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Washington, D.C. 20548

**General Government Division**

B-284063

November 19, 1999

The Honorable Dan Miller  
Chairman, Subcommittee on the Census  
Committee on Government Reform  
House of Representatives

Subject: Decennial Census: Information on the Accuracy of Address Coverage

Dear Mr. Chairman:

This letter responds to your request for information on the extent to which the accuracy of the 1990 Census address counts varied by geographic area, which you asked us to provide at your September 29, 1999, hearing on the Local Update of Census Addresses program. Our response is based on U.S. Census Bureau evaluations of the housing unit coverage of the 1990 Census. In addition, given the Subcommittee's ongoing interest in the accuracy of the address list for the 2000 Census, we describe some of the difficulties that the Bureau faces in building a quality address list.

We identified some of the difficulties based on our on-site observations of block canvassing—an operation the Bureau used to verify the accuracy of “city-style” addresses.<sup>1</sup> We made these observations this past spring in Dallas, TX; Los Angeles, CA; Paterson, NJ; and Long Island, NY. We did not obtain agency comments on a draft of this letter because it was generally based on historical data and our prior work. On November 9, 1999, we discussed our findings with senior Bureau officials. They suggested some minor technical revisions, which we incorporated. We prepared this letter in Washington, D.C., in October and November 1999 in accordance with generally accepted government auditing standards.

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<sup>1</sup> City-style addresses are those where the U.S. Postal Service uses house-number and street-name addresses for mail delivery. Non-city-style addresses include post office boxes, rural route addresses, etc.

## Results in Brief

Bureau evaluations of the 1990 Census suggest that census housing unit coverage was less accurate in rural areas than it was in urban areas. Specifically, the Bureau estimated gross omissions from the census of about 7 percent of the housing units in rural areas, compared to between 2 and 3 percent in urban areas.

The evaluations suggest that a number of factors could have contributed to the errors. They include operational difficulties that temporary census workers encountered when trying to build the address list. In some cases, for example, census workers had to make difficult judgments about whether buildings were “vacant and boarded-up” (and thus should be included on the census address list), or “not fit for habitation” (and thus should be excluded from the list). The type of structure also affected error rates. For example, small multiunit dwellings sometimes contained housing units that did not appear on the mailing lists the Bureau used to develop its census address list.

The Bureau redesigned its address list development strategy for the 2000 Census, adding operations that it believes will result in an address list at least as good as the one used in 1990. Nevertheless, identifying and locating the nation’s estimated 119 million housing units remain a huge and complex task. Some difficulties were evident during the Bureau’s block canvassing operation, where census workers encountered gated communities and “hidden” housing units such as basement apartments, and thus had to use their judgment concerning the existence of housing units. The workers’ decisions will affect whether census questionnaires will be properly delivered to those households in 2000.

## Background

A complete and accurate address list and precise maps are the fundamental building blocks of a successful census. Accurate addresses are essential for delivering questionnaires and avoiding unnecessary and costly field follow-up attempts to find nonexistent residences. Precise maps are critical for counting the correct portions of the population in their proper locations—the basis of congressional reapportionment and redistricting.

The Bureau developed the 1990 Census address list by using a series of overlapping operations in an attempt to develop as complete an address list as possible. For urban areas, the Bureau purchased address lists from commercial vendors. Subsequent operations included Postal Service reviews and the hiring of around 20,000 temporary census workers to physically canvass streets. The Bureau generated its address list for rural areas by canvassing and Postal Service reviews. To check for accuracy, the Bureau gave local governments two opportunities to review the count of housing units contained in the address lists.

The Bureau assessed the census housing unit coverage by comparing housing unit addresses included in the 1990 Census with a sample of housing unit addresses drawn independently of the census. Three indicators of housing unit coverage errors were reported in the subsequent evaluations. First, housing units found in the independent sample, but not matched to

housing units in the 1990 Census, were called “gross omissions.” However, the matching of housing units between the independent sample and the census list was limited to specific search areas around each housing unit, so not all housing units labeled as omissions were necessarily missed in the census. For example, housing units could have been enumerated outside their search area because the Bureau improperly located them on a census map (geocoding errors).

Second, housing units (1) included in the census but not matched in the follow-up sample and (2) determined not to exist within the search area, were called “erroneous enumerations.” Erroneous enumerations included housing units classified as duplicate or nonexistent, as well as those improperly geocoded or having insufficient information to match to housing units in the independent sample. The third indicator is the net undercount of housing units, which the Bureau estimated using a statistical estimation procedure. The net undercount estimates may contain errors related to that estimation procedure and unrelated to the address list itself.

## Rural Addresses Appeared to be Missed More Frequently Than Urban Addresses in 1990

Bureau evaluations of the coverage of housing units in the 1990 census estimated that about 3.5 million housing units were missed, and about 2 million were erroneously counted, including duplicates, nonexistent units, and units counted at the wrong place. The evaluations also found that housing units generally were missed more frequently in rural areas than in urban areas.<sup>2</sup> For example, as shown in table 1, the evaluation estimated gross omissions of housing units from the census of 7.1 percent in rural areas, compared to over 2 percent in urban areas. The net undercount of housing units was also generally higher in rural areas than in urban areas. Although the evaluations did not include an identical analysis for erroneous enumerations, the evaluations reported a similar pattern—errors higher in rural areas than in urban areas.

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<sup>2</sup> According to the Bureau, these studies were generally preliminary in nature and do not necessarily represent the Bureau’s position. However, no final studies were ever issued, and as a result, this information represents the best available data.

**Table 1: 1990 Census Total Housing Unit Coverage Errors <sup>a</sup>**

Type of place <sup>b</sup>	Gross omissions (percent)	Net undercount (percent)
Large Urban <sup>c</sup>	2.20	-0.09
Other Urban	2.94	0.91
Rural	7.14	3.16

<sup>a</sup> Much of the analysis of 1990 census undercounts and other errors was based on estimates calculated separately for occupied and for vacant housing units. The estimates reported here are for "total housing units," which includes both occupied and vacant units.

<sup>b</sup> The search areas used to match housing units between the independent sample and the census differed by type of place, so the respective estimates are not perfectly comparable.

<sup>c</sup> Urban places with population greater than or equal to 250,000.

Source for gross omissions: *The Impact of Type of Address on Housing Coverage*, 1990 Decennial Census: Preliminary Research and Evaluation Memorandum No. 264 (December 1993), table 4, p.8.

Source for net undercount: *Coverage of Housing in the 1990 Decennial Census*, 1990 Decennial Census: Preliminary Research and Evaluation Memorandum No. 253 (October 1993), table 8, p.15.

To further explore this pattern, one evaluation created an "address type" variable to estimate gross omissions from the census separately for households with city-style and non-city-style (mostly rural) addresses. Estimated omissions for housing units with non-city-style addresses were generally higher than for housing units with city-style addresses. The same evaluation study reported omission rates separately for total housing units with city-style and non-city-style addresses in four regions of the country: Northeast, West, South, and Midwest. The differences between the estimated omission rates for total housing units between city-style and non-city-style addresses were significant in each of these regions, with the omissions being higher everywhere for non-city-style addresses.

## Developing a Complete and Accurate Address List Remains a Complex Task With Many Challenges

As we noted in our 1992 report on the results of the 1990 Census, the labor-intensive and costly procedures that the Bureau used did not guarantee a complete and accurate list in 1990.<sup>3</sup> According to the Bureau, a variety of factors could have contributed to errors in the 1990 address list. For example, the evaluations suggest that deficiencies in training temporary workers on definitions of "vacant" housing units might have been responsible for some of the observed errors. Temporary workers had to make judgments as to whether houses were "vacant and boarded-up" (and thus should be included on the census address list), or "not fit for habitation" (and thus excluded from the list).<sup>4</sup> In such cases, the workers may have inaccurately recorded the total number of housing units within the community.

The type of structure also appeared to contribute to the error rate. For example, small multiunit dwellings (in some cases, illegal conversions), as well as mobile homes, tents, vans, and boats, tended to be particularly problematic. The Bureau found that individual housing units in small multiunit dwellings were not always included in the mailing lists the Bureau

<sup>3</sup> *Decennial Census: 1990 Results Show Need for Fundamental Reform* (GAO/GGD-92-94, June 9, 1992).

<sup>4</sup> PREM No. 253, p.9.

used to build the 1990 address list and may not have received mail separate from other housing units in the structure. According to the Bureau, mobile homes and other nonpermanent dwellings had higher error rates because these housing units are easily moved.

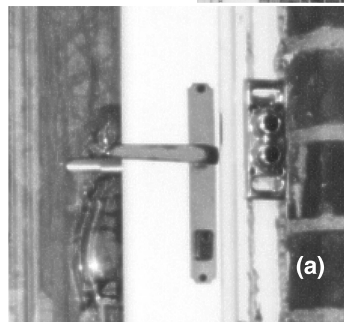
Although the Bureau redesigned its address list development strategy for the 2000 Census, identifying and locating the nation's estimated 119 million housing units is still a huge and complex task. The Bureau's plan to develop its address list for the 2000 Census includes several major operations. Together, they require computerized matching and merging of extremely large databases; communication between the Bureau, federal agencies, and thousands of local and tribal governments; and the mobilization of tens of thousands of temporary workers, all on a tight schedule. The Bureau believes that these operations will produce an address list that will be at least as complete and accurate as the 1990 list. However, achieving this goal will be an enormous challenge for the Bureau, since operational difficulties similar to those that affected the accuracy of the 1990 address list are not easily resolved.

For example, during block canvassing, which took place earlier this year, temporary census workers faced the task of detecting "hidden" housing units such as basement apartments. To spot hidden housing units, workers had to hunt for clues, such as multiple doorbells, entrances, mailboxes, and utility meters. As shown in figure 1, such clues can be hard to find, and even then, the number of housing units they contain can be difficult to determine if residents speak a different language, are unavailable, or some other knowledgeable person cannot be found for verification. Further, gated communities and secured multiunit dwellings presented their own challenges, since census workers in some cases could not gain access to them to verify the existence of the housing units located within. In both of these situations, decisions on the number of housing units were based partly on the census workers' judgment, and the accuracy of their decisions will affect whether census questionnaires are properly delivered to those households in 2000.

Figure 1: Examples of “Hidden” Housing Units



Determining the number of units in a residence can be difficult. Here, the possibility of additional or “hidden” households, in what appear to be single family dwellings, is suggested by multiple  
(a) doorbells,  
(b) electrical meters, and  
(c) names on a mailbox.





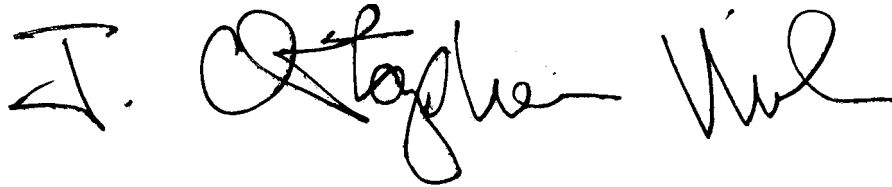
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We are sending copies of this letter to the Honorable Carolyn B. Maloney, Ranking Minority Member of this Subcommittee; the Honorable William M. Daley, Secretary of Commerce; and the Honorable Kenneth Prewitt, Director of the Bureau of the Census. Copies are available to others upon request.

Please contact me on (202) 512-8676 if you have any questions. Major contributors to this letter were Robert Goldenkoff, Ty Mitchell, Leigh White, and Cleofas Zapata.

Sincerely yours,

A handwritten signature in black ink, appearing to read "J. Christopher Mihm". The signature is written in a cursive style with a large initial "J" and a stylized "M".

J. Christopher Mihm  
Associate Director, Federal Management  
and Workforce Issues



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