multiunit										Mobile Home Not in a Park		Mobile Home in a Park		Other	
							2-4 units		5-9 units		10-19 units		20-49 units		50+ units							
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
U.S. City-style Total (excluding Puerto Rico)	**458,051**	**100.00**	**252,419**	**100.00**	**183,443**	**100.00**	**34,718**	**100.00**	**32,320**	**100.00**	**37,783**	**100.00**	**36,885**	**100.00**	**41,737**	**100.00**	**9,385**	**100.00**	**12,589**	**100.00**	**215**	**100.00**
Match	428,745	93.60	238,459	94.47	171,551	93.52	31,755	91.47	30,953	95.77	36,161	95.71	34,299	92.99	38,383	91.96	8,306	88.50	10,359	82.29	70	32.56
Nonmatch	16,218	3.54	6,972	2.76	8,032	4.38	1,807	5.20	850	2.63	1,247	3.30	2,155	5.84	1,973	4.73	587	6.25	562	4.46	65	30.23
Duplicate	355	0.08	151	0.06	174	0.09	64	0.18	49	0.15	3	0.01	13	0.04	45	0.11	20	0.21	8	0.06	2	0.93
Not a HU	12,733	2.78	6,837	2.71	3,686	2.01	1,092	3.15	468	1.45	372	0.98	418	1.13	1,336	3.20	472	5.03	1,660	13.19	78	36.28
U.S. Noncity-style Total (excluding Puerto Rico)	**31,541**	**100.00**	**23,275**	**100.00**	**1,984**	**100.00**	**897**	**100.00**	**343**	**100.00**	**383**	**100.00**	**243**	**100.00**	**118**	**100.00**	**4,737**	**100.00**	**1,367**	**100.00**	**178**	**100.00**
Match	26,127	82.84	19,929	85.62	1,455	73.34	677	75.47	291	84.84	326	85.12	161	66.26	0	0.00	3,866	81.61	802	58.67	75	42.13
Nonmatch	2,965	9.40	1,973	8.48	244	12.30	127	14.16	34	9.91	1	0.26	82	33.74	0	0.00	512	10.81	187	13.68	49	27.53
Duplicate	67	0.21	58	0.25	2	0.10	2	0.22	0	0.00	0	0.00	0	0.00	0	0.00	6	0.13	1	0.07	0	0.00
Not a HU	2,382	7.55	1,315	5.65	283	14.26	91	10.14	18	5.25	56	14.62	0	0.00	118	100.00	353	7.45	377	27.58	54	30.34

*Percentages may not sum to totals due to rounding.
Source: Sample Design File version 3 and HUMaRCS dB table: IL Address

The final two tables present the unweighted AFU Clerical Matching results for census units in the CCM sample areas, by type of structure.

As shown in Table 55, in the CCM sample areas within the U.S. (excluding Puerto Rico), there are 484,150 census units, of which 92.03 percent are matches; 3.82 percent are nonmatches; 1.03 percent are duplicates; and 3.13 percent are not housing units. The unweighted census results by type of structure (excluding Puerto Rico) show that we matched 94.84 of the 260,928 single units; 90.32 the 177,460 multiunits; 84.72 percent of the 25,835 mobile homes; 35.27 percent of the 584 other types of structures, and 81.12 percent of the 19,343 units with missing structure type. In Puerto Rico, 87.46 percent of the single units are matches, and 81.58 percent of the multiunits are matches.

Table 56 shows the unweighted counts for census units in the U.S. (excluding Puerto Rico) by CCM city-style block clusters and CCM noncity-style block clusters. In city-style block clusters, we matched 92.63 percent of the 453,532 census housing units. In noncity-style block clusters, we matched 83.11 percent of the 30,618 census housing units. As seen with the CCM units, we matched proportionally more census units in city-style block clusters than in noncity-style block clusters, for each type of structure. For example, in city-style block clusters, we matched 95.77 percent of the single units, whereas in the noncity-style block clusters, we only matched 85.37 percent of the single units.

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Table 55

The 2010 Census Coverage Measurement Clerical Matching Operation

Number of Census Housing Units (HUs) in CCM Sample Areas by Match Code and Type of Structure for the After Followup Clerical Matching Operation: Unweighted

Clerical Match Code	Total of All Types of Structures		Single Unit		Multiunit		Mobile Home		Other		Missing	
	Count (Row %)	Percent of Total*	Count (Row %)	Percent of Total*	Count (Row %)	Percent of Total*	Count (Row %)	Percent of Total*	Count (Row %)	Percent of Total*	Count (Row %)	Percent of Total*
Total U.S. HUs (excluding Puerto Rico)	**484,150 (100.00)**	**100.00**	**260,928 (53.89)**	**100.00**	**177,460 (36.65)**	**100.00**	**25,835 (5.34)**	**100.00**	**584 (0.12)**	**100.00**	**19,343 (4.00)**	**100.00**
Match	445,545	92.03	247,475	94.84	160,285	90.32	21,888	84.72	206	35.27	15,691	81.12
Nonmatch	18,494	3.82	6,691	2.56	8,965	5.05	1,435	5.55	80	13.70	1,323	6.84
Duplicate	4,974	1.03	1,272	0.49	2,347	1.32	316	1.22	9	1.54	1,030	5.32
Not a HU	15,137	3.13	5,490	2.10	5,863	3.30	2,196	8.50	289	49.49	1,299	6.72
Total Puerto Rico HUs	**29,663 (100.00)**	**100.00**	**19,902 (67.09)**	**100.00**	**9,626 (32.45)**	**100.00**	**19 (0.06)**	**100.00**	**2 (0.01)**	**100.00**	**114 (0.38)**	**100.00**
Match	25,319	85.36	17,407	87.46	7,853	81.58	14	73.68	2	100.00	43	37.72
Nonmatch	1,745	5.88	930	4.67	782	8.12	1	5.26	0	0.00	32	28.07
Duplicate	498	1.68	254	1.28	232	2.41	0	0.00	0	0.00	12	10.53
Not a HU	2,101	7.08	1,311	6.59	759	7.88	4	21.05	0	0.00	27	23.68
Total U.S. HUs (including Puerto Rico)	**513,813 (100.0)**	**100.00**	**280,830 (54.66)**	**100.00**	**187,086 (36.41)**	**100.00**	**25,854 (5.03)**	**100.00**	**586 (0.11)**	**100.00**	**19,457 (3.79)**	**100.00**
Match	470,864	91.64	264,882	94.32	168,138	89.87	21,902	84.71	208	35.49	15,734	80.87
Nonmatch	20,239	3.94	7,621	2.71	9,747	5.21	1,436	5.55	80	13.65	1,355	6.96
Duplicate	5,472	1.06	1,526	0.54	2,579	1.38	316	1.22	9	1.54	1,042	5.36
Not a HU	17,238	3.35	6,801	2.42	6,622	3.54	2,200	8.51	289	49.32	1,326	6.82

*Percentages may not sum to totals due to rounding.
Source: Sample Design File version 3 and HUMaRCS dB table: Census Address

Table 56

The 2010 Census Coverage Measurement Clerical Matching Operation

Number of Census Housing Units (HUs) in CCM Sample Areas by Address Type Cluster Group Recode, Match Code and Type of Structure for the After Followup Clerical Matching Operation: Unweighted

Clerical Match Code	Total of All Types of Structures		Single Unit		Multiunit		Mobile Homes		Other		Missing	
	Count (Line %)	Percent of Total*	Count (Line %)*	Percent of Total*	Count (Line %)*	Percent of Total*	Count (Line %)*	Percent of Total*	Count (Line %)*	Percent of Total*	Count (Line %)*	Percent of Total*
U.S. City-style Total (excluding Puerto Rico)	**453,532**	**100.00**	**237,788**	**100.00**	**176,108**	**100.00**	**20,213**	**100.00**	**291**	**100.00**	**19,132**	**100.00**
Match	420,099	92.63	227,721	95.77	159,114	90.35	17,502	86.59	140	48.11	15,622	81.65
Nonmatch	16,179	3.57	5,016	2.11	8,867	5.03	968	4.79	38	13.06	1,290	6.74
Duplicate	4,497	0.99	970	0.41	2,330	1.32	206	1.02	3	1.03	988	5.16
Not a HU	12,757	2.81	4,081	1.72	5,797	3.29	1,537	7.60	110	37.80	1,232	6.44
U.S. Noncity-style Total (excluding Puerto Rico)	**30,618**	**100.00**	**23,140**	**100.00**	**1,352**	**100.00**	**5,622**	**100.00**	**293**	**100.00**	**211**	**100.00**
Match	25,446	83.11	19,754	85.37	1,171	86.61	4,386	78.01	66	22.53	69	32.70
Nonmatch	2,315	7.56	1,675	7.24	98	7.25	467	8.31	42	14.33	33	15.64
Duplicate	477	1.56	302	1.31	17	1.26	110	1.96	6	2.05	42	19.91
Not a HU	2,380	7.77	1,409	6.09	66	4.88	659	11.72	179	61.09	67	31.75

*Percentages may not sum to totals due to rounding.

Source: Sample Design File version 3 and HUMaRCS dB table: Census Address

In the following tables, unweighted results are presented for the duplicate census housing units found in surrounding blocks to the sample block clusters, by type of structure.

Per Table 57, of the 2,138 census duplicates in surrounding blocks within the U.S. (excluding Puerto Rico), 475 (22.22 percent) are single units; 1,477 (69.08 percent) are multiunits; 117 (5.47 percent) are mobile homes; 3 (0.14 percent) are other; and 66 (3.09 percent) are missing a structure type. So, most of duplication is for multiunits. Table 58 shows the duplicate counts for the U.S. (excluding Puerto Rico); by type of structure, separately for the CCM city-style block clusters and noncity-style block clusters.

Table 57

The 2010 Census Coverage Measurement Clerical Matching Operation

Number of Duplicate Census Housing Units (HUs) in Surrounding Blocks to CCM Sample Areas by Type of Structure for the After Followup Clerical Matching Operation: Unweighted

Duplicates	Total of All Types of Structures		Single Unit		Multiunit		Mobile Home		Other		Missing	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. HUs (excluding Puerto Rico)	**2,138**	**100.00**	**475**	**22.22**	**1,477**	**69.08**	**117**	**5.47**	**3**	**0.14**	**66**	**3.09**
Total Puerto Rico HUs	**83**	**100.00**	**69**	**83.13**	**14**	**16.87**	**0**	**0.00**	**0**	**0.00**	**0**	**0.00**
Total U.S. HUs (including Puerto Rico)	**2,221**	**100.00**	**544**	**24.49**	**1,491**	**67.13**	**117**	**5.27**	**3**	**0.14**	**66**	**2.97**

*Percentages may not sum to totals due to rounding.
Source: Sample Design File version 3 and HUMaRCS dB tables: Census Coding History and Census Address

Table 58

The 2010 Census Coverage Measurement Clerical Matching Operation

Number of Duplicate Census Housing Units in Surrounding Blocks to CCM Sample Areas by Address Type Cluster Group Recode and Type of Structure for the After Followup Clerical Matching Operation: Unweighted

Duplicates	Total of All Types of Structures		Single Unit		Multiunit		Mobile Home		Other		Missing	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
U.S. City-style Total+ (excluding Puerto Rico)	**1,992**	**100.00**	**367**	**18.42**	**1,475**	**74.05**	**90**	**4.52**	**2**	**0.10**	**58**	**2.91**
U.S. Noncity-style Total+ (excluding Puerto Rico)	**146**	**100.00**	**108**	**73.97**	**2**	**1.37**	**27**	**18.49**	**1**	**0.68**	**8**	**5.48**

*Percentages may not sum to totals due to rounding.
+Classification as city-style or noncity-style is based on the Address Type Group Recode of the sample block cluster of the duplicate's primary unit, i.e. the unit to which it is a duplicate.
Source: Sample Design File version 3 and HUMaRCS dB tables: Census Coding History and Census Address

5.23 What is the distribution of number of duplicates found per census address?

During BFU Clerical Matching, staff reviewed the duplicates found by computer matching and also searched for additional duplicates not identified during computer matching. Addresses coded as duplicates upon completion of BFU Clerical Matching were included in the IHUFU and were reviewed during AFU Clerical Matching. Clerical matchers also found additional duplicate addresses during AFU Clerical Matching. This question looks at census addresses with duplicate addresses, upon the completion of AFU Clerical Matching. The duplicate addresses may be located in either the sample block cluster or a surrounding block.

Table 59 presents unweighted counts of census housing units, showing how many were identified as having no duplicate addresses, one duplicate address, two duplicate addresses, or three or more duplicate addresses upon completion of AFU Clerical Matching. The number of census housing units with one or more duplicate addresses upon completion of AFU clerical matching is 5,098. This is just 0.99 percent of all census housing units in the U.S. (including Puerto Rico). Referring back to Table 44, the number of census housing units with one or more duplicates from computer matching is 1,685 or 0.33 percent of all census housing units in the U.S. (including Puerto Rico). So the percentage of census housing units with at least one duplicate increased from 0.33 percent at the end of computer matching to 0.99 percent at the end of clerical matching.

Table 59

The 2010 Census Coverage Measurement Clerical Matching Operation

Number of Census Housing Units in CCM Sample Areas by Count of Duplicates per Unit: Unweighted

Address Type Cluster Group Recode	Total HUs		No Duplicates		1 Duplicate		2 Duplicates		3 or More Duplicates	
	Count (Row %)	Percent of Total*	Count (Row %)	Percent of Total*	Count (Row %)	Percent of Total*	Count (Row %)	Percent of Total*	Count (Row %)	Percent of Total*
Total U.S. Housing Units (including Puerto Rico)	**513,813 (100.00)**	**100.00**	**508,715 (99.01)**	**100.00**	**4,826 (0.94)**	**100.00**	**270 (0.05)**	**100.00**	**2 (0.00)**	**100.00**
U.S. City-style Total	453,532	88.27	449,480	88.36	3,804	78.82	247	91.48	1	50.00
U.S. Noncity-style Total	30,618	5.96	30,082	5.91	532	11.02	4	1.48	0	0.00
Puerto Rico Total	29,663	5.77	29,153	5.73	490	10.15	19	7.04	1	50.00

*Percentages may not sum to totals due to rounding.
Source: Sample Design File version 3 and HUMaRCS dB table: Census Address

5.24 What is the housing unit status assigned for each unit (e.g., housing unit, potential housing unit, erroneous enumeration, duplicate, geocoding error, unresolved)?

Each CCM unit from IL was classified as either a housing unit, potential housing unit, not a housing unit, duplicate, geocoding error, or unresolved, based on the match code assigned to the unit at the end of AFU Clerical Matching. A CCM unit is a housing unit unless classified as one of the following based on the results of the IHUFU interview.

- Potential housing unit: The CCM unit did not exist as a housing unit at the time of IHUFU, but it had the potential to become a housing unit by the time of the Person Interview. The unit status could be under construction, future construction, unfit for habitation, demolished or burned down, or an empty mobile home site. Potential housing units were given a chance to be selected for the CCM PI.

- Not a housing unit: The CCM unit did not exist as a housing unit at the time of IHUFU and did not have the potential to become a housing unit by the time of the Person Interview. It could have been a business, a structure used for the storage of non-household goods, or a unit that was merged with another housing unit. A CCM unit that was determined to be a GQ at the time of IHUFU is also classified as not a housing unit. A unit with an erroneous map spot number (identified during BFU Clerical Matching and removed from further processing) is also not a housing unit. Units classified as "not a housing unit" were not included in the CCM PI.

- Geocoding error: The CCM unit was actually located in a block outside of the sample block cluster in which it was listed.

- Duplicate: The CCM unit was the same as another CCM unit listed in the sample block cluster.

- Unresolved: There was not enough information from IHUFU to confirm that the unit was a housing unit or potential housing unit or to confirm that it was located in the sample block cluster.

Each census unit listed on the UC&M file as a housing unit within the CCM sample block clusters was given an enumeration status of correct enumeration, erroneous enumeration, duplicate, geocoding error, or unresolved, based on the match code assigned to the unit at the end of AFU Clerical Matching. A census unit was classified as a correct enumeration unless classified as one the following based on the results of the IHUFU interview.

- Geocoding Error: The census unit is geocoded to the sample block cluster on the UC&M file, but was actually located in a block beyond the sample block cluster and its surrounding blocks. (Note: A census unit located in a surrounding block but geocoded in the sample block cluster is not considered a geocoding error.)

- Erroneous Enumeration: The census unit did not exist as a housing unit at the time of IHUFU. It could have been under construction, future construction, unfit for habitation, demolished or burned down, an empty mobile home site, a business, a structure used for the storage of non-household goods, or a unit that was merged with another housing unit. A census unit that was determined to be a GQ at the time of IHUFU is also not a housing unit.

- Duplicate: The census unit was the same as another census unit listed in the sample block cluster or its surrounding blocks.

- Unresolved: There was not enough information from IHUFU to confirm that the census unit was a housing unit or to confirm that it was located in the sample block cluster or its surrounding blocks.

The first two tables provide unweighted results for CCM housing units, by type of structure. As seen in Table 60, 95.24 percent of the 521,649 CCM units within the U.S. (including Puerto Rico) are classified as housing units. Within each structure type, the percentages of CCM units classified as housing units are, from lowest to highest: 60.00 percent of "Other"; 82.24 percent of "Mobile Home in a Park"; 91.32 percent of "Mobile Home Not in a Park"; 95.65 percent of "Single Unit"; and 95.88 percent of "All Multiunits".

Table 61 presents the unweighted results for CCM addresses in city-style and noncity-style block clusters, excluding Puerto Rico. For city-style block clusters, the percentages of CCM units classified as housing units within each structure type are, from lowest to highest: 55.35 percent of "Other"; 83.92 percent of "Mobile Home in a Park"; 93.21 percent of "Mobile Home Not in a Park"; 96.32 percent of "All Multiunits"; and 96.39 percent of "Single Unit" For noncity-style block clusters in Table 61, the percentages of units classified as housing units within each structure type are, from lowest to highest: 65.73 percent of "Other"; 66.72 percent of "Mobile Home in a Park"; 84.93 percent of "All Multiunits"; 87.67 percent of "Mobile Home Not in a Park"; and 91.13 percent of "Single Unit".

Table 60

The 2010 Census Coverage Measurement Clerical Matching Operation

Housing Unit (HU) Status for CCM Addresses by Type of Structure for the Clerical Matching Operation: Unweighted

Housing Unit Status	Total of All Types of Structures		Single Unit		All Multiunits		Multiunit										Mobile Home Not in a Park		Mobile Home in a Park		Other	
							2-4 units		5-9 units		10-19 units		20-49 units		50+ units							
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)	**489,592**	**100.00**	**275,694**	**100.00**	**185,427**	**100.00**	**35,615**	**100.00**	**32,663**	**100.00**	**38,166**	**100.00**	**37,128**	**100.00**	**41,855**	**100.00**	**14,122**	**100.00**	**13,956**	**100.00**	**393**	**100.00**
HU	467,513	95.49	264,528	95.95	178,371	96.19	33,891	95.16	31,751	97.21	37,332	97.81	36,124	97.30	39,273	93.83	12,901	91.35	11,477	82.24	236	60.05
Unresolved HU	766	0.16	331	0.12	203	0.11	96	0.27	49	0.15	46	0.12	5	0.01	7	0.02	75	0.53	137	0.98	20	5.09
Not a HU	4,994	1.02	1,862	0.68	2,326	1.25	1,022	2.87	252	0.77	220	0.58	244	0.66	588	1.40	395	2.80	315	2.26	96	24.43
Duplicate	422	0.09	209	0.08	176	0.09	66	0.19	49	0.15	3	0.01	13	0.04	45	0.11	26	0.18	9	0.06	2	0.51
Geocoding Error	5,776	1.18	2,474	0.90	2,708	1.46	379	1.06	328	1.00	357	0.94	568	1.53	1,076	2.57	295	2.09	296	2.12	3	0.76
Potential HU	10,121	2.07	6,290	2.28	1,643	0.89	161	0.45	234	0.72	208	0.54	174	0.47	866	2.07	430	3.04	1,722	12.34	36	9.16
Total Puerto Rico	**32,057**	**100.00**	**20,934**	**100.00**	**11,094**	**100.00**	**7,276**	**100.00**	**1,907**	**100.00**	**1,162**	**100.00**	**130**	**100.00**	**619**	**100.00**	**27**	**100.00**	**0**	**0.00**	**2**	**100.00**
HU	29,284	91.35	19,201	91.72	10,062	90.70	6,422	88.26	1,798	94.28	1,120	96.39	106	81.54	616	99.52	20	74.07	0	0.00	1	50.00
Unresolved HU	287	0.90	235	1.12	52	0.47	52	0.71	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Not a HU	767	2.39	254	1.21	510	4.60	449	6.17	40	2.10	18	1.55	0	0.00	3	0.48	2	7.41	0	0.00	1	50.00
Duplicate	69	0.22	48	0.23	21	0.19	16	0.22	5	0.26	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Geocoding Error	585	1.82	410	1.96	175	1.58	162	2.23	13	0.68	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Potential HU	1,065	3.32	786	3.75	274	2.47	175	2.41	51	2.67	24	2.07	24	18.46	0	0.00	5	18.52	0	0.00	0	0.00
Total U.S. (including Puerto Rico)	**521,649**	**100.00**	**296,628**	**100.00**	**196,521**	**100.00**	**42,891**	**100.00**	**34,570**	**100.00**	**39,328**	**100.00**	**37,258**	**100.00**	**42,474**	**100.00**	**14,149**	**100.00**	**13,956**	**100.00**	**395**	**100.00**
HU	496,797	95.24	283,729	95.65	188,433	95.88	40,313	93.99	33,549	97.05	38,452	97.77	36,230	97.24	39,889	93.91	12,921	91.32	11,477	82.24	237	60.00
Unresolved HU	1,053	0.20	566	0.19	255	0.13	148	0.35	49	0.14	46	0.12	5	0.01	7	0.02	75	0.53	137	0.98	20	5.06
Not a HU	5,761	1.10	2,116	0.71	2,836	1.44	1,471	3.43	292	0.84	238	0.61	244	0.65	591	1.39	397	2.81	315	2.26	97	24.56
Duplicate	491	0.09	257	0.09	197	0.10	82	0.19	54	0.16	3	0.01	13	0.03	45	0.11	26	0.18	9	0.06	2	0.51
Geocoding Error	6,361	1.22	2,884	0.97	2,883	1.47	541	1.26	341	0.99	357	0.91	568	1.52	1,076	2.53	295	2.08	296	2.12	3	0.76
Potential HU	11,186	2.14	7,076	2.39	1,917	0.98	336	0.78	285	0.82	232	0.59	198	0.53	866	2.04	435	3.07	1,722	12.34	36	9.11

*Percentages may not sum to totals due to rounding. .

Source: Sample Design File version 3 and HUMaRCS dB table: IL Address

Table 61

The 2010 Census Coverage Measurement Clerical Matching Operation

Housing Unit (HU) Status for CCM Addresses by Address Type Cluster Group Recode and Type of Structure for the Clerical Matching Operation: Unweighted

Housing Unit Status	Total of All Types of Structures		Single Unit		All Multiunits		Multiunit										Mobile Home Not in a Park		Mobile Home in a Park		Other	
							2-4 units		5-9 units		10-19 units		20-49 units		50+ units							
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
U.S. City-style Total (excluding Puerto Rico)	**458,051**	**100.00**	**252,419**	**100.00**	**183,443**	**100.00**	**34,718**	**100.00**	**32,320**	**100.00**	**37,783**	**100.00**	**36,885**	**100.00**	**41,737**	**100.00**	**9,385**	**100.00**	**12,589**	**100.00**	**215**	**100.00**
HU	439,436	95.94	243,318	96.39	176,686	96.32	33,098	95.33	31,429	97.24	37,005	97.94	35,881	97.28	39,273	94.10	8,748	93.21	10,565	83.92	119	55.35
Unresolved HU	504	0.11	179	0.07	199	0.11	95	0.27	46	0.14	46	0.12	5	0.01	7	0.02	40	0.43	71	0.56	15	6.98
Not a HU	3,941	0.86	1,430	0.57	2,099	1.14	961	2.77	240	0.74	184	0.49	244	0.66	470	1.13	235	2.50	118	0.94	59	27.44
Duplicate	355	0.08	151	0.06	174	0.09	64	0.18	49	0.15	3	0.01	13	0.04	45	0.11	20	0.21	8	0.06	2	0.93
Geocoding Error	5,023	1.10	1,934	0.77	2,698	1.47	369	1.06	328	1.01	357	0.94	568	1.54	1,076	2.58	105	1.12	285	2.26	1	0.47
Potential HU	8,792	1.92	5,407	2.14	1,587	0.87	131	0.38	228	0.71	188	0.50	174	0.47	866	2.07	237	2.53	1,542	12.25	19	8.84
U.S. Noncity-style Total (excluding Puerto Rico)	**31,541**	**100.00**	**23,275**	**100.00**	**1,984**	**100.00**	**897**	**100.00**	**343**	**100.00**	**383**	**100.00**	**243**	**100.00**	**118**	**100.00**	**4,737**	**100.00**	**1,367**	**100.00**	**178**	**100.00**
HU	28,077	89.02	21,210	91.13	1,685	84.93	793	88.41	322	93.88	327	85.38	243	100.00	0	0.00	4,153	87.67	912	66.72	117	65.73
Unresolved HU	262	0.83	152	0.65	4	0.20	1	0.11	3	0.87	0	0.00	0	0.00	0	0.00	35	0.74	66	4.83	5	2.81
Not a HU	1,053	3.34	432	1.86	227	11.44	61	6.80	12	3.50	36	9.40	0	0.00	118	100.00	160	3.38	197	14.41	37	20.79
Duplicate	67	0.21	58	0.25	2	0.10	2	0.22	0	0.00	0	0.00	0	0.00	0	0.00	6	0.13	1	0.07	0	0.00
Geocoding Error	753	2.39	540	2.32	10	0.50	10	1.11	0	0.00	0	0.00	0	0.00	0	0.00	190	4.01	11	0.80	2	1.12
Potential HU	1,329	4.21	883	3.79	56	2.82	30	3.34	6	1.75	20	5.22	0	0.00	0	0.00	193	4.07	180	13.17	17	9.55

*Percentages may not sum to totals due to rounding.

Source: Sample Design File version 3 and HUMaRCS dB table: IL Address

The next tables show the unweighted counts of enumeration status for census units in the CCM sample areas, upon completion of clerical matching. For the U.S. (including Puerto Rico), Table 62 shows 95.24 percent of the 513,813 census addresses are correct enumerations; 96.78 percent of the 280,830 single units are correct enumerations; and 94.71 percent of the 187,086 multiunits are correct enumerations.

Table 63 presents the unweighted results for census addresses in city-style and noncity-style CCM block clusters, excluding Puerto Rico. The percentage of correct enumerations is higher for city-style block clusters (96.02 percent) than noncity-style block clusters (89.55 percent) over all type of structures, and also for each individual type of structure. Looking at the "other" category for noncity-style block clusters, the majority (61.09 percent) of these census units are erroneous enumerations. However, in the city-style block clusters the majority (58.08 percent) of the "other" category are correct enumerations.

Table 62
The 2010 Census Coverage Measurement Clerical Matching Operation
Enumeration Status for Census Addresses in CCM Sample Areas by Type of Structure for the Clerical Matching Operation: Unweighted

Enumeration Status	Total of All Types of Structures		Single Unit		Multiunit		Mobile Home		Other		Missing	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total U.S. (excluding Puerto Rico)	**484,150**	**100.00**	**260,928**	**100.00**	**177,460**	**100.00**	**25,835**	**100.00**	**584**	**100.00**	**19,343**	**100.00**
Correct Enumeration	462,895	95.61	253,674	97.22	168,862	95.15	23,152	89.61	272	46.58	16,935	87.55
Erroneous Enumeration	14,867	3.07	5,445	2.09	5,678	3.20	2,190	8.48	289	49.49	1,265	6.54
Unresolved Enumeration	1,144	0.24	492	0.19	388	0.22	171	0.66	14	2.40	79	0.41
Duplicate	4,974	1.03	1,272	0.49	2,347	1.32	316	1.22	9	1.54	1,030	5.32
Geocoding Error	270	0.06	45	0.02	185	0.10	6	0.02	0	0.00	34	0.18
Total Puerto Rico	**29,663**	**100.00**	**19,902**	**100.00**	**9,626**	**100.00**	**19**	**100.00**	**2**	**100.00**	**114**	**100.00**
Correct Enumeration	26,485	89.29	18,102	90.96	8,321	86.44	15	78.95	2	100.00	45	39.47
Erroneous Enumeration	2,098	7.07	1,308	6.57	759	7.88	4	21.05	0	0.00	27	23.68
Unresolved Enumeration	579	1.95	235	1.18	314	3.26	0	0.00	0	0.00	30	26.32
Duplicate	498	1.68	254	1.28	232	2.41	0	0.00	0	0.00	12	10.53
Geocoding Error	3	0.01	3	0.02	0	0.00	0	0.00	0	0.00	0	0.00
Total U.S. (including Puerto Rico)	**513,813**	**100.00**	**280,830**	**100.00**	**187,086**	**100.00**	**25,854**	**100.00**	**586**	**100.00**	**19,457**	**100.00**
Correct Enumeration	489,380	95.24	271,776	96.78	177,183	94.71	23,167	89.61	274	46.76	16,980	87.27
Erroneous Enumeration	16,965	3.30	6,753	2.40	6,437	3.44	2,194	8.49	289	49.32	1,292	6.64
Unresolved Enumeration	1,723	0.34	727	0.26	702	0.38	171	0.66	14	2.39	109	0.56
Duplicate	5,472	1.06	1,526	0.54	2,579	1.38	316	1.22	9	1.54	1,042	5.36
Geocoding Error	273	0.05	48	0.02	185	0.10	6	0.02	0	0.00	34	0.17

*Percentages may not sum to totals due to rounding.
Source: Sample Design File version 3 and HUMaRCS dB table: Census Address

Table 63

The 2010 Census Coverage Measurement Clerical Matching Operation

Enumeration Status for Census Addresses in CCM Sample Areas by Address Type Cluster Group Recode and Type of Structure for the Clerical Matching Operation: Unweighted

Enumeration Status	Total of All Types of Structures		Single Unit		Multiunit		Mobile Home		Other		Missing	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
U.S. City-style Total (excluding Puerto Rico)	**453,532**	**100.00**	**237,788**	**100.00**	**176,108**	**100.00**	**20,213**	**100.00**	**291**	**100.00**	**19,132**	**100.00**
Correct Enumeration	435,476	96.02	232,492	97.77	167,601	95.17	18,367	90.87	169	58.08	16,847	88.06
Erroneous Enumeration	12,508	2.76	4,050	1.70	5,612	3.19	1,535	7.59	110	37.80	1,201	6.28
Unresolved Enumeration	802	0.18	245	0.10	380	0.22	103	0.51	9	3.09	65	0.34
Duplicate	4,497	0.99	970	0.41	2,330	1.32	206	1.02	3	1.03	988	5.16
Geocoding Error	249	0.05	31	0.01	185	0.11	2	0.01	0	0.00	31	0.16
U.S. Noncity-style Total (excluding Puerto Rico)	**30,618**	**100.00**	**23,140**	**100.00**	**1,352**	**100.00**	**5,622**	**100.00**	**293**	**100.00**	**211**	**100.00**
Correct Enumeration	27,419	89.55	21,182	91.54	1,261	93.27	4,785	85.11	103	35.15	88	41.71
Erroneous Enumeration	2,359	7.70	1,395	6.03	66	4.88	655	11.65	179	61.09	64	30.33
Unresolved Enumeration	342	1.12	247	1.07	8	0.59	68	1.21	5	1.71	14	6.64
Duplicate	477	1.56	302	1.31	17	1.26	110	1.96	6	2.05	42	19.91
Geocoding Error	21	0.07	14	0.06	0	0.00	4	0.07	0	0.00	3	1.42

*Percentages may not sum to totals due to rounding.
Source: Sample Design File version 3 and HUMaRCS dB table: Census Address

5.25 How many block clusters skipped Before Followup Clerical Matching, by size of block cluster?

Based on specific criteria, certain block clusters were not included in the BFU phase of clerical matching. Housing units in these block clusters were sent directly from HUMaRCS preprocessing to either field followup or AFU Clerical Matching. (Some block clusters had no CCM or census units. These block clusters skipped all phases of matching. They are excluded from these tables, but are included in Table 66, in the next section.)

Table 64 below, shows that a total of 1,288 block clusters skipped BFU Clerical Matching and went directly to field followup. Of this total, 123 (9.55 percent) were small block clusters (0 to 2 housing units), 825 (64.05 percent) were medium block clusters (3 to 79 housing units), and 340 (26.40 percent) were large block clusters (80 or more housing units)[17]. This total is also shown by city-style, noncity-style, and Puerto Rico block clusters (all noncity-style). The majority of the 1,288 block clusters (95.26 percent) were classified as city-style block clusters. Looking at the data by size of block cluster, the columns in Table 64 also show that for each size group, city-style block clusters comprise the largest percentage (95.26 percent). For small block clusters, 78.05 percent were city-style. For medium block clusters, 96.00 percent are city-style. And for large block clusters, 99.71 percent are city-style.

Table 64

The 2010 Census Coverage Measurement Clerical Matching Operation

Number of Block Clusters that Skipped to Field Followup by Block Cluster Size: Unweighted

Address Type Cluster Group Recode	Block Cluster Size							
	All Sizes		Small (0 – 2 housing units)		Medium (3 – 79 housing units)		Large (80+ housing units)	
	Count (Row %)	Percent of Total*	Count (Row %)	Percent of Total*	Count (Row %)	Percent of Total*	Count (Row %)	Percent of Total*
Total Block Clusters	**1,288 (100.00)**	**100.00**	**123 (9.55)**	**100.00**	**825 (64.05)**	**100.00**	**340 (26.40)**	**100.00**
U.S. City-style Total	1,227	95.26	96	78.05	792	96.00	339	99.71
U.S. Noncity-Style Total	55	4.27	21	17.07	33	4.00	1	0.29
Puerto Rico Total	6	0.47	6	4.88	0	0.00	0	0.00

*Percentages may not sum to totals due to rounding.
Source: HUMaRCS dB tables: Cluster Stage and Cluster Control, and Sample Design File version 3

Table 65 shows the number of block clusters that went directly to AFU Clerical Matching, skipping BFU Clerical Matching and field followup. There is a total of 781 block clusters that skipped to AFU Clerical Matching. The majority of that total, 96.29 percent, were city-style block clusters. In fact, across all size classifications, the majority of block clusters that skipped to AFU Clerical Matching were city-style. Of the 67 small block clusters, 88.06 percent were city-style. Of the 636 medium block clusters, 96.70 percent were city-style. And of the 78 large block clusters, 100.00 percent were city-style. Also note that no Puerto Rico block clusters skipped directly to AFU Clerical Matching.

[17] Block cluster size is obtained from the Sample Design File (version 3).

Table 65

The 2010 Census Coverage Measurement Clerical Matching Operation

Number of Block Clusters that Skipped to After Followup by Block Cluster Size: Unweighted

Address Type Cluster Group Recode	Block Cluster Size							
	All Sizes		Small (0 – 2 housing units)		Medium (3 – 79 housing units)		Large (80+ housing units)	
	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*	Count	Percent of Total*
Total Block Clusters	**781**	**100.00**	**67**	**100.00**	**636**	**100.00**	**78**	**100.00**
U.S. City-style Total	752	96.29	59	88.06	615	96.70	78	100.00
U.S. Noncity-style Total	29	3.71	8	11.94	21	3.30	0	0.00
Puerto Rico Total	0	0.00	0	0.00	0	0.00	0	0.00

*Percentages may not sum to totals due to rounding.
Source: HUMaRCS dB tables: Cluster Stage and Cluster Control, and Sample Design File version 3

5.26 How many block clusters skipped all matching, by size of block cluster?

Block clusters skipped all matching if there were no CCM units listed in IL and there were no census units in the UC&M file. Table 66 below shows the counts for these block clusters. In the U.S., there were 297 block clusters that skipped all matching, including six such block clusters in Puerto Rico.

Table 66

The 2010 Census Coverage Measurement Clerical Matching Operation

Number of Block Clusters that Skipped All of Clerical Matching: Unweighted

Address Type Cluster Group Recode	Count	Percent of Total*
Total Block Clusters	**297**	**100.00**
U.S. City-style Total	273	91.92
U.S. Noncity-style Total	18	6.06
Puerto Rico Total	6	2.02

*Percentages may not sum to totals due to rounding.
Source: Sample Design File version 3 and HUMaRCS db Tables: Cluster Stage and Cluster Control

5.27 How many followup notes did clerical matchers enter?

Clerical matchers working in BFU could enter followup notes in HUMaRCS to be included as special questions on the IHUFU forms.

Per Table 67, there were 6,937 followup notes for CCM addresses. Per Table 68, there were 107 followup notes for census addresses. The large difference between the counts is explained by the fact that followup notes for linked CCM and census addresses were always entered and stored on the CCM address records.

Table 67
The 2010 Census Coverage Measurement Clerical Matching Operation
Number of Followup Notes Entered by Clerical Matchers for CCM Addresses: Unweighted

Address Type Cluster Group Recode	Count	Percent of Total*
Total Block Clusters	**6,937**	**100.00**
U.S. City-style Total	4,219	60.82
U.S. Noncity-style Total	1,613	23.25
Puerto Rico Total	1,105	15.93

*Percentages may not sum to totals due to rounding.
Source: Sample Design File version 3 and HUMaRCS dB Tables: Cluster Stage and Cluster Control

Table 68
The 2010 Census Coverage Measurement Clerical Matching Operation
Number of Followup Notes Entered by Clerical Matchers for Census Addresses: Unweighted

Address Type Cluster Group Recode	Count	Percent of Total*
Total Block Clusters	**107**	**100.00**
U.S. City-style Total	79	73.83
U.S. Noncity-style Total	21	19.63
Puerto Rico Total	7	6.54

*Percentages may not sum to totals due to rounding.
Source: Sample Design File version 3 and HUMaRCS dB Tables: Cluster Stage and Cluster Control

5.28 How many block clusters went 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 weighted 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 flagged for review by Headquarters staff.

As shown in Table 69, 402 block clusters were sent to AFO for clerical review, the majority of those (85.82 percent) being U.S. city-style block clusters.

Table 69
The 2010 Census Coverage Measurement Clerical Matching Operation
Number of Block Clusters in Outlier Review: Unweighted

Address Type Cluster Group Recode	Count	Percent of Total*
Total Block Clusters	**402**	**100.00**
U.S. City-style Total	345	85.82
U.S. Noncity-style Total	53	13.18
Puerto Rico Total	4	1.00

*Percentages may not sum to totals due to rounding.
Source: Sample Design File version 3 and HUMaRCS dB Tables: Cluster Stage and Cluster Control

5.29 How many duplicates were found in After Followup Clerical Matching that needed to be reviewed in Final Housing Unit operations?

During AFU Clerical Matching, clerical matchers may have identified possible duplicates that were not confirmed during IHUFU. These duplicates were sent to Final Housing Unit Followup (FHUFU) for confirmation. Table 70 and Table 71 show there are 20 such duplicates to CCM addresses and 436 such duplicates to census addresses.

Table 70
The 2010 Census Coverage Measurement Clerical Matching Operation
Number of Duplicates Found in After Followup Clerical Matching that Needed Review in the Final Housing Unit Operation for CCM Addresses: Unweighted

Address Type Cluster Group Recode	Count	Percent of Total*
Total U.S. Housing Units (including Puerto Rico)	**20**	**100.00**
U.S. City-style Total	11	55.00
U.S. Noncity-style Total	6	30.00
Puerto Rico Total	3	15.00

*Percentages may not sum to totals due to rounding.
Source: Sample Design File version 3 and HUMaRCS dB Table: IL Address

Table 71
The 2010 Census Coverage Measurement Clerical Matching Operation
Number of Duplicates Found in AFU that Needed Review in the Final Housing Unit Operation for Census Addresses: Unweighted

Address Type Cluster Group Recode	Count	Percent of Total*
Total U.S. Housing Units (including Puerto Rico)	**436**	**100.00**
U.S. City-style Total	351	80.50
U.S. Noncity-style Total	49	11.24
Puerto Rico Total	36	8.26

*Percentages may not sum to totals due to rounding.
Source: Sample Design File version 3 and HUMaRCS dB Table: Census Address

Initial Housing Unit Followup Results

The following sections present the unweighted results from IHUFU. No weighted data are included in this report. No statistical testing was done, nor any inferences to the general population are intended. Statements based on the unweighted data should be interpreted purely as an assessment of the CCM operations.

5.30 How was the Initial Housing Unit Followup workload distributed?

The 2010 IHUFU workload of 4,932 block clusters with 125,192 cases was delivered to the 12 RCCs and Puerto Rico, on a flow basis starting on February 23, 2010 through May 10, 2010, as block clusters completed BFU Clerical Matching. Prior to the start of IHU Computer Matching, RCCs were given the opportunity to prioritize block clusters, allowing the RCCs to influence the order in which the work arrived to better plan staffing and training and help to complete the operation on schedule.

All block clusters were prioritized as follows:

"Must do first" block cluster (Priority 0)– In the event that a special circumstance existed that made it imperative that a block cluster be returned before any others, there was a "must do first" priority code. The RCC had to send a description of the special situation via email to FLD for approval. It was planned for no more than one of these block clusters per RCC and Puerto Rico.

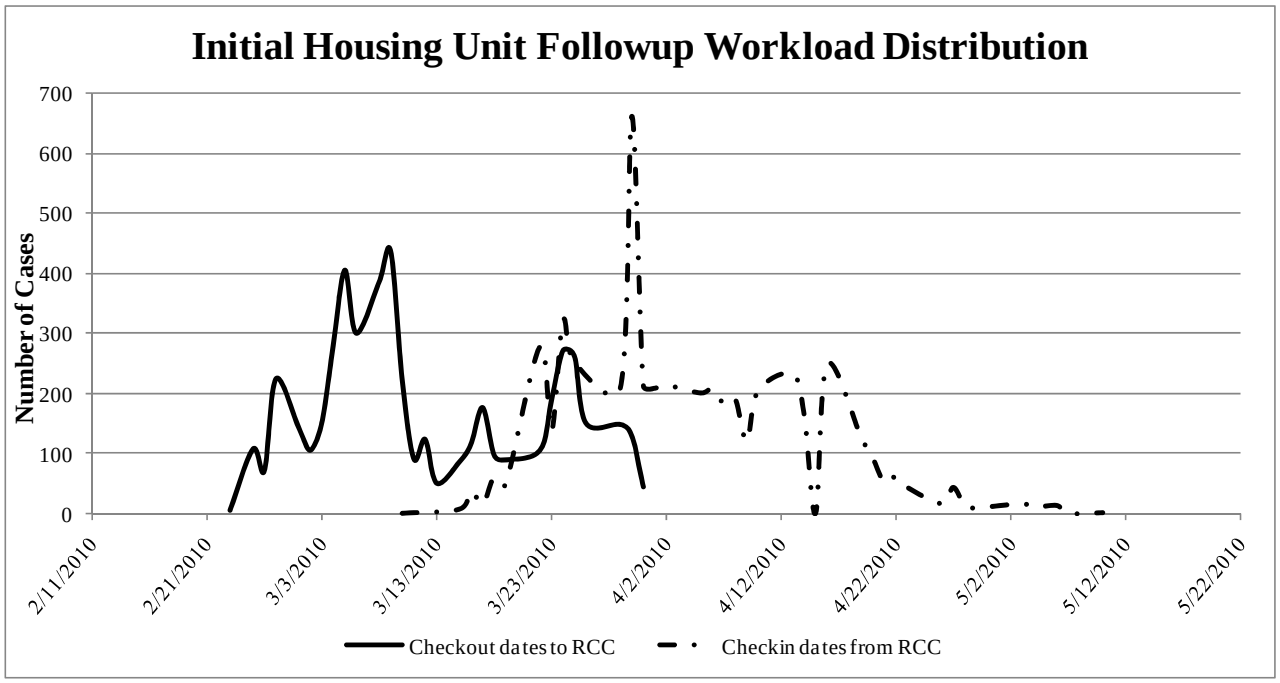
"Smaller Block Clusters" (Priority 1) – The NPC required 1,300 smaller block clusters (no fewer than three housing units and no more than 40 housing units per block cluster) from the 12 RCCs and Puerto Rico for their clerical matchers to start with in order to gain expertise and to expedite the matching process. Each RCC and Puerto Rico placed approximately 10 percent of their block clusters into priority group code "1".

Remaining Priority Block Cluster Groups (Priority 2 +) – Each of the subsequent priority block cluster groups contained approximately 100 block clusters. One-half of these priority groups were comprised of block clusters with an expected housing unit count of 40 or below until block clusters of that size were exhausted. Larger block clusters take more time to match. Regions could not place all their large block clusters in the highest priority group because this scenario would slow down matching for all regions. To ensure that the matching process did not become bottlenecked and that matched block clusters were sent to all RCCs on a flow basis, one-half of priority groups 2+ had to be comprised of block clusters with an expected housing unit count of 40 or below until block clusters of that size were exhausted.

Some field staff was trained at the start of the operation, and additional staff was trained according to where work would be available. If needed, additional staff was trained later because of attrition. FOSs and CLs received staggered training, in which they received training for all positions they supervised (for example, CLs received both interviewer and CL training).

IHUFU packets, which contained the cover page for tracking, case forms, QC form, reference list of all housing units listed by CCM and census in the block cluster, and all maps needed for IHUFU, were printed, assembled, and checked for printing quality and assembly, at the NPC as block clusters completed BFU Clerical Matching each night. It generally took a week for an IHUFU packet to complete the processing at the NPC. Once assembly QC was completed, the IHUFU packets were checked out to the FLD using HUMaRCS and then shipped to the RCCs. Once the IHUFU packet had completed all field work and arrived back at the NPC, clerks at the NPC checked the block cluster back in. Figure 4 shows the workload distribution based on checkout and check-in dates. As expected we saw a spike in check-in about a month into the operation, because it took several weeks to get a large amount of the work to the field, due to an error creating some IHUFU packets at the start of the operation.

Figure 4 – Initial Housing Unit Followup Workload Distribution

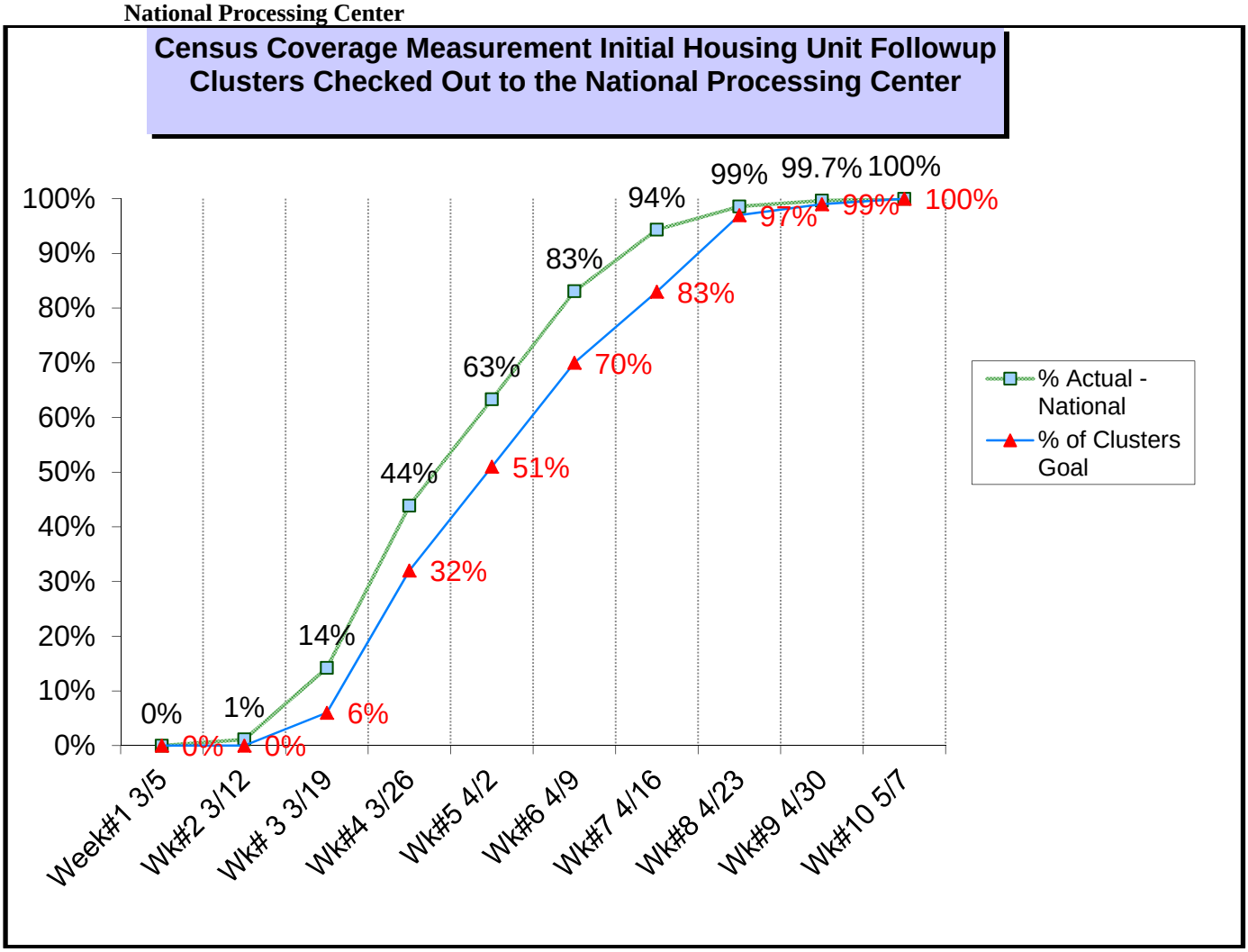


Source: Initial Housing Unit Clerical Matching Cluster Control Output File

For a more detailed look at the amount of time it took for the interviewers and QC checkers to complete each block cluster, please refer to the 2010 Census Coverage Measurement Initial Housing Unit Followup Quality Profile Memorandum #2010-H-03. These times were calculated by using the dates registered in the CMOCS.

RCCs were provided weekly goals on the number of block clusters that should be checked out to the NPC, meaning the block cluster had completed field work (both IHUFU and IHUFU QC). Figure 5 shows the National weekly goals and the actual block clusters checked out to the NPC for IHUFU. All weekly goals for the IHUFU operation were either met or exceeded.

Figure 5 – Census Coverage Measurement Initial Housing Unit Followup Clusters Checked Out to the National Processing Center



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

5.31 How many block clusters and units were sent to Initial Housing Unit Followup?

The workload for IHUFU was determined from the IHU Matching activities. Some followup cases were identified after the HUMaRCS preprocessing and others were determined after BFU Clerical Matching. Each night during the BFU Clerical Matching operation, several files were created to determine new cases identified for followup based on the processing that day. The workload for IHUFU continued to increase throughout the BFU clerical operation, which continued for two weeks after IHUFU had begun.

Table 72 shows the Number of Block Clusters by Address Type Recode in IHUFU and Table 73 shows the information by RCC.

Table 72
The 2010 Census Coverage Measurement Initial Housing Unit Followup Operation
Number of Block Clusters by Address Type Recode in Initial Housing Unit Followup: Unweighted

Address Type Recode	Total Block Clusters	Percent of Total[+]	Block Clusters			
			Requiring Followup		Not Requiring Followup	
			Count	Row Percent[+]	Count	Row Percent[+]
U.S. Total…….....…	6,148	95.82	4,682	76.15	1,466	23.85
U.S. City-style……..…	5,356	87.12	3,975	74.22	1,381	25.78
U.S. Noncity-style…..…….	792	12.88	707	89.27	85	10.73
Puerto Rico…….....….	268	4.18	250	93.28	18	6.72
Total (U.S. and Puerto Rico)..…	**6,416**	**100.00**	**4,932**	**76.87**	**1,484**	**23.13**

+Percentages may not sum to totals due to rounding.
Source: Initial Housing Unit Clerical Matching Cluster Control Output File

Table 73
The 2010 Census Coverage Measurement Initial Housing Unit Followup Operation
Number of Block Clusters by Regional Census Centers in Initial Housing Unit Followup: Unweighted

	Total Block Clusters	Percent of Total+	Block Clusters			
			Requiring Followup		Not Requiring Followup	
			Count	Row Percent+	Count	Row Percent+
U.S. Total……	6,148	95.82	4,682	76.15	1,466	23.85
Boston …….....	472	7.36	383	81.14	89	18.86
New York…….....	231	3.60	202	87.45	29	12.55
Philadelphia……. ……	424	6.61	324	76.42	100	23.58
Detroit…….....……..	410	6.39	318	77.56	92	22.44
Chicago……..	416	6.48	298	71.63	118	28.37
Kansas City…… ...…….	501	7.81	349	69.66	152	30.34
Seattle……...…...	522	8.14	369	70.69	153	29.31
Charlotte……..…..…	548	8.54	448	81.75	100	18.25
Atlanta……...…...	590	9.20	473	80.17	117	19.83
Dallas…….....…….	583	9.09	422	72.38	161	27.62
Denver…….....…..	941	14.67	692	73.54	249	26.46
Los Angeles……...…	510	7.95	404	79.22	106	20.78
Puerto Rico…….…...…....….	268	4.18	250	93.28	18	6.72
Total (U.S. and Puerto Rico)…...	**6,416**	**100.00**	**4,932**	**76.87**	**1,484**	**23.13**

+Percentages may not sum to totals due to rounding.
Source: Initial Housing Unit Clerical Matching Cluster Control Output File

As shown in Table 72, 76.87 percent of the 6,416 block clusters in sample, or 4,932 block clusters, required followup overall (U.S. and Puerto Rico). There was a lower percent of followup block clusters in the U.S. city-style block clusters, 74.22 percent (or 3,975 block clusters), than in U.S. noncity-style block clusters, 89.27 percent (or 707 block clusters). The majority of the block clusters in Puerto Rico, 93.28 percent (or 250 block clusters) required followup. Excluding Puerto Rico, New York had the highest percentage of block clusters requiring followup at 87.45 percent, or 202 block clusters, as shown in Table 73. The Kansas City region had the lowest percentage of block clusters requiring followup at 69.66 percent, or 349 block clusters.

Table 74 displays the overall number of IHUFU cases in each block cluster and for the U.S. and Puerto Rico separately. Overall, 54.52 percent or 2,689 of the block clusters had one to nine followup cases. In the U.S., 56.15 percent or 2,629 block clusters had one to nine followup cases. The largest IHUFU packet contained 725 followup cases. In Puerto Rico, 24.00 percent or 60 block clusters had one to nine followup cases. Most of the block clusters requiring followup in Puerto Rico contained 20 or more cases at 56.40 percent or 141 block clusters. The largest IHUFU packet for Puerto Rico contained 1,125 followup cases. The large IHUFU packets in Puerto Rico may be attributed to the many unique address fields collected during IL, which made it difficult to clerically match.

Table 74
The 2010 Census Coverage Measurement Initial Housing Unit Followup Operation
Number of Followup Cases in Each Initial Housing Unit Followup Form: Unweighted

Number of Followup Cases	Total Block Clusters		U.S. Block Clusters		Puerto Rico Block Clusters	
	Count	Percent of Total+	Count	Percent of Total+	Count	Percent of Total+
Total	**4,932**	**100.00**	**4,682**	**100.00**	**250**	**100.00**
1 – 2	1,043	21.15	1,032	22.04	11	4.40
3 – 5	881	17.86	855	18.26	26	10.40
6 – 9	765	15.51	742	15.85	23	9.20
10 – 19	924	18.73	875	18.69	49	19.60
20 – 49	768	15.57	723	15.44	45	18.00
50 – 99	296	6.00	266	5.68	30	12.00
100+	255	5.17	189	4.04	66	26.40

+Percentages may not sum to totals due to rounding.
Source: Housing Unit Matching, Review and Coding System (HUMaRCS) Output Files: IHUFU Forms List History

As an indicator of how well the CCM listing and census operations did in properly listing housing units, the results of the IHUFU operation were analyzed. Each IHUFU case form could contain one or more addresses to be followed up. Table 75 shows the number of addresses in IHUFU.

Table 75
The 2010 Census Coverage Measurement Initial Housing Unit Followup Operation
Number of Addresses in Initial Housing Unit Followup by Address Type Record: Unweighted

Address Type Record	Count	Percent of Total+
Total U.S. Addresses…….…….	141,830	79.85
CCM Addresses…….……..……..	67,512	47.60
Census Address in Block Cluster…….…….	62,094	43.78
Census Group Quarters in Block Cluster…….....	243	0.17
Census Housing Unit in Surrounding Block……..	11,981	8.45
Total Puerto Rico Addresses……..……	35,800	20.15
CCM Addresses…….……..……..	18,748	52.37
Census Address in Block Cluster…….…….	16,354	45.68
Census Group Quarters in Block Cluster…….……...	9	0.03
Census Housing Unit in Surrounding Block……..	689	1.92
Total Addresses Requiring Followup (U.S. and Puerto Rico).....	**177,630**	**100.00**
**CCM Addresses…….……..…….. **	**86,260**	**48.56**
Census Address in Block Cluster…….……..	**78,448**	**44.16**
Census Group Quarters in Block Cluster……	**252**	**0.14**
**Census Housing Unit in Surrounding Block…….. **	**12,670**	**7.13**

+Percentages may not sum to totals due to rounding.
Sources: Initial Housing Unit Clerical Matching Independent Listing Address Output File and Initial Housing Unit Clerical Matching Census Address Output File

Table 75 shows that there were 177,630 addresses requiring followup in the U.S. and Puerto Rico. Of the addresses requiring followup, 86,260 or 48.56 percent were CCM addresses, 78,448 or 44.16 percent were Census Addresses in the Block cluster, 252 or 0.14 percent were Census GQs in the Block cluster, and 12,670 or 7.13 percent were Census Housing Units in Surrounding Block.

Table 76 shows the number of addresses in IHUFU by RCC.

Table 76
The 2010 Census Coverage Measurement Initial Housing Unit Followup Operation
Number of Addresses in Initial Housing Unit Followup by Regional Census Center: Unweighted

	Total		CCM		Census	
	Count	Percent of Total+	Count	Row Percent+	Count	Row Percent+
U.S. Total…….....…	141,830	79.85	67,512	47.60	74,318	52.40
Boston …….....	8,511	4.79	3,667	43.09	4,844	56.91
New York…….....	10,026	5.64	4,094	40.83	5,932	59.17
Philadelphia……...……	9,493	5.34	4,286	45.15	5,207	54.85
Detroit……....……..	7,985	4.50	3,767	47.18	4,218	52.82
Chicago……...……..	6,475	3.65	2,997	46.29	3,478	53.71
Kansas City…….....…….	6,378	3.59	3,590	56.29	2,788	43.71
Seattle……..……..	9,523	5.36	5,052	53.05	4,471	46.95
Charlotte……...……	14,002	7.88	7,357	52.54	6,645	47.46
Atlanta……...…..	22,489	12.66	10,737	47.74	11,752	52.26
Dallas……...…….	14,916	8.40	7,035	47.16	7,881	52.84
Denver……...…..	17,965	10.11	8,451	47.04	9,514	52.96
Los Angeles……...…	14,067	7.92	6,479	46.06	7,588	53.94
Puerto Rico……....….	35,800	20.15	18,748	52.37	17,052	47.63
Total	**177,630**	**100.00**	**86,260**	**48.56**	**91,370**	**51.44**

+Percentages may not sum to totals due to rounding.
Sources: Initial Housing Unit Clerical Matching Independent Listing Address Output File, Initial Housing Unit Clerical Matching Census Address Output File, and Initial Housing Unit Clerical Matching Initial Housing Unit Followup Forms List History File

In Puerto Rico, 35,800 (20.15 percent) of all addresses required followup. This may be related to the additional address fields collected in Puerto Rico, which made the matching operations more difficult. The Atlanta RCC had the highest percentage of addresses requiring followup within the U.S. at 22,489 addresses or 12.66 percent of the addresses requiring followup, followed by the Denver RCC with 17,965 addresses or 10.11 percent of the total addresses requiring followup. All other RCCs had less than 15,000 addresses for followup.

5.32 How many units required an address correction during Initial Housing Unit Clerical Matching?

Table 77 shows how many units required an address correction. Address corrections to CCM addresses and census housing units in the block cluster could be made by analysts during BFU Clerical Matching and could be made by technicians and analysts during AFU Clerical Matching. Changes to census addresses only updated the data in HUMaRCS and did not affect census data files. Note an address correction is any change to any address component. This could include changing the apartment designation to a unit, changing the actual house number, changing street designations from road to street, or updates to spelling. No address corrections were made in HUMaRCS to census GQs or housing units in surrounding blocks.

Table 77
The 2010 Census Coverage Measurement Initial Housing Unit Followup Operation
Number of Address Corrections by Clerical Matching Stage: Unweighted

Address Corrections	Total	Percent of Total +	CCM				Census			
			Requiring Followup		Not Requiring Followup		Requiring Followup		Not Requiring Followup	
			Count	Row Percent +	Count	Row Percent +	Count	Row Percent +	Count	Row Percent +
U.S. Total…….....…	35,864	76.88	23,133	64.50	10,507	29.30	2,217	6.18	7	0.02
Before Followup.…….....	4,715	10.11	674	14.29	4,041	85.71	0	0.00	0	0.00
After Followup.....……	31,149	66.77	22,459	72.10	6,466	20.76	2,217	7.12	7	0.02
Puerto Rico……...….	10,788	23.12	9,485	87.92	736	6.82	567	5.26	0	0.00
Before Followup.…….....	356	0.76	162	45.51	194	54.49	0	0.00	0	0.00
After Followup.....……	10,432	22.36	9,323	89.37	542	5.20	567	5.44	0	0.00
Total (U.S. and Puerto Rico)…..	**46,652**	**100.00**	**32,618**	**69.92**	**11,243**	**24.10**	**2,784**	**5.97**	**7**	**0.02**
**Before Followup.……..... **	**5,071**	**10.87**	**836**	**16.49**	**4,235**	**83.51**	**0**	**0.00**	**0**	**0.00**
**After Followup.....……. **	**41,581**	**89.13**	**31,782**	**76.43**	**7,008**	**16.85**	**2,784**	**6.70**	**7**	**0.02**

+Percentages may not sum to totals due to rounding.
Sources: Initial Housing Unit Clerical Matching Independent Listing Address Output File, Initial Housing Unit Clerical Matching Census Address Output File, and Initial Housing Unit Clerical Matching Initial Housing Unit Followup Forms List History File

Counting both CCM and Census housing units, a total of 46,652 addresses were corrected. As expected, most of the address corrections happened during AFU (89.13 percent, or 41,581 addresses) because IHUFU interviewers had indicated the address correction on the IHUFU Form.

5.33 How many Initial Housing Unit Followup case forms were created?

Table 78 shows the count and percentages of each type of follow-up form in descending order of the overall form count. There were a total of 39 form types available for the IHUFU operation that contained questions tailored to resolve discrepancies in the address list. The list of the case forms along with a brief description of the forms purpose is located in Appendix A. Ten of the forms were not used during the IHUFU operation, because they did not have any units fitting the code during IHU computer or clerical matching. The forms not used in IHUFU are listed in bold in Appendix A.

Table 78
The 2010 Census Coverage Measurement Initial Housing Unit Followup Operation
Distribution of Initial Housing Unit Followup Case Forms: Unweighted

Initial Housing Unit Followup Case Forms	Overall		U.S		Puerto Rico	
	Count	Percent of Total+	Count	Row Percent+	Count	Row Percent+
CCM Nonmatched Address (NI)	38,489	30.74	31,403	81.59	7,086	18.41
Census Nonmatched Address (NE)	38,308	30.60	33,079	86.35	5,229	13.65
Possible CCM-Census Match (P)	25,191	20.12	15,341	60.90	9,850	39.10
Surrounding Block Match (M*SB)	8,844	7.06	8,405	95.04	439	4.96
Unit Status Update (M*)	6,441	5.14	5,951	92.39	490	7.61
CCM-Census Match/Duplicate Census Address (M/DE)	2,835	2.26	2,751	97.04	84	2.96
Unit Status Update/Possible CCM-Census Match (P*)	1,928	1.54	1,409	73.08	519	26.92
Census Nonmatched and Duplicate Address (NE/DE)	1,038	0.83	1,010	97.30	28	2.70
Surrounding Block Match/Possible CCM-Census Match (P*SB)	737	0.59	562	76.26	175	23.74
CCM-Census Match/Duplicate CCM Address (M/DI)	340	0.27	330	97.06	10	2.94
Possible CCM-Census Match/Duplicate Census Address (P/DE)	252	0.20	216	85.71	36	14.29
CCM-Census Match/Two Duplicate Census Addresses (M/DE/DE)	229	0.18	228	99.56	1	0.44
Group Quarters (GQ)	146	0.12	145	99.32	1	0.68
Group Quarters with Census Address Match (GQ*)	91	0.07	83	91.21	8	8.79
Unit Status Update and Surrounding Block Match / Possible CCM-Census Match (P*USSB)	89	0.07	86	96.63	3	3.37
Unit Status Update and Surrounding Block Match (M*USSB)	78	0.06	72	92.31	6	7.69
Unit Status Update/Duplicate Census Address (M*/DE)	49	0.04	44	89.80	5	10.20
CCM Nonmatched and Duplicate Address (NI/DI)	19	0.02	18	94.74	1	5.26
Unit Status Update/Duplicate CCM Address (M*/DI)	18	0.01	17	94.44	1	5.56
Unit Status Update/Possible CCM-Census Match / Duplicate Census Address (P*/DE)	18	0.01	17	94.44	1	5.56
Possible CCM-Census Match/Duplicate CCM Address (P/DI)	16	0.01	11	68.75	5	31.25
CCM-Census Match/Two Duplicate CCM Addresses (M/DI/DI)	11	0.01	10	90.91	1	9.09
Census Nonmatched/Two Duplicate Census Addresses (NE/DE/DE)	10	0.01	10	100.00	0	0.00
Possible CCM-Census Match/Two Duplicate Census Addresses (P/DE/DE)	5	0.00	4	80.00	1	20.00
Unit Status Update /Two Duplicate Census Addresses (M*/DE/DE)	3	0.00	3	100.00	0	0.00
Surrounding Block Match/Duplicate CCM Address (M*SB/DI)	3	0.00	3	100.00	0	0.00
CCM Nonmatched/Two Duplicate CCM Addresses (NI/DI/DI)	2	0.00	1	50.00	1	50.00
Unit Status Update/Possible CCM-Census Match/Duplicate CCM Address (P*/DI)	1	0.00	1	100.00	0	0.00
Possible CCM-Census Match/Two Duplicate CCM Addresses (P/DI/DI)	1	0.00	0	0.00	1	100.00
Total Followup Case Forms	**125,192**	**100.00**	**101,210**	**80.84**	**23,982**	**19.16**

+Percentages may not sum to totals due to rounding.

Source: Initial Housing Unit Clerical Matching Initial Housing Unit Followup Forms List History File

As Table 78 shows, five forms accounted for over 93.66 percent of all forms generated for IHUFU. The CCM Nonmatched Address (NI) Form accounted for 38,489 cases or 30.74 percent of all follow-up forms; 38,308 cases or 30.60 percent were the Census Nonmatched Address (NE) Form; 25,191cases or 20.12 percent were the Possible CCM-Census Match (P) Form; 8,844 cases or 7.06 percent were the Surrounding Block Match (M*SB) Form; and 6,441 cases or 5.14 percent were the Unit Status Update (M*) Form.

6. RELATED EVALUATIONS, EXPERIMENTS, AND/OR ASSESSMENTS

Information on the IL DQC can be found in the 2010 CCM IL Quality Profile. Information on the IHUFU QC can be found in the 2010 CCM IHUFU Quality Profile.

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

- Assessment for the 2010 CCM Person Interview Operation
- Assessment for the 2010 CCM Person Matching and Followup Operations
- Assessment for the 2010 CCM 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 IHU operations based on observations by Headquarters staff during the field operations, debriefing sessions held in each RCC for office and field staff, and discussions with Headquarters and the NPC staff that worked on the operations.

7.1.1 Independent Listing

- Based on information from interviewer debriefings and Headquarters observations, the collection of respondent name and phone number in the 2010 IL Operation made the respondents reluctant to respond. The information is not used in later CCM operations, so it is suggested to consider deleting the collection of these data in 2020. However, if in 2020 both census and CCM were to collect this information, it would be useful for purposes of matching housing units. In addition, collecting the information could help deter falsification.

- More time should be spent in listing training to clarify how to conduct interviews in GQs to find housing units within the GQ.

- When the IL coverage question: "At (*address*), are there any basement or garage apartments, trailers, or other residences, even if no one is living there now?" was read to respondents, respondents often misheard or misunderstood the question, answering the house had a basement or garage. Rewording of this question should be considered. Could consider a two question alternative like, "Are there any basement or garage apartments at this address even if no one is living there now?" After a pause for a "Yes" or "No" response, ask "Are there any trailers or other residences that share this same address?"

- The ILB would not fit into the census bag and was very cumbersome for listers to use in the field. Investigate a smaller, notebook-size listing page, or an automated instrument.

- When shipping the completed ILBs back to the NPC, the RCCs included a shipping document indicating if sketch and/or auxiliary maps were present and the number of ILBs per block cluster. The number of ILBs or maps present was often incorrect because it was based on incorrect entries made by the field staff into the CMOCS. Since the ATAC and CMOCS systems interfaced to report shipping discrepancies, the inability to correct CMOCS data caused misreporting of missing maps and ILBs that had to be reconciled by Headquarters, the RCCs, and the NPC staff. Therefore, the next application must allow the data collected and tracked for maps and numbers of ILBs to be edited.

- Some ILBs received from the field were very messy with entries in lead, green, and red pencil. These ILBs confused the techs and keyers and had to be sent to the analysts for

pre-key edit. For future CCMs, a better editing method for the QA and RCC office staff should be created, for example, erasing or crossing out entries and reentering neatly. However, automating IL would eliminate this problem.

- The edits on keyed data were run twice, once after initial keying and once after verification keying. This caused many ILBs to cycle back to edit resolution multiple times mainly because of keying errors rather than errors in the ILBs. It was often difficult for the analysts to determine how to correct the errors because they did not have access to the keyed data. To resolve these discrepancies, post-it notes were used to ask keyers to look at the keyed data, and if this was not the issue, the ILBs were cycled back to edit resolution. Having the keying edits run once after the classification of keyed and verified data would have eliminated the extra work to try to correct keying errors that did not exist in the ILBs, as well as cut down on the number of times ILBs were transferred between the keying and edit resolution areas.

- Listing in military block clusters had different field procedures than non-military block clusters, and for 2010 we also had restrictions to ensure that block maps for military block clusters could not contain map spots. We propose that for 2020 the GEO identify military block clusters by using an additional code in the TEA variable so the ILB labels could contain noncity-style, city-style, or military indicators.

- The ILBs proved to be very bulky for the listers in the field as well as in the NPC. All the processing, editing, and keying of the books can be eliminated if the IL operation was automated by using handheld computers. An automated instrument would also force the entry of on-path data, eliminating missing data and eliminating the requirement to key data.

- There were many errors while keying the Puerto Rico ILBs. It would have been helpful to have more bilingual technicians and analysts to conduct more thorough pre-key edit and edit resolution activities, including content editing, to reduce the number of errors in keying and decrease the overall cost of processing Puerto Rico ILBs. During the final weeks of keying, after most ILBs had been received at the NPC, bilingual technicians helped transcribe data before they were keyed, because keying issues many times were due to illegible handwriting that had to be deciphered by non-Spanish-speaking keyers. If the IL operation was conducted using an automated instrument, it would eliminate transcribing time and keying errors. During the 2010 planning, automating IL was considered and ultimately rejected due to restrictions placed on the data that could be collected by developers of the Address Canvassing instrument. For 2020 an automated listing instrument is being considered to use both for census and CCM operations. CCM requirements, in particular the IL coverage question listed in the third bullet of this section, must be included for CCM to be able to use the same instrument as Address Canvassing.

- As CCM had to report to Executive Staff by the three waves of listing data collection, it is recommended that if waves are used in future CCMs, then they should be part of the automated tracking system and should be defined in future software requirements.

7.1.2 Initial Housing Unit Computer Matching

- For FLD priorities, do not allow all rural block clusters to be sent to computer or clerical matching up front. Not only should FLD take size of the block cluster into consideration, but they should also take rural and urban block clusters into consideration for priorities.

- Include removing punctuation from UC&M address fields that are used for computer matching.

- Need to improve consistency in the address components collected for Puerto Rico addresses, between census and CCM.

7.1.3 Initial Housing Unit Clerical Matching

- Start training clerical matchers a few weeks earlier to give the trainees more practice. Try online tutorial, quizzes, etc.

- Instead of bulky paper manuals, consider electronic manuals.

- Look into using Global Positioning System (GPS) in Puerto Rico to improve our ability to match housing unit locations between the IL and census.

- Research notes -- We have these notes for Clerical Geocoding (CGC) but nowhere else – should consider an electronic sticky note attached to a given case to note things that would be helpful for later operations. Note that Cluster notes are for big situations – GQs, major geocoding issues -- that will flag a block cluster for AFO. They carry throughout an operation, but we do not carry them from housing unit to person operations.

- Since there were errors adding CCM-Map Spot Numbers (MSNs), make two fields - one for CCM-MSN (4-digit numeric) and one for CCM-MSN Suffix (2-digit alpha) or add edits (pop-up window) on added MSNs (duplicates, too many zeroes, etc.).

- In the HUMaRCS, need to be able to filter windows independently -- one filter for IL and one for census, have more range-like filters or greater than/less than options (house number, unit fields, for instance). Also filter on Sample Indicator, on a range of MSNs, and new CCM MSNs assigned to census addresses.

- Need to be able to display Google maps with our CCM data on top of them for the census maps.

- Sketch maps should have barcodes.

- The analysts should start working as technicians on large rural block clusters at the beginning of BFU Clerical Matching. This could possibly reduce the number of large rural block clusters at the end. If such a strategy were to be implemented, the automated matching system would need to be able to prevent the analysts from performing quality assurance on their own work.

- Technician Feedback - The technicians were frequently asking how they were doing and wanted individual feedback. Due to time constraints, it was impossible to do this. The analysts did provide feedback for people making systematic errors, and some senior analysts were able to relay that information to them by going into the rooms to provide information to them as a group.

7.1.4 Initial Housing Unit Followup

- In the future, should consider having more workload available at the start of the followup operation. This will require a larger schedule gap between the start of the BFU Clerical Matching Operation and Field Followup Operation.

- Interviewers felt the amount of materials needed during the operation was rather cumbersome and that the staple holding every 50 pages of the IHUFU forms was too weak causing pages to come loose. The one staple for 50 pages is not adequate for flipping repeatedly between pages in the IHUFU forms. Interviewers suggested stapling every 25 pages or having the cases arranged in a binder so flipping could be done more quickly.

- May want to reconsider assigning street-type errors as critical errors during QC. This could increase the QC rate, but when streets are very close and have similar names, this could be a significant error.

- Office staff requested that for future operations, the IHUFU production and QC be considered as separate operations in the CMOCS, as tracking block clusters' status between IHUFU and QC was difficult when these were considered as one operation.

- IHUFU Question L, which asks for the number of housing units at the BSA, confused some interviewers when following-up on a basement or garage apartment, and for multiunits. The confusion was thought to be in part because the concept of the BSA was not stressed during the training, although it was present in the glossary. Interviewers did not understand how to answer the number of units when respondents would say they did not receive mail addressed to the apartment, and were confused when interviewing at multiunits as to whether the question was referring to the individual follow-up unit, the apartment, or the whole structure. Training should place more emphasis on the concepts and differences between a BSA and a housing unit, and when they differ.

- For future CCM operations, it may be beneficial to have a letter describing what CCM is and how it is different from the census to explain to respondents why we are there to

collect additional information, especially for those CCM operations occurring in the field when census forms have been mailed.

- There were multiple sheets for the various types of maps for the block cluster, making the maps cumbersome in both size and quantity. It was observed that often the interviewer/QC Checker mixed up the map sheets for one type of map with those for another. Future discussions are encouraged to solicit ideas for making the various types of maps more manageable in size and number and more recognizable from one another. It is also recommended to reduce the number of different map types and simplify the naming to better distinguish between map types. Likewise, more training is needed on when to use each type of map.

- The NPC analysts suggested rewording the question "Is there a housing unit at this address" on the IHUFU form in the future to "Determine if Address fits the definition of a housing unit."

7.2 Conclusions

In this section we summarize the results of the IHU operations. These results are from an operation standpoint and are not the final CCM estimates of coverage.

7.2.1 Independent Listing

The IL operation was managed from the 12 RCCs. Similar to Census 2000, for reasons of weather-related issues and management of field work, the operation was conducted in three overlapping six-week periods, called waves, from August 28, 2009 through December 4, 2009, across the United States. Puerto Rico began the IL Operation three weeks after the stateside listing began (on September 18, 2009), because the additional three weeks were needed for translation and printing of training materials.

The IL operation was estimated to cost $19,181,077, with IL Production estimated at $15,586,152 and IL DQC estimated at $3,594,925. Training cost was estimated at $2,649,317, wages for hourly field workers were estimated at $8,163,690, and mileage reimbursement at $8,368,070.

The IL operation was under budget by $4,019,671 (20.96 percent). IL Production was under budget by $4,545,247 (29.16 percent) while IL DQC was overspent by $525,576 (14.62 percent).

The IL Production rate was 2.50 housing units listed per hour. The IL DQC rate was 2.90 housing units per hour.

The total initial IL workload was 12,364 block clusters, which contain one or more contiguous census blocks. There were 18,165 collection blocks contained in the block clusters selected for IL with an expected number of housing units to list of 960,041 housing units. The U.S. workload was 11,835 block clusters or 95.72 percent of the block clusters and 906,139 expected housing units or 94.39 percent of the expected number of housing units to list. The Puerto Rico

workload was 529 block clusters or 4.28 percent of the block clusters and 53,902 expected housing units or 5.61 percent of the expected number of housing units to list.

CCM listed 2,210 block clusters (90.35 percent) that contained zero to two housing units (as expected); hence the housing unit count expected did not differ much from the actual number of housing units listed in the small block clusters. There were 5,475 block clusters (84.65 percent) that were listed as expected to contain 3 to 79 housing units and 3,344 block clusters (96.93 percent) that were listed as expected to contain 80 or more housing units. Therefore, only 1,335 (10.80 percent) of the listed block clusters changed from the expected size category. Most (15.35 percent) of the changes happened in the medium size, with 993 block clusters that changed, 377 switched from the medium to the small category, while 616 switched from the medium to the large size category.

A total of 892,976 housing units were listed across the U.S. and Puerto Rico. Over half, 503,503 (56.38 percent), of these housing units listed were single family homes. There were 342,008 (38.30 percent) individual multiunit/apartment units listed. A total of 23,202 (2.60 percent) mobile homes not in a park were listed, while 23,544 (2.64 percent) mobile homes in a park were listed. Lastly, there were 719 other (occupied camper, tent, van, boat, etc.) units listed.

There were 432,934 single family homes or 54.98 percent of the U.S. city-style housing units listed as single family homes. There were 37,120 multiunit structures in the United States city-style block clusters and 637 in noncity-style block clusters. There are a total of 6,434 multiunit structures in Puerto Rico.

In 2010, CCM listed a total of 892,976 housing units in 12,364 block clusters while the 2000 A.C.E. listed a total of 2,039,488 housing units in 29,695 block clusters. The difference of listing approximately one million additional housing units in 2000 can be attributed to a change in the scope of the coverage program. In January 1999 the Supreme Court made a declaration, which resulted in a sample reduction for all A.C.E. operations after listing (U.S. Census Bureau, 2004). Consequently, the 2010 CCM sample size requirements were also reduced.

During IL, listers were to ask the respondent at each single unit house and mobile home or trailer, NOT in a park with a unit status of occupied or vacant and intended for occupancy if there were any hidden housing units. They were to ask, "At <*address*>, are there any basement or garage apartments, trailers, or other residences, even if no one is living there now?" If the respondent answered "yes," then the lister asked, "How many?" In addition to asking this question, the lister also asked if the additional housing unit was attached, detached, or both and for the number of additional housing units. With this item in the ILB, CCM aimed to capture those additional housing units that are not so clearly marked for the listers such as garage or basement apartments.

If the respondent answered there was an additional housing unit and it was attached, listing procedures had the lister change the type of address to multiunit and then list the additional unit(s) in the multiunit Section of the ILB. The listing procedure did not clearly indicate if the lister should then erase the previous response to the IL coverage question, so a number of multiunits had a response to the IL coverage question. Of the 44,191 multiunit BSAs, 826 or

1.87 percent, had a "Yes" response to the IL coverage question with the number of additional units indicated as one or greater, accounting for potentially 1,089 additional multiunit units added. This included 877 possible additional attached units, 42 possible additional detached units, 28 possible additional units where both attached and detached was indicated, and 142 units where neither attached or detached was indicated.

The listing procedure did not require the IL coverage question to be asked at mobile home parks or other (occupied camper, tent, van, boat, etc.) housing units or single unit or mobile homes or trailers, NOT in a park with a unit status other than occupied or vacant and intended for occupancy. Of the 1,479 mobile home parks or other housing units listed, ten had a "Yes" response to the IL coverage question, which may have been due to lister or keyer error. Of the 19,497 single unit or mobile homes or trailers, NOT in a park with a unit status other than occupied or vacant and intended for occupancy, 69 had a "Yes" response to the IL coverage question, which may have been due to lister or keyer error. Seventy-nine possible additional detached units were indicated and five possible additional units with neither attached or detached indicated by these incorrect entries.

Of the 507,208 BSAs listed as single unit or mobile homes or trailers, NOT in a park with a unit status of occupied or vacant and intended for occupancy, most responses were no (502,397 or 99.05 percent). There were 838 BSAs, or 0.17 percent, that did not complete the IL coverage question. However, 34 potential additional housing units were indicated with the No response and 53 potential additional units were indicated with the blank response, which may have been due to lister or keyer error. Entries were not expected in the additional residences field for these categories.

A total of 4,621 possible additional housing units were listed because this question was asked at single units and mobile homes NOT in a park. As expected most of the responses for additional housing units were detached (3,707 responses or 93.30 percent of the responses which accounted for 4,350 of the possible additional housing units). We expected most responses to be detached, because the lister should have changed the type of address to multiunit if the additional unit was attached. Twenty-eight possible additional attached housing units were added because this question was asked, and 241 housing units were potentially added with no indication if the unit was attached or detached.

A total of 551,820 BSAs were recorded in the U.S. during IL. The listers collected several types of address information for each housing unit in the ILB such as house number, street name, rural route number, box number, PO Box number, or structure identifier. A structure identifier was collected when two or more buildings shared the same BSA to distinguish them from each other. There were 29,430 or 5.80 percent of the addresses in city-style areas and 7,802 addresses or 17.54 percent in noncity-style areas had a structure identifier entry. Also, 493,575 or 97.29 percent of the U.S. addresses contained a house number and street name in the city-style areas and 33,140 or 74.51 percent in noncity-style areas.

A total of 43,282 BSAs were listed in Puerto Rico. Over 27,775 or 64.17 percent of the Puerto Rico BSAs contained a barrio or sector name and 15,579 or 35.99 percent of BSAs contain area name 1 and area name 2.

Each lister received an ILB with maps of their assignment areas showing the block clusters and blocks in the area. There were 18,165 block maps created for the 12,364 block cluster maps, which was the workload for IL. A total of 17,333 or 95.42 percent of the block maps and 12,354 or 99.92 percent of the block cluster maps consisted of single sheets, while 832 or 4.58 percent of the block maps were multi-sheeted and 10 or 0.08 percent of the block cluster maps were multi-sheeted. Only 1.46 percent or 264 of the block maps required 6 to 20 sheets to display the assignment areas.

When completed block cluster materials arrived at the NPC, the maps were edited with the ILBs and then sent to map scanning, so the images could be loaded into the Map Viewing System for use in later CCM operations. During scanning some maps may have been scanned more than once because of poor imaging, but because only the last image was used in the Map Viewing System, the counts reflect only the last image. There were 21,946 Block Maps, 854 Block Index Maps, and 4,487 Sketch Maps scanned after IL.

A total of 15,061 ILBs (14,266 ILBs for the U.S. and 795 ILBs for Puerto Rico) were used by the listers to list all the housing units in the nationwide sample. Over 70 percent of the block clusters were listed on one ILB; 10,413 block clusters in the U.S. and 400 block clusters in Puerto Rico. The Puerto Rico block clusters were listed on one to nine ILBs, with only one block cluster that required nine ILBs. The U.S. block clusters required one to 17 ILBs, but only 15 block clusters required nine or more ILBs to be listed.

Of the addresses with a unit status indicated by a lister for the U.S. and Puerto Rico, 863,242 or 96.73 percent had a unit status of "Occupied or vacant and intended for occupancy." When looking at the U.S. addresses and Puerto Rico Addresses separately, 807,838 or 96.90 percent of the U.S. addresses had a unit status of "Occupied or vacant and intended for occupancy," and Puerto Rico had 55,404 or 94.33 percent of the addresses in the same category.

The future construction unit status is specific to CCM (i.e., census does not indicate a unit to be future construction). Future construction units are captured during IL to try to capture additional housing units that may exist on Census Day or on the day PI was conducted that would otherwise be missed. Future construction was indicated as the unit status of 10,756 total housing units or 1.21 percent of units listed. For U.S. addresses, 10,302 or 1.24 percent of the housing units had a status of future construction, and for Puerto Rico housing units 454 or 0.77 percent had a unit status of future construction. The reason for future construction was usually a sign indicating future construction was planned.

For each type of housing unit, the lister was to record the respondent type, whoever provided them with the address information or if they conducted the listing by observation, which is done as a last resort. There were three possible respondent types: household member, proxy, or manager. The lister could have left this item blank inadvertently or could have checked off multiple entries. Overall, household members provided the information for 47.47 percent or 271,337 of the housing units listed, proxies provided the information for 29.26 percent or 167,252 of the housing units listed, and managers provided information for 6.48 percent or 37,024 of the housing units listed. At multiunits, listers were instructed to contact an apartment

manager when available to get the housing unit information and if no manager was available, to contact as few household members as possible to gather the information for all units within the multiunit. For multiunits, 36.68 percent or 16,209 of the housing unit information was collected from managers, 34.03 percent or 15,038 of the housing unit information was collected from household members, and 18.74 percent or 8,281 of the housing unit information was collected from proxies.

A total of 2,757 of the 12,364 block clusters, or 22.30 percent, of the sample block clusters had at least one block with zero housing units. In addition, the greater the number of blocks per block cluster the higher the probability of having at least one block in the block cluster with no housing units. There were 8,188 single block clusters or 83.23 percent that contained housing units, while 1,650 single block clusters or 16.77 percent had no housing units.

7.2.2 Initial Housing Unit Computer Matching

The IHU Computer Matching operation was planned to begin on January 25, 2010 and end on March 1, 2010. The operation began a day late on January 26, 2010, but ended early on February 23, 2010.

Addresses from the CCM IL and the census addresses from the UC&M file were linked in the IHU Computer Matching operation. However, only those addresses that could be standardized were eligible for computer matching.

Of all CCM housing units within the U.S. (including Puerto Rico), there are 1,421 (0.27 percent) with addresses that could not be standardized for computer matching.

Of all census housing units in the CCM sample areas within the U.S. (including Puerto Rico), there are 5,403 (1.05 percent) with addresses that could not be standardized for computer matching.

The computer matching results were processed by HUMaRCS to assign match codes to the CCM and census addresses. The match codes indicate that the units are matches, possible matches, nonmatches, or duplicates. The addresses that could not be standardized were coded as nonmatches.

A summary of the processed computer matching results for the CCM and census housing units is given below. All counts and percents are unweighted.

Of the 521,649 CCM housing units in the U.S. (including Puerto Rico), 62.82 percent are computer matches; 14.01 percent are possible matches; 22.90 percent are nonmatches; and 0.27 percent are duplicates.

In the U.S. (including Puerto Rico), there are 513,813 census housing units within the CCM sample block clusters, of which 62.53 percent are computer matches; 13.10 percent are possible matches; 24.22 percent are nonmatches; and 0.15 percent are duplicates.

For this assessment, census housing units were tabulated by the number of duplicates found per address. The unweighted results for the U.S. (including Puerto Rico) show that of the 513,813 census housing units in the CCM sample areas, 99.67 percent have no duplicates and 0.32 percent have one duplicate, after computer matching. The remaining addresses, with more than one duplicate, are 0.01 percent of all census housing units.

7.2.3 Initial Housing Unit Clerical Matching

BFU Clerical Matching was planned to begin on February 16, 2010 and end on March 26, 2010. AFU Clerical Matching was planned to begin on March 29, 2010 and end on May 19, 2010. Both began and finished on time.

Clerical matching has two phases: BFU Clerical Matching was performed before the field housing unit followup operation and AFU Clerical matching was performed after field followup.

Certain block clusters were not included in BFU Clerical Matching. Housing units in these block clusters were sent directly to field followup or to AFU Clerical Matching. Some block clusters skipped all matching, if there were no CCM units listed in the IL, and there were no census units in the UC&M file.

There are 1,288 block clusters that skipped BFU Clerical Matching and went directly to field followup, including six block clusters in Puerto Rico. There are 781 block clusters that skipped BFU Clerical Matching and went directly to AFU Clerical Matching; none of those were in Puerto Rico. There are 297 block clusters that skipped all clerical matching, including six in Puerto Rico.

During BFU Clerical Matching, NPC staff reviewed the match codes resulting from computer matching and recoded housing units as appropriate. Clerical matchers could enter followup notes to be included as special questions on the IHUFU forms. A total of 6,937 notes was entered for CCM cases. There were only 107 notes entered for census cases sent to followup. (The large difference between the numbers of followup notes for CCM addresses compared with census addresses is explained by the fact that followup notes for linked census and CCM addresses were always entered and stored on the CCM address record.)

During AFU Clerical matching, NPC staff reviewed the information from field followup and recoded housing units, as appropriate. Clerical matchers also identified possible duplicate housing units that were not confirmed during IHUFU. These duplicates were sent to FHUFU for confirmation; 20 are CCM duplicate housing units and 436 are census duplicates.

A summary of the progression of resolving the CCM and census addresses, from computer matching to BFU Clerical Matching to AFU Clerical matching is provided in the table below. The percentages are based on unweighted counts of the CCM housing units and the census housing units in the CCM sample areas. As shown, the clerical matching operations helped resolve many discrepancies between housing units in the two programs. In particular, the percent of matched census records increased substantially by nearly 30 percentage points, from 62.53 percent as a result of computer matching to 91.64 percent at the conclusion of AFU

Clerical Matching. However, only 4.98 percentage points were realized in the percent of matches[18] as a result of IHUFU and the use of those results in the AFU Clerical Matching. On the other hand, given that a major goal of CCM was to detect census duplicates, we observed the percent of duplicates among census records in the CCM sample areas increased from 0.15 percent in computer matching to 0.34 percent in BFU Clerical Matching and up to 1.06 percent in AFU Clerical Matching. Therefore, we need to consider these results in planning for 2020 CCM operations.

Results of Computer and Clerical Matching for Census Coverage Measurement and Census Addresses – Unweighted Percentages						
United States Results (including Puerto Rico)	Census Coverage Measurement			Census		
	Computer Matching	Clerical Matching		Computer Matching	Clerical Matching	
		Before Followup	After Followup		Before Followup	After Followup
Matches	62.82	87.10	92.16	62.53	86.66	91.64
Possible Matches	14.01	5.43	Not Applicable	13.10	5.34	Not Applicable
Nonmatches	22.90	7.38	4.49	24.22	7.66	3.94
Duplicates	0.27	0.09	0.09	0.15	0.34	1.06
Not a Housing Unit[19]	Not Applicable	0.00	3.25	Not Applicable	Not Applicable	3.35

For this assessment, census housing units were tabulated by the number of duplicates per address. Upon completion of IHU Clerical Matching, of the 513,813 census housing units in the CCM sample areas within the U.S and Puerto Rico, 99.01 percent have no duplicates and 0.94 percent have one duplicate. The remaining census addresses, with more than one duplicate, account for 0.05 percent of all census housing units.

In addition to the tabulations by match code, this assessment shows results by the housing unit status of the CCM addresses and the enumeration status of the census addresses.

Each CCM unit from the IL was classified as either a housing unit, potential housing unit (an address that could become a housing unit by CCM PI day, for example under construction or future construction), not a housing unit, duplicate, geocoding error or unresolved, based on the match code assigned to the unit at the end of AFU Clerical Matching. A CCM unit was classified as unresolved if clerical matching could not confirm the unit's status as a housing unit or potential housing unit or could not confirm that it was located in the sample block cluster.

Each census unit listed on the UC&M file as a housing unit within the CCM sample block clusters was given an enumeration status of correct enumeration, erroneous enumeration, duplicate, geocoding error, or unresolved, based on the match code assigned to the unit at the end of AFU Clerical Matching.

[18] This does not include matches that were found for CCM and census units that are classified as "not a housing unit."

[19] The classification "not a housing unit" was given to a very small number of CCM units (those with erroneous map spot numbers) in BFU Clerical Matching. The classification "not a housing unit" did not apply to census units in BFU Clerical Matching. Recall that census group quarters from the UC&M file were excluded from this evaluation.

A summary of the housing unit status for CCM and enumeration status for census addresses at the end of IHU operations is given below. All counts and percents are unweighted.

Of the 521,649 CCM addresses, 95.24 percent are housing units; 1.10 percent are not housing units; 0.09 percent are duplicates; 1.22 percent are geocoding errors; 2.14 percent are potential housing units; and 0.20 percent are unresolved housing units.

Of the 513,813 census addresses in the CCM sample areas, 95.24 percent are correct enumerations; 3.30 percent are erroneous enumerations; 1.06 percent are duplicates; 0.05 percent are geocoding errors; and 0.34 percent are unresolved enumerations.

7.2.4 Initial Housing Unit Followup

The IHUFU was planned from March 4, 2010 through April 23, 2010. The operation began and finished on time in the U.S. Puerto Rico began on time, but due to a large amount of work being sent to followup towards the end of IHU BFU Matching for Puerto Rico, we extended the field operation in Puerto Rico until May 2, 2010.

The IHUFU was estimated to cost $20,688,471, with IHUFU Production estimated at $9,871,093 and IHUFU QC estimated at $10,817,378. Overall training cost was estimated at $3,565,270, wages for hourly field workers was estimated at $11,215,356, and the cost of mileage reimbursement was estimated at $3,915,469.

The IHUFU operation was under budget by $11,826,857 (57.17 percent). The IHUFU and IHUFU QC operations were under budget by $4,689,114 (47.50 percent) and $7,137,743 (65.98 percent), respectively.

During IHUFU, 0.74 cases were completed per hour. During IHUFU QC, 0.41 cases were completed per hour.

The workload for IHUFU was determined from the IHU Matching activities. There were 76.87 percent of the 6,416 block clusters in sample, or 4,932 block clusters which required followup overall (U.S. and Puerto Rico). There was a lower percent of followup block clusters in the U.S. city-style block clusters (74.22 percent or 3,975 block clusters) than in U.S. noncity-style block clusters, (89.27 percent or 707 block clusters). For Puerto Rico, 93.28 percent or 250 block clusters required followup. At the RCC level, New York had the highest percentage of block clusters requiring followup at 87.45 percent, or 202 block clusters.

Overall, 54.52 percent or 2,689 of the block clusters had one to nine followup cases. This includes 56.15 percent or 2,629 block clusters in the U.S., while only 24.00 percent or 60 block clusters in Puerto Rico.

There were 177,630 addresses requiring followup. Of the addresses requiring followup, 86,260 or 48.56 percent were CCM addresses, 78,448 or 44.16 percent were Census addresses in the block cluster, 252 or 0.14 percent were Census GQs in the block cluster, and 12,670 or 7.13 percent were Census Housing Units in a Surrounding Block.

Counting both CCM and census housing units, a total of 46,652 addresses were corrected, overall. As expected, most of the address correction happened during AFU Clerical Matching (89.13 percent, or 41,581 addresses) because IHUFU interviewers had indicated the address correction on the IHUFU Form. For Puerto Rico, 10,788 (23.12 percent) of the IHUFU cases, while for the U.S. 76.88 percent of the cases (35,864) required address changes.

There were a total of 39 form types available for the IHUFU operation that contained questions tailored at resolving the discrepancy in the address list. Ten of the forms were not used during the IHUFU operation, because they did not have any units fitting the code during IHU computer or clerical matching. Overall, five forms accounted for over 93.66 percent of all forms generated for IHUFU. The CCM Nonmatched Address Form accounted for 38,489 cases or 30.74 percent of all followup forms, 38,308 cases or 30.60 percent were the Census Nonmatched Address Form, 25,191cases or 20.12 percent were the Possible CCM-Census Match Form, 8,844 cases or 7.06 percent were the Surrounding Block Match Form, and 6,441 cases or 5.14 percent were the Unit Status Update Form.

7.3 Recommendations

In this section we provide recommendations for improving future CCM Programs.

7.3.1 Independent Listing

Based on information from interviewer debriefings and Headquarters observations, the collection of respondent name and phone number in the 2010 IL Operation made respondents reluctant to respond. The information is not used in later CCM operations, so it is suggested to consider deleting the collection of these data in 2020. However, if in 2020 both census and CCM were to collect this information, it would be useful for purposes of matching housing units. In addition, collecting the information could help deter falsification.

When the IL coverage question: "At (*address*), are there any basement or garage apartments, trailers, or other residences, even if no one is living there now?" was read to respondents, respondent often misheard or misunderstood the question, answering the house had a basement or garage. The wording of the IL coverage question should be reworded so the information gathered from respondents is as intended.

The ILBs proved to be very bulky and cumbersome for the listers in the field, as well as in the NPC, and would not fit in the lister's census bag. Investigate using a smaller, notebook-size listing page or an automated instrument. All the processing, editing, and keying of the ILBs could be eliminated if IL was automated. An automated instrument would also force the entry of on-path data, eliminating missing data and eliminating the requirement to key data.

There were many errors while keying the Puerto Rico ILBs. It would have been helpful to have more bilingual technicians and analysts to conduct a more thorough pre-key edit and edit resolution, including content editing, to reduce the number of errors in keying and decrease the overall cost of processing Puerto Rico ILBs. During the final weeks of keying, after most ILBs

had been received at the NPC, bilingual technicians helped transcribe data before they were keyed, because keying issues many times were due to illegible handwriting that had to be deciphered by non Spanish-speaking keyers. If IL was conducted using a handheld, it would eliminate transcribing time and keying errors. During the 2010 planning, automating IL was considered and ultimately rejected due to restrictions placed on the data that could be collected by developers of the Address Canvassing instrument.

Military block clusters have different field procedures and for 2010 also had restrictions that block maps could not contain map spots. It was suggested to have the GEO identify military block clusters by using an additional code in the TEA variable so the ILB labels could identify them as noncity-style, city-style, or military.

As CCM had to report to Executive Staff by waves, it is recommended that if waves are used in future CCMs, then they should be part of the automated tracking system and should be defined in future software requirements.

7.3.2 Initial Housing Unit Computer Matching

In the future, for those addresses that fail standardization for computer matching, consider looking at the location description fields. A lister may have entered a house number and street name in the location description fields. Using those fields may give us another chance for a match or possible match.

7.3.3 Initial Housing Unit Clerical Matching

In the future if we have an automated listing instrument, we should consider moving matching and followup operations closer to the listing operation. That is, as soon as a block cluster clears listing, match it, and get it back out to followup (or wait for followup until Census Day if that is needed for estimation purposes).

We should consider a new approach for clerical matching that puts more reliance on decisions made by the automated matching system instead of the matchers. For example, ask the clerical matchers questions like “Are the linked addresses housing units or a GQ?”, “What’s the housing unit status of the linked addresses?”, “What block are the linked addresses located in?” etc. and design the system to use this information to assign the appropriate match or housing unit status code.

7.3.4 Initial Housing Unit Followup

In the future, we should plan to have more workload available at the start of the followup operation. This will require a larger schedule gap between the start of the BFU Clerical Matching Operation and the IHUFU.

During IHUFU QC, we may want to reconsider street-type errors as critical errors. It could increase the QC rate, but when streets are very close and have similar names minor changes could cause significant errors.

In talking with office staff, they requested that for future operations, QC be treated as a separate operation from production in CMOCS, as tracking block clusters' status between IHUFU and QC in the system was difficult.

IHUFU Question L, which asks for the number of housing units at the BSA, confused some interviewers when following up a basement or garage apartment and a multiunit. The confusion was thought to be in part because the concept of the BSA was not stressed during the training; though it was present in the glossary. Listers did not understand how to answer the number of units when respondents would say they did not receive mail addressed to the apartment and were confused for multiunits as to whether the question was referring to the individual follow-up unit, the apartment, or the whole structure. Training should place more emphasis on the concepts and differences between a BSA and a housing unit, and when they differ.

For future CCMs, it may be beneficial to have a respondent letter describing what CCM is and how it is different from the census to explain to respondents why enumerators are there to collect additional information, especially for those operations occurring in the field when census forms are mailed.

There were multiple sheets for the various types of maps for the block cluster, making the maps cumbersome in both size and quantity. It was observed that often the interviewer/QC Checker mixed up the map sheets for one type of map with those for another. Future discussions are encouraged to solicit ideas for making the various types of maps more manageable in size and number and more recognizable from one another. Likewise, more training is needed on when to use each type of map.

The NPC Analysts suggested rewording the question "Is there a housing unit at this address" on the IHUFU form in the future to "Determine if Address fits the definition of a housing unit."

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Appendix A – List of Initial Housing Unit Case Forms

Initial Housing Unit Followup (IHUFU) Case Forms	IHUFU Form Code	IHUFU Form Description
CCM Nonmatched Address	NI	The CCM listed an address that the Census did not. Determine if the CCM address is a housing unit.
CCM Nonmatched and Duplicate Address	NI/DI	The CCM listed an address that the Census did not. The CCM address is a possible duplicate with another CCM address. Determine if the CCM address is a housing unit and if the addresses on the CCM list are the same.
CCM Nonmatched/Two Duplicate CCM Addresses	NI/DI/DI	The CCM listed an address that the Census did not. The CCM addresses are possible duplicates with other CCM addresses. Determine if the CCM address is a housing unit and if the addresses on the CCM list are the same.
CCM-Census Match/Duplicate CCM Address	M/DI	The CCM and Census address match. The CCM address is a possible duplicate with another CCM address. Determine if the addresses on the CCM list are the same.
CCM-Census Match/Duplicate Census Address	M/DE	The CCM and Census address match. The Census address is a possible duplicate with another Census address. Determine if the addresses on the Census list are the same.
CCM-Census Match/Two Duplicate CCM Addresses	M/DI/DI	The CCM and Census address match. The CCM addresses are possible duplicates with other CCM addresses. Determine if the addresses on the CCM list are the same.
CCM-Census Match/Two Duplicate Census Addresses	M/DE/DE	The CCM and Census address match. The Census addresses are possible duplicates with other Census addresses. Determine if the addresses on the Census list are the same.
Census Nonmatched Address	NE	The Census listed an address that CCM did not. Determine if the Census address is a housing unit.
Census Nonmatched and Duplicate Address	NE/DE	The Census listed an address that CCM did not. The Census address is a possible duplicate with another Census address. Determine if the Census address is a housing unit and if the addresses on the Census list are the same.
Census Nonmatched/Two Duplicate Census Addresses	NE/DE/DE	The Census listed an address that CCM did not. The Census addresses are possible duplicates with other Census addresses. Determine if the Census address is a housing unit and if the addresses on the Census list are the same.
Group Quarters	GQ	CCM listed the address as a housing unit, but Census listed it as a GQ. Determine if the CCM address is a housing unit or a GQ.
Group Quarters with Census Address Match	GQ*	
Possible CCM-Census Match	P	The CCM and Census addresses are possible matches. Determine if the CCM and Census addresses are the same.
Possible CCM-Census Match/Duplicate CCM Address	P/DI	The CCM and Census addresses are possible matches. The CCM address is a possible duplicate with another CCM address. Determine if the CCM and Census addresses are the same and if the addresses on the CCM list are the same.

[1] Form not used in IHUFU

Initial Housing Unit Followup (IHUFU) Case Forms	IHUFU Form Code	IHUFU Form Description
Possible CCM-Census Match/Duplicate CCM Address	P/DI	The CCM and Census addresses are possible matches. The CCM address is a possible duplicate with another CCM address. Determine if the CCM and Census addresses are the same and if the addresses on the CCM list are the same.
Possible CCM-Census Match/Duplicate Census Address	P/DE	The CCM and Census addresses are possible matches. The Census address is a possible duplicate with another Census address. Determine if the CCM and Census addresses are the same and if the addresses on the Census list are the same.
Possible CCM-Census Match/Two Duplicate CCM Addresses	P/DI/DI	The CCM and Census addresses are possible matches. The CCM addresses are possible duplicates with other CCM addresses. Determine if the CCM and Census addresses are the same and if the addresses on the CCM list are the same.
Possible CCM-Census Match/Two Duplicate Census Addresses	P/DE/DE	The CCM and Census addresses are possible matches. The Census addresses are possible duplicates with other Census addresses. Determine if the CCM and Census addresses are the same and if the addresses on the Census list are the same.
Surrounding Block Match	M*SB	The CCM and Census addresses were matched, but the blocks for the two addresses are different. Determine the correct block.
Surrounding Block Match/Duplicate CCM Address	M*SB/DI	The CCM and Census addresses were matched, but the blocks for the two addresses are different. The CCM address is a possible duplicate with another CCM address. Determine the correct block and if the addresses on the CCM list are the same.
Surrounding Block Match/Possible CCM-Census Match	P*SB	The CCM and Census addresses are possible matches, and the blocks for the two addresses are different. Determine if the addresses are the same and the correct block.
Surrounding Block Match/Possible CCM-Census Match/Duplicate CCM Address[1]	**P*SB/DI**	**The CCM and Census addresses are possible matches, and the blocks for the two addresses are different. Determine if the addresses are the same, the correct block, and if the addresses on the CCM list are the same.**
Surrounding Block Match/Possible CCM-Census Match/Two Duplicate CCM Addresses[1]	**P*SB/DI/DI**	
Surrounding Block Match/Two Duplicate CCM Addresses[1]	**M*SB/DI/DI**	**The CCM and Census addresses were matched, but the blocks for the two addresses are different. The CCM addresses are possible duplicates with other CCM addresses. Determine the correct block and if the addresses on the CCM list are the same.**
Unit Status Update	M*	The CCM and Census addresses match, but the unit status was listed by CCM as something other than occupied or vacant. Determine the unit status of the CCM address.
Unit Status Update /Two Duplicate Census Addresses	M*/DE/DE	The CCM and Census addresses match, but the unit status was listed by CCM as something other than occupied or vacant. The Census addresses are possible duplicates with other Census addresses. Determine the unit status of the CCM address and if the addresses on the Census list are the same.
Unit Status Update and Surrounding Block Match	M*USSB	The CCM and Census addresses were matched, but the unit status was listed by CCM as something other than occupied or vacant and the blocks for the two addresses are different. Determine the unit status and the correct block.

[1] Form not used in IHUFU

Initial Housing Unit Followup (IHUFU) Case Forms	IHUFU Form Code	IHUFU Form Description
Unit Status Update and Surrounding Block Match	M*USSB	The CCM and Census addresses were matched, but the unit status was listed by CCM as something other than occupied or vacant and the blocks for the two addresses are different. Determine the unit status and the correct block.
Unit Status Update and Surrounding Block Match/Duplicate CCM Address[1]	**M*USSB/DI**	**The CCM and Census addresses were matched, but the unit status was listed by CCM as something other than occupied or vacant and the blocks for the two addresses are different. The CCM address is a possible duplicate with another CCM address. Determine the unit status, the correct block, and if the addresses on the CCM list are the same.**
Unit Status Update and Surrounding Block Match/Possible CCM-Census Match	P*USSB	The CCM and Census addresses are possible matches, the unit status was listed by CCM as something other than occupied or vacant, and the blocks for the two addresses are different. Determine if the addresses are the same, the unit status, and the correct block.
Unit Status Update and Surrounding Block Match/ Possible CCM-Census Match/Duplicate CCM Address[1]	**P*USSB/DI**	**The CCM and Census addresses are possible matches, the unit status was listed by CCM as something other than occupied or vacant, and the blocks for the two addresses are different. Determine if the addresses are the same, the unit status, the correct block, and if the addresses on the CCM list are the same.**
Unit Status Update and Surrounding Block Match/ Possible CCM-Census Match/Two Duplicate CCM Addresses[1]	**P*USSB/DI/DI**	
Unit Status Update and Surrounding Block Match/Two Duplicate CCM Addresses[1]	**M*USSB/DI/DI**	**The CCM and Census addresses were matched, but the unit status was listed by CCM as something other than occupied or vacant and the blocks for the two addresses are different. The CCM addresses are possible duplicates with other CCM addresses. Determine the unit status, the correct block, and if the addresses on the CCM list are the same.**
Unit Status Update/Duplicate CCM Address	M*/DI	The CCM and Census addresses match, but the unit status was listed by CCM as something other than occupied or vacant. The CCM address is a possible duplicate with another CCM address. Determine the unit status of the CCM address and if the addresses on the CCM list are the same.
Unit Status Update/Duplicate Census Address	M*/DE	The CCM and Census addresses match, but the unit status was listed by CCM as something other than occupied or vacant. The Census address is a possible duplicate with another Census address. Determine the unit status of the CCM address and if the addresses on the Census list are the same.
Unit Status Update/Possible CCM-Census Match	P*	The CCM and Census addresses are possible matches, and the unit status was listed by CCM as something other than occupied or vacant. Determine if the addresses are the same and the unit status of the CCM address.
Unit Status Update/Possible CCM-Census Match/Duplicate CCM Address	P*/DI	The CCM and Census addresses are possible matches, and the unit status was listed by CCM as something other than occupied or vacant. Determine the unit status of the address and if the addresses on the CCM list are the same.

[1] Form not used in IHUFU

Initial Housing Unit Followup (IHUFU) Case Forms	IHUFU Form Code	IHUFU Form Description
Unit Status Update/Possible CCM-Census Match/Duplicate Census Address	P*/DE	The CCM and Census addresses are possible matches, and the unit status was listed by CCM as something other than occupied or vacant. Determine if the addresses are the same, the unit status of the CCM address, and if the addresses on the Census list are the same.
Unit Status Update/Possible CCM-Census Match/Two Duplicate CCM Addresses[1]	**P*/DI/DI**	**The CCM and Census addresses are possible matches, and the unit status was listed by CCM as something other than occupied or vacant. Determine if the addresses are the same, the unit status of the CCM address, and if the addresses on the CCM list are the same.**
Unit Status Update/Possible CCM-Census Match/Two Duplicate Census Address[1]	**P*/DE/DE**	**The CCM and Census addresses are possible matches, but the unit status was listed by CCM as something other than occupied or vacant. Determine if the addresses are the same, the unit status of the CCM address, and if the addresses on the Census list are the same.**
Unit Status Update/Two Duplicate CCM Addresses[1]	**M*/DI/DI**	**The CCM and Census addresses match, but the unit status was listed by CCM as something other than occupied or vacant. The CCM addresses are possible duplicates with other CCM addresses. Determine the unit status of the CCM address and if the addresses on the CCM list are the same.**

[1] Form not used in IHUFU

Appendix B - List of Acronyms

Acronym	Definition
A.C.E.	Accuracy and Coverage Evaluation
AFA	After Followup Analyst
AFO	After Followup Outlier
AFU	After Followup
AOQL	Average Outgoing Quality Limit
ATAC	Automated Tracking and Control
ATC	Address Type Cluster
BFU	Before Followup
BSA	Basic Street Address
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
CR	Change Request
CUF	Census Unedited File
DAPPS	Decennial Applicant, Personnel and Payroll System
DMD	Decennial Management Division
DQC	Dependent Quality Control
DSF	Delivery Sequence File
DSSD	Decennial Statistical Studies Division
E Sample	Enumeration Sample
FDCA	Field Data Collection Automation
FHUFU	Final Housing Unit Followup
FLD	Field Division
FOS	Field Operations Supervisor
GEO	Geography Division
GPS	Global Positioning System
GQ	Group Quarters
HM	Hectometer
HU	Housing Unit
HUMaRCS	Housing Unit Matching, Review, and Coding System
IHU	Initial Housing Unit
IHUFU	Initial Housing Unit Followup
IL	Independent Listing
ILB	Independent Listing Book
KM	Kilometer
MAS	Master Activity Schedule
M&IE	Meals and Incidental Expenses

Acronym	Definition
MSN	Map Spot Number
NPC	National Processing Center
PFU	Person Followup
PI	Person Interview
P Sample	Population Sample
PO	Post Office
QC	Quality Control
RCC	Regional Census Center
TEA	Type of Enumeration Area
TMO	Technologies Management Office
UAT	User Acceptance Testing
UC&M	Universe Control and Management

Appendix C - Initial Housing Unit Independent Listing, Matching, and Followup Operations Software and Systems

Several software and systems were developed to implement and manage the IHU IL, Matching, and Followup Operations. This section details the systems and software used in the IHU Operations.

The primary software and systems for IL included the following:
- CMOCS
- Automated Tracking and Control (ATAC) System
- CCM Housing Unit IL Keying Output File, Pickup, Verification, and Edit
- IL Keying Software
- Software/systems with which CMOCS software interfaced, such as the DAPPS and FDCA software.

The primary software and systems for IHU Clerical Matching included the following:
- Small block subsampling
- Computer Matching
- HUMaRCS software
- Software/systems with which HUMaRCS software interfaced, such as the CMOCS and the Census Evaluations and Experiments software

The primary software and systems for IHUFU included the following:
- CMOCS
- HUMaRCS software
- Docuprint software
- Software/systems with which CMOCS software interfaced, such as the DAPPS and FDCA software.

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

1.0 Coverage Measurement Operations Control System

For the 2010 Census, the TMO developed the CCM IL and IHUFU Operations software to be used in the RCCs.

TMO was responsible for:
- developing the software for the control and management of IL and IHUFU work for the office staff (CMOCS)
- developing the software for the IL DQC sample selection and management operation
- establishing interfaces between several different Census Bureau systems such as HUMaRCS, the DAPPS, C&P software, the NPC, and the DSSD Census Evaluations and Experiments System 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 GEO
- testing CMOCS and its interfaces to ensure that the software functioned as expected and the data captured are accurate.

TMO conducted software demonstrations of the CMOCS during the development process to allow stakeholders to see the system and provide feedback, if necessary, to ensure the systems were meeting their expectations. TMO also established a change control process to manage changes to existing requirements or introduce new requirements and worked closely with the 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

1.1 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 each component correctly implements the design specifications. Unit Testing validates that business rules, create/read/update/delete functions, data validations, file creation, and similar "low-level" functions operate 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 independent 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.

1.2 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 are 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 is no formal test report from this phase of testing, although testers did generate trouble tickets.

1.3 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 other stakeholders conducted this testing. The testing looked at the CMOCS, the backend database, and external interfaces.

Systems Testing concentrates on requirements and business processes, and ensures that system requirements and business needs have been met. Systems Testing tested the components and interfaces working together as a complete, integrated solution. Systems 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. The FLD was responsible for reviewing the test cases and used them during the Systems Test. The DSSD CCM staff also participated, when available, in the testing.

For Systems Testing, TMO reported on issues reported from FLD only. Software Testing for IL was completed on April 30, 2009 and a total of 23 defects were identified. System testing for IHUFU was completed on October 21, 2009 with 12 defects identified. There was not one major area that presented an issue during the testing for either operation; however, the bulk of the issues reported for both IL and IHUFU centered around the defining of geography, the check-in and check-out functions, the entering and editing of employee data and generating reports.

1.4 Verification Testing

Verification Testing was the second and last round of testing before the system was deployed. The goal of Verification Testing is to ensure that the software application is ready for production implementation.

Verification Testing was conducted in the Test environment. A set of predefined test cases were leveraged from the Systems Tests to execute in Verification Testing. The test cases used for Verification Testing were approved in advance by FLD. 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 FLD only. Verification Testing for IL was completed on June 18, 2009 with 33 defects reported. Verification Testing for IHUFU was completed on December 16, 2009 with 12 defects reported. The primary issues reported, once again, centered around the defining of geography, check-in and check-out functions, the entering and editing of employee data and generating reports.

1.5 Regression Testing

Regression Testing occurred during the Software Testing and Verification Testing, as well as for any changes to the system baseline during production. This ensured that all defects detected were

properly corrected and that the new software changes did not negatively affect any other functionality of the systems.

2.0 Automated Tracking and Control (ATAC) System

The ATAC system was the application used to track the movement of the ILBs and CCM maps throughout the various processing areas or units at the NPC. The ATAC system was also capable of generating shipping and production reports which were used to monitor the check-in process. ATAC was used during the IL operation at the NPC to check-in ILBs and maps received from the RCCs, batch ILBs for data capture, batch maps for scanning, batch observation checklists for keying, and track ILBs needing edit resolution.

The ATAC system contained a file of all CCM maps for each block cluster. During the ATAC check-in, the user was notified of any missing maps, and a file was delivered to CMOCS nightly to alert the RCCs of any missing maps.

The Census Coverage Measurement Section (CCMS) Control Staff used the ATAC system to separately check-in the U.S. and Puerto Rico ILBs and CCM maps by wanding the barcodes from the ILB Cover Page of the first ILB and from each CCM map, except the sketch and auxiliary maps, which did not have barcodes affixed. ATAC generated a barcode for sketch maps in each block cluster, based on the total number of these maps the user entered into ATAC, so that these maps could be tracked and sent to scanning.

Various edits were built into the data capture process of the ILBs. If a block cluster failed any of the edit checks, a report was generated in the keying software and the ILB(s) had to be returned to the CCMS to resolve the issue. The block clusters that failed the edit checks were flagged in the Data Capture system and notification was sent to the ATAC system. The ATAC system automatically checked-in each flagged block cluster to Edit Resolution. Once Edit Resolution was completed for a block cluster, CCMS control staff needed to check-out the ILBs from Edit Resolution to keying via the ATAC system.

The CCMS staff used the ATAC system to separately check-in the U.S. and Puerto Rico IL Observation Checklists by wanding the barcodes affixed to the front page of the IL Observation Checklists.

The ATAC system was used during IHUFU only to batch Observation Checklists for keying. The HUMaRCS was used to check-in followup questionnaires.

User Acceptance Testing (UAT) was conducted on the ATAC system for a very small universe, 25 U.S. and 25 Puerto Rico block clusters. Only two experienced lead staff members from the NPC checked in and batched the block clusters while Headquarters staff observed. Several changes were identified during the testing, most of which were implemented with very little additional testing.

We also conducted testing between the systems that ATAC would communicate with during production. Test files were transferred between CMOCS and ATAC, and C&P and ATAC to test the data sent to and received from these systems. Several issues were identified, and testing to resolve these continued after the scheduled end date of UAT through the start of production.

3.0 Independent Listing Keying Output File Pickup, Verification, and Edit Software

The IL Keying Output File Pickup, Verification, and Edit Software was capable of retrieving and verifying the daily output from the U.S. and Puerto Rico ILB keying operation, including information from the Cover Page (front and back), Listing Section, Multiunit Address Section, and Mobile Home Park Section. The software verified and edited certain variables as defined by the CCM Housing Unit Data Collection Team.

The software created several output files. One of the resulting files was used to create the IL file for subsequent matching operations. The Housing Unit Data Collection Team used the additional files, such as the Rejected Records File, for analysis.

A test deck containing various test scenarios and several block clusters of ILBs was data captured. Its output was provided to the DSSD and used as input to create test Verified ILB files. The test Verified ILB files were reviewed and verified by the CCM Housing Unit Data Collection Team to ensure that the system verified and edited the keyed data and created a complete list of housing units to be used for the data preparation process of Computer Matching as well as the other output files. The software also went through Beta testing.

4.0 Independent Listing Keying Software

The IL Keying Software was used at the NPC to conduct initial keying, verification keying, edit resolution keying, and classification of discrepancies between initial and verification keying data. Two versions of the software were developed, one for the U.S. and one for Puerto Rico.

Initial keying consisted of capturing data from the Cover Page (Sections 1 - 3), the Listing Pages (Section 4), the Multiunit Address Pages (Section 5), and the Mobile Home Park Pages (Section 6) for all ILBs of a block cluster. When the keyer completed the keying of all ILBs for the block cluster, several edits were automatically run. The block clusters that failed the edit checks were flagged in the Data Capture system and a report with the edit failures was generated. Technicians and/or Analysts corrected the edit failures and the corrections were keyed into the software by the same initial keyer.

The same block cluster was then re-keyed during the verification step by a different keyer. Edits were again automatically run, and after corrections were made, the verification keyer keyed the edit corrections. The same procedures were used by the initial and verification keyers.
The software then compared the output from initial and verification keying, including the edit failure correction keying, and a classifier (usually a keying supervisor) determined which keyed data were used, or, in rare cases, rejected both outputs, which required a repeat of the complete process.

UAT and Beta testing were conducted on the IL Keying Software. For the keying UAT, DSSD staff developed 50 block clusters (25 for U.S. and 25 for Puerto Rico) containing dummy data representing various scenarios the edits in the software should flag as incorrect. Staff from Headquarters went to the NPC and used the keying software to key one block cluster each, and then the NPC keyers conducted initial keying and verification keying on the remaining block clusters. Once the software produced the edits, Headquarters staff made corrections, so edit correction keying could occur immediately. Most of the issues identified during the UAT were corrected and retested.

Beta testing was conducted at Headquarters, where Beta testers had access to the keying software and keyed several of the block clusters that were used during the UAT.

5.0 Housing Unit Matching, Review, and Coding System Software and Testing

HUMaRCS was used at the NPC by clerical matchers.

HUMaRCS includes preprocessing functions that:

- Accept and validate data inputs to include:
  - Census address data
  - IL housing unit data
  - Computer matching results
  - Block cluster control data
  - Sample design data
  - Block 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 initial data for various search areas for clerical matching
- Set initial match codes on all IL and Census address records
- Flag records requiring matching and coding
- Set up block clusters for matching by the NPC technicians and analysts

HUMaRCS supports the CCM program by providing easy-to-use online functions for:

- Selecting and checking out an appropriate block cluster for clerical review and/or matching
- Recording the history of matching for each block cluster, including which user performed each stage, the start and end dates and times, etc.
- Allowing a user to update certain IL and Census data fields
- Searching for matching records within specified search areas
- Linking and unlinking IL and Census address records
- Creating IL and Census address duplicate references
- Match coding IL and Census address records
- Entering notes
- Flagging cases for review
- Closing out block clusters at each stage of matching (after confirming that all required processing has been completed)
- Checking IHUFU packages out from the NPC
- Checking IHUFU packages back into the NPC
- Sending block clusters through an Outlier Review process based on the automated calculation of an Outlier Priority
- Allowing authorized users to force block clusters into Outlier Review
- Monitoring the proficiency of all HUMaRCS users
- Ensuring that all matching results adhere to quality standards

HUMaRCS also includes functions for generating management reports to include:

- A detailed report of the status of all block clusters in 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 in 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, showing the user who performed each stage of matching for each block cluster
- 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 QC functions

HUMaRCS includes capabilities for generating complex and comprehensive field followup materials for situations in which additional data are needed to match and code housing unit data accurately. The system creates print files of the IHUFU questionnaires which are sent to Docuprint printers with other supporting information. An IHUFU package includes:

- A Cover Sheet, with electronic bar code and summary data about the IHUFU package
- A Reference List, showing a summary of all address data for the block cluster
- Multiple IHUFU forms, which include header information for both Census and IL address data, as well as multiple questions (with data fill-ins) tailored to the type of followup case
- A QC Sheet, showing cases that have been selected for a field quality check

HUMaRCS has a Check-in/Check-out software application used by designated users to check-out IHUFU packages from HUMaRCS and check-in the packages upon return from the IHUFU operation.

In addition to the base functionality described above, there was also a companion application that allows the clerical matchers to access and view images of Census and IL 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 HUMaRCS Map Viewing System provides access to the maps used by both the Census and CCM staff during Address Canvassing and IL operations and Census block maps for surrounding blocks. HUMaRCS includes easy-to-use functions for accessing a list of all maps available for a particular block cluster. 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.

The map viewer displays Census block cluster maps and CCM block cluster maps simultaneously in side-by-side viewing panels. The users can control Census and CCM block cluster maps such that any user action (such as panning, zooming, and scrolling) on one map is applied to the other map also. The system thus keeps the two images in sync while users are viewing maps of block clusters. In addition, access to the block maps of surrounding blocks is accessible from a drop-down menu on the viewing screen.

Alpha Testing and Regression Testing were conducted on both the HUMaRCS system and all related components according to the business, system and user requirements gathered by the Subject Matter Experts and software development team. The HUMaRCS system was used during the 2010 CCM IHU BFU and AFU Clerical Matching operations. The HUMaRCS system provided functionality to support the IHUFU operation including the identification of the IHUFU universe, creation of IHUFU forms for Docuprint, interviewing case management (early warning and control files), and Check-out/Check-in system functionality for tracking IHUFU forms flowing in and out of the NPC. Testing was conducted in increments of the pre-determined software phases (Pre-processing, BFU, IHUFU, and AFU) using both black box and white box methodologies[20]. 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[21] was used for documenting and resolving issues during each release.

Once the Alpha Test Team[22] 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.

6.0 Initial Housing Unit Followup Docuprint Software

Nightly, at the conclusion of the IHU BFU Clerical Matching operation, HUMaRCS generated a set of print files for each block cluster that required followup. Each set of Portable Document Format (.pdf) files contained one block cluster's IHUFU packets (i.e., IHUFU Packet Cover Page, IHUFU form(s), CCM IHU Reference List, and the CCM IHUFU QC form). In addition, HUMaRCS copied all appropriate maps for each block cluster that required followup. The print files were placed on a server that the NPC could access. The print files were copied to the system and coded for printing. The documents for each block cluster were then printed using a high-speed Docuprint laser printer.

To test the Docuprint outputs of the IHUFU packets, print files from the block clusters identified for followup during the Integration Test of HUMaRCS were made available to the NPC. The IHUFU forms, reference lists, and QC forms were printed, and staff at the NPC and at Headquarters reviewed the printed forms to make sure they were printed as specified. No map files were available to test the printing of maps for these block clusters. Instead, placeholders were printed for the maps which stated which map should be printed. A separate test for map printing was conducted before the Integration Test. Headquarters GEO staff reviewed the printed maps to ensure the printing was as specified.

[20] 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.
[21] Mercury Quality Center is a software management tool used to manage application quality (requirements traceability) and conduct software testing (defect reporting).
[22] The Alpha Test team consists of both government employees and contractors managed by DSSD staff.