

## RURAL PRE-CENSUS ADDRESS LIST DEVELOPMENT

Joan Hazard, Michael Tenebaum and George Sledge, United States Bureau of the Census\*  
Joan M. Hazard, Statistical Support Division, Washington, DC 20233

### Introduction

For the 1990 Decennial Census, the mail census methodology will be conducted in urban and rural mail delivery areas. A necessary component in planning and conducting a mail census is the creation of a residential address file. In urban and suburban areas, the Census Bureau purchases a commercial address list from one or more vendors. In selected rural areas of the country, the Bureau compiles its address list by canvassing the ground during an operation called PRELIST. After the prelist operation, the Bureau conducts several coverage checks on the prelist file, including postal updating during the ADVANCE POST OFFICE CHECK (APOC). Since the results of the APOC are used to update the address file, the Bureau conducts a special field operation to verify the accuracy of the APOC results. This operation is called APOC RECONCILIATION. The end result of these overlapping checks is a comprehensive and complete pre-census address file that can be used to deliver a census questionnaire to each living quarters. This paper presents some results of the development of the rural pre-census address list for the 1988 Dress Rehearsal.

### The Prelist

#### Background

For the 1988 Dress Rehearsal, a prelist operation was conducted in parts of six counties in Eastern Washington state and all of 14 rural counties in Eastern Missouri. These areas were chosen to approximate a prelist environment similar to the 1990 Census.

The Washington site was sparsely populated, yet had some city mail delivery in small towns scattered throughout the area. These small towns were designated as prelist pockets for the Dress Rehearsal.

The Missouri site was a typically rural area with a mixture of city and rural delivery addresses.

During the prelist, the enumerators systematically canvassed each assigned block, conducted a short interview to obtain mailing address information, recorded location information in an address register, and map spotted the location of each living quarters on a census map. Each completed address register underwent a thorough edit by a crew leader and another full edit in the district office. Registers with edit failures were reassigned for correction. Registers that passed the office edits

were shipped to the processing offices for keying.

Advance listing was the quality assurance component of the operation. Before the actual prelist began, specially trained enumerators visited a sample of blocks to list and map spot six addresses. After the regular prelist enumerator finished work in an advance listed block, a supervisor matched the lister's work against the advance listing. Blocks with potential problems were adjudicated.

### Results

As shown in Table 1, the prelisters in the Washington site identified a total of 41,119 living quarters in the six towns. Over 95 percent of the living quarters had city type mailing addresses (house number/street name). Almost 65 percent of the incomplete addresses in Washington did not have house numbers, as shown in Table 2.

In the Missouri site, the prelist enumerators identified a total of 162,387 mailing addresses. Forty-nine percent were rural type addresses (non-house number), 34 percent had house numbers and the remainder had incomplete addresses. As shown in Table 3, over 19 percent of the incomplete addresses for Missouri were vacant units. In addition, 100 clusters were reported in the Missouri site. Clusters were defined as inaccessible living quarters for which mailing address information could not be obtained.

For Missouri, The results from APOC discussed later showed that 93 percent of the prelist addresses for Washington which were reviewed during the postal check were considered deliverable by the United States Postal Service (USPS). Some of the addresses considered undeliverable were the result of the prelisters recording only a location description and resident surname for units where additional information could not be ascertained.

For the Missouri site, the APOC results showed that 84 percent of the addresses sent to APOC were considered deliverable. Most of the undeliverables were in areas with a high concentration of seasonally vacant units, where prelisters could not obtain adequate mailing addresses.

The quality assurance results from the advance listing for Washington showed that three percent of the assignment areas required adjudication, which

indicates that city delivery areas are relatively easy to canvass.

The results of the quality assurance program for the Missouri site showed that over sixty percent of the assignment areas required recanvassing due to discrepancies between the advance listing and the prelist. However, the

adjudication found that the majority of these discrepancies were caused by advance lister errors. In order to prevent extensive recanvassing for the 1990 prelist, procedures were developed for identifying the source of errors and recanvassing only areas which the prelist enumerator listed incorrectly.

TABLE 1

Prelist Addresses by Address Type

	WA	(%)	MO	(%)
Total Prelist Addresses*	162,387	(100.0)	41,119	(100.0)
Urban Addresses	55,345	(34.1)	39,605	(96.3)
Rural Addresses	78,914	(48.6)	1,188	(2.9)
Incomplete Mailing Addresses	27,223	(16.8)	122	(0.3)
Special Places	805	(0.5)	204	(0.5)
Clusters	100	(0.1)	0	(0.0)

\*3.8% of the Washington prelist addresses and 20% of the Missouri prelist addresses were for vacant housing units.

TABLE 2

Washington Prelist Address Composition Tallies  
By Address Type

	Urban	(%)	Rural	(%)	Incomplete	(%)
Total Addresses	39,605	(100.0)	1,188	(100.0)	122	(100.0)
Addresses w/House Number	39,538	(99.8)	3	(0.2)	79	(64.8)
Addresses w/Street Name	39,605	(100.0)	1,181	(99.4)	41	(33.6)
Addresses w/Unit Desig.*	12,302	(31.1)	210	(17.7)	25	(20.5)
Addresses w/Householder Name*	47	(0.1)	1,132	(95.3)	0	(0.0)
Addresses w/Location Info.	49	(0.1)	1,174	(98.8)	28	(23.0)
Addresses for Vacant Units	1,480	(3.7)	65	(5.5)	29	(23.7)

\*Prelist enumerators were instructed not to record householder name and physical location information for city delivery addresses.

TABLE 3

Missouri Prelist Address Composition Tallies  
By Address Type

	Urban	(%)	Rural	(%)	Incomplete	(%)
Total Addresses	55,345	(100.0)	78,914	(100.0)	27,223	(100.0)
Addresses w/House Number	53,999	(98.0)	1,041	(1.3)	495	(1.8)
Addresses w/Street Name	55,345	(100.0)	76,908	(97.4)	26,368	(96.7)
Addresses w/Unit Desig.*	13,907	(25.0)	5,491	(7.0)	2,136	(7.9)
Addresses w/Householder Name*	466	(0.1)	76,072	(96.4)	0	(0.0)
Addresses w/Location Info.	1,412	(3.0)	78,072	(99.0)	26,630	(97.8)
Addresses for Vacant Units	3,178	(6.0)	4,226	(5.4)	24,893	(91.4)

\*Prelist enumerators were instructed not to record householder name and physical location information for city delivery addresses.

## ADVANCE POST OFFICE CHECK (APOC)

### Background

The Advance Post Office Check (APOC) was the first coverage check on the file of addresses compiled during the prelist operation. As such, it was one in a series of overlapping checks designed to ensure that the pre-census address list was complete and accurate. The purpose of the APOC was to have the United States Postal Service (USPS) examine the addresses compiled during prelist in preparation for the mail census. The most important reason for conducting APOC is the improvement of coverage in the prelist areas. In addition, the address information obtained during prelist may not always agree with the USPS address information and therefore, the APOC may improve the deliverability of the prelist addresses.

Following the processing of the prelist file, the addresses of all known living quarters were printed on address cards (known as buff cards because of their color), sorted by ZIP code and carrier route, and shipped to the local post offices. The local carriers were asked to examine the address cards and determine if each address was deliverable with or without minor corrections. The carriers also identified duplicate address cards and prepared a Post Office Report Of Missing Address (a blue-colored card) for any residential address on their route for which no buff card was received.

### Results

Prelist resulted in 202,497 addresses; 161,582 for the Missouri site and 40,915 in Washington. Of these, 175,052 were sent to the USPS for the APOC. The addresses withheld from APOC were either deliberately suppressed for quality control purposes or met the Bureau's definition of "known undeliverables." Known undeliverables are addresses that the Bureau identified as lacking sufficient address information.

Nearly 14 percent of the prelist addresses were classified as known undeliverables and consequently withheld from the APOC.

The USPS carriers classified 86.4 percent of the prelist addresses sent to APOC as deliverable, with or without minor corrections. For the Missouri site, 84.2 percent were considered deliverable while 93.6 percent were deliverable in the Washington site. This reflects the nature of the address systems in the two sites. The prelist areas of Washington were predominantly city delivery, while the prelist areas of Missouri were a mixture of city and rural delivery.

About 11 percent of the prelist addresses required minor corrections by the postal carriers. The majority of the corrections to the buff cards were for rural route and street name, as would be expected, since many rural routes were unmarked.

The postal service prepared 24,764 Report of Missing Address blue cards during APOC. The carriers prepared 21,839 blue cards for the Missouri site and 2,925 for Washington.

During the APOC operation, the carriers classified about 3 percent of the prelist addresses as duplicates. Of the addresses sent to APOC for the Missouri site, 3.4 percent were coded as duplicates, whereas only 0.9 percent of the Washington prelist addresses were coded as APOC duplicates.

## APOC RECONCILIATION

### Background

The APOC reconciliation was a further attempt to verify the completeness and accuracy of the pre-census address file. The reconciliation was a field check conducted by Census Bureau enumerators to (1) locate each blue card address to determine if it was already in the census file and if not, to add it, (2) obtain, if possible, a better mailing address for cases returned as undeliverable by the USPS during APOC or cases withheld from APOC as known undeliverables, and (3) field check each address classified as a duplicate during APOC.

Following the processing of the APOC materials, the Bureau produced a listing of all the prelist addresses, including those withheld from APOC or marked undeliverable during APOC. Using the assignment listing and the blue cards, enumerators attempted to verify or resolve the information provided by the USPS during the APOC. The enumerators tried to obtain better addresses for undeliverables, and searched for each blue card address on the ground. Once a blue card address was found, the enumerators applied special match rules to determine if the case was already in the listing under an alternate address since many of the blue cards were filled for addresses withheld from APOC or for undeliverables that were already in the census files. Thus, the reconcilers had to be certain that the living quarters was not already in the files before coding it as a valid add.

The APOC reconciliation for the Dress Rehearsal included three significant procedural refinements. First, a formal verbatim training package replaced the less structured training methods used earlier in the test census cycle. Second, the APOC reconcilers were supplied with computer generated listings

in place of the actual APOC buff-colored address cards. In previous test censuses, the reconcilers received the buff cards as well as a supplemental listing of prelist addresses. Third, addresses considered duplicated during APOC were not differentiated from other types of undeliverables in the field materials. The purpose was to see if the reconcilers could successfully resolve duplicates without information identifying them as such. This procedure was part of a special study of APOC duplicates discussed later in this paper.

## Results

A total of 9,571 undeliverable addresses were assigned for APOC reconciliation; 7,208 in Missouri and 2,363 in Washington. For the Missouri site, nearly 64 percent of the undeliverables assigned for reconciliation had been classified as undeliverable by the USPS during APOC, and the remaining addresses had been withheld from APOC because they did not contain sufficient address information. For Washington, 95 percent of the undeliverables came from APOC since only five percent were withheld as known undeliverables.

Over 4 percent of the undeliverable addresses for Missouri were coded for deletion; in Washington this figure is almost 11 percent. The enumerators coded addresses for deletion if the structures were demolished, condemned, converted into something other than living quarters, could not be found in the field or were true duplicates.

Almost 30 percent of the APOC undeliverables were verified as correct mailing addresses by the householders. In some cases, the address on the APOC card may have misled the carrier because unit designations did not always appear. The Bureau plans to display unit designations on the APOC cards for the 1990 Census.

During the APOC, the carriers identified 1001 alleged duplicate addresses in Missouri and 377 in Washington. Duplicates were treated the same as undeliverables during the reconciliation. Both addresses in a pair of alleged duplicates were assigned for reconciliation as undeliverables.

The reconciliation enumerators obtained a corrected and presumably better address for over 64 percent of the undeliverables and one-third of the duplicates in Missouri. About 66 percent of the undeliverables and 37 percent of the duplicates in Washington were corrected. For Missouri, rural routes and householder names comprised the majority of the corrections. For Washington, the house number and street name were corrected most frequently,

although most were minor spelling errors.

As shown in Table 4, 1,964 addresses were added to the pre-census mailing list following the APOC reconciliation; 1,177 in Missouri and 787 in the Washington site. Seventy-six percent of the adds in Missouri came from blue cards, while almost 98 percent of the adds in Washington came from the blue cards. The remaining adds were addresses that the reconcilers found in the routine course of their duties which were apparently missed in prelist and in APOC.

Thirteen percent of the blue cards in Missouri resulted in adds to the pre-census mailing list. For Washington, 19 percent of the blue cards identified units missing from the census files. This indicates the importance of conducting a field reconciliation of blue card addresses, and is consistent with earlier test census results.

About 40 percent of the blue card addresses in each site matched to undeliverable addresses already in the census files. Surprisingly, almost 20 percent of the blue card addresses in each site matched to a deliverable address in the files. Presumably, these are cases in which the USPS carriers completed a blue card for addresses whose APOC card was misplaced or destroyed prior to the APOC, or for living quarters that did not meet the census definition of a separate housing unit but which the carriers considered a separate living quarters.

The reconcilers were unable to locate about 12 percent of the blue card addresses in Missouri and about 9 percent in Washington. The enumerators were instructed to use the geocode of the nearest deliverable unit in conjunction with the prelist map and computer listing to locate the blue card addresses. However, some rural addresses were difficult to locate because the nearest deliverable unit was several miles away. It is not possible to estimate the number of these cases that would have been true adds.

Thirteen percent of the Missouri blue cards were coded as "Outside Test Site" by the reconcilers. However, closer investigation revealed that many of these addresses were inside the test site but outside the specific enumerator's assignment area. Thus, some proportion of these cards may have been true adds in an adjacent assignment area. This procedural problem may have reduced the coverage gain and is currently being addressed for 1990.

The APOC reconciliation showed a net coverage gain of 2.2 percent for Missouri and 1.7 percent for Washington, as shown in Table 4. These are potential net gains, since the results of subsequent operations determine the final coverage gain.

TABLE 4

## APOC Reconciliation Summary

	Total	(%)	MO	(%)	WA	(%)
Prelist Addresses						
Prior to Reconciliation	88,771	(100.0)	47,856	(100.0)	40,915	(100.0)
Addresses Corrected (During Rec)	7,839	(8.8)	5,776	(12.1)	2,063	(5.0)
Duplicates/Deliverables						
Coded for Deletion	219	(0.2)	127	(0.3)	92	(0.2)
Undeliverables						
Coded for Deletion	548	(0.6)	293	(0.6)	255	(0.6)
Not Changed	80,165	(90.3)	41,660	(87.0)	38,505	(94.1)
Addresses Added to File After Reconciliation	1,964	2.2%	1,177	2.4%	787	1.9%
Prelist Addresses After Reconciliation	89,968	(na)	48,613	(na)	41,355	(na)
Net Coverage Gain	1,745	2.0%	1,050	2.2%	695	1.7%

Supplemental Study of APOC DuplicatesIntroduction

One of the tasks that the USPS carriers were instructed to perform during the APOC was to identify duplicate addresses by transcribing identification codes from the first card for a duplicate to the other cards for the address.

As one part of our investigation into ways to simplify the postal updating operations for the USPS, the Census Bureau questioned the need for the postal carriers to do the transcription of identification codes onto duplicate address cards.

For the Dress Rehearsal APOC, postal carriers transcribed the codes for duplicate address cards, but these cases were not differentiated from other types of undeliverables on the field reconciliation listings. Both addresses in a pair of duplicates were assigned for follow up as undeliverable addresses. If the reconcilers did a good job of deleting true duplicates while retaining valid addresses in the file, this would suggest that the postal transcription is not necessary for the 1990 Census.

The duplicates assigned for reconciliation in the Missouri site were revisited by independent verifiers. The independent verifiers were told which addresses were considered duplicates of each other during APOC. Because the independent verifiers were experienced enumerators and because they had access to more information about the duplicate addresses than did the APOC reconcilers, we assumed that the independent verification provided the number of true duplicates that should have been deleted during APOC reconciliation.

The study examined two variables: how well the APOC reconcilers deleted true duplicates from the census files and how well the reconcilers retained valid addresses in the file.

Results

The postal carriers identified 390 pairs of duplicate addresses and 179 unpaired duplicates.

The 959 duplicate addresses (390 pairs plus 179 unpaired) represent about two percent of the prelist addresses in the mailout/mailback area.

During the APOC reconciliation, the reconcilers deleted 72 addresses from the file as true duplicates. The study showed that reconcilers failed to delete about fifty percent of the true duplicates. While this miss rate seems disturbing, its effect on the accuracy of the pre-census address file is minimal. Since the true duplication rate in the pre-census address file is only two-tenths of one percent, the high error rate seen during APOC reconciliation resulted in only a one-tenth of one percent duplication rate in the pre-census file.

The reconcilers deleted only 14 valid addresses from the prelist file. This suggests that the modified procedure for identifying duplicates as undeliverables on the field materials did not impact the reconcilers' ability to recognize valid living quarters.

An examination of the data showed a high transcription error rate during APOC. The data suggest that the carriers transcribed an incorrect identification code to about eleven percent of the cards, and did not transcribe any codes to about thirty percent of the cards.

This suggests that the transcription operation does not result in high quality data, and is not particularly worthwhile.

### Operational Considerations

The Dress Rehearsal prelist, APOC and APOC reconciliation encountered very few significant operational problems. In almost all cases, the operational problems that occurred were solved for the 1990 pre-census operations by incorporating procedural refinements recommended by field staff, Headquarters observers and a special Headquarters Task Force, which made an intensive study of the entire prelist operation.

The Census Bureau developed an innovative approach to map training for prelist enumerators which involved using a gameboard simulation that enabled enumerators to practice the prelist procedures without going into the field.

The prelist procedures have been refined to clarify the handling of seasonally vacant units, develop more efficient path of travel rules, and provide instructions for handling mobile home parks and other unusual types of housing units.

In the Missouri test site, about 17 percent of the prelist addresses were not sent to the USPS for the APOC operation because they were obviously undeliverable, many of which were seasonally vacant units where mailing address information could not be obtained. For 1990, areas in which the Bureau has reason to anticipate significant delivery problems will be enumerated using an update/leave methodology. Under this methodology, enumerators will deliver the census questionnaires rather than relying on the USPS. Thus, addresses that would be considered undeliverable by the USPS may contain enough information (such as a map spot and location description) to allow an enumerator to deliver the questionnaire. In Missouri, nine whole prelist counties and the majority of three prelist counties were converted to the update/leave methodology for the 1988 Dress Rehearsal, as well as the 1990 Census.

The APOC carriers apparently had trouble understanding the procedures for filling the blue cards, especially for rural addresses. Over 15 percent of the blue cards did not provide enough information to allow the Bureau to assign the address for reconciliation. The quality control program has been modified for the 1990 census to help eliminate this source of error.

The major operational flaw in the APOC reconciliation procedures was that the enumerators were told to limit their search for a blue card address to their specific assignment area. As a result,

some of the blue cards that enumerators could not find may have been true adds in an adjacent assignment area. The search will be extended for 1990.

### Summary

The 1988 Dress Rehearsal was designed to simulate the 1990 Decennial Census in test areas in Missouri and Washington State. The Dress Rehearsal confirmed the effectiveness of selected programs involved with rural address list development while revealing the weaknesses of others. For the prelist and the APOC reconciliation, two training modifications proved to be quite effective. The gameboard simulation of the prelist was well-received during prelist training and the APOC reconciliation verbatim training package served to better prepare the enumerators for address verification. In addition, the use of computer generated listings instead of APOC cards for the APOC reconciliation did not present any significant problems.

From a coverage standpoint, the results of the APOC suggest that the prelisters did a good job of obtaining deliverable mailing addresses, although the deliverability rate for Missouri was substantially lower than that of the Washington site due to the large number of seasonally vacant units. The APOC reconciliation results revealed a net coverage gain of 2.2 percent for Missouri and 1.7 percent for Washington, although the results of subsequent coverage improvement operations determine the final coverage gain.

A special study was conducted to see whether the APOC reconcilers could successfully resolve duplicate addresses if they were not identified as such in the field materials. The results showed that the reconcilers did not erroneously delete many valid addresses and they correctly deleted about one-half of the true duplicates. Based on these results, the Census Bureau will not require the USPS to transcribe identification codes to duplicate address cards for the 1990 Census.

The operational problems identified during the Dress Rehearsal, resulted in several procedural refinements for the national prelist, APOC and APOC reconciliation. Overall, the 1988 Dress Rehearsal served as an effective method for evaluating the compilation of the rural pre-census address list in preparation for the 1990 Census.

\*This paper reports the general results of the research undertaken by the Census Bureau staff. The views expressed are attributable to the authors and do not necessarily reflect those of the Census Bureau.