

A PRELIMINARY EXAMINATION OF THE ADDRESS LIST FOR CENSUS 2000

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Abstract: The key to a successful census is an accurate housing list. For the United States Census 2000, the housing list is the Decennial Master Address File (DMAF). The DMAF was initially created in July 1999 and is updated periodically through December 2000. Addresses come from files from the United States Postal Service and from various address listing operations. Each file or operation provides information in regard to the status of the address. By the time of the creation of the address list for questionnaire printing, there is a status code from each operation for each address. In this paper we give some preliminary results of the number of addresses on the initial DMAF by address list-building operation.

INTRODUCTION

Census 2000 required an up-to-date and accurate list of the housing that existed on Census Day, April 1, 2000. The many files and operations used to create this list were selected for their potential to yield the best information about the status of housing units. The housing unit addresses are maintained by the Census Bureau in the Master Address File (MAF). The eligibility of addresses on the MAF for the Decennial MAF (DMAF), the address list for Census 2000, depends on their status from these operations. The overlapping time frame of these operations impacts the process of determining the status of certain housing units and complicates any evaluation of the effectiveness of an individual operation. In this paper we discuss the operations that contributed to the MAF, their relationship to one another, and their initial impact on the more than 120 million housing units listed on the DMAF. More complete evaluations of each of these operations will be provided as part of the Census 2000 evaluation program.

The majority of addresses in the country are in what is known as the Mailout/Mailback areas, which in general are areas with a predominance of city-style addresses. A city-style address is of the type "121 Main Street." The approximately 98 million addresses in these areas were mailed questionnaires for the Census. The starting point for building the list of addresses on the MAF for the Mailout/Mailback areas was the 1990 Census address

file, the Address Control File (ACF). The first update to the MAF was the address list of mail delivery points from the United States Postal Service (USPS), called the Delivery Sequence File (DSF). The DSF is updated every month by the USPS. The Census Bureau added the residential addresses from a number of DSFs to the MAF. In a process known as geocoding, a census block number is determined for an address. After incorporating the November 1997 and the September 1998 DSFs into the MAF and geocoding these addresses, lists of addresses were compiled for a status check operation. The Census Bureau performed a simultaneous update of the address lists and census maps of all blocks in Mailout/Mailback areas in an operation called Block Canvassing.

In addition to Block Canvassing, there was also a cooperative effort with participating Governmental Units (GUs) to update the address file. This operation was called Local Update of Census Addresses 1998 (LUCA 1998). Block Canvassing and LUCA 1998 occurred in an overlapping time frame, but there are a number of important distinctions between the programs. Participation in LUCA 1998 was voluntary and so was not uniform across the country. Another major distinction is the timing of the updates and the operations. Sometimes the LUCA 1998 submissions were processed in time to incorporate updates into the list sent to Block Canvassing, sometimes a LUCA 1998 address file and a Block Canvassing address file were processed simultaneously, and sometimes the Block Canvassing updates were incorporated into the materials sent to the LUCA 1998 participant. This led to a variety of possible actions on an address, many of which can represent the same unit status. Because of this complexity it is too difficult to evaluate the operations collectively with respect to relative efficacy.

Two routes were taken to incorporate new housing units into the address list in Mailout/Mailback areas up until Census Day. The first, the New Construction operation, was a further cooperative effort in which participating GUs annotated census address lists with new housing units. The second effort made by the Bureau was the inclusion of geocoded addresses from the February 2000 and April 2000 DSFs.

In areas with a high percentage of non-city-style addresses, the address list was created in an operation called Address Listing. All addresses in these areas were

listed and simultaneously added to Census maps with a location designation known as a map spot. Housing unit counts by block were checked by participating GUs, and contested blocks were then recanvassed in an operation called LUCA 1999. The address list was updated again during the census in an operation called Update/Leave, in which preaddressed questionnaires were hand-delivered for the Census. Updates were made to the address list and the maps concurrent with questionnaire delivery.

Areas that do not have a predominance of city-style addresses that are also remote or inaccessible in certain seasons were address listed and enumerated concurrently around Census Day, in operations called List/Enumerate and Remote Alaska. Because the address lists were not created in advance of the census, these operations will not be discussed in this paper.

In this paper we give preliminary results of the impact on the MAF and the DMAF of the incorporation of the DSF address files and the Block Canvassing, Address Listing and LUCA operations.

DELIVERY SEQUENCE FILE

A file of mail delivery point addresses for all areas of the country called the DSF is produced and maintained by the USPS. While all DSF addresses are maintained on the MAF, only those DSF addresses determined to be in Mailout/Mailback areas of the country were considered to be valid for updating the MAF and DMAF. The following DSFs were used to update the MAF in the Mailout/Mailback areas for Census 2000: November 1997 (and earlier), September 1998, November 1999, February 2000, and April 2000. Some of these later DSF addresses matched addresses added in Block Canvassing or later Census operations.

Preliminary Results: To quantify the impact of the DSF on the MAF-building process throughout Census 2000 operations, the number of addresses added at each delivery is profiled.

Table 1 presents the number of addresses provided at each DSF delivery across residential status in Mailout/Mailback areas of the country. Historical residential status information was not maintained in the MAF until the September 1998 update of the MAF. For that reason the November 1997 DSF has a large number of addresses with "unknown" residential status. Starting with the November 1999 DSF, however, addresses with an "unknown" residential status include units that are not receiving mail as of the date of the DSF. The number of addresses on the February 2000 DSF, 696,762, is

relatively small compared to the previous deliveries because only new addresses from this DSF were selected, in order to minimize the time needed to process the records into the MAF.

In order to determine the number of new addresses geocoded in the MAF at each delivery of the DSF, consecutive deliveries of the DSF were compared with the following results. The September 1998 DSF had an additional 1,805,991 geocoded addresses compared to the previous DSF. On the November 1999 DSF there were an additional 2,326,955 geocoded addresses that were not on the September 1998 DSF, and there were 339,077 new, geocoded addresses on the February 2000 DSF. Many of these later addresses were also added to the MAF by other operations.

BLOCK CANVASSING

The Census Bureau conducted the Census 2000 Block Canvassing operation from January 1999 through May 1999 to improve coverage and geographic location information on the MAF inside Mailout/Mailback areas. Block Canvassing is the only field operation that performs a 100% verification of addresses.

Block Canvassing consisted of field listers canvassing the Mailout/Mailback areas in their entirety. The version of the MAF that went into Block Canvassing included addresses obtained from the Census Bureau's 1990 ACF and the November 1997 and September 1998 DSFs. Some LUCA 1998 participants' submissions had been processed in time for them to appear on the Block Canvassing address list. The Block Canvassing listers had the ability to add, delete, verify, or correct addresses in the address register based on the true addresses that they observed. For addresses that needed to be added, the listers were required to list the city-style address for each unit, or a non-city-style address and/or location description if a unit did not have a city-style address. The listers also made all necessary additions, deletions and corrections to features on Census maps.

Some addresses on the MAF sent to Block Canvassing were geocoded to the wrong Census block. The listers did not have a way to correct geocoding problems directly because they were instructed to add addresses that existed but were not on their list and to delete addresses on the list that did not exist. When Block Canvassing addresses were processed for the MAF, if an add in one Census block matched exactly to a delete in a different Census block, it was designated as a block move.

Table 2 shows the total number of addresses that were

added to, deleted from, and corrected on the MAF as of April 2000. All counts reported are for the fifty states and the District of Columbia. Block Canvassing was not conducted in Puerto Rico because there was no Mailout/Mailback enumeration there. Table 2 also shows the total number of addresses compared to only the number that were DMAF-deliverable as of April 2000. Deliverability to the DMAF depends on the information from all the MAF-building operations, so some units deleted in Block Canvassing were deliverable to the initial DMAF. The Address Corrections are the number of cases where one or more address fields were corrected. The Geographic Corrections are the number of addresses designated as a block move.

All of the Block Canvassing deletes that were on the initial DMAF were sent to LUCA 1998 Field Verification to confirm their status. As a general rule, an address was not removed from subsequent Census processes unless it was deleted by at least two different MAF-building operations. However most addresses that were deleted in Block Canvassing and in LUCA 1998 Field Verification were still mailed questionnaires because Field Verification occurred after the initial questionnaire printing. These questionnaires could not be removed from the mail stream. Some percentage of these questionnaires were returned by the USPS as undeliverable.

ADDRESS LISTING

Address Listing was used to create the initial MAF for Update/Leave areas of the country. From July 1998 to May 1999, census workers canvassed door-to-door to identify the mailing address and physical location of addresses in areas where the addresses are primarily non-city-style. The address listers provided a concise physical description of structures where it was not possible to determine a mailing address. The listers also located each housing unit with a map spot on a block map. When possible the listers also gave an occupant name and telephone number.

Block counts of addresses on the address lists were delivered to participating GUs in the LUCA 1999 operation. Census questionnaires were hand-delivered to each address in the designated areas during the Update/Leave operation.

Preliminary Results: Nationwide approximately 23.3 million addresses were listed in Address Listing, including in Puerto Rico. Of the addresses listed, 60.98% had a city-style address and 20.41% a non-city-style address (e.g. PO BOX, Rural Route), while 17.76% had

a mailing address that was deemed unknown. For the latter category, enumerators were not able to determine the mailing address because it was not posted and no other information was available.

Addresses provided in the Address Listing operation required a block code and a map spot, which allows an enumerator to locate and enumerate the address during the Update/Leave and Nonresponse Followup (NRFU) operations. Addresses in Update/Leave areas that were not DMAF-deliverable were missing some part of the information necessary for locating such addresses in the field. These addresses could become DMAF-deliverable by way of other census address list operations after Address Listing.

The delineation of the country into areas where Mailout/Mailback methodology could be used and those where other questionnaire delivery methodologies must be used occurred in advance of any address list-building operations. Therefore it is useful to examine how effective that delineation was. Table 3 profiles the addresses listed in Address Listing according to their match status with the September 1998 DSF. This DSF was processed at about the same time that Address Listing took place. Approximately 38.42% of the addresses added in Address Listing matched to addresses that were identified as residential on the September 1998 DSF. Additionally, 0.22% of the addresses added during Address Listing matched to addresses flagged as nonresidential on the DSF. These findings suggest that the Bureau may want to reassess the methodology of delineation of Mailout/Mailback versus Update/Leave areas of the country, and that it may be reasonable to use the DSF as an address list building tool in some Update/Leave enumeration areas.

LOCAL UPDATE OF CENSUS ADDRESSES

The Census Address List Improvement Act of 1994 (Public Law 103-430) provided for the formation of partnerships between the Census Bureau and tribal and local governments. This partnership was formed to improve the address list for Census 2000. The address list review, known as LUCA, is divided into two main phases: LUCA 1998 and LUCA 1999.

LUCA 1998: The LUCA 1998 program took place in areas of the country that used Mailout/Mailback enumeration methods. The Census Bureau provided participating tribal and local governments that signed a Confidentiality Agreement a list of the geocoded addresses on the MAF in each census block within their jurisdiction. They were also provided copies of the

Census Bureau's maps that show the street and census block numbers within their jurisdictions. They were allowed three months to make additions, deletions, or corrections to the information they were provided.

The results from the LUCA 1998 operation helped determine whether an address was delivered to the DMAF. Some of the LUCA 1998 adds and corrections were processed in time to be incorporated into the Block Canvassing universe of addresses. The rest were compared to the address list resulting from the Block Canvassing operation. A total of 80,573,336 addresses were sent to LUCA 1998 participants. Of these, the LUCA participants corrected 2,783,935 addresses, deleted 460,461 addresses, and determined that 24,928 addresses were nonresidential. In addition, they added 6,386,923 addresses. (The data in tables 4 and 5 are from the reference paper.)

The Census Bureau performed LUCA 1998 Field Verification in October and November of 1999 to reconcile adds and corrections that were inconsistent between LUCA 1998 and Block Canvassing. Block Canvassing deletes were also included in this operation to verify their status. Added units were not allowed to result from Field Verification. A total of 5,324,125 addresses were sent to the LUCA 1998 field verification operation. In table 4, the units verified in Field Verification represent two situations:

- ▶ those cases in which the LUCA 1998 and Block Canvassing actions did not agree. For these cases, if the LUCA 1998 information is correct, the case is considered verified.
- ▶ those cases that were deleted by Block Canvassing but were verified as existent in Field Verification.

Field Verification corrections included corrections made to street name or apartment designation, as well as corrections made to block number. Deletes are the total number of units sent to Field Verification that received a delete action. This number includes addresses deleted in Block Canvassing that were not deleted in any other concurrent operation or file.

The participating tribal and local governments received disposition materials informing them of the results of the field verification. If the participating government still disagreed with regard to a specific address, they could seek a formal review through the appeal process. The Census Address List Appeals Office was established at the Office of Management and Budget as a temporary

office outside the Department of Commerce to resolve appeal cases. The LUCA 1998 participants appealed 285,643 addresses. Table 4 shows the final results for the LUCA 1998 Appeals addresses.

LUCA 1999: The LUCA 1999 program is for the Update/Leave enumeration areas, including Puerto Rico. The Census Bureau provided participating tribal and local governments who signed a Confidentiality Agreement a count of the addresses from the Address Listing operation that are on the DMAF, by census block within their jurisdiction. They were also provided the list of individual addresses or location descriptions and copies of the Census Bureau's maps that show the streets and census block numbers within their jurisdictions. The participants were allowed to identify census blocks that had too few or too many addresses on the DMAF. They could challenge the block counts but couldn't provide specific address adds because of the difficulties matching non-city-style addresses.

If the tribal or local government indicated a discrepancy between the Bureau's count and their count, Bureau staff relisted all of the addresses in each disputed block. These addresses were then provided to the tribal or local GU for review. If the GU participant disagreed with particular addresses, they could seek a formal review through the appeal process similar to the LUCA 1998 appeal process.

The LUCA 1999 operation helped determine whether an address was delivered to the DMAF. The number of blocks challenged during the LUCA 1999 process was 114,020. Table 5 shows the outcome of the LUCA 1999 recanvassing of the 2,222,980 listed addresses in the challenged blocks. Listers added 338,756 addresses to the challenged blocks; however, 619 of the added addresses were already in the LUCA 1999 universe.

Of the addresses that the LUCA participants appealed, 18,133 addresses were accepted.

Supplemental LUCA: The LUCA 1998 and LUCA 1999 counts above include what is known as "Supplemental LUCA". Prior to sending the address lists to the participating governments in LUCA 1998, the Census Bureau determined that the lists for approximately 700 governmental units appeared to be deficient, based on Bureau estimates of numbers of housing units. The Census Bureau decided to postpone the LUCA review by participants for these areas until the Block Canvassing and Address Listing operations were completed. After these operations were completed, the Bureau also discovered that because of some changes in the way that addresses were compiled in certain geographic areas, the

addresses for some participating governments had not been sent out for review. Also some governments had inadvertently not been invited to participate in the program. All governments affected by these situations were invited to participate in the Supplemental LUCA program.

Additional addresses provided by participants through the Supplemental LUCA 1998 program did not go through field verification because of the timing of the Supplemental LUCA. Instead questionnaires were mailed to all added addresses and all corrections were incorporated into the DMAF.

CONCLUSION

The process of constructing the address list for Census 2000 was very complex. The operations that were undertaken involved input from the USPS, local governments and census field operations. Each was expected to have valuable input about particular situations. The USPS maintains a nationwide list of mail delivery points, while local governments have knowledge about annexations and new housing and are mandated to be allowed to participate in the Census address list-building process. Census Bureau field operations were performed across the country but can also fill in any gaps in housing unit coverage due to nonparticipation from governmental units or in areas where the USPS does not have sufficient mailing address information.

Determination of the status of certain addresses was impacted by the timing of the updates to the address list from the different operations. The overlapping timing of these operations also complicates any evaluation of the

effectiveness of the operations. This aspect will be examined in an evaluation of the MAF-building process. The operations discussed in this paper resulted in a total of about 98 million addresses in the Mailout/Mailback portion of the census and over 23 million addresses in the Update/Leave areas. Since November 1997, 4.4 million residential addresses in Mailout/Mailback areas have been added to the MAF from the DSF process. LUCA 1998 resulted in nearly 6.4 million adds, and Block Canvassing resulted in 6.6 million adds. Many of these added addresses overlap between operations. Corrections and deletes also resulted from the listing operations. Addresses added even in the later operations can be deleted in the Nonresponse Followup and Coverage Improvement Followup operations that occur after Census Day. Address Listing was responsible for the vast majority of the more than 23 million addresses in Update/Leave areas, while LUCA 1999 relisting and appeals put an additional 357,000 units on the MAF.

REFERENCE

Owens, Karen L. "Census 2000 Address List Review," ASA JSM Proceedings, August 2000

DISCLAIMER

This paper reports the results of research and analysis undertaken by Census Bureau staff. It has undergone a Census Bureau review more limited in scope than that given to official Census Bureau publications. This report is released to inform interested parties of ongoing research and to encourage discussion of work in progress.

Table 1. Distribution of Delivery Sequence File Addresses Across Residential Unit Status in Mailout/Mailback Areas of the Country, as reflected in the MAF*

DSF Vintage	Residential	Nonresidential	Unknown	Total
November 1997	1,826,791	438,795	92,310,594	94,576,180
September 1998	88,268,579	7,239,557	191	95,508,327
November 1999	83,399,863	6,146,042	3,665,411	93,211,316
February 2000	408,777	98,572	189,413	696,762

*These numbers are preliminary and could change in subsequent census processing.

Table 2. Block Canvassing Actions to the Master Address File*

Type of Addresses	Adds	Deletes**	Address Corrections	Geographic Corrections***
DMAF Deliverable	6,596,338	2,805,989	2,314,384	3,198,695
Total	6,601,002	5,180,691	2,314,585	3,198,748

*These numbers are preliminary and could change in subsequent census processing.

** This category includes deleted addresses, addresses converted to nonresidential status and addresses converted to uninhabitable status.

*** This category includes cases deleted from one block and added to another and cases verified in one block and added to another.

Table 3. Matching of Address Listing Adds to the September 1998 DSF*

Match Status	Count	Percent
DSF is not available in Address Listing Area	449,681	1.93%
Address Listing Add does not match to Sept 98 DSF	13,837,825	59.34%
Address Listing Add matched to a residential unit on the DSF	8,945,985	38.42%
Address Listing Add matched to a nonresidential unit on the DSF	52,334	0.22%
Total	23,285,825	100.00%

* These numbers are preliminary and could change in subsequent census processing.

Table 4. LUCA 1998 Results*

Count of...	Adds	Verified	Corrections	Deletes	Nonresidential
LUCA 1998	6,386,923	N/A	2,783,935	460,461	24,928
Field Verification	N/A	1,766,601	918,000	2,387,988	251,536
Appeals	275,214	N/A	N/A	10,429	N/A

* These numbers are preliminary and could change in subsequent census processing.

Table 5. LUCA 1999*

Count of...	Adds	Verified	Corrections	Deletes	Nonresidential
Relisting	338,756	1,685,099	389,313	144,392	3,557
Appeals	18,133	N/A	N/A	N/A	N/A

* These numbers are preliminary and could change in subsequent census processing.