UNITED STATES DEPARTMENT OF COMMERCE
Economics and Statistics Administration
U.S. Census Bureau
Washington, DC 20233-0001

April 4, 2012

2010 CENSUS PLANNING MEMORANDA SERIES

No. 186

MEMORANDUM FOR The Distribution List

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

Subject: 2010 Census Postal Tracking Assessment Report

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

If you have questions about this report, please contact James Marsden at (301) 763-8857.

Attachment

2010 Census Postal Tracking Assessment

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

FINAL REPORT

James Marsden
Decennial Systems and Contracts Management Office
Supported by Gunnison Consulting Group, Inc.

Table of Contents

List of Tables

List of Figures

EXECUTIVE SUMMARY

This document summarizes and evaluates the implementation of United States Postal Service postal tracking technologies (specifically, the Confirm services) during the 2010 Census. The technology provided timely electronic data regarding responses on their way back to the Paper Data Capture Centers as well as on Undeliverable as Addressed mail. The U.S. Census Bureau used this technology to remove responding households and Undeliverable as Addressed mail pieces from the targeted replacement mailing, reducing addressing and mailing costs as well as preventing compliant respondents from receiving multiple forms.

This analysis was conducted by the Decennial Systems and Contracts Management Office. The primary objectives of this evaluation were defined in the planning document "2010 Census Study Plan: 2010 Census Postal Tracking Assessment." The overall goals are to confirm the reliability of postal tracking data, as compared to the "traditional" Paper Data Capture Center check-in methods and to the 2008 Census Dress Rehearsal conclusions; to confirm the consistency of the data (again, comparing to check-in and the 2008 Census Dress Rehearsal test data); and to evaluate the uses and benefits of the data during the 2010 Census.

Decennial Systems and Contracts Management Office contracted with the initial/replacement questionnaire printer to place postal tracking information on mail pieces via the Intelligent Mail Barcode, and then to retrieve the data from the United States Postal Service scans of these mail pieces. The questionnaire vendor provided the data from the initial mailing to the Decennial Response Integration System program contractor just prior to the compilation of the replacement mailing address list, providing the program with the opportunity to remove addresses from the targeted replacement mailing. Following the 2010 Census, Decennial Systems and Contracts Management Office retrieved all data files from the questionnaire vendor and the Decennial Response Integration System program, created an integrated database, and produced the queries to support this study.

After detailed analysis of the data, we provide evidence for the following conclusions:

- The United States Postal Service postal tracking Confirm services are reliable on a nationwide scale. The data are consistent with the much smaller 2008 Census Dress Rehearsal, showing similar patterns throughout.
- Postal tracking mitigated a major realized risk to the replacement mailing. The Decennial Response Integration System program relied on postal tracking data operationally to create the replacement mail mailing list when its systems encountered technical issues related to the Census Bureau headquarters processing requirements in early April 2010.
- The use of postal tracking data to remove Undeliverable as Addressed mail and responding households from the targeted replacement mailing operation substantially reduced the size of the replacement mailing. This resulted in a major cost savings not only in reduced postage but also in overall operational efficiency.
- The replacement mailing operation reduced Nonresponse Followup workload, and enabled the Census Bureau to match the mail-back response rate from the previous decennial census for the first time in thirty years.

- The targeted replacement mailing was more efficient than the blanket replacement mailing in that it (a) generated fewer Undeliverable as Addressed mail pieces, (b) generated fewer duplicate responses and (c) achieved higher average response rate relative to the size of the outbound mailing.
- The United States Postal Service was able to provide reason codes for non-delivery for a great majority of the Undeliverable as Addressed mail. As expected, vacancy was the most common reason for non-delivery during the 2010 Census.

Lessons learned as well as recent technologies point to future paths to pursue in the use of postal tracking data. Recent oversight reports in particular (by the Office of the Inspector General and the National Academy of Sciences) underscore the potential use of administrative records such as these to provide efficiencies and reduce costs. This is one major use of postal tracking data; others include:

- Reduce the Undeliverable as Addressed rate of mailings by using United States Postal Service tracking services (and/or other records) to identify and remove Undeliverable as Addressed mail pieces prior to subsequent mailings.
- Utilize the United States Postal Service Undeliverable as Addressed reason codes to point to issues with the address file.
- Investigate other uses of the United States Postal Service postal tracking "paradata" for surveys.
- Collaborate with the United States Postal Service on other potential uses of its address status information. As an example, we can possibly determine actual street addresses for areas that use post office boxes, and provide linkages within the Master Address File, potentially eliminating costly Update Leave operations in certain areas.
- Consider using postal tracking services as a replacement for questionnaire sorter check-in at the Paper Data Capture Centers, eliminating an entire, costly operation and resulting in a significant reduction in the size of the Paper Data Capture Centers.
- Consider implementing a full targeted replacement mailing rather than the hybrid targeted and blanket replacement mailing approach, which meant sending a replacement mailing to a great number of households that had already responded or that were Undeliverable as Addressed. Staggered, targeted replacement mailing cutoff dates should also be considered.
- Use United States Postal Service secure destruction services to eliminate the return of 15 million Undeliverable as Addressed questionnaire returns to the Paper Data Capture Centers, resulting in a significant reduction in the size of the Paper Data Capture Centers.

Finally, we note the advantages that the close collaboration between the United States Postal Service and the Census Bureau provided for the 2010 Census. The United States Postal Service/Census Bureau Joint Committee was an important stakeholder communications effort and the various working groups of technical experts were critical to planning and testing. We recommend continued collaboration, preferably concentrating on strategic-level goals and objectives, to achieve enterprise-level cost-savings and efficiencies.

1.0 INTRODUCTION

1.1 Scope

The scope of this assessment is to evaluate the implementation of United States Postal Service (USPS) postal tracking using Intelligent Mail Barcode (IMB) technologies during the 2010 Census. For the 2010 Census printing and distribution effort, there were important operational needs to quickly remove mail pieces identified as either a mail return or Undeliverable as Addressed (UAA) from the 2010 Census replacement mailing (RM) workload. Postal tracking provided timely electronic data regarding responses on their way back to the Paper Data Capture Centers (PDCCs) as well as on undeliverable mail. This document will assess the use of postal tracking technologies during the 2010 Census for the removal of returned mail from the RM workload, compare USPS postal tracking data with Paper Data Capture Center (PDCC) check-in data, confirm the consistency of the data and evaluate the overall uses and benefits of USPS postal tracking services using IMB technology.

1.2 Intended Audience

The intended audiences for this assessment are the decennial census management, Forms Printing and Distribution Integrated Product Team, Content and Forms Design Product Team, DSCMO, U.S. Government Printing Office, DRIS Paper Channel Integrated Product Team, Census Integration Group (CIG), Decennial Leadership Group, the National Processing Center (NPC), and the Decennial Management Division (DMD) staff.

2.0 BACKGROUND

During the 2005 National Census Test, the 2006 Census Test, and the 2008 Census Dress Rehearsal (DR), DSCMO analyzed the effectiveness of USPS postal tracking technologies, which use barcode scans at several points in the mailing operation to provide an early indication to the Census Bureau that respondents had mailed their questionnaires back.

The 2006 Census Test analyzed specifically the accuracy and use of Destination Confirm[1] and Origin Confirm[2] services as predictors of mail on its way to a respondent as well as on its way back to a PDCC, once completed by respondents.

The 2008 Census Dress Rehearsal Use of Postal Tracking Technologies Assessment indicated that the Census Bureau gained an average of more than three days advance notice of returning mail pieces (compared with NPC check-in results), with a 99.1 percent agreement between USPS

[1] For outgoing mail, this barcode tracking gives information regarding the movement of mail pieces through the postal system to the destination (housing unit).

[2] For incoming mail, this barcode tracking gives information regarding the movement of mail pieces through the postal system to the origin ZIP code – the Paper Data Capture Centers (PDCC).

scan and eventual NPC check-in for letter-size mail pieces (Caldaro and Letourneau, 2009). In addition, USPS postal tracking technologies can assist to determine if a mail return is a UAA mail piece.

For the 2010 Census printing and distribution effort, there were important operational needs to remove mail pieces identified as either a mail return or UAA from the 2010 Census targeted RM workload. First, we did not want to send a replacement questionnaire to respondents who had already sent their completed Initial Questionnaire (IQ) back. Second, we did not want to send a replacement questionnaire to households that had been deemed UAA by the USPS just two weeks prior.

Based on the results of assessments of the USPS postal tracking technologies from 2005 through 2008, DSCMO utilized these technologies during the 2010 Census operations. The following sections describe the implementation, to include data ordered and collected, how the data were used during operations, and an assessment of the effectiveness of the technologies and lessons learned from this effort.

2.1 2008 Census Dress Rehearsal Lessons

The 2008 Census Dress Rehearsal Use of Postal Tracking Technologies Assessment provided the information required to enable the Census Bureau to use postal tracking technologies to remove UAAs from the RM workload for the 2010 Census. The 2008 Census DR was the first opportunity to apply much of what had been learned from census tests conducted throughout the decade. The two primary objectives of this assessment were to:

1) Gauge the best methods for removing the UAAs from the RM workload using USPS postal tracking technologies, and
2) Gauge the best date to prepare the address list for the targeted RM.

Based on the 2008 Census Dress Rehearsal Use of Postal Tracking Technologies Assessment results, the Census Bureau concluded that using USPS postal tracking Destination Confirm service provided better and faster data than the USPS OneCode ACS™ [3] in identifying UAA mail piece returns. Destination Confirm service scans were tracked an average of 2.38 days earlier than Address Change Service scans. Data on mail responses on their way back were also faster; Origin Confirm service data averaged 5.13 days earlier than NPC check-in. The 2008 Census Dress Rehearsal Use of Postal Tracking Technologies Assessment also showed that when compared to check-in data, postal tracking was 98.9 percent accurate (Caldaro and Letourneau, 2009).

The primary conclusions from the use of postal tracking technologies in the 2008 Census DR were:

[3] USPS ACS™ service provides postal customers with information regarding accurate change of address information, including UAA scans. (www.usps.com, July 2010)

- The DR postal tracking results showed that postal tracking could provide a reliable early indicator not only of returning mail pieces, but also of UAA mail pieces.
- The size of the RM workload can be effectively reduced by removing both (a) UAA addresses and (b) addresses which postal tracking indicates have already returned a response.

While we did evaluate the best date to create the targeted RM list, operational decisions drove the selection of the preparation timeframes for the RMs, and postal tracking was not a significant factor in the decision.

2.2 2010 Census Mailings

The 2010 Census used a mailing strategy consisting of multiple contacts. The multiple contacts in the 2010 Census include:

- An advance letter alerting households that the census forms will be sent to them soon.
- The IQ.
- The reminder postcard serving as a thank you for respondents who mailed back their questionnaire or as a reminder to those who had not.
- The replacement questionnaire, using a new RM strategy.

One change from the Census 2000 mailing strategy was the implementation of an RM.

Using the housing unit counts and mail response rates to estimate the RM workload, preliminary files were created and the RM operation was conducted using one of three treatments:

- Blanket RM – All households within these areas received a replacement questionnaire, regardless of whether or not they sent back their IQ. Defined as housing units within tracts having a historical mail response rate of less than 59 percent.
- Targeted RM – Households within these areas will only receive a replacement questionnaire if their IQ has not been checked in by a predetermined date, or there is no UAA record. Defined as housing units within tracts having a historical mail response rate greater than or equal to 59 percent, but less than 67 percent.
- No RM – None of the households within these areas receive an RM, regardless of whether or not they sent back their IQ. Defined as housing units within tracts with a historical mail response rate greater than or equal to 67 percent.

While a total targeted RM was originally planned, the particular strategy for a hybrid RM was chosen in response to Nonresponse Followup (NRFU) reverting back to a paper operation late in the decade. The capability to identify late mail returns from the NRFU workload before the start of NRFU, rather than on a continual basis through automation, dictated the need to address and distribute replacement questionnaires for the blanket mailing in an earlier timeframe. Dividing the country into areas that would receive a blanket or targeted RM was low risk, because: (a) there was no need to wait for responses to determine the blanket RM universe, and (b) fewer

areas would receive a targeted RM. This revised RM strategy was presented to and approved by the CIG in mid-2009. Post-operational analysis of the decennial print metrics indicates that 2010 Census printing resources would have been sufficient to execute a nationwide targeted RM approach, should the hybrid approach not been adopted.

Forty-seven million RM packages were pre-assembled, with 32 million assembled for the blanket RM and 15 million assembled for the targeted RM.

The primary operational objective for the use of postal tracking technologies in the 2010 Census mailings was to enable the targeted RM. As recommended by the findings of the 2008 Census Dress Rehearsal Use of Postal Tracking Technologies Assessment, the Census Bureau used postal tracking to reduce the size of the targeted RM workload. The reduction of the targeted RM workload was done in two ways. First, the Origin Confirm service was used to determine which households had already sent back the IQ. When the Origin Confirm service reported a returning mail piece, the responding household was removed from the targeted RM workload. This was the same approach proven in the 2008 Census DR, now applied to the nationwide mailing. Second, we utilized the Destination Confirm service to remove addresses that the USPS determined as UAA. As soon as the Destination Confirm service reported that an address was UAA, that address was removed from the targeted RM workload. One of the additional benefits to using the Destination Confirm service to help determine UAA status was that it relieved the PDCCs of having to prioritize the check-in of UAA mail pieces. Because of the reliability of postal tracking, PDCC UAA check-in could be determined as a second priority after the check-in of respondent questionnaires. This prioritization helped reduce the risk inherent in such an enormous check-in operation, and ensured that the RM workload could still be optimized even if the UAA check-in process was delayed for any reason.

3.0 METHODOLOGY

3.1 Questions to be Answered

The high-level research questions to be answered in this evaluation were outlined in the 2010 Census Postal Tracking Assessment Study Plan.

Question 1
Were the basic conclusions derived from the 2008 Census DR study accurate?

Question 2
What was the reduction of addresses for the RM workload and how was 2010 postal tracking data used to support other program areas?

Question 3
What is the RM response rate identified by DRIS check-in and what is the RM response rate identified by USPS postal tracking?

Question 4
What were the overall UAA results from the 2010 IQ mailing as compared to actual check-in results?

3.2 Methods

3.2.1 Implementation of USPS Postal Tracking Technologies in the 2010 Census

After the 2008 Census DR, the RM approach was modified for the 2010 Census and consisted of defining a medium response area, called the targeted RM, which was to receive a replacement questionnaire if the IQ was not returned by the respondent. Beginning March 2, 2010 through April 5, 2010, DRIS compiled information through check-in processes, tabulating mail responses (including Update/Leave housing units). In addition, the print vendor delivered postal tracking data to DRIS via secure transmission regarding the outbound and return mail using postal tracking technologies. DRIS ultimately created a targeted RM universe using these sets of data, eliminating UAA and respondent returns from the targeted RM workload. This file was transmitted back to the questionnaire vendor infrastructure for targeted RM addressing. With a potential 29 million housing units in the medium response area and a five day window to address mail pieces, it was imperative that already known UAA addresses, as well as responses which were on their way back to a PDCC, were removed from the targeted RM universe. It is also important to note that the removal of UAA mail pieces from the targeted RM workload was done almost solely through the use of postal tracking data.

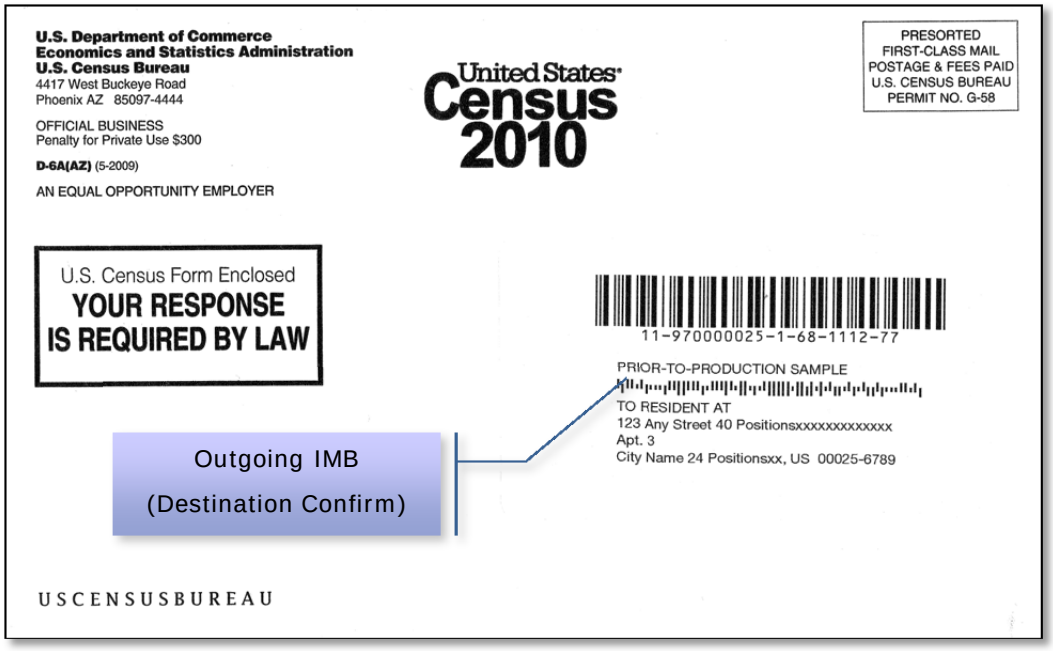
3.2.1.1 Mail Pieces and Services

The Census Bureau, via the 2010 Census printing vendor, acquired postal tracking services from the USPS. For these services, the printing vendor obtained separate Subscriber Identification (ID) numbers for each “Confirm” mailing. The vendor then applied the USPS required IMB to the IQ mailing. The targeted RM mailing used the “traditional” Planet and PostNet bar codes.

To identify successful outgoing mailings, the Census Bureau acquired the following service:

- USPS Destination Confirm service on the IQ

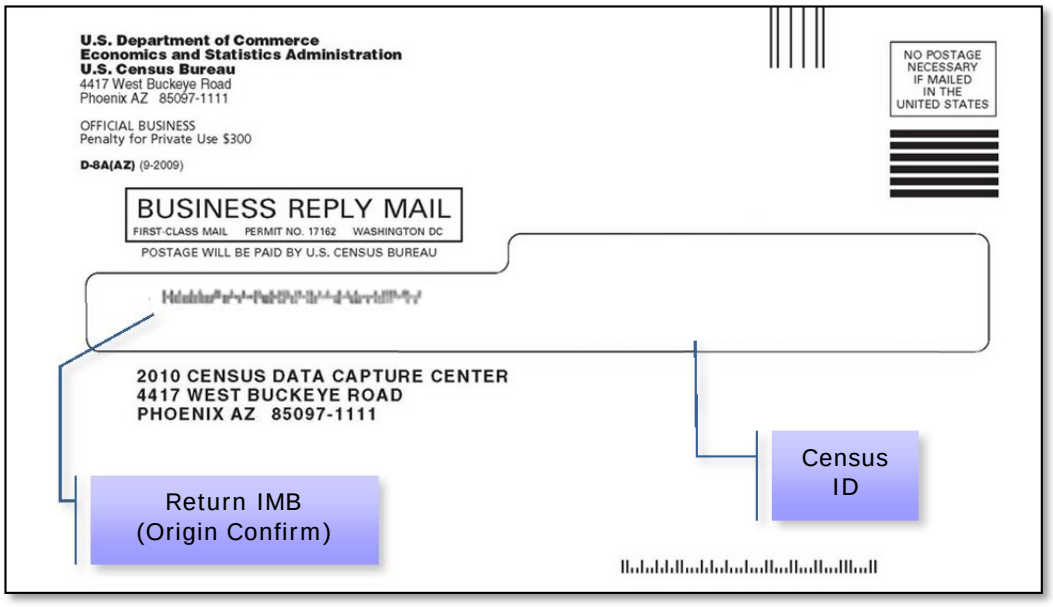
Figure 1. Example Outgoing Mail Piece for the IQ with Census ID and IMB (fictitious addressing)



To identify returns on their way back to the PDCC, the Census Bureau acquired the following service:

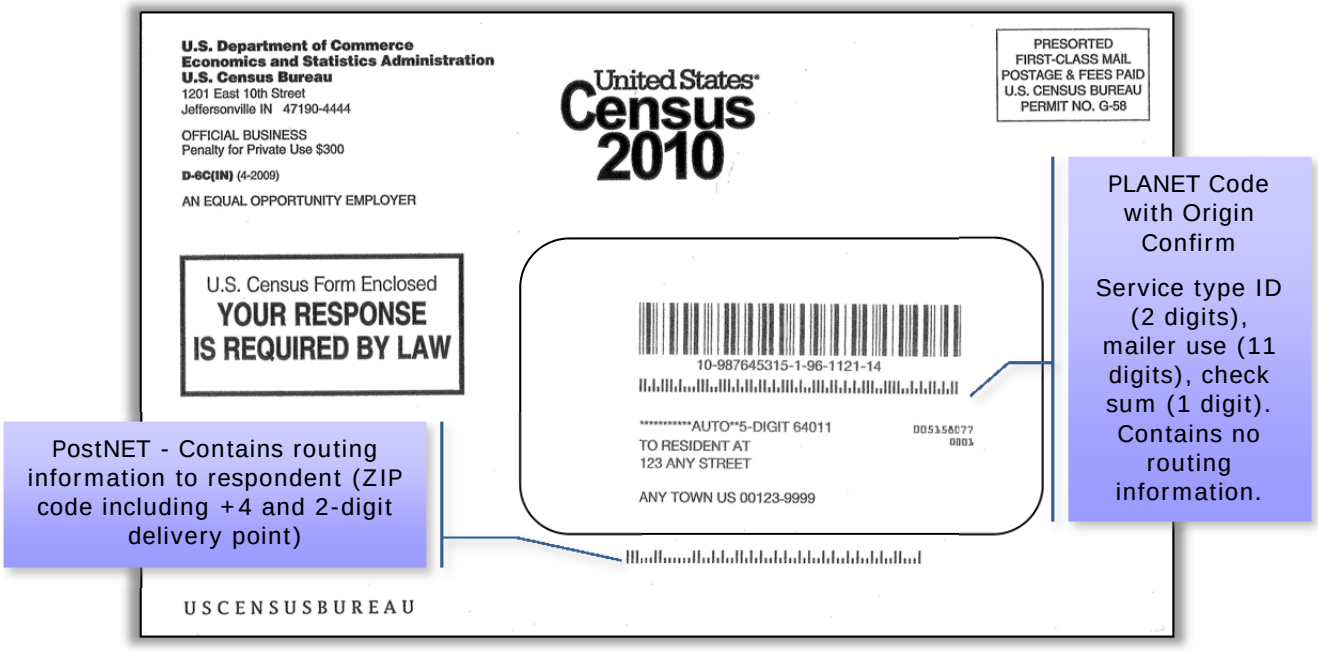
- USPS Origin Confirm service on the IQ

Figure 2. Example Return Mail Piece for the IQ with Census ID for PDCC Check-In and IMB for Origin Confirm service



- USPS Origin Confirm service on the replacement questionnaire

Figure 3. Example Outgoing Mail Piece for RM with Census ID for PDCC Check-In and Planet Code for Origin Confirm service



Note that postal tracking was also used on other mail pieces, such as the Update/Leave questionnaires (Origin Confirm service only). This tracking was used primarily for operational purposes, to identify any mailing issues. However, for this assessment we only consider mail pieces that were tracked both by the USPS postal tracking services and DRIS check-in processes. Postal tracking data on other mail pieces not tracked by DRIS, such as letters and postcards, may have interest for other evaluations, such as evaluations of address quality, but for answering our study questions the above referenced tracking data are the only relevant data.

3.2.1.2 2010 Census Mail Schedule

Key events and dates in the mailing strategy for the 2010 Census were as follows. The overall 2010 Census mail flow process is shown in Appendix A.

Table 1. Key Dates for the 2010 Census

Event	Date(s)
Delivery of advance notice letter	March 8-10, 2010
Delivery of IQ	March 15-17, 2010
IQ check-in processing begins	March 2, 2010
UAA check-in processing begins	March 4, 2010
Delivery of reminder postcard	March 22-24, 2010
Update/Leave operation in the field	March 1, 2010 – April 2, 2010
Census Day	April 1, 2010
Delivery of RM (blanket)	April 1-3, 2010
Target RM address list cutoff date	April 3, 2010
Delivery of RM (targeted)	April 6-10, 2010
NRFU universe determined	April 22, 2010
Start/End of NRFU enumeration	May 1, 2010 – July 10, 2010

3.2.1.3 Postal Tracking Data Repository (PTDR)

In support of this evaluation, DSCMO tasked Gunnison Consulting Group Inc. to develop a data repository to gather and analyze all postal tracking data and check-in data from DRIS (as they did for the 2008 Census DR. This repository is documented separately, to include all raw data with sources, the edited data (such as removing Update/Leave results for the purposes of this evaluation) and queries.

It is important to understand that mail utilizing postal tracking receives multiple scans during its course through the postal system. The USPS may scan a mail piece three to five times on its way out and on its return. Therefore, to confirm that a mail piece is about to reach its destination (via the Destination Confirm service); USPS uses the *final* scan—the last scan before delivery to a respondent's house. To confirm that a mail piece is being returned to a PDDC (via the Origin Confirm service), we used the *first* scan captured by the USPS—the first scan received after a respondent puts the questionnaire in the mail. To consider a mail piece "undeliverable", our algorithm utilized certain USPS undeliverable operation codes combined with a PDCC's return Zone Improvement Plan (ZIP) code.

While there is a very small risk that these scans do not mean the mail piece ultimately gets delivered either to the households or back to a PDCC, we found through the 2008 Census DR that the delivery reliability, as indicated by these scans, is over 99 percent.

The USPS IQ data ranges from February 27 through August 2, 2010. DRIS check-in data for this evaluation range from March 2, 2010 through September 30, 2010. All available data were included in this evaluation, with the exception of the necessary exclusions listed in Section 3.2.2 below. Note that it is possible that some "late" returns/scans would have come in after these timeframes. However, as returns had greatly decreased to mere hundreds per week by this point through both services, we can safely consider the net effects of these uncounted returns to be insignificant.

3.2.1.4 Assumptions and Constraints

- Check-in processing of all mail returns and UAAs occurred six days a week and officially began March 2, 2010. (Note, however, that we still observed receipts on nonworking days.)
- Mail service by the USPS was six days a week (Monday – Saturday), except for holidays (5/31/10 and 7/5/10). Regardless, we saw scans on the nonworking days.
- UAA check-in was second priority for DRIS, behind check-in of respondent returns.
- All UAAs received at the PDCCs prior to May 1 were required to be checked in by May 1.
- Mail out of the IQ included a Bilingual (English/Spanish) questionnaire to pre-determined areas.
- All RMs used D-1 letter-size English-language packages only, except for some experimental panels.
- The initial and blanket RM universes excluded address records that had no chance of delivery.
- DRIS checked in all UAAs received, regardless if they were duplicates or not and regardless if they were mailed out or not.
- DRIS destroyed UAA questionnaires ten days after check-in.

3.2.2 Assessment Universe

Our baseline for outgoing mailing quantities comes from the original address lists – this is our universe for each mailing. These quantities are provided in Table 2 and are our baseline of comparison for all "percent of total calculations." There is a small difference in these numbers due to possible differences in methods of counts between the USPS and the mail vendor**.**

Table 2. 2010 Census Mailing Quantities by Mail Piece

	Total IQs (IQ and Supplemental IQ)	Targeted RM	Blanket RM
Total	118,918,810	9,975,819*	24,764,056

Source: PTDR7104 Data Summary Table Count Summary, Non-duplicate record counts of actual census mailing files provided to print vendors.
** Reflects number of targeted RM packages actually mailed after using postal tracking data. The entire targeted RM universe was originally 28,062,754.*

Our analysis made adjustments for some data that would skew the results if not accounted for. It is important to note that these data most likely will not correspond *exactly* to data from the DRIS program[4] regarding the 2010 Census return rates. The DRIS program is concerned with statistics on ***responses***; in this evaluation, we are concerned about *tracked mail*.

Unless otherwise specified in the document the data *exclude*:

- Mail pieces checked in by DRIS but never mailed out via the USPS, such as Update/Leave, Puerto Rico and Be Counted forms; any mail pieces with Processing IDs.
- Mail-out universes that were not tracked. This includes all experimental panel mailings.
- Addresses scanned by either operation not found in the universe address files (as provided to the mail vendor. This includes all records that do not match a Master Address File (MAF) ID from a known 2010 Census mail-out universe.
- Mail that was checked in manually at a PDCC that had not been scanned by USPS through Destination or Origin Confirm services.

The data *include*:

- Scans of addresses that may have been scanned more than once, for example, as both an IQ return *and* an RM return.
- IQ scans that were later "reversed" per PDCC requirements, because the forms were found to have "no data" per the DRIS definition. These mail pieces were still scanned by the USPS services and valid for mailing purposes and therefore remain included in our scan totals for both the USPS and the PDCC.

[4] Data were validated with data used for the report "DRIS Enterprise Integration (EI) Post Production Analyses and Enhanced Lessons (PALs)" (June 2011). However, the two data sets have different date ranges and other differences, so cannot be compared one-for-one.

4.0 LIMITATIONS

- Check-in processing of all mail returns and UAAs occurred six days a week and officially began March 2, 2010. (Note, however, that we still observed receipts on nonworking days.)
- Mail service by the USPS was six days a week (Monday – Saturday), except for holidays (5/31/10 and 7/5/10). Regardless, we saw scans on the nonworking days.
- UAA check-in was second priority for DRIS, behind check-in of respondent returns.
- DRIS checked in all UAAs received, regardless if they were duplicates or not and regardless if they were mailed out or not.

Our analysis made adjustments for some data that would skew the results if not accounted for. It is important to note that these data most likely will not correspond *exactly* to data from the DRIS program[5] regarding the 2010 Census return rates. The DRIS program is concerned with statistics on ***responses***; in this evaluation, we are concerned with ***tracked mail***.

5.0 RESULTS

5.1 Analysis of 2008 Census Dress Rehearsal Assumptions: Origin Confirm Service

This section addresses in detail the high-level question: Were the basic conclusions derived from the 2008 Census DR study accurate? The overall purpose of this section is to show that USPS postal tracking services were reliable on a nationwide scale as anticipated. It is important to keep in mind when comparing the 2010 Census data with the 2008 Census DR analysis, that the data mining requirements for this report have necessarily been secondary to 2010 Census operational needs. The Census Bureau employed postal tracking in the 2010 Census to gain operational efficiencies, and this objective took precedence over the requirements associated with creation and maintenance of a post-production database for use in data mining. Additionally, for operational reasons, postal tracking data were stored and managed by the vendors during 2010 Census operations. This meant that the Census Bureau was one layer more removed from the handling of the raw data as compared to the 2008 Census DR operations. While these factors do not significantly impact our conclusions, combined they do introduce a small degree of uncertainty in our analysis. We will endeavor to point out any areas of analysis where this uncertainty comes into play in the sections that follow.

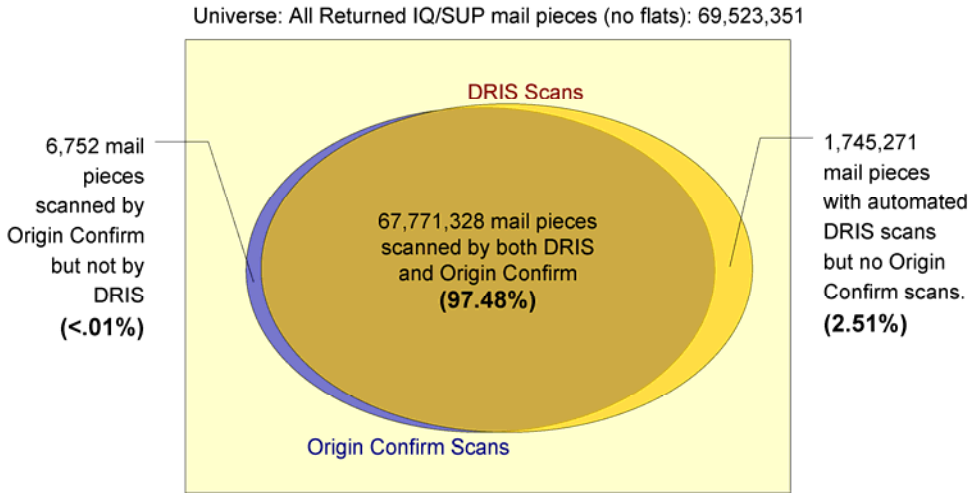
5.1.1 Origin Confirm Service/DRIS Check-in Correlation

A primary conclusion from the 2008 Census DR postal tracking initiative is that the Origin Confirm service scans are highly correlated with downstream DRIS check-in events for returning mail pieces. Specifically, the 2008 Census DR data indicated that 96.8 percent of all returning mail pieces received both an Origin Confirm service scan and a DRIS check-in scan ("2008 Census Dress Rehearsal Use of Postal Tracking Technologies Assessment," Figure 7, Page 16). The question that remained was whether those results—which were based on mailings only to

[5] Data were validated with data used for the report "DRIS Enterprise Integration (EI) Post Production Analyses and Enhanced Lessons (PALs)" (June 2011). However, the two data sets have different date ranges and other differences, so cannot be compared one-for-one.

certain areas of California and North Carolina—would persist for the national mailings of the 2010 Census. Figure 4 shows the level of agreement between the Origin Confirm service and the DRIS check-in records in the 2010 Census.

Figure 4. Origin Confirm Service Overlap with DRIS Check-In



Source: PTDR7301_AssessmentWorksheet_A_AssumptionVerification.xlsx

The data indicate that the level of agreement observed in the 2010 Census is comparable to what we observed in the 2008 Census DR.

5.1.2 Origin Confirm Service Early Warning Analysis

In the 2008 Census DR, we saw a mean early warning from the Origin Confirm service of 5.13 days. This is a better result than we saw on the 2010 Census mailings, where the early warning was 3.04 days.

Table 3. Statistics for Origin Confirm Service "Advance Notice" of Responses Returned

	2008 Census Dress Rehearsal	2010 Census
Mean	5.13 days	3.04 days
Median	4.79 days	2.65 days
Mode	4.49 days	2.57 days

Source 1: 2008 DR Use of Postal Tracking Technologies Assessment Report;
Source 2: PTDR7301_AssessmentWorksheet_A_BYZIP_AssumptionVerification.xlsx
Source Tab: 1E_ByZIP

There are a number of factors that contributed to this difference in average early warning from the 2008 Census DR to the 2010 Census:

- First, the USPS was primed to bulk returning mail pieces for the 2010 Census to the PDCCs. This meant that returning delivery times were reduced as compared to the 2008 Census DR.
- Second, DRIS operated 6 days/week in the 2010 Census. In the 2008 Census DR, NPC operations were halted on Saturdays and Sundays. This meant that in the 2010 Census DRIS was able to process returning mail pieces more quickly, on average, thus lowering the overall early warning average.
- Third, returning mail did not have as far to travel in the 2010 Census as compared to the 2008 Census DR. In the 2008 Census DR, mail was returned from North Carolina and California to NPC in Indiana. In the 2010 Census, mail centers were regionally distributed around the country in Baltimore, MD, Phoenix, AZ and Jeffersonville, IN. The shorter return-mail path contributed to a lowered average early warning.
- Finally, the lower average early warning from the Origin Confirm service is partially due to the operational decision to prioritize the check-in of returning mail pieces over the check-in of UAA mail pieces. By focusing on the check-in of returning mail pieces rather than UAA mail pieces, DRIS was able to process returning mail pieces faster. Due to the extra capacity in NPC relative to the size of the 2008 Census DR mail out, this de-prioritization of UAA check-ins did not have a measurable effect on the rate of UAA check-ins during the 2008 Census DR. However, the mail volumes of the 2010 Census warranted that this operational decision did have an effect in the 2010 Census. The effect was a lowered average Origin Confirm service early warning benefit (and a corresponding increase in the average UAA early warning from the Destination Confirm service).

5.1.3 Origin Confirm Service Analysis by ZIP Code

There was one major question we posed during the 2008 Census DR analysis of postal tracking technologies that we could not answer during a small scale regional test: Did the Origin Confirm service perform uniformly across ZIP codes, or did mail pieces returning from certain ZIP codes have greater or less accuracy compared to DRIS check-in? With national-level data for the 2010 mailings in hand, we can now examine further the efficacy of the Origin Confirm service as a predictor for returning mail pieces.

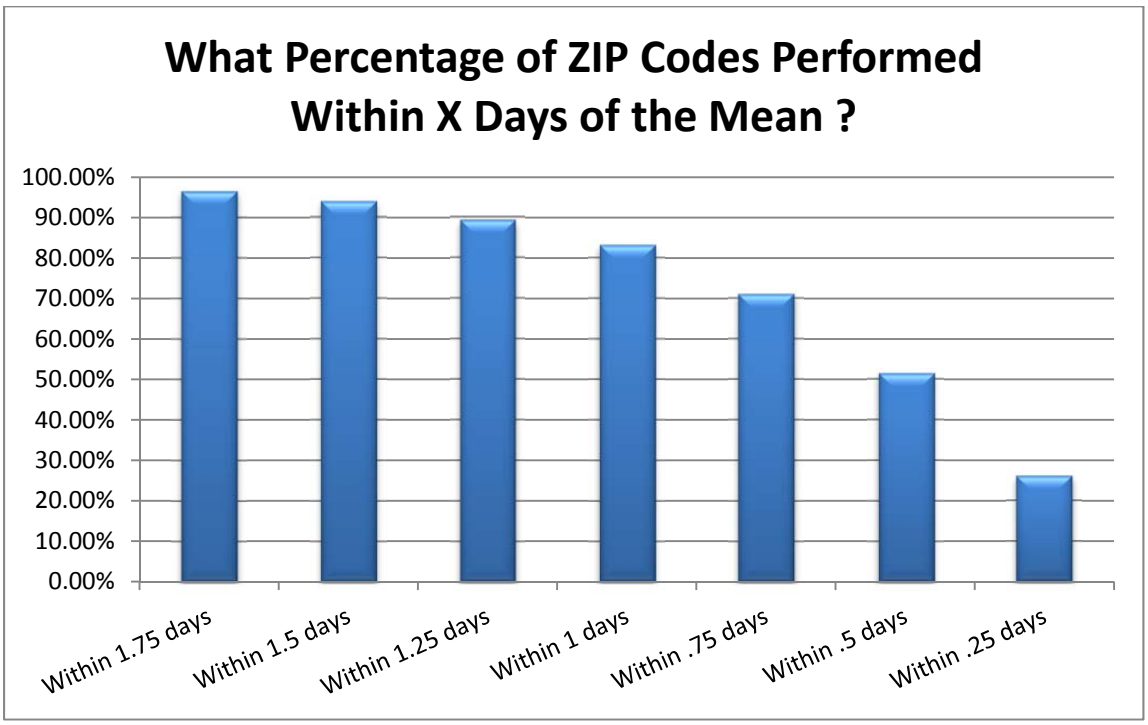
5.1.3.1 Origin Confirm Service/DRIS Check-in Correlation by ZIP Code

Nearly 70 percent of ZIP codes had *full or near full agreement* between the Origin Confirm service and DRIS check-in. More than half the states had at least one ZIP code whose USPS data did not match up perfectly with DRIS check-in records, but these did not represent a substantial amount of records in total nor the number of ZIP codes affected. Only about 2 percent of the ZIP codes had significant disagreement (10 percent or more of addresses missed by the Origin Confirm service). Further, there was no discernible pattern to these Origin Confirm service "misses."

5.1.3.2 Origin Confirm Service Advance Warning Analysis by ZIP Code

Figure 5 provides a graphical depiction of the extent to which ZIP codes deviated from the 3.04 day early warning national average. Note that this analysis does not take into account the number of mail pieces returned from each particular ZIP code. This graph shows that although the national average Origin Confirm service advance warning was 3.04 days, most ZIP codes will reflect about a +/- one day variation (i.e., 2.04 to 4.04 days). Stated another way, if the Census Bureau standardizes on the assumption of a 3.04 day early warning from the Origin Confirm service, then there is evidence that the Origin Confirm service will provide an average early warning for 83 percent of the responding ZIP codes that is within one day of the 3.04 day nationwide average. Ninety percent of responding ZIP codes will have an average Origin Confirm service early warning that is within 1.25 days of this national average.

Figure 5. Graphical Depiction of Deviation from Mean by ZIP Code



Source: PTDR7301_AssessmentWorksheet_A_BYZIP_AssumptionVerification.xlsx Source Type: Charts

One dynamic in looking at early warning averages by ZIP code is that it does not take into account the extent to which the proximity of a ZIP code to a PDCC affected the degree to which an early warning was possible through the Origin Confirm service. That is, if the returning mail piece was only a few miles from a PDCC, this mitigates the value of the Origin Confirm service early warning.

5.1.4 Origin Confirm Service and Mail Piece Size

In the prior utilization of the Confirm services, we observed that the USPS data are somewhat less reliable in tracking flat mail pieces (6 1/8" x 11 ½") as compared to letter-size mail pieces. The Origin Confirm service data from the 2010 Census mailings support this finding; the Origin

Confirm service was slightly less predictive on flat mail pieces as compared to letter-size mail pieces. As shown below, if we analyze returning mail pieces by mail size we see that the Origin Confirm service data on flat mail pieces performs slightly worse in each category.

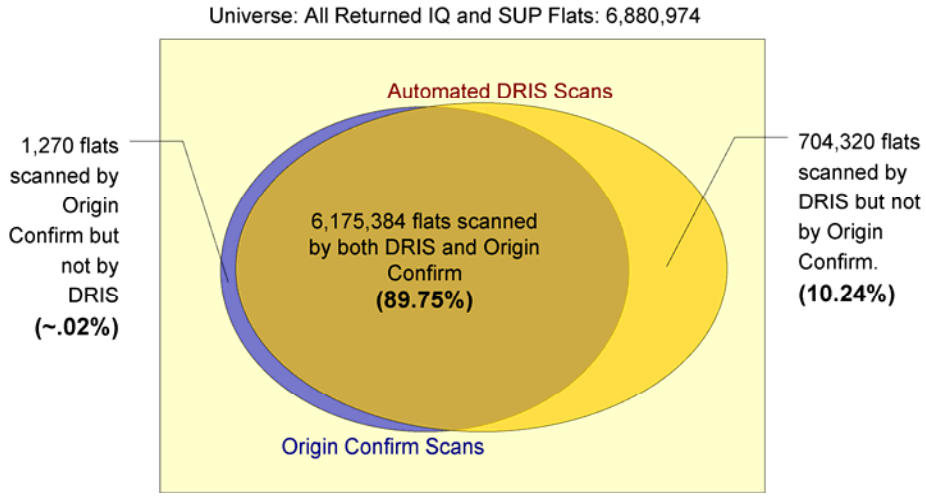
Table 4. Distribution of Origin Confirm Service/DRIS Overlap by Mail Piece Size

	Flat Mail Pieces	Letter-Size Mail Pieces
Origin Confirm Service scan only	**~ .02%**	**< .01%**
DRIS Check-in scan only	**10.24%**	**2.51%**
Overlapping scans	**89.75%**	**97.48%**

Source: PTDR7301_AssessmentWorksheet_A_AssumptionVerification.xlsx
Source Tab: 1F_ByMailType

The same data are presented in a Venn diagram in Figure 6. Notice how the Origin Confirm service not only missed a higher percentage of returning flat mail pieces, but also displayed a higher rate of false positives. The divergence is not sufficient to call into question the Origin Confirm service generally, but it does confirm that the Census Bureau was correct to anticipate a slightly lower level of accuracy on flat mail pieces.

Figure 6. Origin Confirm Service Overlap with DRIS Check-in – Flat Mail Pieces Only



Source: PTDR7301_AssessmentWorksheet_A_AssumptionVerification.xlsx
Source tab: 1F_ByMailType

5.1.5 Origin Confirm Service and DRIS Exception Check-in

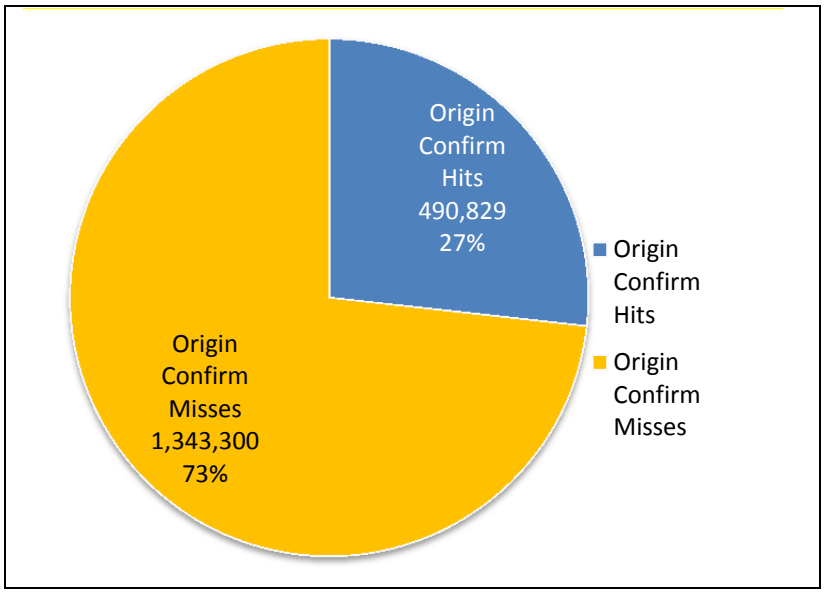
A certain portion of mail pieces were checked in by DRIS manually. These are known as "exception check-ins" because they failed the DRIS automated check-in process. A mail piece might fail the automated check-in process for a variety of reasons. For example, if a mail piece is not inserted correctly into the return envelope (i.e., put in backwards) or if the barcodes on the

returning mail piece are smudged, blocked out, or otherwise rendered unreadable, then the mail piece will fail the DRIS automated process.

One assumption that we made as a result of previous postal tracking tests in the 2005 National Census Test and the 2008 Census DR is that there would be a high correlation between mail pieces that failed DRIS automatic check-in and mail pieces that were missed by the Origin Confirm service. That is, if the barcodes were unreadable during the DRIS check-in process, then they may also have been unreadable on the USPS Confirm scanners.

The data from the 2010 Census mailings show that there is indeed a correlation between exception check-ins and Origin Confirm service "misses." Figure 7 shows the total universe of exception check-ins. The analysis shows that only around one-quarter of the mail pieces that failed DRIS check-in had an Origin Confirm service scan.

Figure 7. Origin Confirm Service Scans of Manually Checked-In Mail Pieces



Source: PTDR7301_AssessmentWorksheet_A_AssumptionVerification.xlsx
Source tab: 1G_ByExceptionCheckin

The Census Bureau employed a robust quality control effort during the 2010 Census printing operations, and no issues were discovered with the variable imaging techniques used to print the barcodes in question. Therefore, the quality of the barcode printing is not in question in this context. With this in mind, we speculate that there are at least two reasons why a mail piece that failed DRIS automated check-in might still receive an Origin Confirm service scan.

First, the DRIS automated check-in was generated from the Interleaved 2 of 5 (I2 of 5) barcode and the Origin Confirm service scans were based on the IMB. This meant that there could have been cases in which the I2 of 5 barcode was rendered illegible, but the IMB was not. Second, it might be that the IMB is slightly more forgiving than the I2 of 5 barcode in cases when there is a partial smudging or other physical degradation of the symbols.

Both of these possibilities raise the question of whether or not exception check-in could have been reduced if the Census Bureau had used the IMB or check-in scanning rather than the I2 of 5 barcode. The 2010 Census DRIS sorters were all capable of reading the IMB in addition to or in place of the I2 of 5 barcode. This approach would not only reduce the number of barcodes printed on both outbound and inbound census forms, but would also increase the conceptual integrity of census operations from a systems engineering point of view.

As a final step in our analysis of the 2010 Census exception check-ins, we highlight the analysis performed by NPC for the reasons that mail pieces went through the exception check-in process during the 2008 Census DR. Since we do not have exception check-in reasons for the 2010 data, the 2008 Census DR data are our best guide. These data show that among the entire universe of exception check-ins, 20.2 percent were characterized as "Sorter Rejects", and an additional 4.9 percent were characterized as "Bar code Cannot Be Scanned" (Caldaro and Letourneau, 2009.) Taken together, this constitutes 25.1 percent of the 2008 Census DR exception check-ins. Note that 27 percent of the 2010 Census exception check-ins were successfully scanned by the Confirm services. We speculate that if the data were available to complete an analysis of the exception check-in reasons for the 2010 Census mailings, that most of the 27 percent of 2010 Census exception check-ins that were successfully scanned by the Confirm services would fall into the "Sorter Rejects" and "Bar code Cannot Be Scanned" categories.

5.2 Analysis of 2008 Census Dress Rehearsal Assumptions: Destination Confirm Service

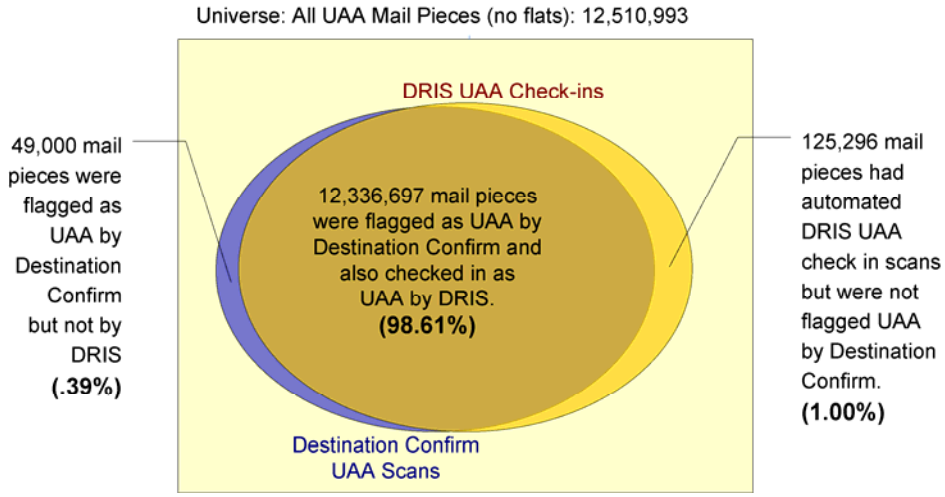
5.2.1 Destination Confirm Service/DRIS Check-In Correlation

In the analysis of the postal tracking data gathered on the 2008 Census DR mailings, we observed a high correlation between mail pieces that were reported to be UAA by the Destination Confirm service and mail pieces that were checked in as UAA by NPC. On the strength of these results, the Census Bureau elected to remove from the 2010 Census targeted RM workload those addresses that were reported by the Destination Confirm service to be UAA in the mail out of the IQ. The task now is to verify the extent to which the correlation between UAAs in the Destination Confirm service and check-in at NPC observed in 2008 Census DR also existed for the 2010 Census mailings.

Before looking at the data it is important to note that the Destination Confirm service in and of itself does not provide UAA information to mailers. The Census Bureau developed a series of algorithms that interpreted the USPS operation code and return ZIP code data reported in the Destination Confirm service data in order to determine whether mail pieces are UAA.

Figure 8 shows that there was indeed a high correlation between mail pieces that were reported as UAA by the Destination Confirm service (according to our UAA algorithm) and mail pieces that were checked in as UAA by DRIS**.**

Figure 8. Destination Confirm Service Overlap with DRIS Check-In: UAA Mail Pieces



Source: PTDR7301_AssessmentWorksheet_A_AssumptionVerification.xlsx
Source tab: 2ABC_UAA_Dest_V_DCC

We can see from Figure 8 that the pattern observable in Figure 4 is also present here. Namely, there are a very small percentage of mail pieces—less than half of one percent—that are "false positives" from the Confirm services. By "false positive", we mean:

1. Mail pieces that were reported by the Origin Confirm service to be "on their way home" as valid responses, which in fact were never checked in by DRIS, and
2. Mail pieces that were reported by the Destination Confirm service to be UAA, but that were never checked in as UAA by DRIS.

In addition, we also see that the Confirm services did not report 1 percent of the UAAs that were eventually checked in at DRIS. This higher percentage fits the same pattern we saw in Figure 4. The diagrams show that there is a consistent pattern of between 1 percent and 2.5 percent "misses" from the Confirm services. By "misses", we mean:

1. Mail pieces that had an automated DRIS check-in but for which we have no Origin Confirm service early warning scans, and
2. Mail pieces that had an automated DRIS UAA check-in but for which we have no Destination Confirm service early warning scans.

5.2.2 Destination Confirm Service Early Warning Analysis

In the 2010 Census mailings the Census Bureau prioritized the check-in of UAA mail pieces below the check-in of respondent returned forms. This meant that whenever possible, the PDCCs checked in respondent returned mail pieces before turning to the UAA mail pieces. This prioritization was made possible because of the confidence we had in the Destination Confirm service to provide an early warning of UAA mail pieces. Because we were able to remove UAAs from the RM workload using the Destination Confirm service, we did not have to rely on

the timing of the check-in of the UAA forms in the PDCCs. In this way, the check-in of UAAs was removed from the critical path of the targeted RM.

One of the consequences of this operational decision is that the lag between the Destination Confirm service report of the UAA status of a mail piece and the DRIS check-in of that UAA mail piece was increased. This increased lag is evident in Table 5.

Table 5. Destination Confirm Service "Advance Notice" of UAAs (IQs)

	2008 Census Dress Rehearsal	2010 Census
Mean (averages)	5.53 days	8.25 days
Median	5.89 days	9.00 days
Mode	2.62 days	9.00 days

Source 1: 2008 Census DR Use of Postal Tracking Technologies Assessment Report;
Source 2: PTDR7301_AssessmentWorksheet_A_BYZIP_AssumptionVerification.xlsx
Tab: 2E_UAA_ByZIP. Cells C2 – G2

5.2.3 Destination Confirm Service ZIP Code Analyses

As with the Origin Confirm service, with national-level data we can now analyze further into the efficacy of the Destination Confirm service as a predictor for UAAs by analyzing its accuracy across ZIP codes. Did mail pieces returning as UAA from certain ZIP codes have a higher likelihood of receiving a Destination Confirm service UAA scan than mail pieces returning from other ZIP codes?

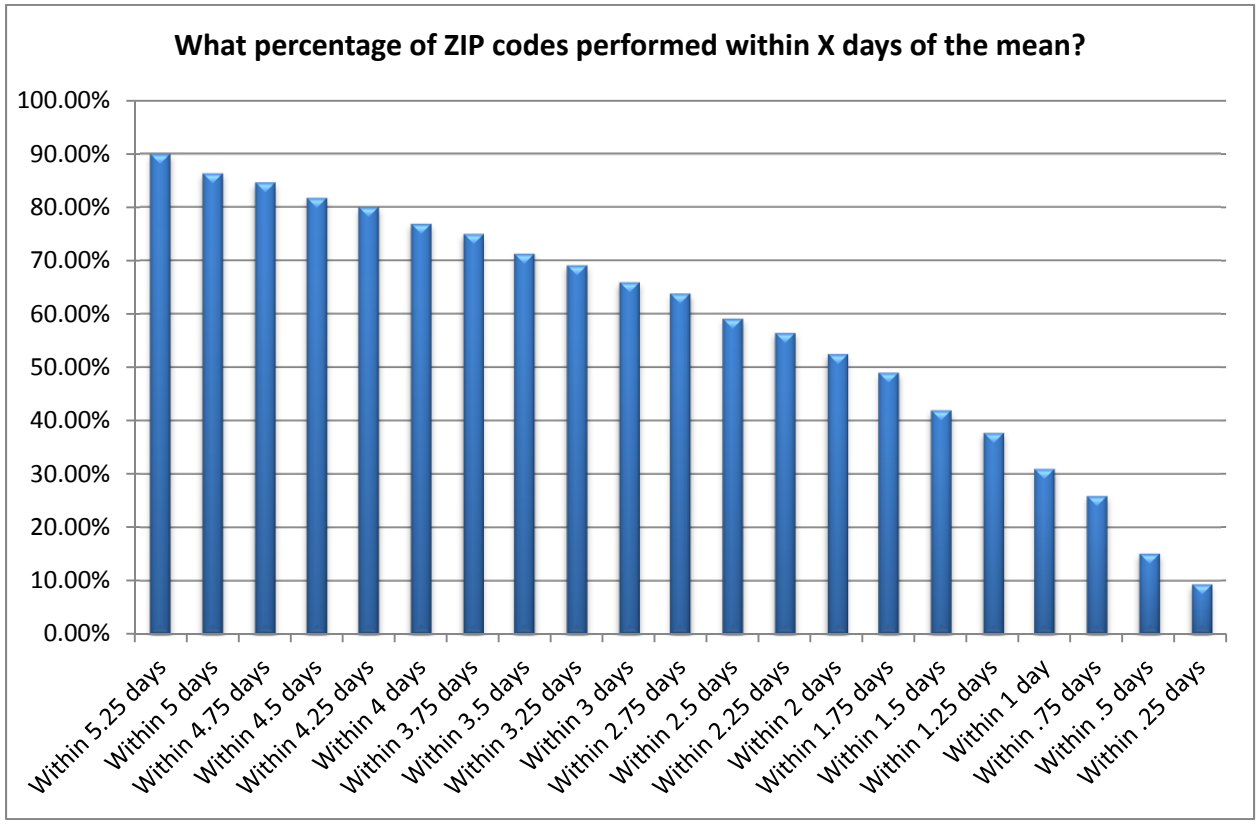
5.2.3.1 Destination Confirm Service/DRIS Correlation by ZIP Code

Similar to the findings on the Origin Confirm service, about 70 percent of the ZIP codes had full or near full agreement between the Destination Confirm service UAA and DRIS UAA. However, for the Destination Confirm service, about 7 percent of the ZIP codes had disagreement, where 10 percent or more of the addresses in the ZIP code were missed by the Destination Confirm service. Almost all the states had at least one ZIP code from which a Destination Confirm service UAA scan was not detected for records even though the record was checked in by DRIS as UAA. Again, these discrepancies were minor relative to the number of mail pieces and again, we observed no discernible patterns across ZIP codes.

5.2.3.2 Destination Confirm Service Early Warning Analysis by ZIP

Given the de-prioritization of DRIS UAA check-ins, we can draw no strong conclusions at the ZIP code level regarding the efficacy of the Destination Confirm service early warning. Nevertheless, the data available to us are provided in Figure 9. This graph is the Destination Confirm service analog to Figure 5, and in both graphs, we see a similar overall slope in the columns. This similarity supports the conclusion that the Confirm services perform consistently across all the country's ZIP codes.

Figure 9. Deviation from Mean by ZIP Code (UAAs)



Source: PTDR7301_AssessmentWorksheet_A_BYZIP_AssumptionVerification.xlsx
Source tab: Charts

5.2.4 Destination Confirm Service and Mail Piece Size

The only major USPS shortcoming we discovered in the 2008 Census DR was in Destination Confirm service's predictive power for flat UAA mail pieces. There were a high percentage of flat mail pieces checked into NPC as UAA for which we could find no Destination Confirm service early warning scans. The Census Bureau alerted the USPS to this issue after the DR; therefore, we were particularly interested to see if the issues surrounding flat UAA mail pieces still existed during the 2010 Census.

Table 6 shows that the Destination Confirm service was not able to detect flat UAA mail pieces with the same level of accuracy that it detects letter-size UAA mail pieces. The data indicate that the Census Bureau was right not to rely on the Destination Confirm service to provide any early warning for flat UAA mail pieces.

Table 6. Distribution of Destination Confirm Service/DRIS Overlap by Mail Piece Size (UAAs)

	Flat Mail Pieces	Letter-Size Mail Pieces
Destination Confirm Service scan only	**.84%**	**.39%**
DRIS automated check-in scan only	**90.08%**	**1.00%**
Overlapping scans	**.15%**	**98.34%**

Source: PTDR7301_AssessmentWorksheet_A_AssumptionVerification.xlsx
Source tab: 2F_UAA_ByMailtype

It is important to keep in mind when looking at these results that the Destination Confirm service in and of itself is not offered by USPS as a UAA-detection mechanism. Its stated purpose is to track mail to its destination. The Census Bureau developed and refined algorithms that use the Destination Confirm service data in an innovative way to detect UAAs. Therefore, when we say that the Destination Confirm service "failed" to detect flat UAA mail pieces, this should not necessarily be taken as indicative of a problem with USPS processing. Rather it means that the Destination Confirm service could not in every case support the innovative purposes that the Census Bureau brought to the technology.

Having said this, we recommend that the treatment of flat mail pieces be a fruitful area for further research. In our analysis, we find that letter-size mail pieces performed differently than flat mail pieces. In addition to investigating postal tracking data on American Community Survey Office (ACSO) mailings over the next years, the Census Bureau might also consider an alternate design of the bilingual form. This would potentially eliminate the need for flat mail pieces and could create substantial opportunities for savings and increased processing efficiencies. The Census Bureau should also consider purchasing the Address Change Service on flat mail pieces only. This would ensure the Census Bureau would receive automated UAA data on the mail pieces for which our Destination Confirm service algorithms do not produce the intended results.

5.3 RM Workload Reduction

An important goal of the implementation of postal tracking in the 2010 Census was to enable the targeted RM. The challenge was in the short timeframe we had to address and mail such a large number of mail pieces (estimated during planning at 15 million). This section addresses the questions:

1. What was the reduction of addresses from the targeted RM workload due to the USPS tracking services? And how was postal tracking used to support other program areas?
2. What is the RM response rate identified by DRIS check-in and what is the RM response rate identified by USPS postal tracking?

As noted above, an address was removed from the targeted RM address list if:

1. it was determined to be UAA by the Destination Confirm service, or
2. it generated an Origin Confirm service scan, which let the Census Bureau know a return mail piece was on its way to a PDCC, or
3. there was a UAA or IQ check-in event for the address in DRIS.

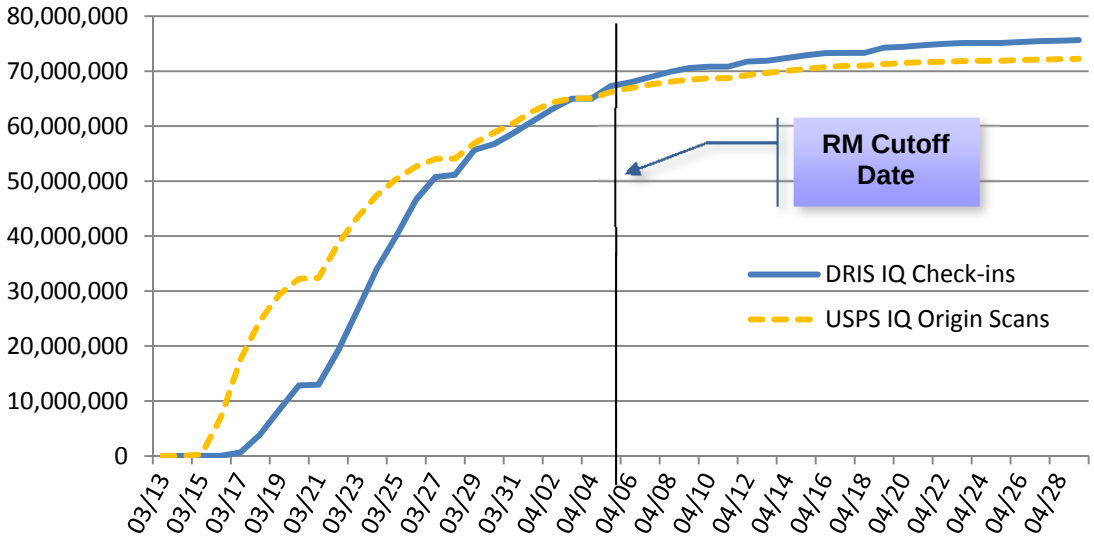
Note that we do not attempt to evaluate *response rates* in this analysis, only mailing workloads.

5.3.1 Cumulative IQ DRIS Check-ins/Origin Scans by Date

The evaluation of the targeted RM workload reduction requires an understanding of *when* the Census Bureau knew that mail pieces were returning from respondents. The targeted RM cutoff date must balance the time required to address and ship the mail pieces with the consideration that by waiting longer to determine the targeted RM address list, the returning IQ mail pieces will result in a smaller targeted RM mailing. If the Census Bureau waited too long to determine the targeted RM address list, then the printer would not have had time to complete the addressing on the mailings. On the other hand, if the targeted RM address list was determined too early, then many households would have needlessly received a second mailing, at increased cost to the Census Bureau.

Figure 10 provides a graphical depiction of when the Census Bureau learned of returning mail pieces. The data show that the Origin Confirm service provides an early warning of returning mail pieces, potentially allowing for an earlier targeted RM cutoff date. Note however that the DRIS line crosses the USPS line on the graph at about the targeted RM cutoff date, meaning that at that point in time the early warning provided by the Origin Confirm service of responses on their way back did not substantially reduce the targeted RM workload. If the targeted RM address list cutoff had been earlier, the early warning of the Origin Confirm service would have had more of an advantage, as noted in the 2008 Census DR assessment paper.

Figure 10. Cumulative Returned IQ Mail Pieces



Source: PTDR7301_AssessmentWorksheet_B_RM_Analysis.xlsx; Source tab: B1_DRIS_ByDay

A corollary to this finding is that if postal tracking data were the sole driver of the targeted RM workload reduction—that is, if there had been no DRIS laser sorter scans—then the targeted RM workload would have been unchanged. This is an important consideration when weighing the expense associated with the laser sorter operation compared to the relatively low cost of the USPS postal tracking services. If both approaches yield an equivalent workload, and one is substantially cheaper than the other is, the Census Bureau should consider eliminating the more expensive approach.

Finally, we wish to point out that the data in Figure 10 underscore the value of postal tracking as paradata on the 2010 Census mailings. On March 18, 2010, there was serious concern about the level of mail back response rate being reported by DRIS. Census Bureau leadership needed information to determine what kind of corrective action should be taken. In response, the Census Bureau Printing Program Office (PPO) was able to provide postal tracking data to the Census Bureau Director. These data showed that responses were indeed "in the mail" back to the PDCCs, and that there were no problems with the mail out/mail back operation. The Census Bureau leadership found this information so valuable that they requested the PPO to continue to provide daily updates on anticipated response rates using postal tracking data. This is where the "early warning" capacity of postal tracking data provided its highest value added during the decennial operations. It gave the Census Bureau leadership real-time intelligence into mission critical operations so that corrective actions could be evaluated and executed as needed.

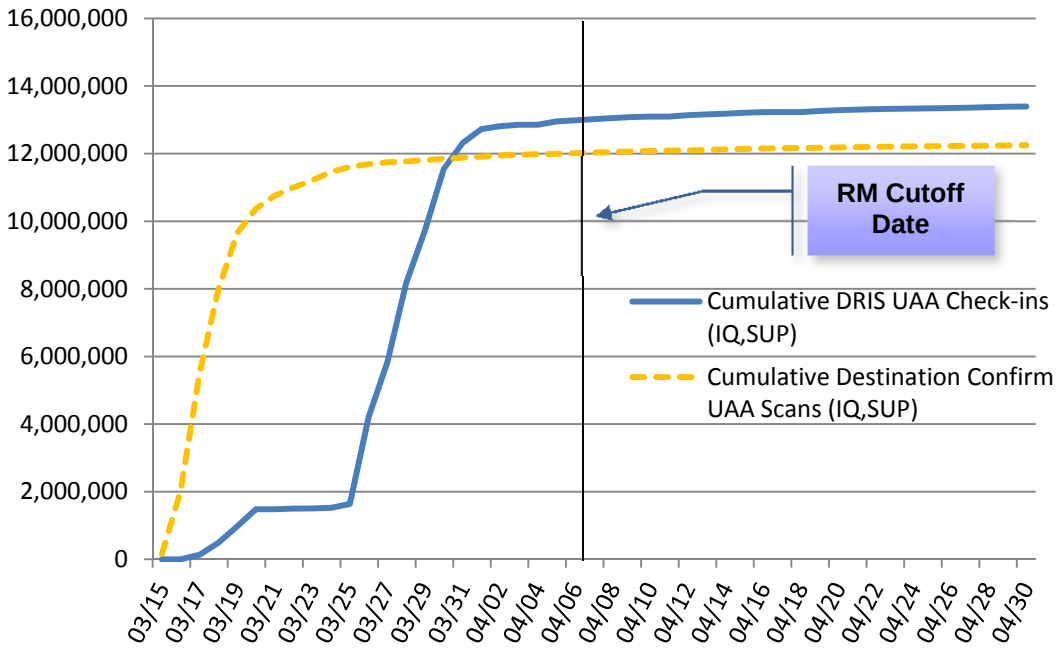
5.3.2 Cumulative UAA Destination Scans by Date

The second component to reducing the size of the targeted RM workload was to remove UAA households from the address list. The Census Bureau used UAA data from the Destination Confirm service in order to learn as early as possible when an address was UAA. Again, the

timing of *when* the Census Bureau learned of UAA addresses is the key. If the UAA data arrived too late, the Census Bureau would needlessly send a second mailing to unmailable addresses.

Figure 11 shows the timing of when the Census Bureau learned about the UAA status of its undeliverable IQ mail pieces. Note that by the targeted RM cutoff date of April 3, 2010, DRIS already had data on nearly all of the UAA mail pieces from the first mailing. As the graph shows, the UAA data were available to the Census Bureau in time to make the necessary reduction to the targeted RM workload.

Figure 11. Cumulative IQ Destination Confirm Service and DRIS UAA Scans



Source: PTDR7301_AssessmentWorksheet_B_RM_Analysis.xlsx
Source tab: B3_First_UAA_ByDay

As with the Origin Confirm service, we can see that if postal tracking data were the sole driver of UAA-based targeted RM workload reduction—that is, if there was no DRIS UAA check-in at all—then the targeted RM workload would be roughly the same. Again, given the relative costs of the two data sources, the Census Bureau should consider eliminating the more expensive approach.

In addition to eliminating the need to purchase, house, and maintain expensive laser sorting equipment, the Census Bureau can realize other savings benefits through better use of certain USPS services. The USPS secure destruction of UAAs is a prime example. By allowing USPS to securely destroy UAA mail pieces, the Census Bureau is relieved of the costs associated with this aspect of its mail out/mail back operations. Because these costs include the storage space necessary to hold these mail pieces before destruction, the savings here are substantial. By

entrusting USPS with the secure destruction of UAA mail, the storage space associated with holding these mail pieces could have been eliminated from 2010 Census costs.

5.3.3 Total Reduction in RM Workload

An address was removed from the targeted RM Universe when any one of the following events occurred:

(a) DRIS checked in a returning IQ mail piece for the address
(b) Origin Confirm service reported that an IQ mail piece was returning from the address
(c) DRIS checked in a UAA IQ mail piece for the address
(d) Destination Confirm service reported that the IQ mail piece for the address was UAA.

The question is: Which of these events were responsible for which portions of the RM workload reduction? We know that the Confirm services precede DRIS check in by at least 3 days, but we also know that if the RM cutoff date is late enough, the early warning benefits of the Confirm services are mitigated.

This analysis is complicated by a technical issue that DRIS encountered when processing the RM file. This issue meant that even though a mail piece from a given household was physically checked-in, the DRIS database could not be updated with this information until some days after the check-in event occurred. A DRIS check-in event occurring on, say, Monday, March 22, might not be written to the database until five days later on Friday, March 26. Looking back on the database now, the data *appear* to indicate that DRIS had the check-in data on the Monday when the check-in event occurred, when *actually* the check-in data would not have been available in the DRIS database for another five days.

As a result, it is difficult to know what data were available in the DRIS database at any given point in the processing activities that led up to the RM cutoff date of April 3. This makes it difficult to know whether the removal of a given responding address from the RM universe was attributable to the Confirm services or to a DRIS check-in event. Our original question of which of these events—DRIS check-in or "Confirm" scan—were responsible for which portions of the RM workload reduction cannot be answered with the desired precision.

Our method for addressing this challenge is to provide two separate estimates of the impact of postal tracking on the targeted RM workload. First, we provide a "conservative" estimate, and then the "likely" estimate.

Table 7 shows the conservative estimate of the impact of postal tracking on the size of the targeted RM. The analysis in Table 7 ignores the DRIS performance issues and gives DRIS credit for the maximum number of removed households. That is to say, if the DRIS database indicates that a mail piece was checked in on a Monday, we give DRIS credit for removing that household from the targeted RM on that Monday, even if we have reason to suspect that the check-in event on that particular day was not available in the DRIS database until Friday. Using this conservative approach, we find that postal tracking provided for the removal of over 3.56 million addresses from the targeted RM universe.

Table 7. Replacement Mailing Reductions Summary – "Conservative" Estimate

Data Set	*Households*	*Comments*
A. Targeted RM Eligible Universe	28,062,754	This is the total of all households in the identified targeted RM strata.
B. Actual Targeted RM Mail Out	9,975,819	This is the actual amount of targeted RMs mailed.
C. Total Targeted RM Reduction	18,086,935	A minus B.
D. DRIS Check-Ins as of April 3	14,521,142	These households all have a check-in date in the DRIS database that is on or before April 3. Even though these households were physically checked in, the records of these check-in events may not have been available in the DRIS database at the time of the cutoff date.
E. Confirm services Address Removals	3,565,793	C minus D. The minimum amount of workload reduction based on Confirm services.

Source 1: PTDR7104_DataSummary_TableCountSummry.xlsx
Source 2: PTDR7301_AssessmentWorksheet_C_RM_Analysis.xlsx

Table 7 establishes that postal tracking was responsible for the removal of a *minimum of* 3.56 million households from the targeted RM. This is our more conservative estimate. The estimates from Table 7 do not take into account the update timing issues on the DRIS database.

We now turn to the question of what is the "likely" number of removed households. Just prior to the April 3 targeted RM cutoff date; DRIS delivered a memorandum outlining estimated targeted RM workloads[6]. The timing of this report is important because it took place when the issues affecting the DRIS database had not yet been resolved and DRIS was using postal tracking data as a contingency plan to reduce the size of the targeted RM workload.

[6] In addition to this memorandum dated 4/09/10, a second email from Ed Tignor of the DRIS team to Mark Wolfram on 11/08/10 corroborates our analysis here: "There was no requirement to track the response status of a household. The only functional purpose of the household status was to create the targeted replacement mailing. We identified an alternative mechanism to create the replacement mailing in order to address replication problems in the high volume early days of paper processing. This enabled us to turn off some triggers that set the household status in order to fix a performance issue while still delivering the correct targeted replacement mailing. Once those triggers were disabled we stopped updating the household status."

Table 8. Replacement Mailing Reductions Summary – "Likely" Estimate

Data Set	*Households*	*Comments*
A. Targeted RM Eligible Universe	28,062,754	This is the total of all households in the identified targeted RM strata.
B. Estimated size of targeted RM mail out	10,499,744	This was the DRIS estimate of the total size of the targeted RM mail out, at the time the memorandum was written.
C. Total estimated reduction of targeted RM mail out.	17,563,010	A minus B.
D. Estimated Origin Confirm service removals	8,586,763	This is the number of responding households DRIS estimated could be removed from the targeted RM based on the Origin Confirm service data alone. These mail pieces were "in the mail" at the time of the memorandum.
E. Estimated UAA removals	3,465,581	This is the number of households that were determined to be UAA by either DRIS check-in or the Destination Confirm service at the time of the memorandum.
F. Estimated targeted RM reduction due to postal tracking	12,052,344	D plus E.

Source spreadsheet: PTDR7106_DataSummary_DRISBacklogInfo.xls
Original memorandum from Ed Tignor (DRIS) to Mark Wolfram on 4/09/2010

Table 8 shows that the actual targeted RM workload reduction was probably closer to 12 million households. Responses from 8.59 million households were "in the mail" back to the PDCCs. These households did not have DRIS check-in events recorded in the DRIS database at the time of the memorandum. This fact alone more than doubles our "conservative" estimate from Table 7 that postal tracking was responsible for the removal of only 3.56 million households from the targeted RM workload.

In addition to these "in the mail" households, DRIS reported that 3.47 million addresses could be removed from the universe due to their UAA status. It is not clear from the memorandum whether these UAA determinations were made through the Destination Confirm service or DRIS check-in, but given that UAA check-in was de-prioritized, it is likely that a substantial number of these addresses were removed as a result of the Destination Confirm service alone.

In conclusion, the "likely" estimate of the effect of postal tracking on the targeted RM workload was the removal of between 8.59 million and 12.06 million addresses from the mail out universe. This constituted a major cost savings for the Census Bureau both in reduced postage, and in overall operational efficiency. Perhaps more importantly we see that postal tracking served as a vital contingency plan when DRIS encountered technical issues in the database. Because this

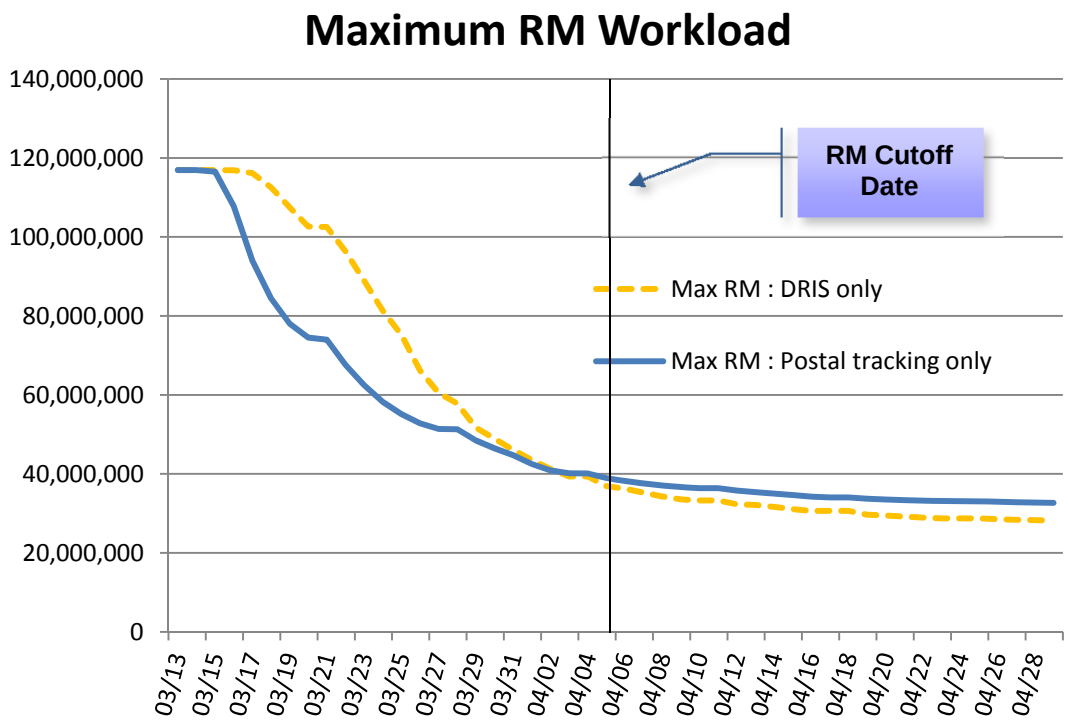
contingency was available, DRIS did not have to expend limited technical resources correcting issues in the database during those crucial days of peak processing, and could instead remain focused on other mission critical aspects of their task, meeting all HQ processing requirements. This was a key success of postal tracking in the 2010 Census.

5.3.4 Optimal RM Workload Cut-off Analysis

The optimal RM workload cut-off date is the result of an analysis of addressing equipment capability metrics coupled with an estimation of expected RM workload. The idea is to wait long enough to allow as many responding households as possible to be removed from the targeted RM workload, while not waiting so long as to create a risk in the outbound processing of the targeted RM packages. The NRFU operational timelines are also a major factor in this decision.

Due to the demonstrated efficiencies of the targeted RM addressing operation, the Census Bureau was able to wait until April 3 to cut the targeted RM mailing list without putting the mailing operation at risk. As shown in Figure 12, this date was late enough to allow DRIS check-in data to catch up with the postal tracking early warning (keeping in mind the caveats noted in the previous section that DRIS actually utilized a significant amount of USPS data in its contingency operation). As noted previously, this suggests that the future value of postal tracking might be not so much in the early warning it provides—although as paradata this is extremely valuable—but rather in its ability to replace reliably, rather than just supplement, the more expensive laser sorter process that has been the key driver for workload reduction in the past.

Figure 12. Analysis of RM Workloads Using Various Data Sets



Source: PTDR7301_AssessmentWorksheet_B_RM_Analysis.xlsx
Source tab: B5_Resp_Or_UAA_ByDay Details

Further, we note another potential opportunity for the USPS to enable the targeted RM cutoff. That is, the Census Bureau may not necessarily need one cutoff date for the targeted RM. As the USPS data comes in on a flow basis, it is entirely possible to determine different targeted RM mailing dates/timeframes for different locations based on needs to start NRFU operations earlier (for traditionally hard to count areas) or the ability to delay these operations until later (for traditionally high responding areas). Although more analysis is needed here, this approach might not only reduce NRFU risk, but would certainly reduce the targeted RM mailing risk of addressing and mailing huge volumes in a very short timeframe.

5.4 2010 RM Analysis

The purpose of the RM was to increase the mail-based response rate and reduce the size of the costly NRFU workload. Every household that responded to the RM operation was one less household that required a door-to-door visit. In regards to postal tracking technology and the NRFU operation, the goal is to determine its usefulness in reducing the NRFU workload. What households did not return the original questionnaire, but did return an RM questionnaire? What households returned both? What was the correlation between the Origin Confirm service and DRIS check-in for the returning RM mail pieces? What early warning did the Origin Confirm service provide to DRIS in regards to returning RM responses?

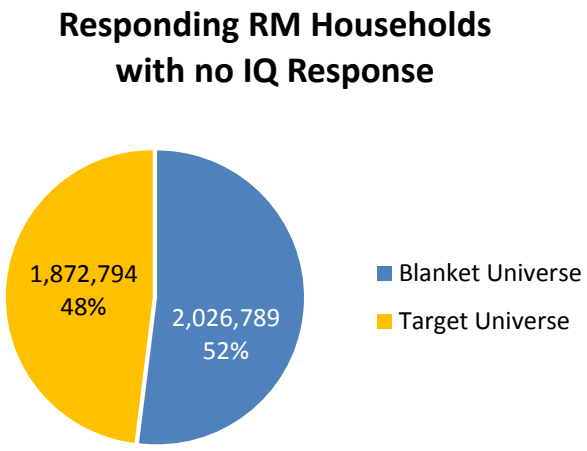
5.4.1 The Hybrid Approach

As outlined in Section 1, a key element of the "hybrid" approach to RM workload management was the division of the country into three types of mailout regions referred to as: blanket, targeted (or target-eligible), and non-eligible. All households in the blanket universe received an RM mailing. Non-UAA households in the targeted universe that did not return an IQ received an RM. And finally, no households in the non-eligible universe received an RM. In the analysis that follows, we will look at the effect of this division on the RM mailing results.

5.4.2 Households Responding to the RM Only

DRIS check-in records indicate that 3,899,583 households returned an RM questionnaire (from either mailing) but did not return an IQ. These are households that would have been part of the NRFU workload if not for the RM. Of these, about one half were from households falling within the blanket RM universe, and about one half were from households falling within the target RM universe. Figure 13 depicts this result.

Figure 13. Households Responding to the RM Only, by Universe Type



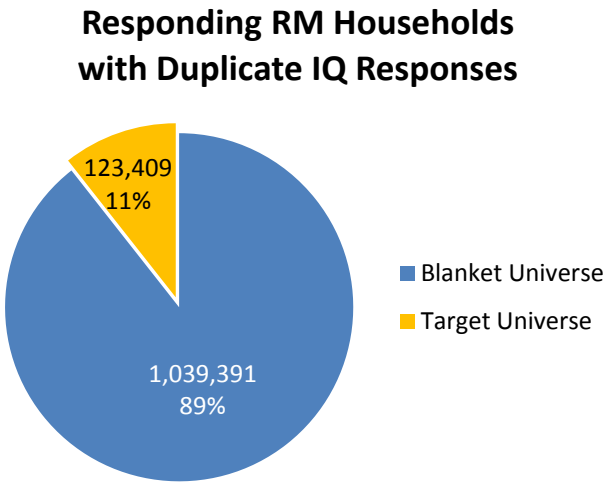
Source: PTDR7301_AssessmentWorksheet_C_RM_Analysis.xlsx, Source tab: C123

The data shown in Figure 13 support the hypothesis that the targeted RM approach was more efficient than the blanket RM mail out approach. The blanket RM universe was many times larger than the target eligible RM universe, but both universes yielded about the same number of non-duplicated responses.

5.4.3 Duplicate Responses

DRIS check-in records indicate that 1,162,800 households returned both an IQ and an RQ. The majority of these duplicate mail responses were from households falling in the blanket RM universe. Therefore, these are households that would have been removed from the NRFU workload even if there had not been a RM mail out. Figure 14 depicts this result.

Figure 14. Households Responding to Both the RM and the IQ, by Universe Type



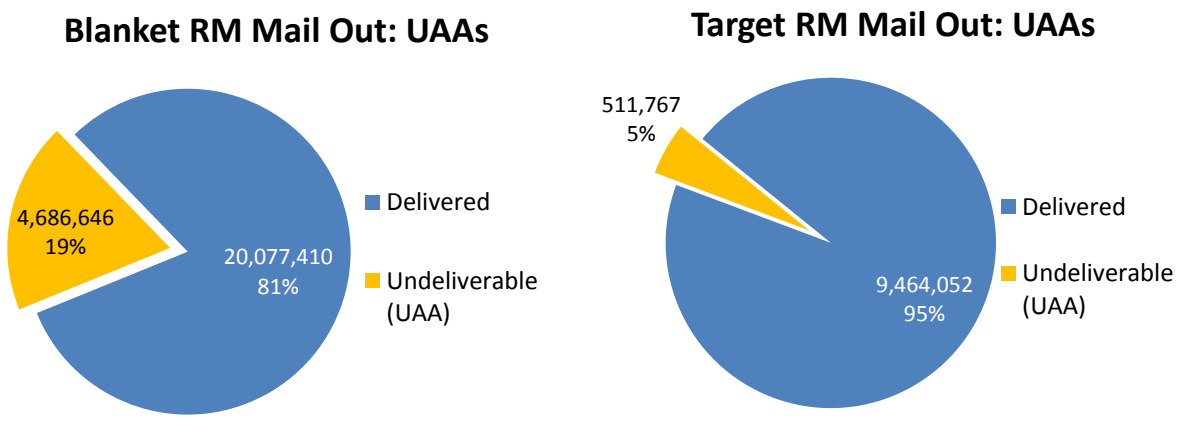
Source: PTDR7301_AssessmentWorksheet_C_RM_Analysis.xlsx, Source tab: C123

Once again the data support our hypothesis that the targeted approach to the RM was more efficient than the blanket approach, as duplicate responses seem to be highly correlated with households that are within the blanket mail out universe. Because postal tracking enabled the Census Bureau to remove households from the targeted RM universe that had already responded to the IQ, there were fewer duplicate responses coming from households in this universe.

5.4.4 UAA RM Mail Pieces

In the same way that postal tracking reduced duplicate responses from the targeted RM universe, so also would we expect the UAA rates to be lower in the targeted RM regions as compared to the blanket RM regions. Again, this was by design; the Census Bureau accepted the likelihood of both higher duplicates and higher RM UAAs in order to blanket certain areas. The impact on RM UAA rates is shown in Figure 15. As expected, a higher percentage of blanket RM mail pieces were undeliverable as compared to the targeted RM mail out.

Figure 15. RM UAA Analysis: Targeted and Blanket RM Universes



Source: PTDR7301_AssessmentWorksheet_B_RM_Analysis.xlsx, Source tab: B0_RM_Summary

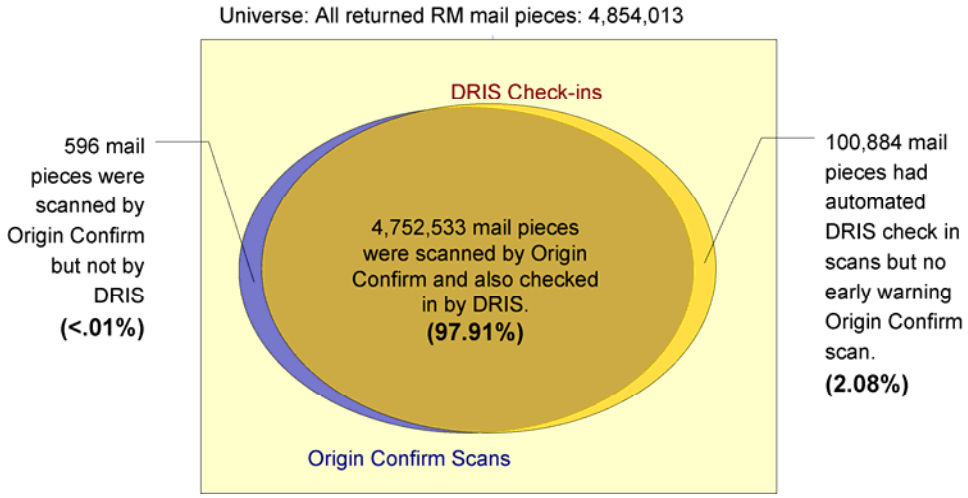
As before, the data show that the targeted approach was more efficient than the blanket approach. Additionally, it is noteworthy that the 5 percent UAA rate in the target RM universe corresponds to the USPS's estimate of what the UAA percentage should be for any national mailing of this size. This suggests an opportunity for further research. The question to answer is: Why was the UAA rate for the targeted RM mailing more in line with USPS estimates while the UAA rate for the other 2010 mailings was significantly higher than the USPS estimate? We suggest that the approach the Census Bureau used to remove UAAs from the targeted RM mailing should be evaluated for use in other contexts where the Census Bureau is aiming to increase operational efficiency.

5.4.5 RM: Origin Confirm Service/DRIS Check-in Correlation

Just as we were able to measure the correlation between the Origin Confirm service and DRIS on returning IQs, so also are we in a position now to investigate this correlation as it pertains to returning RM questionnaires. This is important in part because the Census Bureau employed different barcode technologies on the RM questionnaires in order to achieve Origin Confirm service tracking on the returning mail pieces. As noted in Section 3.2.1.1. The Census Bureau used the older PostNet/PlanetCode barcode technologies for the targeted RM packages. This was necessary because the RM address universe could not be known at the time that the RM outbound packages were printed and inserted, when the IMB could have been applied. One of the questions to address now is whether or not the use of these older barcodes affected the predictive characteristics of the Origin Confirm service.

Figure 16 shows the results. Again, we see a high correlation between the Confirm services and the DRIS check-in results. There is no evidence in this data set that the use of PostNet/PlanetCode barcode technologies negatively affected the results.

Figure 16. Origin Confirm Service Overlap with DRIS Check-in: RM Mail Pieces

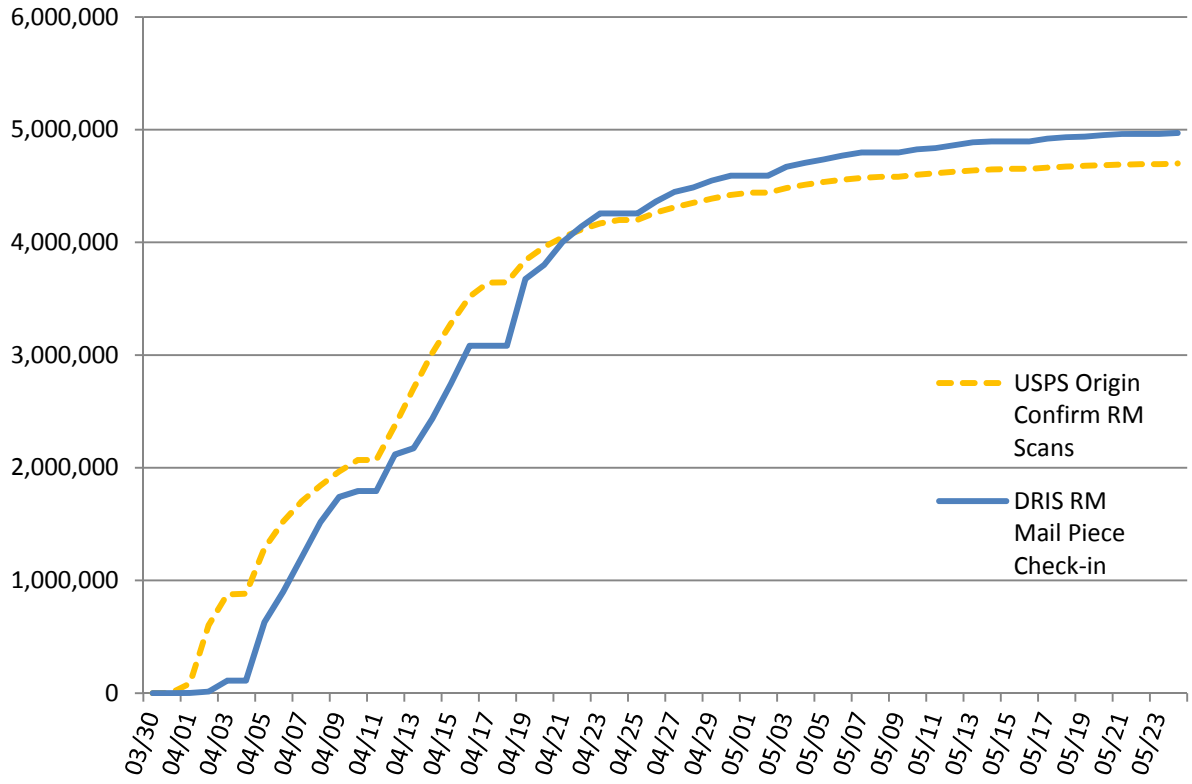


Source: PTDR7301_AssessmentWorksheet_C_RM_Analysis.xlsx, Source tab: C123

5.4.6 Cumulative RM DRIS Check-ins/Origin Scans by Date

As noted above, the Census Bureau used PostNet/PlanetCode barcode technologies to achieve Origin Confirm service tracking on the RM mail pieces. This was a key difference from the 2008 Census DR. In the 2008 Census DR, there was no Origin Confirm service tracking on the RM. As such, the 2010 Census RM is our first opportunity to study the behavior of the Origin Confirm service on the returning RM mail pieces. As Figure 17 shows, we find similarities between the early warning characteristics of the Origin Confirm service on the RM and the early warning characteristics of the Origin Confirm service on the IQ. Compare Figure 17 with Figure 10 in this light. Both show that the Origin Confirm service gives an early indication of coming workload, and both show that the value of this early warning diminishes over time as the check-in process catches up with the USPS scans.

Figure 17. Cumulative Returned RM Mail Pieces: Origin Scans and DRIS Check-in



Source: PTDR7301_AssessmentWorksheet_C_RM_Analysis.xlsx, Source tab: C5-SEPARATE

This set of findings regarding the behavior of the Origin Confirm service on returning RM mail pieces suggests two possible new census uses for postal tracking technologies in the future: (1) the Census Bureau should consider using the Origin Confirm service data from RM mailings to reduce the size of the NRFU workload, and (2) the Census Bureau should consider using RM Origin Confirm service data to optimize the process of removing late mail returns from the NRFU workload.

Use RM Origin Confirm Service Data to Reduce NRFU Workloads: In 2010, the Census Bureau did not use the RM Origin Confirm service data specifically to reduce the NRFU workload. Rather, the NRFU workload was reduced by official Census Bureau data capture methods. Given the high correlation between Origin Confirm service scans and DRIS check-in events for returning RM mail pieces, it seems reasonable to ask whether or not RM Origin Confirm service data could be used to reduce NRFU workloads in the same way that IQ Origin data were used to reduce RM workloads. As a next step, the Census Bureau should investigate the number of households whose RM questionnaires were "in the mail" at the time of the NRFU cutoff date. Some of these households may have been visited in the NRFU operation needlessly.

Use RM Origin Confirm Service Data to Optimize Handling of Late Mail Returns: Due to the reversion to a paper-based NRFU operation in 2010, the removal of late mail RM returns

from the NRFU workload was a manual process. In the future, this process can be optimized through the use of Origin Confirm service data on the RM. Real-time data feeds of Origin Confirm service data could be sent directly to the Operations Control System to notify Field Division of late responding households in the follow-up workload. At a minimum, the assignment of follow-up households with RM questionnaires "in the mail" and awaiting data capture can be prioritized below households for which there is no evidence of a mail out/mail back response.

5.4.7 Analysis of the Hybrid Approach

The key question in the analysis of the hybrid approach is: What would the RM workload reduction have been if the Census Bureau had pursued a nationwide targeted approach? Some parts of the answer to this question are clear from the data we have already investigated in the previous sections. Namely, we would expect:

1. A lower overall UAA rate for the RM mailings as a whole.
2. Fewer households returning both an RM and an IQ, i.e., less RM duplicate responses.

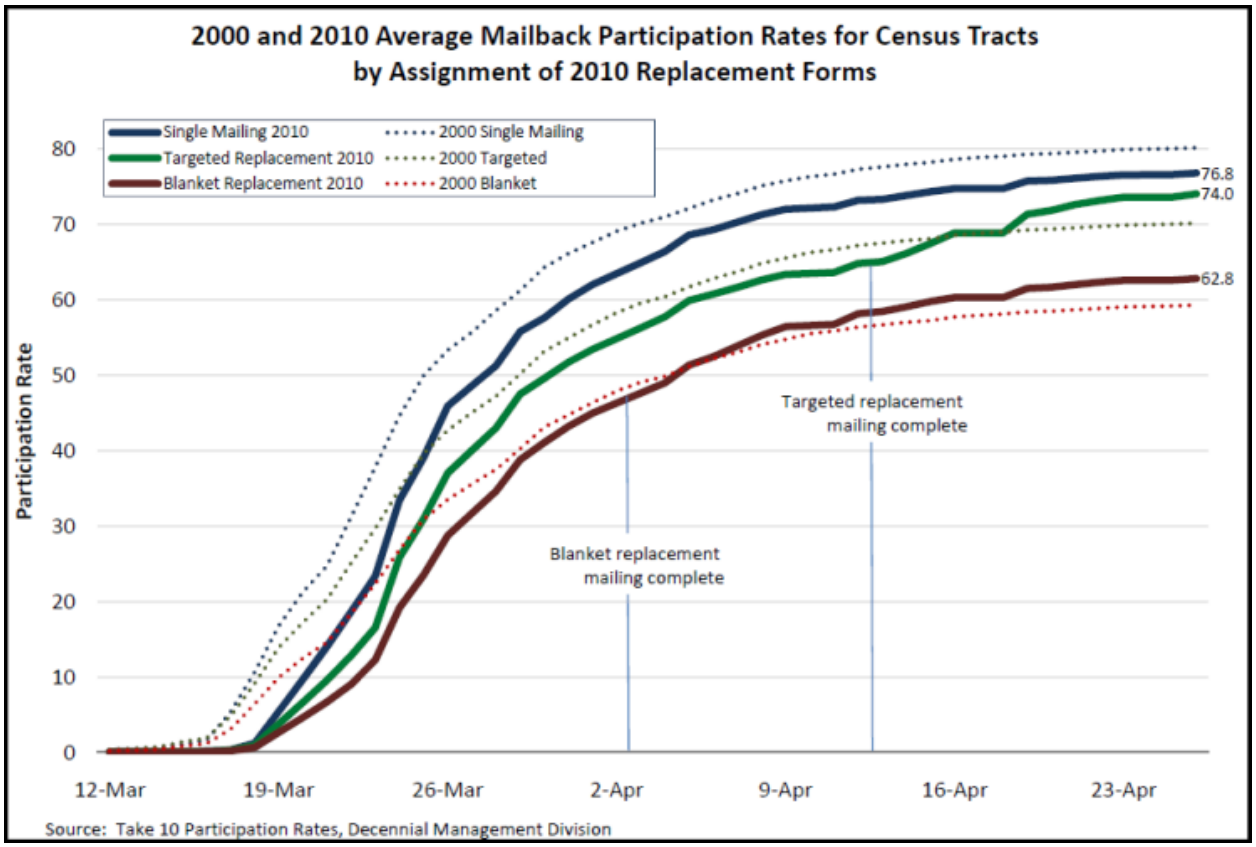
The data suggest that a solely targeted RM approach would be more efficient in future operations. In addition to this, we note that there is evidence that response rates in areas that received an RM mailing of any kind increased in 2010 over their 2000 levels. The CUNY Center for Urban Research report of April 28, 2010 reports the following important observations:

1. "Almost three-quarters of tracts nationwide that received a targeted or blanket mailing improved their mail-in rates over 2000," (*Source: Center for Urban Research at the Graduate Center, City University of New York, 2010*) and
2. "Only 21percent of tracts receiving a single questionnaire improved their participation rates. More than 70 percent of these tracts had mail-in rates worse than 2000." (*Source: Center for Urban Research at the Graduate Center, City University of New York, 2010*)

Taken together, these observations present a strong case for a universal targeted mailing. Had the Census Bureau pursued this path for the 2010 Census it is certainly possible that we would have realized the first increase in mail back response rates in thirty years. As it turned out, the RM mailings ensured that 2010 mail back response rates were comparable to the 2000 mail back response rates. This was the first time in thirty years that mail back response rates did not decline as compared to previous decennial results. The CUNY Center for Urban Research report supports the claim that the RM mailings were crucial to this important accomplishment (*Source: Center for Urban Research at the Graduate Center, City University of New York, 2010*).

The "2010 Census Operational Press Briefing" produced by the DMD, corroborates this analysis. See Figure 18. This figure shows (1) census tracts that received an RM had improved response rates in 2010 as compared to 2000, and (2) census tracts that did not receive an RM showed a decline in response rate.

Figure 18. 2000 and 2010 Average Mailback Participation Rates for Census Tracts by Assignment of 2010 Replacement Forms



Source: 2010 Census Operational Press Briefing, DMD, April 28, 2010

5.5 Evaluation Topic: UAA Analysis

This section addresses the question: What were the overall UAA results from postal tracking for the 2010 IQ mailing as compared to actual check-in results? The purpose of this section is to analyze the UAA data and suggest UAA-reduction strategies, if available.

5.5.1 Comparison with 2008 Census DR Data

First, how does the 2010 Census UAA count (via the Destination Confirm service and/or DRIS check-in) compare with the 2008 Census DR data? Are there any inconsistencies between the 2008 Census DR and the 2010 Census which might lead us to conclusions regarding the use of the Destination Confirm service for UAA uses in the future?

UAA Identification. In the 2010 Census, USPS data assisted us to identify a cumulative total of 10.4 percent of the IQ as UAAs, whereas DRIS identified 11.5 percent. When we examine these numbers by English and Bilingual mail (letter-size mail pieces as compared with flat mail pieces), we can see that we have the same pattern noted in Table 6 regarding the overlap of the

Destination Confirm service scans with DRIS data; the USPS did not enable the prediction of flat UAA mail pieces as accurately as letter-size mail pieces.

Table 9. 2008 Census DR and 2010 Census UAAs - Cumulative

	2008 Census DR Quantity Scanned (or derived) as UAA	2010 Census Quantity Scanned (or derived) as UAA	DR Percent of Total Mailing	2010 Percent of Total Mailing
Destination Confirm service				
IQ - English	**70,626**	**12,385,697**	**14.0%**	**11.5%**
IQ - Bilingual	**70**	**9,908**	**0.2%**	**0.08%**
DRIS Check-Ins				
IQ - English	**71,849**	**12,541,335**	**14.2%**	**11.7%**
IQ - Bilingual	**4,196**	**1,122,027**	**12.2%**	**9.6%**

2010 Source: Postal Tracking Database (incl. Confirm services daily data files and DRIS Check-in)
2008 Census DR Source: 2008 Census DR Use of Postal Tracking Technologies Assessment, Caldaro and Letourneau, 2009, pg10, PTDR7301_AssessmentWorksheet_D_UAA_Analysis.xlsx

These cumulative numbers correlate with the 2008 Census DR UAA analysis; noting of course the much smaller, regional scope of that test. (*Caldaro and Letourneau, 2009, page 9*)

Advance Notice Capability. The 2010 Census data also confirmed the "advance notice" advantage of UAA identification, reflected in the 8.25 days mean advance notice of UAAs provided by the Destination Confirm service. The advance notice provided by the Destination Confirm service identification of UAAs in the 2008 Census DR was calculated to be less, 5.53 days. As noted earlier, this is likely due to both the USPS distribution plans for the 2010 Census, as well as the large volumes of UAAs for PDCC non-priority check-in.

Level of Agreement. In the 2008 Census DR, 0.9 percent (*Caldaro and Letourneau, 2009)* of the IQ mail pieces were flagged as UAA by NPC but not by the Destination Confirm service (in this small sample, a total of 4,855). (The data *include* the exception/manual check-ins at NPC; however, the USPS services would not have been able to scan all of these mail pieces.)

Due to the consistency of these data, we believe that the Destination Confirm service is operationally useful, and that our methods for identifying UAA using this service worked fairly well.

5.5.2 UAA Reason Codes

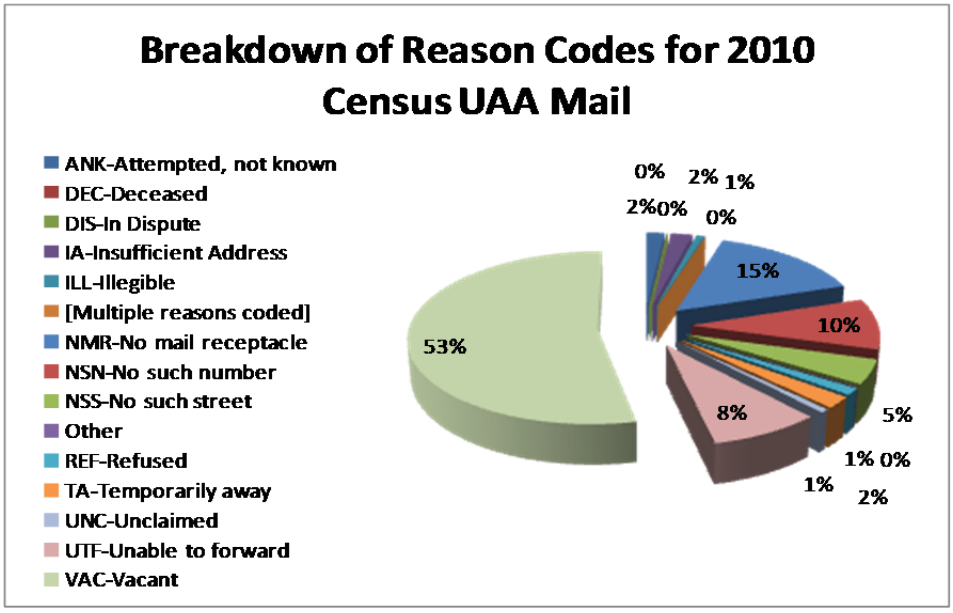
The Census Bureau was able to obtain reason codes for many of the UAA mail pieces from the USPS. This is normally provided through the Address Correction Service, but due to census volumes, the USPS tracked the reasons for non-delivery through separate methods. We do not

have detailed insight into these methods so we cannot speculate on their accuracy; however, these are the *only* data we have on reasons for non-delivery in the 2010 Census, and therefore may be of great interest to various Census Bureau entities. In particular, we were interested in answering the following two questions:

- What reasons did USPS provide for UAA mail pieces?
- What percentage of UAAs was due to vacancies?

The distribution of UAAs by reason codes is illustrated as follows. Clearly, the major reason for UAA mail in the 2010 Census was vacancy, at 53.42 percent.

Figure 19. 2010 Census UAA Reason Codes



Source: PTDR7301_AssessmentWorksheet_D_UAA_Analysis

The following table provides the counts and detailed percentages by reason code for all addresses in the USPS UAA reason code feed. Note that the feed provided by the USPS only contains reason code information on 84 percent (PTDR7301_AssessmentWorksheet_D_UAA_Analysis, E28) of the 13.7 million (PTDR7301_AssessmentWorksheet_D_UAA_Analysis, D9) addresses checked in as UAA by DRIS or determined to be UAA using the Destination Confirm service.

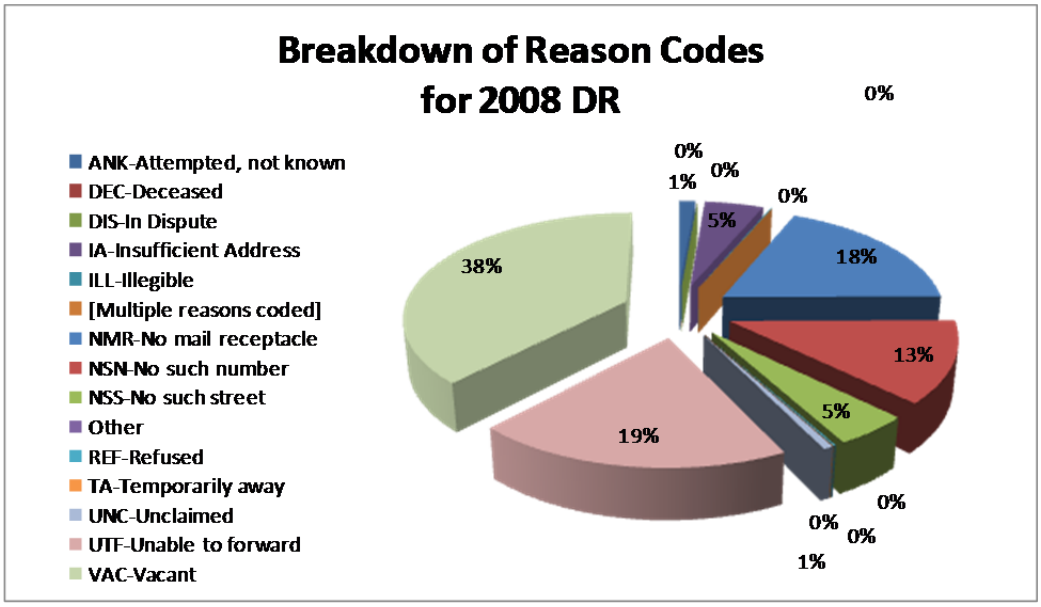
Table 10. UAA Reason Codes

UAA Reasons	Number of IQ UAAs	Percent of Total IQ UAAs
Vacant (VAC)	**6,157,140**	**53.42%**
No Mail Receptacle (NMR)	**1,741,565**	**15.11%**
No Such Number (NSN)	**1,102,060**	**9.56%**
Unable to Forward (UTF)	**970,277**	**8.42%**
No Such Street (NSS)	**524,502**	**4.55%**
Temporarily Away (TA)	**249,670**	**2.17%**
Insufficient Address (IA)	**245,969**	**2.13%**
Attempted – Not Known (ANK)	**203,074**	**1.76%**
Refused (REF)	**144,787**	**1.26%**
Illegible (ILL)	**91,362**	**0.79%**
Unclaimed (UNC)	**77,210**	**0.67%**
In Dispute (DIS)	**9,268**	**0.08%**
Other	**6,296**	**0.06%**
Deceased (DEC)	**2,346**	**0.02%**
[Multiple reasons coded]	**161**	**0%**

Source: PTDR7301_AssessmentWorksheet_D_UAA_Analysis

Interestingly, the 2008 Census DR UAA reason code distribution (derived from the Address Change Service) is somewhat different, with not as many vacancies (Figure 19). However, we hesitate to draw any conclusions from this small sample size. What we can say, is that for any census study utilizing these reason codes, the codes will probably vary depending on the sample – both in terms of geography and in terms of demographic characteristics of the population residing in the covered area.

Figure 20. 2008 Census Dress Rehearsal UAA Reason Codes



Source: PTDR7301_AssessmentWorksheet_D_UAA_Analysis

5.5.3 UAAs by Mail Piece Size

One cautionary note on the use of the Destination Confirm service is the difference between mail piece size (i.e., letter-size and flat mail pieces) and the USPS ability to identify UAAs. As noted in the 2008 Census DR assessment report and again in this report (Section 5.2.4), the USPS tracking services are somewhat less reliable in tracking flat mail pieces.

Further, we were not able to obtain UAA reason codes on flat mail pieces, whereas we were able to obtain them for a large percentage of letter-size mail pieces.

In section 7 we explore briefly some of the additional opportunities we think postal tracking can provide to mitigate census UAA issues.

5.5.4 UAA Paradata Case Study: Bolton, MA

Early in the mailout/mailback operation in 2010, the Census Bureau was notified that no households in the town of Bolton, MA had received a census questionnaire. The Census Bureau investigated and determined that the forms intended for Bolton had mistakenly been sent back to the Census Bureau as UAAs. During this investigation, the Census Bureau was able to leverage postal tracking data to determine exactly which households had not received a form, and was able to take immediate corrective action. This highlights again the important role that postal tracking data can play as paradata on any future mail out /mail back operation. Only through the real time operational visibility provided by postal tracking data can the Census Bureau respond efficiently to unexpected operational challenges. This is true not only in relatively small scale-situations like Bolton, but in larger scale Disaster Recovery scenarios as well.

6.0 RELATED EVALUATIONS, EXPERIMENTS, AND/OR ASSESSMENTS

Caldaro, Teresa and Earl Letourneau (2009). "2008 Census Dress Rehearsal Use of Postal Tracking Technologies Assessment" (Version 2.1), September 17, 2009.

Jackson, Geoff and Letourneau, Earl (2011), "2010 Census Preliminary Report of the Final Mail Response Rates." October 26, 2010.

7.0 LESSONS LEARNED, CONCLUSIONS, AND RECOMMENDATIONS

7.1 Uses and Benefits of USPS sPostal Tracking in the 2010 Census

Throughout this document we have elucidated the following conclusions:

- The USPS postal tracking services are reliable on a nationwide scale. We noted only one small flaw in the tracking of decennial mail pieces; postal tracking data interpreted to determine UAAs do not perform as well on flat mail pieces. The data were generally consistent with data from the much smaller 2008 Census DR (Section 5.1.1).
- Nationwide, USPS postal tracking provides advance notice of responses on their way back on the average of 3 days. In the 2010 Census the lead notice for UAAs was 8.25 days on average, due primarily to a low priority to "check in" UAA mail at the PDCCs (Section 5.2.2).
- The purposeful de-prioritization of UAAs, due to the confidence the Census Bureau has in the Destination Confirm service's ability to identify UAAs, provided operational savings to the DRIS program (Section 5.2.2).
- We noted no discernible differences in the postal tracking accuracy between ZIP codes or geographic regions of the country. (Section 5.2.3.1).
- Postal tracking mitigated a major realized risk—the DRIS program relied on its contingency to utilize the USPS UAA and return mail information operationally when its systems encountered technical issues processing the RM file (Section 5.3.3, paragraph 3).
- The targeted RM would have faced increased operational risks without postal tracking, which provided the majority of the UAA and return mail data to reduce the RM workload. *A major cost savings from reduced postage and reduced NRFU workload was a result* (Section 5.4.3).
- The targeted RM generated fewer UAAs and fewer duplicate responses than did the blanket RM (Section 5.4.4).
- The USPS was able to provide reason codes for non-delivery for a great majority of the UAA addresses. As expected, vacancy was the most common reason for non-delivery during the 2010 Census (Section 5.5.2).
- Implementing an entire targeted RM would have increased overall response (Section 5.4.7).

Clearly, postal tracking achieved and surpassed its goal of enabling the targeted RM. While the overall 2010 Census participation rate was the same as in Census 2000, the RM's usefulness is likely to be a key factor in future censuses and surveys. A report by the Center for Urban Research[7] underscores the success of the RM in general:

"Almost three-quarters of tracts nationwide that received a targeted or blanket mailing improved their mail-in rates over 2000 (74 percent and 71 percent, respectively). Only 21 percent of tracts receiving a single questionnaire improved their participation rates" (As of April 28, 2010).

7.2 Future Opportunities

Lessons learned as well as recent developments point to future paths to pursue in the use of postal tracking data. Two recent oversight reports in particular underscore the potential use of administrative records to accomplish the objectives of increased efficiencies and reduced costs in future censuses and surveys.

"For 2020, the use of administrative records to contain costs and improve quality must be explored." – Census 2010: Final Report to Congress, Office of Inspector General Report OIG-11-030-I, June 27, 2011 (pg. 8).

"We encourage the Bureau to be open to and use its matched records–census files, to explore the use of administrative data in a supplementary role to a wide variety of census operations. In particular, roles for administrative data as a supplementary resource to NRFU operations should be explored…" - Panel to Review the 2010 Census, National Resource Council of the National Academies of Science, March 25, 2011.

USPS data were mentioned in both of these reports as an example of current use of administrative data. We were able to employ postal tracking on almost 490 million mail pieces to help enhance operations, with no major security or operational issues. While the 2010 Census focused on enabling the targeted RM, it is clear that the technology and data provide many other potential uses that we have not explored. Preliminary ideas include:

- Reduce the UAA rate of mailings by using USPS tracking services (and/or other records) to identify and remove UAAs prior to subsequent mailings.
- Utilize the USPS UAA reason codes to point to issues with the address file, providing feedback to the Geography Division on possible MAF issues prior to creating the address files. Since the majority of decennial UAAs were due to vacancies, focusing on identifying these prior to the mailing could have a great benefit.
- Collaborate with the USPS on other potential uses of its address status information, which we may or may not currently anticipate. As an obvious example, we can determine the actual addresses for Post Office boxes, and provide the linkages within the MAF.

[7] City of University of New York Graduate Center, May 3, 2010, (http://www.urbanresearch.org/resources/census2010participationApril28).

- Consider using postal tracking as a complete replacement for letter-sized sorter check-in at the PDCCs, eliminating an entire, costly operation.
- Consider implementing a full targeted RM rather than the hybrid targeted and blanket approach, considering that the blanket operations provided replacement questionnaires to a great number of households that had already responded, or that were UAA. Staggered targeted RM cutoff dates could be considered.
- Utilize the USPS service that securely destroys letter-sized UAA mail pieces, just as they did in 2010 with the UAA advance letters, eliminating the need to receive and process these UAAs.
- Investigate other uses of the postal tracking "paradata" for surveys.

Pursuit of these opportunities underscores an important factor that highlighted the success of the use of USPS technologies in the 2010 Census – continued collaboration with the USPS and stakeholders. The USPS/Census Bureau Joint Committee was an important stakeholder communications opportunity, as were the tactical-level working groups of technical experts. We recommend continued communication, preferably concentrating on strategic-level goals and objectives. As more Census Bureau divisions and surveys will likely be using USPS data in the future, the sharing of information from meetings, results from tests, plans, and even enterprise-level cost-sharing may be critical elements in the use of USPS postal tracking technologies and data in future.

8.0 REFERENCES

2010 Census Planning Memoranda Series #147. Caldaro, Teresa (DSCMO) (2010). "Census 2010 Study Plan: 2010 Census Postal Tracking Assessment," June 23, 2011.

2010 Census Operational Press Briefing, Decennial Management Division, April 28, 2010

"A bit of good news," Email thread from Jim Marsden to Director Robert Groves, 3/18/2010.

Caldaro, Teresa and Earl Letourneau (2009). "2008 Census Dress Rehearsal Use of Postal Tracking Technologies Assessment" (Version 2.1), September 17, 2009.

Census 2010: Final Report to Congress, Office of Inspector General Report OIG-11-030-I, June 27, 2011.

Center for Urban Research at the Graduate Center, City University of New York, "Be Counted, America! The Challenge Ahead: An analysis of mail-in participation in the 2010 Census as door-to-door enumeration begin." May 3, 2010.

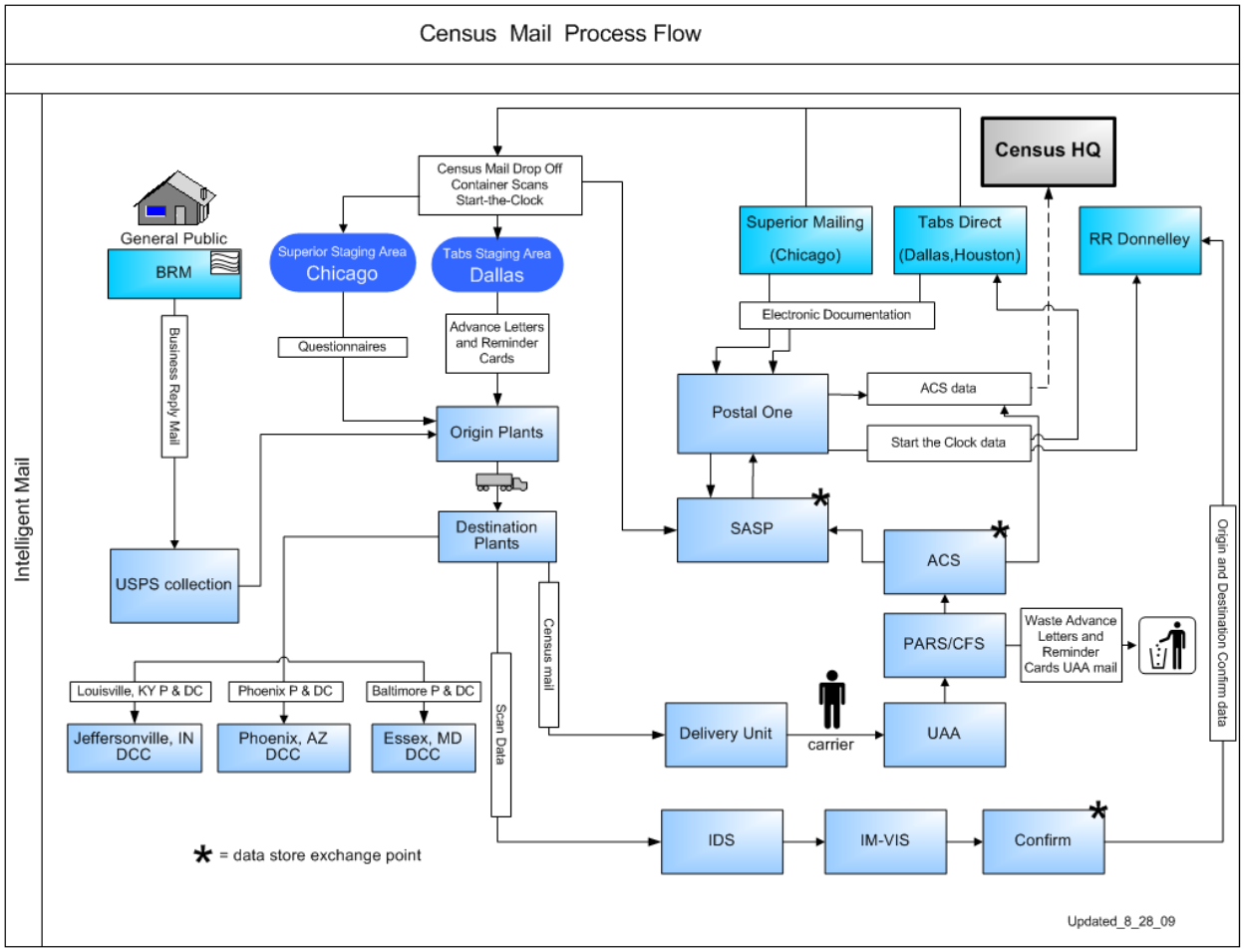
Gunnison Consulting Group Inc. and ADI, LLC (2006). "An Analysis of 2005 and 2006 Test Results and Summary of Future Opportunities" (Version 2.3) Report to U.S. Census Bureau DACMO, October 6, 2006.
Jackson, Geoff and Earl Letourneau (2011), "2010 Census Preliminary Report of the Final Mail Response Rates." October 26, 2010.

Lockheed Martin Report # DRIS-2011-0023 (2011). "Decennial Response Integration System (DRIS) Enterprise Integration (EI) Post Production Analyses and Enhanced Lessons (Pals)" (Version 1.0), June 17, 2011.

Panel to Review the 2010 Census, National Resource Council of the National Academies of Science, March 25, 2011

United States Postal Service, Intelligent Mail Planning and Standards (2008). "Intelligent Mail® Barcode Technical Resource Guide." Rev 3.5, January 13, 2009.

APPENDIX A: 2010 CENSUS MAIL FLOW PROCESS



Source : USPS Joint Committee Meeting Presentation, April 20, 2011

APPENDIX B: ACRONYMS AND ABBREVIATIONS

CIG	Census Integration Group
DACMO	Decennial Automation and Contracts Management Office
DMD	Decennial Management Division
DRIS	Decennial Response Integration System
DR	Dress Rehearsal
DSCMO	Decennial Systems and Contracts Management Office
HQ	Headquarters
ID	Identification
IMB	Intelligent Mail Barcode
IQ	Initial Questionnaire
NPC	National Processing Center
NRFU	Nonresponse Followup
OIG	Office of the Inspector General
PDCC	Paper Data Capture Center
PTDR	Postal Tracking Data Repository
RM	Replacement Mailing
UAA	Undeliverable as Addressed
USPS	U.S. Postal Service
ZIP	Zone Improvement Plan