

Study of the U.S. Postal Service Reasons for Undeliverability of Census 2000 Mailout Questionnaires

FINAL REPORT

This evaluation reports the results of research and analysis undertaken by the U.S. Census Bureau. It is part of a broad program, the Census 2000 Testing, Experimentation, and Evaluation (TXE) Program, designed to assess Census 2000 and to inform 2010 Census planning. Findings from the Census 2000 TXE Program reports are integrated into topic reports that provide context and background for broader interpretation of results.

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EXECUTIVE SUMMARY

During the mailout of Census 2000 questionnaires, the United States Postal Service designated questionnaires as undeliverable as addressed if the mail piece could not be delivered successfully to the labeled address. These mailing pieces with the enclosed questionnaire were annotated with a reason for undeliverability and sent back to the Census Bureau. From the undeliverable questionnaires received, a stratified systematic sample was drawn for the purpose of conducting a study of the reasons for undeliverability. This evaluation examines the distribution of reasons for undeliverability. In addition, inferences are drawn from the sample to the general universe of Census 2000 undeliverable questionnaires at a national level. Furthermore, this evaluation investigates whether the reason for undeliverability is a valid indicator of the final census status of a housing unit. Where possible, the results of the Census 2000 analysis of undeliverable questionnaires are compared to those results experienced in 1990.

What was the Overall Undeliverable As Addressed Questionnaire Workload?

From the results of our sampling procedure, a total of 9.7 million Undeliverable As Addressed questionnaires were received at the National Processing Center in Jeffersonville, Indiana. Note that the undeliverable questionnaires that were successfully redistributed by the redistribution operation conducted by selected Local Census Offices are not included in the workload received at the National Processing Center.

For What Reasons were Census 2000 Questionnaires Undeliverable?

The primary interest of this study was to identify frequent reasons for undeliverability based on our defined categories of undeliverability. The most common reason Census 2000 questionnaires were not deliverable was due to the fact that the housing unit was identified as vacant by the United States Postal Service. Almost half of the undeliverable questionnaires received were stamped or annotated with a “vacant” reason for undeliverability. The Postal Service policy is such that mail is not delivered to vacant units. Following questionnaires not delivered to vacant units, labeled addresses identified as “no such address” composed the next largest portion of undeliverable questionnaires. For these cases the Postal Service is claiming the labeled address does not exist. The next largest portion of undeliverable mailing pieces were labeled addresses that were identified as not having a mail receptacle. These may be cases where the respondent collects their mail at a Post Office Box as opposed to their place of residence. The remaining undeliverability categories (duplicate, under construction, demolished, non-residential, no such apartment, post office box, not deliverable and unable to forward, outside delivery limits, refused, blank other, and illegible) each contributed 6 percent or less to the universe of undeliverable questionnaires.

How do the 1990 Results Compare to the Census 2000 Results?

The results from the 1990 study of reasons for undeliverability were compared to the Census 2000 results to determine if there were any significant differences. Note that the sub-domain of undeliverable questionnaires classified as “vacant” were excluded from this comparative analysis due to a difference in Census Bureau policy in the 1990 census on the delivery of questionnaires to vacant housing units by the United States Postal Service. From our analysis, we found that there was substantial reduction in Census 2000 in the percentage of undeliverable questionnaires marked as “duplicate.” We also had decreases in the rate at which questionnaires were classified as “demolished/new construction,” “non-residential,” “no such apartment.” In contrast, we observed a fairly large increase in the percentage of questionnaires marked “no such address.” We also observed increases in the percentage of questionnaires marked “post office box,” and “no mail receptacle.”

What were the Final Census Status Results of the Undeliverable Questionnaires?

Given the annotated reason for undeliverability on a returned mailing piece, a question of great interest would be whether the annotated reason for undeliverability is a reliable indicator of the final census status for the given labeled housing unit address. At the very least, one would hope that any questionnaire designated as undeliverable indicated the labeled address corresponded to an unoccupied housing unit. From our results, we observed that the vast majority (78 percent) of undeliverable questionnaires were in fact unoccupied. More specifically, 31 percent of the total undeliverable questionnaires received a final census status of vacant and 47 percent received a final census status of delete. However, approximately 22 percent were given a final census status of occupied. In comparison to 1990, these rates were not significantly different from those rates experienced in 1990 except for the category of delete. The rate at which undeliverable questionnaires received a final status of delete in Census 2000 increased an estimated 4 percentage points.

In addition to reviewing the overall final census status results, we were also interested in reviewing the final census status results for each defined category of reason for undeliverability. We found that for the questionnaires marked “vacant”, approximately 50 percent of these cases actually received a final census status of vacant. Assuming the final status is correct, this implies the postal service correctly identifies vacant units about half of the time. We also note that 22 percent of the questionnaires marked vacant received a final status of occupied. For the questionnaires marked as “post office box” or “no mail receptacle,” we estimated that 48 percent of these cases were in fact occupied. This highlights the troublesome aspect of using mailout mailback to enumerate respondents who do not receive mail at their place of residence. A much more favorable result, we estimated that 85 percent of questionnaires marked “demolished,” “new construction,” or “non-residential” received a final status of delete. Furthermore, we estimated 77 percent of questionnaires marked “no such address” or “no such apartment” received a final status of delete.

What are the Recommendations?

In summary, we were able to draw inferences from our sample to the general universe of undeliverable questionnaires excluding questionnaires that were successfully delivered during the Local Census Office redistribution operation. Specifically, we estimated the overall distribution of reasons for undeliverability of Census 2000 questionnaires. Furthermore, we were able to make inferences about the final census status results of the undeliverable as addressed questionnaires as well as review these results for each of our defined categories of reasons for undeliverability. In addition, where possible each of our analysis results were compared with the results experienced during the 1990 census.

One of the largest portions of the undeliverable questionnaire workload consisted of questionnaires marked as “no such address” or “no such apartment.” In addition, 77 percent of these undeliverable questionnaires resulted in a final census status of delete. Undeliverable questionnaires of this type are likely missing address elements or contain incorrect address elements. **We recommend using United States Postal Service products/services such as the Address Element Correction service prior to Census mailout to provide corrections to addresses or to identify potentially undeliverable addresses in the mailout/mailback address list.**

In addition to the undeliverable questionnaires marked as “no such address” or “no such apartment,” other reasons for undeliverability have proven to be good indicators of final census status. Specifically, we observed questionnaires marked as “vacant” make up 45 percent of the undeliverable questionnaire workload and 50 percent of the time these cases result in a final status of vacant. Furthermore, 9 percent of the undeliverable questionnaire workload came from questionnaires annotated with “post office box” or “no mail receptacle” and 48 percent of these undeliverable questionnaires resulted in a final census status of occupied. **Given that each of these categories contribute a substantial portion to the overall undeliverable questionnaire workload and provide a fairly good indicator of final status, we recommend that for the 2010 census we capture the data for the Postal Service’s reasons for undeliverability and use these data as a factor in the determination of final census status.**

1. BACKGROUND

During the mailout of Census 2000 questionnaires, the United States Postal Service designated questionnaires as undeliverable as addressed if the mail piece could not be delivered successfully to the labeled address. These mailing pieces with the enclosed questionnaire were annotated with a reason for undeliverability and sent back to the Census Bureau. From the undeliverable questionnaires received, a stratified systematic sample was drawn for the purpose of conducting a study of the reasons for undeliverability.

1.1 Census 1990 Study of Undeliverable As Addressed Questionnaires

During the 1990 Census, the Census Bureau examined the Undeliverable As Addressed (UAA) questionnaires which were not successfully redistributed by the district offices during the UAA questionnaire redistribution operation. In doing so, a 10 percent systematic sample of the 659 pallets of undelivered questionnaires was selected. From the 66 sample pallets, eight cartons of undelivered questionnaires from each pallet were selected with equal probability. This resulted in a sample of size $n = 156,697$ questionnaires. The United States Postal Service (USPS) undeliverability reason was annotated on the questionnaire by the postal carrier. The sample of undelivered questionnaires was sorted by the USPS undeliverability reason. Once the undelivered questionnaires were sorted and batched by USPS undeliverability reason, the batches were sent for data entry. The Census Bureau estimated totals, percents, and sampling variances for each of the USPS undeliverability reasons by final census status and type of enumeration area.

Analysis based on the sample drawn from the UAAs returned to Jeffersonville showed that there were approximately 5,272,000 UAAs which represented about 6 percent of the mailout universe. Over a third of the UAAs were labeled “vacant” by the USPS and almost a quarter of the UAAs were labeled “no such address”. Further analysis showed that 23.7 percent of the UAAs were given a final census status of occupied. Of the UAAs labeled as “vacant,” approximately 20 percent were given a final census status of occupied (U.S. Bureau of the Census, 1993).

1.2 Census 2000 Process Flow of Undeliverable as Addressed Questionnaires

As in 1990, the Census Bureau sampled UAA questionnaires returned to the National Processing Center (NPC) at Jeffersonville. Before sampling, a UAA followed the described process flow. During questionnaire mailout, clerks at local post offices designated addresses that did not match to a carrier route as UAA. Additional questionnaires were designated as UAA by individual carriers. The UAAs were returned to their USPS Sectional Center Facility (SCF).

Mailed questionnaires that were designated UAA by the USPS were either sent to the NPC at Jeffersonville, Indiana or were retrieved by the Census Bureau from the USPS SCFs to be included in the Local Census Offices (LCO) redistribution operation. Previous to the mailout of Census 2000 questionnaires, the Census Bureau identified ZIP codes that were likely to have

high concentrations of UAAs. Any UAA labeled with one of these pre-identified ZIP codes was retrieved by the Census Bureau from the USPS SCFs that processed mail for these pre-identified ZIP codes. Designated “lead” LCOs coordinated the pick up of UAAs from each of these SCFs. The “lead” LCOs then distributed UAA workloads to neighboring LCOs that were geographically linked to the pre-identified ZIP codes. The UAAs that did not fall into the pre-identified ZIP codes for redistribution were sent back to the NPC at Jeffersonville.

After the LCOs received their UAA workloads for redistribution, the questionnaires were checked in, sorted into enumerator assignments, and then enumerators attempted to redistribute the questionnaires. Note that if an enumerator ascertained a housing unit was vacant through observation then the corresponding UAA was not delivered. A limitation in the operational plan was the lack of a quality control process to verify enumerator delivery of UAAs. If a successfully delivered UAA was mailed back by the respondent and received by the Census Bureau before the “cut” for Nonresponse Followup (NRFU) then the housing unit was excluded from NRFU. However, UAAs not received before the “cut” for NRFU were eligible for NRFU. Questionnaires not redistributed were checked out of the LCO and shipped to NPC on a priority basis. Non-redistributed cases became NRFU cases unless census data were collected for the housing unit before the NRFU “cut” through another source other than a mailed questionnaire such as the Telephone Questionnaire Assistance (TQA) program or the Internet Data Collection (IDC) program.

At NPC, a sample was drawn and a data file was created from the UAAs received. Arriving at NPC, UAAs were processed through a sorter with bar code reading capability. During the sorting process, Census Identification (ID) numbers were collected from the mailing pieces and the pieces were sorted by long and short form. Due to the sorting and the difference in envelope size of short (10 1/8" x 6") and long forms (12 3/16" x 10 1/4"), short forms were placed in a shallow mail tray and long forms were placed in a deep mail tray. Each short form tray held approximately 400 short form UAAs and each long form tray held approximately 125 long form UAAs. A systematic sample of the UAAs was then hand selected from each of the mail trays.

2. METHODOLOGY

2.1 Sample Design

The sample design for drawing a sample from the UAA universe at NPC consisted of a stratified systematic sample design (Cochran, 1977). As described in Section 1.2, the UAAs were sorted by long and short forms into mail trays. Therefore, strata were formed based on form type and mail tray. Finally, a systematic sample was selected from each stratum. The systematic sampling process was performed by clerks. For each mail tray, a random start was chosen to select the first UAA from the mail tray and then every 34th UAA was selected ($f = 1/34$). The sampling rate was based on an estimate of the number of UAAs predicted to be sent to NPC and our desired level of precision for our estimates (U.S. Bureau of the Census, 2000a).

Once the sample was selected, the UAAs were clerically sorted by UAA reason into 15 broad categories (see appendix). Each UAA was annotated with a number corresponding to a category. After sorting was completed, the UAAs were sent on a flow basis by category to scanning workstations. The Census ID number on each questionnaire was scanned by a bar code reader and the category code was keyed or scanned (U.S. Bureau of the Census, 2000b).

Due to the fact that we did not collect information indicating the tray from which a UAA was sampled, we are not able to derive any estimates and standard errors of the estimates based on the strata created from both form type and tray. However, we did collect information indicating the form type of the sampled UAA, thus allowing us to stratify based on form type. Furthermore, during the clerical process, forms were batched according to reason for undeliverability which may have disrupted any natural geographic ordering of the forms. Therefore, we are limited to assuming a stratified simple random sample model to derive any estimates and standard errors of the estimates in our analysis. In other words, for the purposes of this study we assume a stratified simple random sample design where we have two strata defined by form type (long and short).

2.2 What were the data sources used in this evaluation?

The main source of data for this evaluation came from the sample of UAAs drawn from the UAAs checked in at NPC. The data collected from the UAA sample provided the census identification number and a reason for undeliverability for each sampled case. In addition to the data collected from the sample, a combination file of all the Census 2000 operational files was ancillary to conducting this evaluation.

2.3 Applying Quality Assurance Procedures

We applied quality assurance procedures throughout the creation of this report. They encompassed how we determined evaluation methods, created specifications for project procedures and software, designed and reviewed computer systems, developed clerical and computer procedures, analyzed data, and prepared this report.

3. LIMITATIONS

We note that some UAAs were part of the LCO redistribution operation. Therefore, not all questionnaires designated as UAA by the U.S. Postal Service were received by the Census Bureau at NPC. Since the characteristics of the UAAs in the LCO redistribution operation may differ substantially from those received at NPC, we cannot make inferences from the sample estimates to the overall universe of UAAs. Note that this limitation may affect the recommendations provided by this evaluation.

The sampling process was in turn a tremendous clerical process due to the fact that there were no automated processes incorporated into the sampling process. Clerks were tasked with hand selecting a systematic sample from every mail tray of UAAs received at NPC. In doing so, we employed a measurement technique to draw a systematic sample from each tray. Our sampling interval of 34 UAAs was approximated by a distance measurement (inches) of 34 UAAs contained in a mail tray holding 125 long forms or 400 short forms (U.S. Bureau of the Census, 2000a). Clearly, this method of systematic sampling may not have always maintained our desired sampling rate of $f = 1/34$ due to variation in the volume of forms held by the mail trays. In addition, there is the potential for human error using this technique. Aside from the limitations of our sampling technique, we also recognize the potential for error due to other clerical processes. For example, due to the large number of trays handled, clerks may have inadvertently sampled from a tray more than once or some trays may have been omitted during the sampling process. We assume for the purposes of this evaluation that these errors were minimal and do not seriously affect the results of our study.

Our stratified systematic sample design may not have closely adhered to our desired sampling rate of $f = 1/34$. This is due to the fact that the forms in the mail trays did not divide up evenly into intervals of size 34. Thus, the systematic sample sizes for each of the mail trays varied in size by one. This disturbance is probably negligible since we would expect the variation in sample size from tray to tray to be random. Hence, we ignore this disturbance, for simplicity, in the presentation of our results.

4. RESULTS

4.1 What was the Overall UAA Workload?

As a result of our sampling procedure, we collected 285,630 long and short form UAAs from the entire workload of UAAs received at NPC. Given our sampling rate of $f = 1/34$, this implies that we received a total of 9,711,420 UAAs. As a comparison, a total workload of 10,478,481 UAAs was recorded by the Census Bureau production files. The UAA workload reported by the production files is larger due to the fact that the production file count includes UAAs that were part of the UAA LCO redistribution operation. Not all of the UAAs in this redistribution workload were returned to NPC. If a UAA was “successfully” delivered to a housing unit during this operation then that particular UAA was never received at NPC. There were 1,480,212 UAAs successfully delivered to housing units during the redistribution operation (U.S. Bureau of the Census, 2001). Therefore, according to the production files, we received 8,998,269 UAAs at NPC which reflects the “true” workload received at NPC.

The workload derived from our sample reports 713,151 more UAAs than the “true” workload. Since this difference brings into question the legitimacy of our study, we discuss the potential causes for the difference in the reported workloads and whether our results are seriously affected. Possibly, UAAs that were “successfully” delivered may have ended up back in the mail stream and were eventually returned to NPC, thus inflating our workload derived from the sample. This could have occurred if a mail carrier retrieved a Census re-distributed UAA from a housing unit and placed the mail piece back in the mail stream. In addition, a Census enumerator could have placed some or all of their UAA workload assignment in a USPS mail drop box. Another, potential factor contributing to the disagreement between the two workloads may be due to the occurrence of error during the sampling process. For example, clerical staff could have inadvertently sampled multiple times from a given mail tray. In addition, since the sampling was performed by hand, we would expect the sampling rate of $1/34$ to be compromised at times. Furthermore, the limitations of our sample design described in Section 3 may be contributing to the workload discrepancy. Given that the purpose of this paper is to examine percent distributions based on the reasons for undeliverability and not count distributions, the discrepancy in the totals of the two workloads probably does not seriously affect the results of our analysis.

4.2 For what Reasons were Census 2000 Questionnaires Undeliverable?

Our primary interest is to investigate the overall distribution of reasons for undeliverability of Census 2000 questionnaires based on our defined categories. Table 1 gives the percent of UAAs by category of reason for undeliverability. In addition, the standard errors of the percent estimates and the 95 percent confidence limits (CL) are given. Note that all of the given rates proved to be significant. From Table 1, we see that the most common reason Census 2000 questionnaires were not deliverable was due to the fact that the housing unit was identified as vacant by the U.S. Postal Service. The Postal Service policy is such that mail is not delivered to

vacant units. Following questionnaires not delivered to vacant units, labeled addresses identified as “no such address” composed the next largest portion of undeliverable questionnaires. For these cases the Postal Service is claiming the labeled address does not exist. The next largest portion of undeliverable mailing pieces were housing units that were identified as not having a mail receptacle. These may be cases where the respondent collects their mail at a P.O. box location as opposed to their place of residence. Furthermore, we see that the U.S. Postal Service neglected to provide a reason for undeliverability (blank) for a UAA somewhere between 5.52 and 5.69 percent of the time.

Table 1. Percent Distribution of UAA Reasons

UAA Reason	Percent (n = 285,630)	standard error	Lower 95% CL	Upper 95% CL
Vacant	45.14%	0.09%	44.96%	45.32%
No Such Address	31.50%	0.09%	31.33%	31.67%
No Mail Receptacle	7.62%	0.05%	7.53%	7.72%
Blank	5.61%	0.04%	5.52%	5.69%
Not Deliverable and Unable to Forward	4.08%	0.04%	4.00%	4.15%
Refused	1.78%	0.02%	1.73%	1.83%
No Such Apartment	1.55%	0.02%	1.51%	1.60%
Post Office Box	0.92%	0.02%	0.88%	0.95%
Duplicate	0.53%	0.01%	0.50%	0.55%
Non-Residential	0.41%	0.01%	0.39%	0.44%
Other	0.33%	0.01%	0.31%	0.35%
Demolished	0.27%	0.01%	0.25%	0.29%
Under Construction	0.16%	0.01%	0.14%	0.17%
Outside Delivery Limits	0.10%	0.01%	0.09%	0.12%
Illegible	0.00%†	0.00%†	0.00%†	0.01%
Total	100.00%			

† The percent value calculated is less than 1/100 of a percentage point

4.3 How do the Census 2000 Results Compare to the 1990 Census Results?

In order to compare the 1990 and 2000 results, we collapsed some of the categories in Table 1 to match the available categories from 1990. In addition we excluded vacants from our analysis due to a difference in policy between the 1990 census and Census 2000 for the delivery of questionnaires to vacant units. Specifically, in 1990 the Census Bureau requested the U.S. Postal

Service to deliver to vacant units in hopes of increasing the response rate. In Census 2000 the Census Bureau did not make this request. Note that in general the Postal Service does not deliver to vacant units but made an exception at the request of the Census Bureau in 1990. Even though the Census Bureau made this request in 1990, the Census Bureau still received UAAs that were annotated as undeliverable due to a vacant status for the address of delivery. Ideally, we would like to compare the vacancy rates from 1990 to 2000. However, due to the differences in policy for the delivery of questionnaires to vacant units in 1990 and 2000, the resulting comparison would not be useful.

Table 2 shows the percent distribution of UAA reasons for undeliverability for both the 1990 census and Census 2000 with their respective standard errors. Comparing the rates from 1990 to 2000, we see that we have a substantial increase in the percentage of UAAs marked with the undeliverability reason of “no such address.” We also see that we have increased rates for UAAs marked “no mail receptacle,” “post office box,” and “other.”

Our largest percentage drop for Census 2000 occurred for UAAs marked “duplicate”. We also observed a large percentage drop for UAAs marked “no such apartment.” Other UAA reasons for undeliverability that resulted in percentage decreases were “demolished/new construction,” “non-residential,” and “blank.”

Table 2. 1990 and 2000 Census Percent Distribution of UAA Reasons for Undeliverability Excluding Vacants

UAA Reason	1990 Census		Census 2000	
	Percent (n=82,742)	standard error	Percent (n=156,697)	standard error
No Such Address	36.60%	2.20%	57.43%	0.13%
Duplicate	13.70%	1.60%	0.96%	0.02%
Blank	13.50%	2.80%	10.22%	0.08%
No Such Apartment	12.80%	1.20%	2.83%	0.04%
Other	7.80%	0.80%	11.48%	0.08%
No Mail Receptacle	7.40%	1.20%	13.90%	0.09%
Demolished/New Construction	4.80%	0.60%	0.77%	0.02%
Non-Residential	2.80%	0.40%	0.74%	0.02%
Post Office Box	0.60%	0.10%	1.67%	0.03%
Total	100.00%		100.00%	

From Table 3 we see the percentage differences of the estimates from 1990 and 2000 with their respective “pooled” standard errors. In addition, the 95 percent confidence limits are shown to determine if the differences are statistically significant. After reviewing the confidence limits we see that all differences are significant at a significance level of 0.05, except for the percentage difference for UAAs that were never annotated with a reason for undeliverability. Therefore, the percent of questionnaires with no annotation (blank) did not change from 1990 to 2000 for these particular UAAs. We observed a significant decrease from 1990 to 2000 in the percent of UAAs annotated as “duplicate,” “demolished/new construction,” “non-residential,” and “no such apartment.” Furthermore, we observed a significant increase from 1990 to 2000 in the percent of UAAs annotated as “no such address,” “post office box,” “no mail receptacle,” and “other.”

Table 3. Comparison of the 1990 Census and Census 2000 Percent Distributions of UAA Reasons for Undeliverability

UAA Reason	Percent Difference 2000 rate - 1990 rate	standard error	Lower 95% CL	Upper 95% CL
No Such Address	20.83%	2.20%	16.51%	25.15%
No Mail Receptacle	6.50%	1.20%	4.14%	8.86%
Other	3.68%	0.80%	2.10%	5.26%
Post Office Box	1.07%	0.10%	0.87%	1.27%
Non-Residential	-2.05%	0.40%	-1.27%	2.83%
Blank	-3.28%	2.80%	-8.77%	2.21%
Demolished/New Construction	-4.02%	0.60%	-5.20%	-2.84%
No Such Apartment	-9.97%	1.20%	-12.32%	-7.62%
Duplicate	-12.74%	1.60%	-15.88%	-9.60%

4.4 What were the Final Census Status Results of the UAA Questionnaires?

Given the annotated reason for undeliverability on a returned mailing piece, a question of interest would be whether the marking is a good indicator of the final census status of the given labeled housing unit address. At the least, one would hope that any questionnaire that was designated as UAA indicated the labeled address corresponded to an unoccupied housing unit. Table 4 shows the percent distribution of UAAs by final census status. From Table 4 we see that the vast majority of UAAs were in fact unoccupied. Specifically, 31.06 percent were classified as vacant and approximately 47.38 percent were “deleted” from the census address frame. However, approximately 21.56 percent of the UAAs were classified with a final census status of occupied.

Table 4. Final Census Status Summary

Final Census Status	Percent (n=284,035)*	standard error	Lower 95% CL	Upper 95% CL
Delete/Removed	47.38%	0.09%	47.19%	47.56%
Vacant	31.06%	0.09%	30.89%	31.23%
Occupied	21.56%	0.08%	21.41%	21.71%

*Note that 1,595 UAA cases were not matched to a final census status

4.5 How do the Final Census Status Results from 2000 Compare to 1990?

As a comparison to 1990, Table 5 shows the final census status rates for both 1990 and 2000 with their respective standard errors. We see that the estimated UAA percent distribution by final census status for Census 2000 is very similar to that of the 1990 census.

Table 5. Comparison of 1990 and 2000 Final Census Status Summaries

Final Census Status	1990 Census		Census 2000	
	Percent (n=124,612)	standard error	Percent (n=284,035)*	standard error
Delete/Removed	43.60%	1.80%	47.38%	0.09%
Vacant	32.70%	1.70%	31.06%	0.09%
Occupied	23.70%	1.10%	21.56%	0.08%

*Note that 1,595 UAA cases were not matched to a final census status

Table 6 shows the estimated percent difference of the 1990 and 2000 UAA final census status rates, the standard error of the estimated difference, and the upper and lower 95 percent confidence limits. From Table 6, the 95 percent confidence intervals provide evidence that the rates from 1990 and 2000 are equivalent, except for the difference in the rates for the UAAs identified as “delete/removed.” This particular confidence interval indicates that the percent of UAAs deleted or removed increased from 1990 to 2000 anywhere from 0.25 percent to 7.31 percent. This was due to the fact that UAA status was used to remove/delete a housing unit as part of the “kill” process (U.S. Bureau of the Census, 2000).

Table 6. Comparison of 1990 and 2000 Final Census Status Summaries

Final Census Status	Percent Difference 2000 rate - 1990 rate	standard error	Upper 95% CL	Lower 95% CL
Delete/Removed	3.78%	1.80%	0.25%	7.31%
Vacant	-1.64%	1.70%	-4.98%	1.70%
Occupied	-2.14%	1.10%	-4.30%	0.02%

4.6 What were the Final Census Status Results for each UAA Classification?

We are also interested in investigating the final census status percent distribution for each class of reason for undeliverability. For example, are the mailing addresses identified as vacant by the U.S. Postal Service actually vacant as indicated by the final census status? From Table 7, we see that approximately 22 percent of the UAAs identified as vacant housing units by the U.S. Postal Service were actually identified as occupied housing units as indicated by their final census status. In addition, approximately 50 percent were reported as vacant by their final census status. Furthermore, approximately 29 percent were given a final census status of delete. Assuming that the final census status is valid, we conclude that the U.S. Postal Service correctly identifies vacant housing units about 50 percent of the time.

Examining the class of UAAs identified as duplicates, we observe that the majority of these cases were given a final census status of delete. However, approximately 31 percent of the duplicates were identified as occupied housing units by their final census status. In addition, a smaller percentage was identified as vacants. Referring back to Table 1, the duplicate cases make up approximately a half a percent of the overall UAA workload. For the UAA cases classified as demolished, new construction, or non-residential, we see that the vast majority of these cases received a final census status of delete. Furthermore, approximately 11 percent were assigned a final status of vacant. We would expect some of these cases to have a final census status of vacant since some new construction units may appear to be unoccupied and vacant. Approximately 4 percent were found to be occupied as indicated by the final census status.

In reviewing the final status percent distribution for the UAA cases classified as “no such address,” and “no such apartment,” we observe that 77.4 percent of these cases were classified as delete. In addition, we have 8.6 percent of these cases identified as vacant by their final status. Furthermore, we found that approximately 14 percent of these cases resulted in an occupied final census status. This is a less than desirable result since cases identified as no such address and no such apartment make up approximately 33 percent of the UAA workload as indicated by Table 1.

From Table 7, we notice that 48.1 percent of the UAAs classified as “post office box” or “no mail receptacle” resulted in a final census status of occupied. Obviously, these cases include those census respondents who do not receive mail at their place of residence but at a post office

box, such is the case for many rural settings. These housing units were likely to be identified as occupied through Nonresponse Followup. In addition, we notice that approximately 20.5 percent of the UAAs classified as “post office box” or “no mail receptacle” were identified as vacant by their final census status. Furthermore, 31.4 percent possessed a final census status of delete. Note that these UAAs made up approximately 8.5 percent of the overall UAA workload.

The UAAs classified as “other” or “no reason written” made up an even smaller percentage of the overall workload (approximately 6 percent [Table 1]). In examining this class of UAAs we notice that approximately 24 percent of these UAAs were identified as occupied, 32 percent as vacant, and 43 percent as deletes.

All of the UAA classifications appear to have a substantial percentage of elements that are identified as being occupied excluding the two categories consisting of “demolished, new construction, or non-residential,” and “no such address or no such apartment.” However, the only classification that causes some concern are those UAAs classified as vacant since these UAAs make up approximately 45 percent of the UAA workload, the remaining categories are considerably less (see Table 1).

Table 7. Final Census Status by UAA Reason for Undeliverability

UAA Reason	Final Census Status					
	Occupied		Vacant		Delete/Remove	
	Percent	standard error	Percent	standard error	Percent	standard error
Post Office Box, or No Mail Receptacle (n=24,387)	48.10%	0.32%	20.47%	0.26%	31.43%	0.30%
Duplicate (n=1,501)	30.67%	1.20%	6.97%	0.66%	62.36%	1.26%
Other or No Reason Written (n=33,992)	24.04%	0.23%	32.16%	0.25%	43.81%	0.27%
Vacant (n=128,931)	21.71%	0.12%	49.75%	0.14%	28.54%	0.13%
No Such Address, No Such Apartment (n=94,414)	13.98%	0.11%	8.60%	0.09%	77.42%	0.14%
Demolished, New Construction, or Non-Residential (n=2,395)	4.19%	0.41%	11.27%	0.65%	84.53%	0.74%

Table 8 shows the final census status percent distribution for each of the UAA classifications from 1990. We see that the distributions do change substantially going from 1990 to 2000. In Table 9 we will examine these differences and test their significance.

Table 8. 1990 Final Census Status by UAA Reason for Undeliverability

UAA Reason	Final Census Status					
	Occupied		Vacant		Delete/Removed	
	Percent	standard error	Percent	standard error	Percent	standard error
Duplicate	39.60%	2.20%	11.30%	2.20%	49.10%	2.60%
Post Office Box, or No Mail Receptacle	29.20%	3.30%	45.60%	4.40%	25.20%	3.00%
Other or No Reason Written	28.00%	3.20%	29.20%	2.90%	42.80%	3.00%
No Such Address, No Such Apartment	23.30%	1.60%	12.60%	1.20%	64.10%	2.30%
Vacant	19.80%	0.90%	60.60%	1.60%	19.50%	1.20%
Demolished, New Construction, or Non-Residential	6.20%	0.60%	12.80%	1.30%	81.10%	1.80%

From Table 9, we see the differences in the final status percent distribution for each of the UAA classifications. Note that not all of the percent differences were significant. That is, we conclude the true percent for each of these cells did not change from 1990 to 2000. These insignificant differences included UAAs given a final status of vacant and were classified as “duplicate;” “demolished,” “new construction,” “non-residential;” or “other or no reason written.” In addition, the percent difference of UAAs given a final status of delete and categorized as “demolished, new construction, or non-residential;” and “other or no reason written” was insignificant. Furthermore, UAAs given a final status of occupied and classified as “other or no reason written” resulted in an insignificant percent difference.

Reviewing the final census status of occupied in Table 9, we see that the largest decrease in UAAs having a final status of occupied occurred for UAAs that fell in the category of “post office box or no mail receptacle.” In contrast, we see that the largest increases occurred for UAAs that were either in the category of “no such address, no such apartment” or the category of “duplicate.”

From Table 9, we also observe the percent changes from 1990 to 2000 for UAAs given a final status of vacant. We see that these UAA classifications resulted in a percent increase from 1990 to 2000. However, three of the percent increases were insignificant as noted above. Table 9 shows that UAAs categorized as “post office box or no mail receptacle” resulted in the largest percent increase in UAAs given a final status of vacant. This was followed by UAAs classified as “vacant.”

Reviewing the percent changes for UAAs given a final status of delete, we see that from 1990 to 2000 all of the UAA classifications resulted in a significant percent decrease except for UAAs classified as “other or no reason written” and “demolished, new construction, or non-residential.” We notice that the largest percent decreases in deletes occurred for UAAs classified as “no such address or no such apartment” and those UAAs classified as “duplicate.”

Table 9. Comparison of 1990 and 2000 Final Census Status by UAA Reason for Undeliverability[†]

UAA Reason	Final Census Status					
	Occupied		Vacant		Delete/Removed	
	Percent Difference	Standard Error	Percent Difference	Standard Error	Percent Difference	Standard Error
No Such Address, No Such Apartment	9.32%	1.60%	4.00%	1.20%	-13.32%	2.30%
Duplicate	8.93%	2.51%	4.33%*	2.30%	-13.26%	2.89%
Other or No Reason Written	3.96%*	3.21%	-2.96%*	2.91%	-1.01%*	3.01%
Demolished, New Construction, or Non-Residential	2.01%	0.73%	1.53%*	1.45%	-3.43%*	1.95%
Vacant	-1.91%	0.91%	10.85%	1.61%	-9.04%	1.21%
Post Office Box, or No Mail Receptacle	-18.90%	3.32%	25.13%	4.41%	-6.23%	3.01%

*The percent difference was not significantly different from zero at a significance level of $\alpha = .05$

[†]Percent differences are calculated as follows 2000 rate - 1990 rate

5. RECOMMENDATIONS

In summary, we were able to draw inferences from our sample to the general universe of UAAs excluding UAAs that were successfully delivered during the LCO UAA redistribution operation. Specifically, we estimated the overall distribution of reasons for undeliverability of Census 2000 questionnaires. Furthermore, we were able to make inferences about the final census status results of the UAAs as well as review these results for each of our defined categories of reasons for undeliverability. In addition, where possible each of our analysis results were compared with the results experienced during the 1990 census.

One of the largest portions of the undeliverable questionnaire workload consisted of questionnaires marked as “no such address” or “no such apartment.” In addition, 77 percent of these undeliverable questionnaires resulted in a final census status of delete. Undeliverable questionnaires of this type are likely missing address elements or contain incorrect address elements. **We recommend using United States Postal Service products/services such as the Address Element Correction service prior to Census mailout to provide corrections to addresses or to identify potentially undeliverable addresses in the mailout/mailback address list.**

In addition to the undeliverable questionnaires marked as “no such address” or “no such apartment,” other reasons for undeliverability have proven to be good indicators of final census status. Specifically, we observed questionnaires marked as “vacant” make up 45 percent of the

undeliverable questionnaire workload and 50 percent of the time these cases result in a final status of vacant. Furthermore, 9 percent of the undeliverable questionnaire workload came from questionnaires annotated with “ post office box” or “no mail receptacle” and 48 percent of these undeliverable questionnaires resulted in a final census status of occupied. **Given that each of these categories contribute a substantial portion to the overall undeliverable questionnaire workload and provide a fairly good indicator of final status, we recommend that for the 2010 census we capture the data for the Postal Service’s reasons for undeliverability and use these data as a factor in the determination of final census status.**

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APPENDIX

	Category	
1	Vacant	House, apartment, building not occupied. Empty, deceased, moved - left no address. Seasonal - temporarily away, temporary forward, summer use only, temporary vacant.
2	Duplicate	Addressee received duplicate mail pieces.
3	Under Construction	House, apartment, building is under construction.
4	Demolished	House, apartment, building has been demolished. House Burned, Condemned.
5	Non-Residential	Business only, church, vacant and business.
6	No Such Address	NSA, No such Number (NSN, NS#), No such Street, Insufficient Address, Non-deliverable as addressed, Returned for Better Address, Undeliverable as Addressed (UAA), Route (RT) Unknown.
7	No Such Apartment	Apartment number for the mailed address does not exist.
8	Post Office Box	Wrong P.O. Box #, P.O. Box Delivery Only, City Delivery, Box Closed No Order, General Delivery.
9	No Mail Receptacle	Addressee failed to provide a receptacle for receipt of mail. NMR, Broken Mailbox.
10	Not Deliverable As Addressed and Unable to Forward	Not Deliverable As Addressed and Forwarding Order Expired, Unable to forward, Forwarding order expired.
11	Outside Delivery Limits	Addressed to location outside delivery limits of post office of address. Wrong ZIP Code, Wrong City.
12	Refused	Addressee refused to accept mail. Attempted not known, Unclaimed.
13	Blank (No reason written)	A non-delivery reason is not written on the envelope.
14	Other	The non-delivery reason does not fall into any of the above categories. Inaccessible - dangerous, dog hazard. Unreadable non-delivery reasons.
15	Illegible	Address not readable. Something spilled on it, crunched in machine, received unsealed, address covered up.