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Report to Congressional Requesters

June 1992

DECENNIAL CENSUS

1990 Results Show Need for Fundamental Reform

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The Honorable Herb Kohl, Chairman
Subcommittee on Government Information
and Regulation
Committee on Governmental Affairs
United States Senate

The Honorable Thomas C. Sawyer, Chairman
The Honorable Thomas J. Ridge, Ranking
Minority Member
Subcommittee on Census and Population
Committee on Post Office and Civil Service
House of Representatives

This report responds to your request that we provide an overview of the major lessons learned from the 1990 census and identify opportunities for fundamental reform. The report discusses the need to improve address list development efforts, streamline the census questionnaire and follow-up fieldwork, strengthen planning efforts, and consider other changes.

As arranged with your offices, we plan no further distribution of the report until 30 days from the date of this letter unless you publicly announce its contents earlier. At that time, we will send copies to other appropriate congressional committees, the Secretary of Commerce, the Director of the Bureau of the Census, and the Director of the Office of Management and Budget. Copies also will be made available to other interested parties upon request.

This report was prepared under the direction of L. Nye Stevens, Director, Government Business Operations Issues, who can be reached on (202) 275-8676. Other major contributors are listed in appendix II.

Richard L. Fogel
Assistant Comptroller General

Executive Summary

Purpose

The 1990 decennial census' undercount of millions of persons and its inclusion of millions of double-counts and other errors contributed to making it one of the most controversial censuses in the nation's history. An accurate and equitable census is important because census results are used to reapportion seats in the House of Representatives; redraw congressional, district, and other political boundaries; and address countless other public and private data needs.

At the request of the Senate Subcommittee on Government Information and Regulation, Committee on Governmental Affairs, and the House Subcommittee on Census and Population, Committee on Post Office and Civil Service, GAO monitored the planning, implementation, and evaluation of the 1990 census. The Subcommittees subsequently asked GAO to summarize the major lessons learned from the 1990 census and identify the primary opportunities for census reform.

Background

Since 1970, the Bureau of the Census has used essentially the same census methodology—the Bureau develops an address list of the nation's housing units, mails census forms to the vast majority of households, and asks them to mail back the completed forms. Temporary census-takers, known as enumerators, are then hired by the hundreds of thousands to gather the requested information from each nonresponding household.

The Bureau undertook two primary efforts to evaluate the quality of the 1990 census counts. The Post Enumeration Survey (PES) provided estimates of the number of persons who were missed or erroneously enumerated in the census. Erroneous enumerations include persons who were double-counted, counted in the wrong location—a matter of concern for redistricting—or otherwise improperly included in the census. The Bureau also estimated the coverage of the census through demographic analysis, which entails developing an independent estimate of the population largely from administrative data such as birth and death records.

Results in Brief

The results and experiences of the 1990 census demonstrate that the American public has grown too diverse and dynamic to be accurately counted solely by the traditional "headcount" approach and that fundamental changes must be implemented for a successful census in 2000. In the past, each census was more accurate than the preceding one, in part because of increased spending. However, the accuracy of the 1990

census fell below that of the 1980 census, even as census costs escalated significantly. The net 1990 census undercount, a broad overall measure of census coverage, was at least 4.7 million persons, a greater percentage of the population than in 1980. GAO estimated that the 1990 census had at least 14.1 million errors, including missed persons and those improperly included in the count.

The labor-intensive procedures the Bureau used to develop its 1990 address list added significantly to the cost of the census and did not ensure an accurate or complete list. The Bureau's procedures resulted in sending millions of questionnaires to vacant and nonexistent housing units. GAO estimates that follow-up on these units added about $317 million to the cost of the census. Preliminary results from a Bureau evaluation show that the census housing unit count missed about 3.5 million units and erroneously counted about 2 million units, including duplicated units and units counted in the wrong location.

A sharp decline in the public's willingness to answer the census continued a disturbing pattern. The 1990 mail return rate—the most direct measure of public cooperation—was 74 percent, or 9 percentage points below what the Bureau achieved in 1980, which was itself lower than the 1970 level. As a result of the reduced level of public cooperation, enumerators had to follow up on over 34 million cases.

The need for extensive efforts to gather data on nonresponding households reduced the overall quality of the census. The PES found that persons were more likely to be counted correctly if they were counted on a questionnaire returned by mail rather than on a questionnaire prepared by an enumerator. The PES also showed that data quality was reduced substantially as the census neared completion. For example, persons counted as part of basic data collection efforts, primarily mail returns of questionnaires, had an estimated erroneous enumeration rate of less than 3 percent, but the rate climbed to about 28 percent after primary follow-up efforts in the summer and fall of 1990.

The Department of Commerce and the Bureau appear to recognize that the current approach to taking the census needs to be fundamentally reassessed. They appreciate that, to be effective, census-taking procedures must change as society changes and have implemented a broad effort aimed at redesigning the census. To be successful, the census reform effort must ensure that the Bureau's conservative approach to planning the 1990 census is not replicated in planning for 2000. For 1990, planning and

testing were incomplete and major possible innovations were not pursued vigorously.

GAO's Analysis

The Quality of the 1990 Census Declined From 1980, but Costs Continued to Escalate

The current approach to taking the census appears to have exhausted its potential for counting the population cost-effectively. In the past, the increased cost of each census had contributed to more accurate results. However, the 1990 census was the first census that failed to improve on the accuracy of its predecessor since 1940, when the Bureau began measuring census coverage. On the basis of demographic analysis, the undercount was 1.8 percent, or about 4.7 million persons, which is higher than 1980's net undercount of 1.2 percent. Moreover, the 4.4-percentage-point difference in the undercount between Blacks and non-Blacks was the highest since 1940. The census also contained a significant number of erroneous enumerations. Using PES data, GAO estimated that the 1990 census contained a minimum of 14.1 million gross errors—the combination of missed persons and those improperly counted.

As social and demographic changes have made the population increasingly difficult to count, the cost of taking the census has risen dramatically. In constant 1990 dollars, the $25 spent to count each household for the 1990 census is $5 per household more than was spent for 1980—a 25-percent increase. Overall, the $2.6 billion the Bureau expects to spend to complete the census represents a 65-percent increase in constant dollars over the cost of the 1980 census. The Bureau planning staff estimates that if the current approach to taking the census is retained for 2000, the costs could rise to about $4.8 billion in current dollars (see ch. 4).

Address List Development Efforts Were Costly and Did Not Provide a Complete List

As with previous censuses, the Bureau developed an entirely new address list for the 1990 census. The Bureau purchased lists from private vendors, had temporary staff do extensive field canvassing, had several Postal Service reviews, and implemented other procedures—costing about $182 million in all—to develop its address list. To help ensure that the list would be as complete as possible, once an address was placed on the list it generally was not removed unless identified for deletion in at least three address list development or census follow-up operations.

The Bureau's effort to have as complete a list as possible contributed to expensive follow-up efforts on vacant or nonexistent units. For example, the Bureau did not try to identify vacant units before the census; as a result, questionnaires were delivered to about 8.6 million unoccupied units. Questionnaires also were delivered to about 4.8 million addresses that were later determined not to be housing units. GAO estimates that it cost about $317 million to send enumerators to these vacant and nonexistent units to determine why a census form had not been mailed back.

Despite the extensive and costly list development efforts, the final address list was neither complete nor accurate. On the basis of preliminary Bureau data, the 1990 census missed about 3.5 million housing units and improperly included about 2 million units by including nonexistent ones, counting units twice, or placing units in the wrong location (see ch. 3).

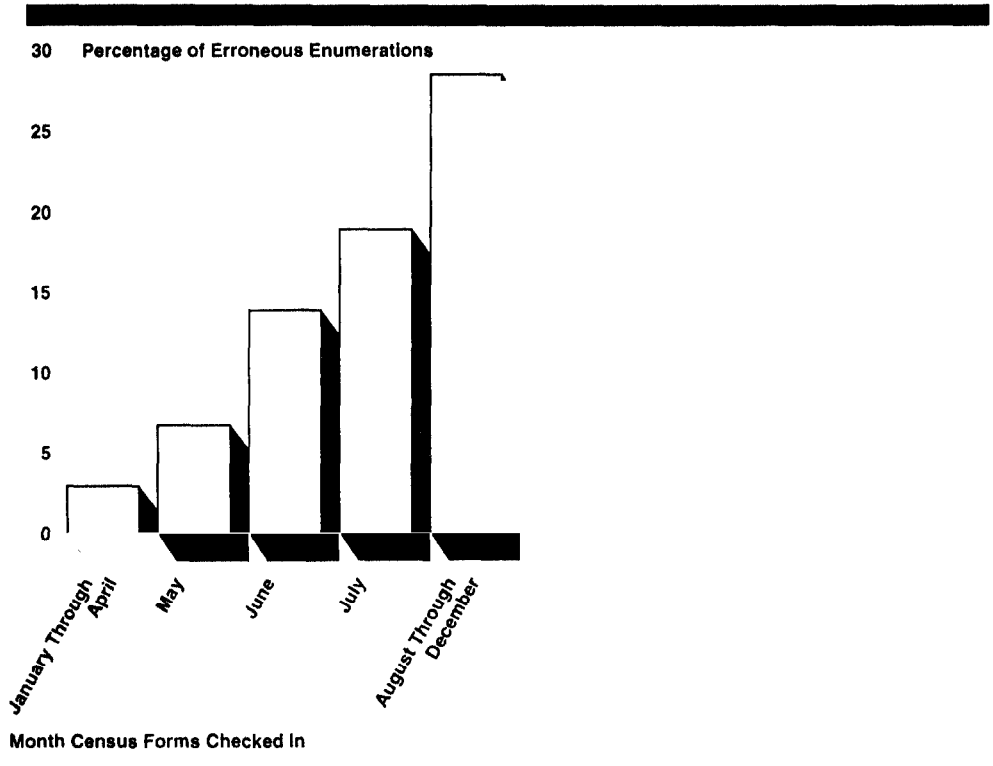
Falling Level of Public Cooperation Poses Formidable Challenges

The 1990 census mail response rate confirmed that the Bureau faces a long-term problem in securing the public's cooperation with the census. Response rates have declined with each census since the Bureau moved to a mail census in 1970. Research by Bureau staff suggests that a number of factors, such as illiteracy, non-English-speaking immigrants, and concerns about privacy, may make the environment for census-taking even worse over the next decade. The problem of public cooperation is complex and not fully within the Bureau's control. However, the differential response rates between the census short and long forms suggest that the public's willingness to cooperate is influenced, at least in part, by questionnaire length (see ch. 4).

Follow-Up Efforts Are Costly and Result in Data of Unreliable Quality

The Bureau's long-standing policy to try to gather data on each nonresponding household has resulted in a reliance on labor-intensive and time-consuming field operations. Such efforts are extremely costly both in terms of the approximately $730 million spent for census fieldwork and the quality of the data gathered. Specifically, the amount of error in the census increases precipitously as time and effort are extended to count the last few percentages of the population, as shown in figure 1.

Figure 1: Erroneous Enumeration Rates, by Month, in 1990



Source: Data from Eugene P. Ericksen, Leobard F. Estrada, John W. Tukey, and Kirk M. Wolter, Report on 1990 Decennial Census and the Post-Enumeration Survey, submitted to the Secretary of Commerce (Washington, D.C.: June 21, 1991).

This increase in the rate of error shows that extended reliance on field follow-up activities represents a losing trade-off between augmenting the count and adding more errors (see ch. 5).

Strong Planning Effort Needed for 2000 Census

The Department of Commerce and the Bureau recognize that the current census methodology does not, and cannot, count the entire population and that the challenges facing the Bureau will continue to mount. As a result, they have implemented a major effort to identify options for redesigning the census. However, the initiative must overcome the Bureau's past reluctance to aggressively pursue promising alternatives to existing procedures. For example, the Bureau has been slow to examine the extent to which a streamlined questionnaire would improve response rates. A 1985 Bureau field test was poorly designed and evaluated and, as a result, of only limited usefulness. The Bureau test of alternative questionnaire

designs done during the 1990 census focused on modifications to the long form rather than to the short form, which about 83 percent of the nation's households receive. The Bureau now appears to appreciate the potential of streamlined questionnaires and is testing various simplified short forms as part of its research.

Opportunities for Reform

Since the mid-1970s, GAO has recommended that the Bureau evaluate a number of specific opportunities for reform.[1] These and a wide variety of other options are now being explored as part of the Department's census redesign effort. It is too early to identify the precise actions needed for a more cost-effective census in 2000. These actions and the specific design of the 2000 census can best be determined through open public discussion and thorough planning and testing of multiple options by the Bureau. Nevertheless, the experiences of the 1990 census suggest the need for a rigorous exploration of reform opportunities in the following three broad areas:

- Address list development efforts can be improved if the Bureau builds on its 1990 investment and increases reliance on the Postal Service. Although estimates of possible savings have not been developed, the 1990 experience shows that savings could be substantial if the Bureau relied on the Postal Service to identify vacant and nonexistent units without additional Bureau confirmation (see ch. 3).
- The Bureau is appropriately assessing the feasibility of using a streamlined census questionnaire as a means of addressing declining public response rates. Decisions on reducing the number of questions require careful consideration as to whether or how data no longer to be collected as part of the census will otherwise be collected. However, as an example of the scope of possible savings, the Bureau estimated that a radically streamlined questionnaire would have saved $480 million in 1990 (see ch. 4).
- Sampling at least a portion of nonresponding households could minimize the cost and length of follow-up efforts. However, careful exploration is needed to determine the extent to which sampling can legally and technically be used. Without addressing legal or technical issues, and in the absence of any other reforms, the Bureau estimates that it could have saved $460 million if it had sampled 10 percent of nonresponding households in 1990 rather than collecting data on all of them (see ch. 5).

[1]See, for example, Programs to Reduce the Decennial Census Undercount (GAO/GGD-76-72, May 5, 1976); Problems in Developing the 1980 Census Mail List (GAO/GGD-80-50, Mar. 31, 1980); and A $4 Billion Census in 1990? Timely Decisions on Alternatives to 1980 Procedures Can Save Millions (GAO/GGD-82-13, Feb. 22, 1982).

Matter for Congressional Consideration

Strong and continuing congressional oversight is essential because of the importance and political sensitivity of the census, the scope of the changes that appear to be needed, and the need to ensure that the current momentum for change does not diminish. GAO suggests that Congress maintain a schedule of oversight hearings beginning early in and continuing throughout the decade to ensure that consistent progress is made in designing and planning the 2000 census. Topics for individual oversight hearings should include the extent to which the Bureau is making timely and appropriate decisions on specific reform opportunities in improving address list development efforts, addressing the declining response rate, and minimizing costly follow-up work.

Agency Comments

The Census Bureau provided written comments on a draft of this report. The Bureau said that it recognizes—and 1990 census data clearly demonstrate—that society has changed dramatically over the last 20 years. That is why it is currently engaged in zero-based planning of design options for the 2000 census. The Bureau agreed that minimizing cost is a major consideration in designing the 2000 census, but it noted that cost must be balanced with other goals, for example, obtaining a complete count and reducing the differential undercount.

The Bureau said the report raises a number of important issues. Many of the opportunities for reform identified in the report are being addressed by the Bureau's research program. The Bureau identified a number of policy and technical issues that need to be addressed in designing the next census, and it noted that GAO's proposals may not be the only ways to reduce the cost and complexity of the census. The Bureau also questioned the validity of using gross errors as a measure of census quality.

GAO believes that its report fully conveys that the decennial census has a number of competing objectives that require careful balancing and that some difficult policy and technical decisions will need to be made in a thorough and open reform process. GAO does not intend to imply that the "opportunities for reform" it identifies are the only ways to improve the census. As the report emphasizes, only rigorous testing and broad consultation can determine the most appropriate changes. GAO's report fully acknowledges that cost control is only one objective, albeit an important one. But the report notes also that the cost of the census is not measured solely in the amount of money spent. Reduced data quality is also a cost of the current approach. The 1990 census was less accurate than the 1980 census in a number of broad measures, including net

undercount, differential undercount, and gross errors, all of which are important.

The letter from the Director of the Bureau of the Census is included as appendix I. Those comments are discussed in detail at the close of chapters 2, 3, 6, and 7. GAO also made technical changes, wherever appropriate, on the basis of Bureau suggestions.

Contents

Abbreviations

OMR	optical mark recognition
PES	Post Enumeration Survey

Introduction

The decennial census is the nation's most comprehensive and expensive statistical data-gathering program. Census results are used during the ensuing decade to address countless public and private data needs. Most importantly, census results are used to reapportion seats in the House of Representatives and redraw congressional, state, and municipal legislative district boundaries. Thus, a key ingredient of an accurate census is not just counting everyone—a formidable challenge in itself—but counting persons in their proper locations. As a result of the 1990 census, 8 states gained and 13 states lost at least one congressional seat.

Census data are also used by public decisionmakers to help meet numerous programmatic needs. For example, census results are used to help guide the distribution of billions of dollars in federal aid. We reported in November 1991 that a total of 100 federal programs providing grants at the state and local levels use data from or based on the census in formulas that allocate all or a portion of program grant money.[1] These programs had total estimated obligations of about $116 billion in fiscal year 1991.

Governments are not the only users of census data. Businesses make extensive use of census data for various marketing purposes, including selecting business sites, forecasting demand, allocating advertising, and managing sales forces. Census data provide the foundation for volumes of academic and policy research and also assist individuals doing historic research by providing, for example, time-series data and genealogical information.

Overview of Major Census Activities

The 1990 decennial census has been managed on a 10-year cycle, beginning with concerted planning in fiscal year 1984 and ending with completion of major data dissemination efforts in fiscal year 1993. For 1990, as it had in recent censuses, the Bureau developed an address list, mailed or hand delivered census forms to the vast majority of the nation's approximately 100 million housing units, and asked that completed forms be mailed back to the Bureau. About 300,000 temporary census-takers, known as enumerators, were then instructed to gather the needed information on each of the over 34 million nonresponding households. After major follow-up efforts had been completed, the Bureau used special coverage improvement programs, which were intended to improve the count. Table 1.1 shows selected major events in the planning and execution of the 1990 census.

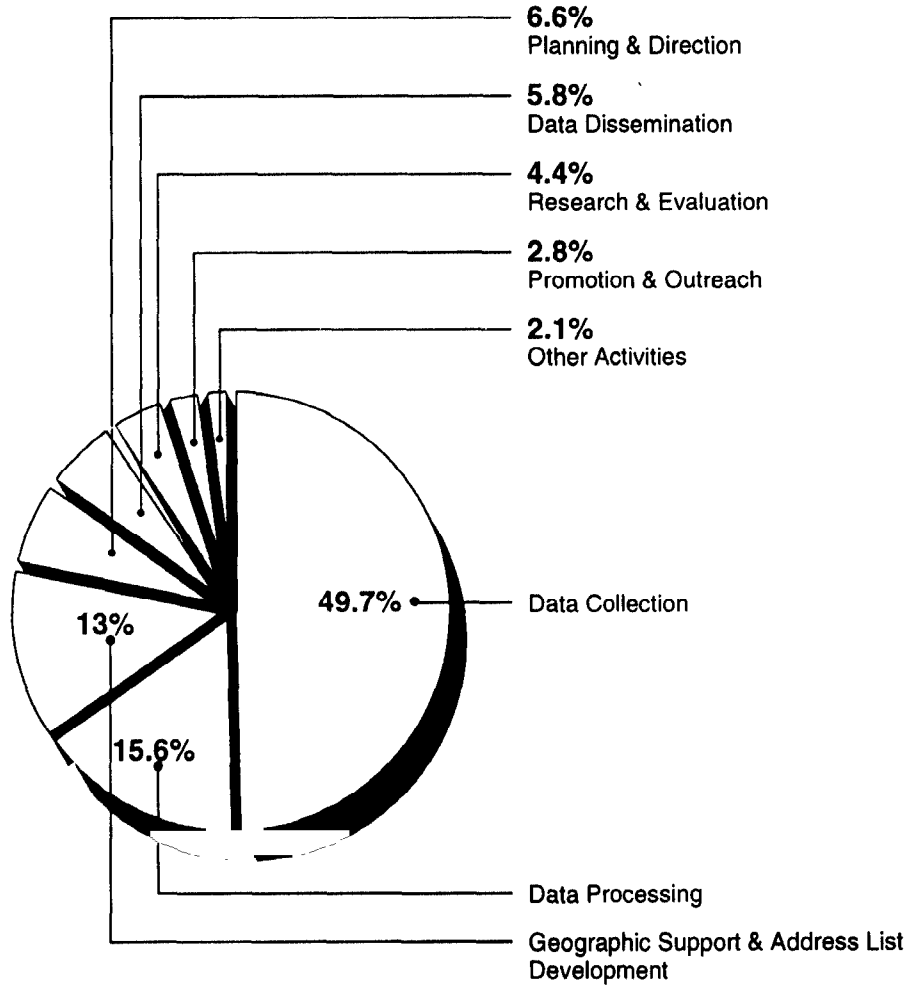
[1]Formula Programs: Adjusted Census Data Would Redistribute Small Percentage of Funds to States (GAO/GGD-92-12, Nov. 7, 1991).

Table 1.1: Chronology of Key 1990 Census Activities

Fiscal year	Census activities
1984	Begin concerted planning and content development process for the 1990 census
1985	Test and evaluate censuses in Tampa and Jersey City
1986	Test and evaluate censuses in Los Angeles and Mississippi
1987	Test and evaluate census in North Dakota
1988	Begin major address list development efforts Test procedures, processes, and systems in dress rehearsal
1989	Continue address list development efforts Print questionnaires
1990	Prepare questionnaire mail packages Open over 400 field offices to manage collection effort Deliver questionnaires to about 100 million households Census Day, April 1, 1990 Collect and process census forms Follow up on nonresponding households Implement post-Census Day coverage improvement programs Measure census coverage and begin other evaluations
1991	Deliver apportionment counts to the President Deliver redistricting counts to the states Begin tabulating and publishing data products Continue evaluations
1992/ 1993	Complete tabulations and publications Complete evaluations

The Bureau reported that the 1990 census is expected to cost about $2.6 billion over the 10-year census cycle. Figure 1.1 shows the extent to which major efforts contributed to census costs.

Figure 1.1: Distribution of 1990 Decennial Census Costs



Source: Bureau of the Census.

Objectives, Scope, and Methodology

At the request of the Senate Subcommittee on Government Information and Regulation, Committee on Governmental Affairs, and the House Subcommittee on Census and Population, Committee on Post Office and Civil Service, we monitored the planning, implementation, and evaluation of the 1990 census. With the completion of major census operational and evaluation activities, the Subcommittees asked us to summarize our major findings on the 1990 census. More specifically, our objective was to

provide an overview of the major lessons learned from the 1990 census and identify the primary opportunities for census reform.

To meet our objective, we relied on work we had done for the reports and testimonies we issued at the request of census oversight committees during the census. A total of 26 selected reports and 28 congressional testimonies we issued on the decennial census are listed in Related GAO Products. We reviewed census planning documents, management information, budget and cost reports, and research evaluations and memorandums prepared by Bureau employees or contractors. We also interviewed key Bureau officials responsible for the planning, implementation, and evaluation of the decennial census.

To determine the quality of the 1990 census, we reviewed the results and evaluations of the Bureau's 1990 Post Enumeration Survey (PES) and demographic analysis.[2] The PES, the demographic analysis, and their attendant evaluations are subject to error. For example, the PES was a sample survey and, therefore, was subject to sampling and nonsampling error. As it has with prior censuses, the Bureau is continuing to assess data from its census evaluation efforts and will issue revisions to its estimates of the accuracy of the census as the research progresses. We have used the most current evaluation data published by the Bureau.

This report does not contain recommendations for specific reforms. At this point in the reform process, it is too early to specify the precise actions needed to reform the census fundamentally. As discussed in chapter 2, the Department of Commerce and the Bureau have initiated a census redesign effort. Although an assessment of that effort is premature and not within the scope of this report, the redesign program is examining many of the opportunities for reform discussed in this report.

We did our detailed work from July 1991 through April 1992 at the Bureau of the Census in Suitland, Maryland, in accordance with generally accepted government auditing standards. We did not independently verify the accuracy or completeness of the source data issued by the Bureau, but we did review Bureau and independent efforts to determine the accuracy of census data. We discussed our findings on address list development efforts and the opportunities for improvement with responsible officials at

[2]The PES was a matching study in which the Bureau interviewed a sample of about 144,000 households several months after the census. The results of these interviews were compared to census questionnaires to determine whether each person was correctly counted, missed, or double-counted in the census. Demographic analysis yields an independent estimate of the population derived largely from administrative data such as birth and death records.

the Postal Service. The Director, Bureau of the Census, provided written comments on a draft of this report. Those comments are addressed in detail at the close of chapters 2, 3, 6, and 7. The letter from the Director is included as appendix I. We did not include the enclosure referred to by the Director in her letter. However, we did make technical changes on the basis of the comments in the enclosure wherever appropriate.

1990 Census Accuracy and Cost Underscore Need for Reform

In the mid-1960s, as the Bureau planned for the 1970 census, it recognized that it confronted a fundamental challenge: it needed to alter the then-prevailing basic census design of having census enumerators visit every household to better ensure the quality of data while controlling costs. The mailout-mailback methodology with enumerator attempts to gather data on all nonrespondents used in 1970 and subsequent censuses was born of this challenge.

Today, the Bureau confronts a situation similar to the one it faced in planning the 1970 census. The current census model appears to have exhausted its potential for counting the population effectively and economically. The 1990 census missed millions of persons and contained millions of other errors. In the past, the increased cost of each census contributed to more accurate results. However, the accuracy of the 1990 census fell below that of 1980 as cost escalation continued.

The Department of Commerce and the Bureau recognize that the current approach to taking the census needs a complete reassessment. The current Bureau Director signaled at her confirmation hearing that census reform would be a major priority during her tenure.[1] She noted that a "fundamental rethinking" of the way the nation takes the census was needed. As recognition that basic changes are needed, the Department of Commerce and the Bureau have implemented a major census redesign and reform effort. The Department and the Bureau recognize that to enumerate a diverse and dynamic society effectively, census methods cannot remain static—changing social conditions demand changed census-taking methods.

Coverage of 1990 Census Did Not Improve Over 1980 Census

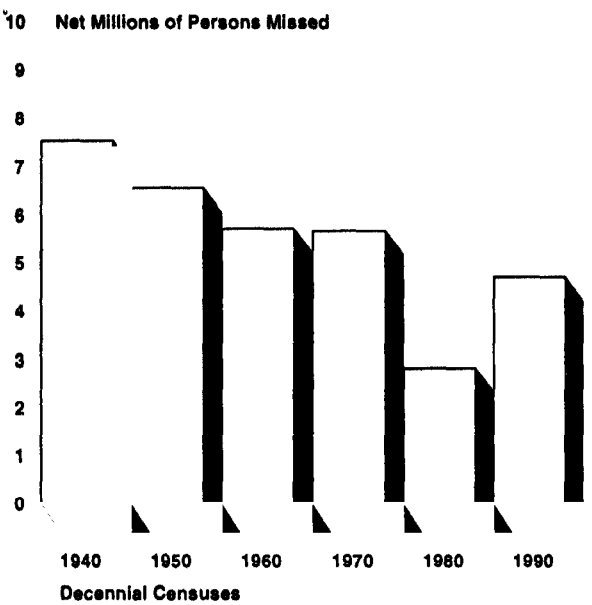
Data from both the Bureau's 1990 census PES and demographic analysis demonstrate that millions of persons were missed by the 1990 census. The net undercount as estimated by the PES was about 2.1 percent of the enumerated resident population of 248.7 million, or approximately 5.3 million persons; on the basis of demographic analysis it was about 1.8 percent, or approximately 4.7 million persons.

Demographic analysis is important because it provides both an independent estimate of the population and a consistent historical series of estimated undercounts for censuses between 1940 and 1990. For example, as shown in figures 2.1 and 2.2, the 1990 census was the first one

[1]Testimony of Dr. Barbara Everitt Bryant, Director, Bureau of the Census, before the Senate Committee on Governmental Affairs, July 13, 1990.

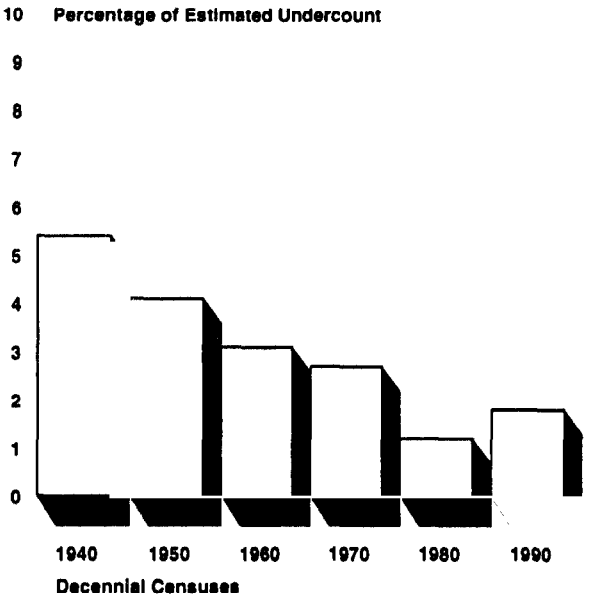
since the Bureau began estimating census coverage in 1940 not to reduce the net undercount over the preceding census.

Figure 2.1: Net Undercounts Represent Millions of Persons



Source: Bureau of the Census estimates of net undercounts based on demographic analysis as of June 1991.

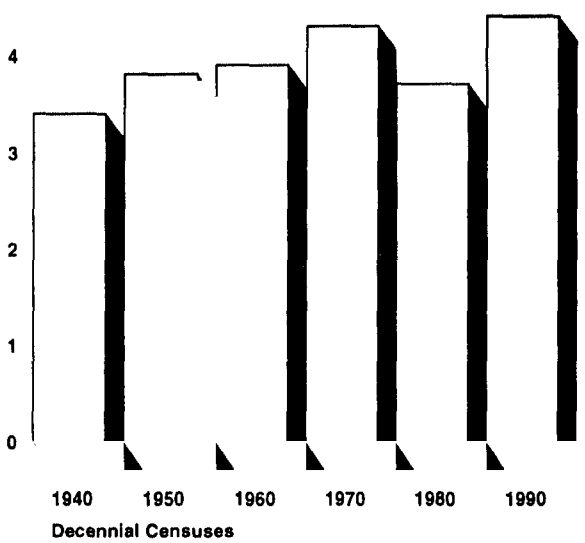
Figure 2.2: 1990 Census Coverage Failed to Improve on Preceding Census



Source: Bureau of the Census estimates of net census undercounts based on demographic analysis as of June 1991.

Moreover, the 4.4-percentage-point difference in the 1990 undercount between Blacks and non-Blacks was the highest since the Bureau began estimating coverage with the 1940 census. The failure to make progress on reducing the differential undercount is particularly disturbing because one of the Bureau's major goals for the 1990 census was to improve the count among minorities. Figure 2.3 shows the difference in percentage of estimated net undercount between Blacks and non-Blacks.

Figure 2.3: 1990 Census Had Highest Black/Non-Black Differential Undercount Since the Bureau Began Estimating Census Coverage



Source: Bureau of the Census estimates of net undercounts based on demographic analysis as of June 1991.

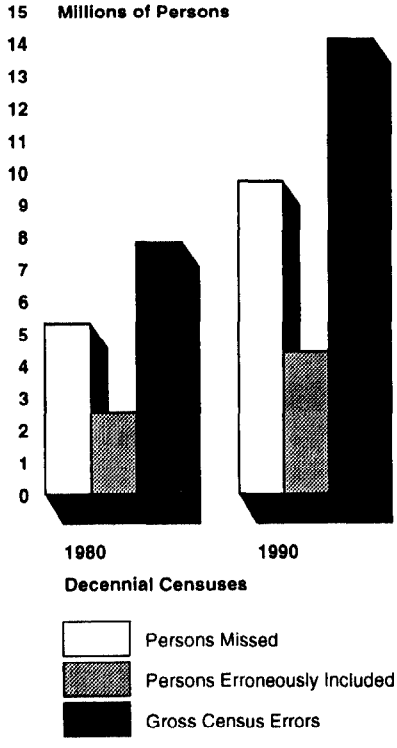
The net undercount, the difference between the estimated population and the census count, is useful in making broad comparisons of census coverage among censuses. However, in addition to persons missed, millions of others were double-counted, otherwise improperly included in the census, or counted in the wrong location—a matter of vital concern for redistricting. Examining this gross error, therefore, provides another measure of census accuracy.[2] When double-counts and other errors that improperly inflate the census count are subtracted from the census, the census appears to have missed substantially more persons than suggested by the net undercount. Overall, we estimated that the 1990 census missed a minimum of 9.7 million persons—or about 3.9 percent of the census count—and contained a minimum of 14.1 million gross errors.

Comparisons of gross errors between 1980 and 1990 must be made with caution because the 1990 PES was of higher quality than its 1980

[2]See 1990 Census: Reported Net Undercount Obscured Magnitude of Error (GAO/GGD-91-113, Aug. 22, 1991) for a discussion of net and gross undercounts and details on the equations used to determine gross error.

counterpart and therefore more successful in detecting errors. Nevertheless, data suggest that, as with the net undercount, the 1990 census appears to have contained more gross errors than the 1980 census. The estimated minimum number of errors in the 1980 census (7.8 million) represented about 3.4 percent of the 1980 count, in contrast to 1990's minimum 14.1 million errors, which represented about 5.7 percent of the count, as shown in figure 2.4.

Figure 2.4: 1990 Census Appears to Have Had More Overall Errors Than the 1980 Census



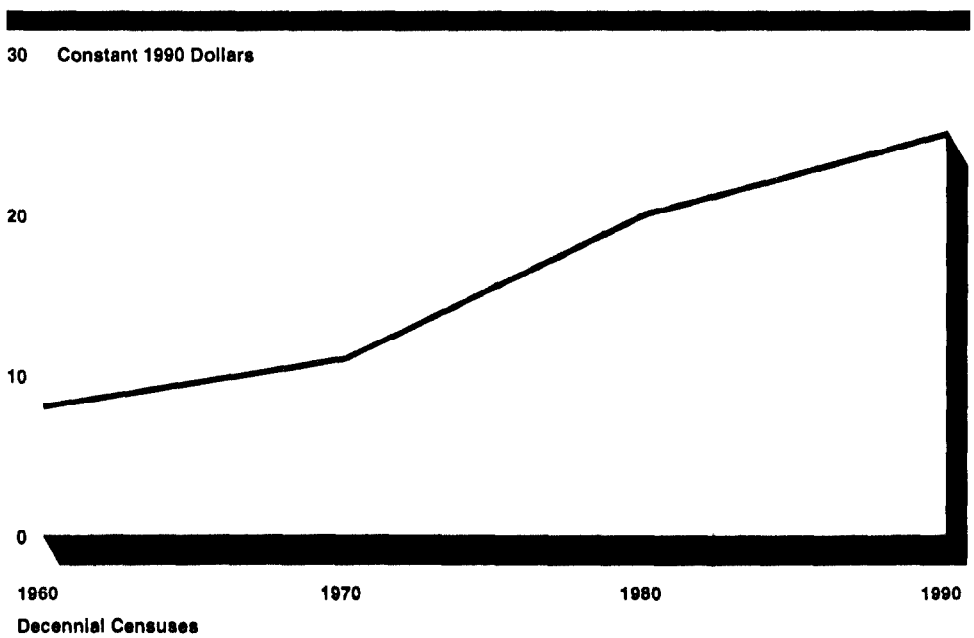
Source: GAO calculation based on Bureau of the Census data. The best data available are used to estimate net undercounts—for 1990, the PES; for 1980, the demographic estimate as of June 1991.

Census Costs Have Escalated Dramatically

Census costs have spiraled in recent decades despite Bureau cost control efforts. Figure 2.5 shows (in constant 1990 dollars) that, using essentially the same census approach, the Bureau spent about $11 in 1970 and about $20 in 1980 to count each housing unit. For 1990, the per-unit cost rose

again to about $25. Limiting the 1990 per-housing-unit cost to that of the 1980 census was initially a major Bureau goal. However, this objective was abandoned in the mid-1980s when it became apparent that it could not be achieved under the current census design.

Figure 2.5: Census Costs Per Household Have Increased Dramatically Since 1960



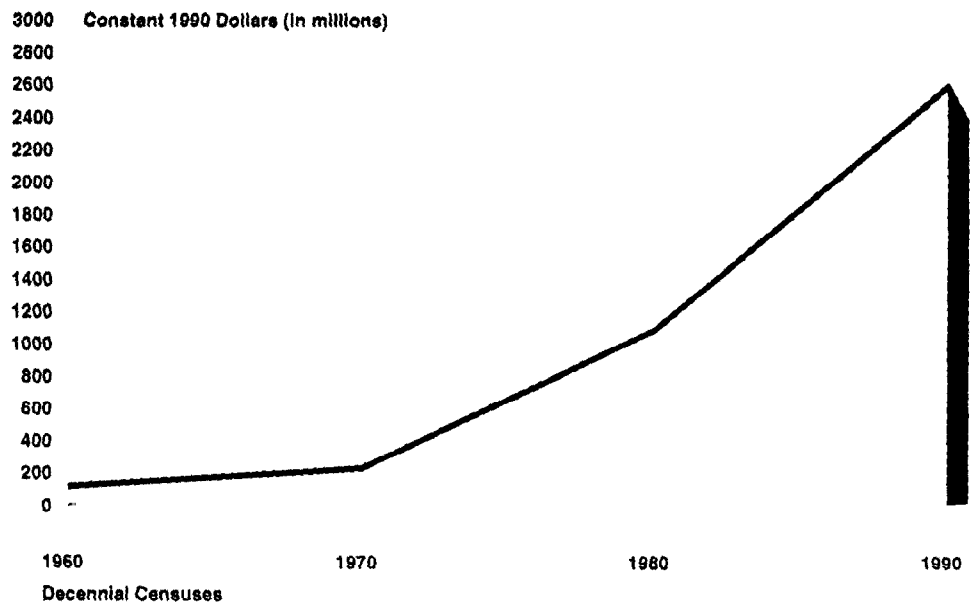
Source: Bureau of the Census; 1990 costs are estimated.

Several factors, some of which are beyond the control of the Bureau, have led to this long history of cost increases. For example, the change in the census methodology after 1960, a declining willingness of the public to respond to the census, the greater demands for accurate and complete data, the increased use of automation in the census, the expansion of census evaluation efforts, and a Bureau management approach that has not stressed cost control have all contributed to cost growth.

With the completion of the 1990 census cycle in fiscal year 1993, the 1990 census is expected to cost about $2.6 billion, according to the Bureau. This total represents an increase of about 65 percent (in constant 1990 dollars)

over the $1.67 billion spent on the 1980 census. Figure 2.6 illustrates the rise in total census costs since 1960.

Figure 2.6: Overall Census Costs Have Soared Since 1960



Source: Bureau of the Census; 1990 costs are estimated.

Department of Commerce and the Bureau Are Implementing Census Redesign Effort

In the years since the Bureau began using the current census design in 1970, society has undergone substantial change. The Bureau's 21st Century Decennial Census Planning Staff observed that the "deep currents" affecting the society and the economy in which the census must take place point to the need for census reform.[3] Household living arrangements, the public's willingness to provide personal information to the government, technological advances, and the size of the workforce available for temporary census work are but a few of the factors that will continue to influence the way the census can be taken. For example, in 1950, 78 percent of households were maintained by married couples; by 1990 this proportion had declined to about 56 percent. Such a significant shift poses a range of challenges for the Bureau. In households where persons are not related, members may be unwilling or unable to provide information on

[3]Deep Currents, Bureau of the Census, 21st Century Decennial Census Planning Staff (Suitland, Md.: May 1990). The views expressed in this document represent those of the staff and are not necessarily the position of the Census Bureau.

one another, and it can be more difficult to locate household members at home during follow-up efforts. In addition, demographic trends point to a shrinking labor pool from which the Bureau will be able to draw the hundreds of thousands of quality temporary workers that will be needed in 2000 if the current census design is retained. Finally, in an era of persistent fiscal limitations, the Bureau may not be able to expect budgetary support for continued sizable cost increases.

The Department and the Bureau appear to recognize that the nation's dramatic and continuing social changes require a thorough reexamination of census-taking procedures. The Department and the Bureau have publicly committed to a fundamental rethinking of the current census design and have established a task force to guide these redesign efforts. The task force consists of three committees. One committee is addressing technical issues associated with redesigning the census, while another is reviewing the policy implications of various design options. Members of these committees include officials from the Department, the Bureau, and other federal agencies, such as the Bureau of Labor Statistics and the Department of Housing and Urban Development, that have a stake in the decennial census. The third committee the Department has established is a public advisory committee consisting of representatives of organizations whose memberships also have a major stake in the census, such as the U.S. Conference of Mayors, the American Statistical Association, and the National Association for the Advancement of Colored People. The task force is intended to use the time before concerted planning for the 2000 census must begin in the mid-1990s to systematically investigate alternative ways of taking the census. The Department has established a schedule for the task force to develop a number of competing census designs for full field testing in 1995.

Agency Comments

The Bureau expressed concern about the report's discussion of gross census errors. The Bureau said that the PES was designed to measure net census coverage and that different definitions of "correct enumeration" result in different estimates of the number of erroneous enumerations. The Bureau believes different census evaluation designs and definitions between 1980 and 1990 make comparing the number of gross errors in those censuses problematic.

The Bureau also said that a focus on gross errors could be misleading when examining census design options. For example, sampling may be shown to reduce net error rates at lower geographic levels, yet increase

the level of gross error. The Bureau said that there are a variety of measures that it believes can more appropriately compare quality between two censuses or to assess coverage error. Such measures include rates of imputation (of count data), rates of substitution (of all characteristics), and rates of item allocation (of individual characteristics).

Our analysis of gross census errors is based on the Department of Commerce's published guidance for other nations in evaluating their censuses.[4] The guidance pointed out the importance of the distinction between gross and net error, and it discussed post enumeration surveys and how gross error is calculated. Our estimate of the number and nature of gross errors in the report is based on the definition of correct and erroneous enumeration that the Bureau used in evaluating the 1990 census. Furthermore, the 1990 gross error figure presented in this report is a conservative estimate that includes as erroneous enumerations only those cases in which PES results clearly identified persons as improperly included in the census because they were either double-counted in their immediate geographic areas or were determined to be fictitious. This estimate does not include other categories of erroneous enumerations, such as statistically estimated persons. We agree, as stated in the report, that comparisons between 1980 and 1990 must be made with caution.

The report uses gross errors as one of several measures of census accuracy. We agree that design options for the 2000 census must be assessed on the basis of several criteria, including the degree to which they reduce the net undercount, because each individual measure of census accuracy has limitations. Comparing the amount of data that is statistically imputed, for example, could be misleading. Striving to limit the amount of statistical imputation may be of little value if it is replaced with data of questionable accuracy from proxy respondents. We previously had urged the Bureau to compare the quality of statistically imputed data with that gathered from nonhousehold members and other proxy respondents.[5]

[4]Evaluating Censuses of Population and Housing, U.S. Department of Commerce, Bureau of the Census, Statistical Training Document ISP-TR-5 (Washington, D.C.: Sept. 1985).

[5]Components of the 1990 Census Count (GAO/T-GGD-91-8, Feb. 21, 1991).

Address List Procedures Did Not Ensure Complete or Accurate List

An accurate and complete address list that identifies the mailing address and physical location of each housing unit is the cornerstone of a successful census. As a primary control for the census, the 1990 list of about 100 million addresses was used to deliver questionnaires and identify nonresponding units for follow-up, and served as a basis for tabulating results. Thus, the Bureau had to identify not only the mailing address for each unit but also the unit's geographic location.

Limitations in the address list affected both the quality and cost of the census. For example, preliminary results of a Bureau evaluation of the list's quality showed that about 3.5 million housing units were missed, and about 2 million were erroneously counted, including duplications, nonexistent units, and units counted at the wrong location.[1] Further, the Bureau's procedures included the delivery of millions of questionnaires to vacant and nonexistent housing units. We estimate that questionnaire follow-up on such units cost about $317 million.

The constant changes in the number and occupancy status of the nation's housing stock and difficulties in locating and identifying some units will always pose a major challenge to the Bureau's address list development efforts. Nevertheless, the Bureau has the opportunity to make substantial improvements for the future, but only if it builds on the investment it made to develop the 1990 list and aggressively explores increasing its reliance on the Postal Service.

Bureau Used Costly Procedures to Develop Its Address List

For 1990, as it had in prior censuses, the Bureau developed an entirely new census address list because it did not have the capability to build upon previous lists. To develop its list, the Bureau employed a series of redundant procedures, beginning in 1988 and costing about $182 million, that were designed to provide an incremental improvement with each procedure. To help ensure that housing units were not missed, the Bureau's procedures encouraged adding addresses but discouraged removing them. Generally, once an address was placed on the list, it was not removed unless identified for deletion in three operations, at least one of which had to be a post-Census Day questionnaire follow-up effort. Thus, the Bureau was willing to incur additional follow-up costs to ensure that every possible household it had identified would have the opportunity to be included in the census.

[1]These preliminary data are subject to change because all Bureau analyses and reviews had not been completed before this report was written.

The Bureau's efforts in urban areas show how redundant procedures were used to construct the 1990 address list. About 59 million addresses, or about 60 percent of all addresses on the list, were in urban areas. The Bureau initially purchased commercial lists at a nominal cost of less than $50,000. After review by the Bureau, the Postal Service checked the commercial lists for completeness and accuracy. The Bureau accepted suggested additions from the Postal Service unless the addition was virtually identical to an address already on the Bureau's list. The Postal Service also identified units that should have been removed from the list, such as addresses for nonexistent units or commercial establishments. However, the Bureau did not delete those addresses from the list, because it believed the best way to ensure a complete list was to be extremely conservative in allowing addresses to be removed.

After the purchased lists had been reviewed by the Postal Service, the Bureau hired about 20,000 temporary census workers to physically canvass streets in urban areas (referred to as precanvassing). The Bureau allowed addresses to be added, but generally did not remove addresses from the list. The list was sent to the Postal Service for another check. Under the Bureau's procedures, the list contained addresses that had been previously identified for removal by the Postal Service. Once again, the Bureau accepted additions from the Postal Service, but did not remove suggested deletions.

The Bureau's list for suburban and rural areas—covering about 38 million addresses—also was generated using a series of redundant procedures designed to make incremental improvements. For these areas, either commercial lists did not exist or the Bureau's automated system could not assign addresses to geographic locations. Therefore, the Bureau hired temporary census workers to canvass suburban and most rural areas to collect mailing addresses and identify the physical locations of housing units on maps. For the most part, these addresses were then checked by the Postal Service during two separate operations, and differences between the Bureau and Postal Service addresses were reconciled by additional Bureau fieldwork.[2]

[2]For about 28 percent of these addresses, the Bureau did not use the Postal Service check and reconciliation procedures because of delays in producing its maps, funding limitations, and concern that the addresses prepared by the temporary census workers would not provide a complete mailing address. Bureau field staff delivered questionnaires to these housing units rather than mail them. See 1990 Census: Delays in Completing the Address List for Suburban and Rural Areas (GAO/GGD-89-74, July 10, 1989).

Local governments were given two opportunities to verify the accuracy of the Bureau's list. In early 1990, before the census, local governments in urban and suburban areas were provided with block-level housing unit counts. Later in 1990, after major census data collection efforts were completed, all of the nation's 39,000-plus local governments were provided with block-level counts for their review.

Address List Limitations Contributed to Decreased Quality of Census Results and Costly Unneeded Follow-Up Work

The redundant, labor-intensive, and costly procedures the Bureau used did not guarantee a complete and accurate list. The Bureau missed or erroneously included millions of housing units in its final count of 102.3 million, according to preliminary data from the Bureau's evaluation of the address list. About 3.5 million, or 3.4 percent, of all housing units—occupied and vacant—were missed, and another 2 million, or 2 percent, were erroneously enumerated. Erroneously enumerated units included those that were counted twice, did not exist, did not represent residential units, or were assigned to the wrong geographic location. Data that break out the size of these different categories of erroneous enumerations are not currently available.

Some of the units missed were vacant, but about 2.5 percent of all occupied units were missed. This percentage compares unfavorably with the 1.5 percent of occupied housing units missed by the 1980 census.[3] Data on the extent to which the residents of missed households were nevertheless included in the census are not currently available, but presumably most of the residents were not included. On the other hand, if the Bureau had multiple addresses on its file for the same housing unit, there is a high probability that those people were counted more than once. As with occupied units that were missed, data are not currently available to isolate the extent to which the double-counted units affected the quality of the population count. However, errors in the final census count from missed units and double-counted units are reflected in PES estimates of the coverage of the 1990 census.

Housing Units Were Assigned to the Wrong Geographic Locations

The incorrect geographic assignment of housing units—and their occupants—is a potentially major concern for state and local redistricting efforts. The 2 percent of units that were erroneously enumerated includes units that were placed more than two blocks from where they really exist. In other cases, units that were not correctly placed were assigned to a

[3]See The Coverage of Housing in the 1980 Census, U.S. Bureau of the Census, PHC-80-E1 (Suitland, Md.: July 1985), p. 11.

block near where they should have been placed. Overall, between 4 and 5 percent of all housing units were assigned to the wrong location—including those improperly assigned to another area and those incorrectly located but still within adjacent blocks. In Georgia, Alabama, and Florida, the preliminary data show that about 10 percent of the housing units were not assigned to the correct geographic locations. The highest rates of geographic errors occurred in urban and suburban areas where the Bureau used its full complement of address list development procedures—including extensive field work by its temporary employees.

The Bureau's precanvass procedures illustrate how redundant address list development efforts designed to improve the list actually contributed to some degree of error. During precanvass, enumerators were to verify the accuracy of the address list, add any missing units, and correctly transfer those units that were assigned to the wrong geographic location. Transferring addresses required deleting the address from the incorrect geographic location and adding it to the correct one. The Bureau's automated process required an almost exact match of the "add" and "delete" to make the transfer. Minor spelling or keying differences between the two, or slight variations in the addresses—such as "St." instead of "Rd."—did not constitute a match, and the transfer was not made. Instead, the added address was recorded on the file, and the deleted address remained on the file as well. Thus, two addresses for the same housing unit would be on the files in two different geographic locations. Each of the addresses would have a unique identification number, making it difficult to detect and correct the duplication in subsequent census operations.

The Bureau recognized before the census that in many areas the precanvass add rates were higher than expected. For example, the lists in 29 of 423 precanvass areas increased by 20 percent or more; 3 of these increased over 40 percent. The Bureau was able to make corrections for only some of the offices before mailing the questionnaires. As a result, duplications were included in the precensus housing unit counts, and the extent to which they were corrected in subsequent operations cannot be determined.

Address List Procedures Generated Unnecessary Follow-Up Work

We estimate that total field costs to follow up on questionnaires not mailed back because the housing unit was vacant or nonexistent were about $317 million. That amount consists of $213 million in direct costs—those categories such as enumerator time, training, and travel that the Bureau

can specifically assign to programs—and $104 million in indirect costs such as district office space and equipment, recruiting, and administration that we allocated in a ratio of direct costs for the programs we examined compared to total direct field costs. These costs were incurred because the Bureau did not try to identify vacant units and generally did not remove nonexistent units from the address list before questionnaires were mailed out. Of the approximately 100 million questionnaires delivered, 8.6 million were to units subsequently found to be vacant, and 4.8 million were to nonexistent units, according to Bureau records. These 13.4 million addresses represented about 39 percent of the 34.3 million housing units that required personal visits from census enumerators because a questionnaire was not mailed back.[4]

Opportunities to Improve Address Listing

The Bureau has major opportunities to improve its address list for the 2000 census, but only if it builds on investments it made for the 1990 census and aggressively explores increasing its reliance on the Postal Service. The Bureau made substantial investments in its address list that have established a solid foundation upon which to build for the future and should help eliminate the need to repeat its redundant and costly address list development and follow-up procedures.

Build on 1990 Investment

The Bureau appears to be well-positioned to make significant improvements for the future. For the first time, the Bureau developed an automated address control file to incorporate changes resulting from its various procedures. In a major improvement over the 1980 census, the Bureau invested about $328 million to develop an automated geographic system to generate maps and geographically locate addresses.[5] These automated systems provide the foundation for an improved address list in 2000, but only if the Bureau upgrades, updates, and integrates them. One area needing attention is the Bureau's geographic files which lack address ranges outside the 345 major urban areas. As a result, approximately 40 percent of the addresses could not be assigned to the correct geographic location using those files.

[4]On the basis of Bureau time and motion studies, about 35 percent of the nonresponse follow-up effort was to these addresses. Thus, of the $560.3 million spent for nonresponse follow-up fieldwork ($376.8 million in direct costs and $183.5 million in indirect costs), we estimate that about $196 million could be allocated to visiting vacant units and invalid addresses. In addition, we estimate the Bureau spent another $121 million ($81 million in direct costs and $40 million in indirect costs) for subsequent follow-up on vacant units and invalid addresses.

[5]Less than one-half of this amount, about $154 million, was allocated by the Bureau to the 1990 decennial census; the remainder of this cost was allocated to other activities.

Increase Reliance on the Postal Service

We have long believed that the Bureau needs to work closely with the Postal Service to develop, maintain, and update its address list.[6] We believe that letter carriers, who visit addresses regularly, should be in a much better position than temporary, inexperienced census workers to identify housing units and their occupancy status. Moreover, recent Postal Service technological advances reinforce the practicality of our prior recommendations. The Postal Service has developed an instantly accessible automated address file that will include every address to which mail is delivered. Letter carriers update the system daily on changes to their delivery routes; this includes identifying additions and vacancies. The Postal Service's goal is to have 95 percent of the nation's addresses in the system by 1995. The system will support the Postal Service's program to barcode every letter for automated sorting to the sequence carriers use to walk their routes. Postal officials anticipate that by 2000, 98 percent of all addresses in the country will be in a format appropriate for census use, with the unit's mailing address and physical location identifiable.

The long history of cooperation between the Bureau and the Postal Service cooperatively should facilitate an even closer relationship. Reliance on the Postal Service would eliminate the need for the Bureau to purchase and geographically code vendor address lists, make precensus Postal Service checks of the Bureau's list, or create its own mailing list by field canvassing. The Bureau recognizes the advantages of working more closely with the Postal Service to maintain and improve its geographic files and address list, and has initiated a pilot project to test the efficacy of a cooperative program.

In addition to helping construct the address list, other much more fundamental opportunities exist for greater reliance on the Postal Service. For example, at the urging of Members of Congress, the Bureau used the Postal Service during the 1990 census to help identify occupancy of some of the last, most difficult follow-up cases. A Bureau study found that although additional testing was needed, this appeared to be a very inexpensive and useful way to help complete these final cases. Using the Postal Service to identify vacant and nonexistent units before census forms are mailed rather than just assisting with the cases hardest to resolve could yield substantial savings. Testing the Postal Service's use in this capacity will be needed, because 1990 census data are not available to identify the extent to which the Postal Service accurately identified units

[6]See Problems in Developing the 1980 Census Mail List (GAO/GGD-80-50, Mar. 31, 1980) and A $4 Billion Census in 1990? Timely Decisions on Alternatives to 1980 Procedures Can Save Millions (GAO/GGD-82-13, Feb. 22, 1982).

as nonexistent. The Bureau did not ask the Postal Service to identify vacant units during address list development operations.

Agency Comments

In its comments on a draft of this report, the Bureau noted that data from its 1990 Housing Unit Coverage Check—which provides estimates of the accuracy of the final census housing unit counts—are preliminary and have not undergone thorough review within the Bureau. As a result, the data do not represent official Bureau findings.

Although the draft acknowledged the preliminary nature of the data from the 1990 Housing Unit Coverage Check, we have included additional statements to reinforce the point. Whatever the precise amount and type of error, the Bureau's investment in building the 1990 address list, combined with increasing its reliance on the Postal Service, appears to offer the opportunity for a more cost-effective address list in 2000. Officials at the Postal Service said that they agreed with our discussion of the issues affecting the Postal Service.

Falling Level of Public Cooperation Proves Formidable Challenge

A high level of public cooperation is the key to obtaining accurate data at a reasonable cost. A major benefit of the mailout-mailback census design is that voluntary mail responses are a less costly source of data than relying on enumerators to obtain information for every household in the nation. Bureau studies have also indicated that responses from mail returns tend to be more accurate than the responses obtained from enumerator-prepared questionnaires.

The disappointing response rates from the 1990 census warn of a continued downward trend in public cooperation. Since a census that relies on voluntary public response through mailbacks and other means is still expected to be the most effective and efficient method for basic data collection in the 2000 census, the Bureau needs to plan for increased difficulty in obtaining public cooperation. The Bureau recognizes that it is not enough to assimilate the lessons of the 1990 census: the 2000 census must be designed to accommodate new features of the population of 2000.

Census Relies on Questionnaire Mailbacks for Basic Data Collection

In the past three censuses, the Bureau has relied on public mailbacks of census questionnaires to collect data on most of the households in the nation. For the 1990 census, the Bureau asked about 95 percent of the nation's households to mail back their census forms. The other 5 percent were asked to hold their questionnaires for pickup by census enumerators. About 100 million census questionnaires were delivered to housing units on the Bureau's address lists starting in March 1990. Most questionnaires were delivered through the Postal Service, but about 10 percent were delivered by Bureau employees. The instructions on the questionnaires directed recipients to return the forms by April 1. The resulting mail returns accounted for almost 167 million persons in 1990, or about 67 percent of the reported resident population total.

Response to 1990 Census Was Lower Than Expected

The 1990 census mail response rate was disappointing. The mail response rate was only 63 percent by April 19, 1990, when the Bureau prepared its assignment lists for the start of follow-up operations.[1] This was 7 percentage points less than the planned 70-percent rate, which was still pessimistic compared to the 75-percent response achieved in 1980. The Bureau's plans were made on the basis of results from the test censuses and the decreasing cooperation encountered in other surveys.

[1]Due to late mail returns, the mail response rate subsequently increased to about 65 percent.

While the mail response provides a direct indication of the nonresponse workload, it is an imperfect measure of public cooperation. The response rate is calculated as a percentage of all forms mailed or left by enumerators that are completed and mailed back by respondents. It factors in housing units that are discovered to be vacant, uninhabitable, or nonexistent during nonresponse follow-up. A more precise measure of public cooperation, therefore, is the postcensus calculation of the mail return rate, defined as the percentage of forms completed and returned for occupied housing units. Overall, the 1990 results declined from previous levels and extended a downward trend, as shown in table 4.1.

Table 4.1: Comparison of Public Responses to the Decennial Censuses

	1970	1980	1990
Mail response rate (Percentage of total mailout)	78	75	65
Mail return rate (Percentage of occupied housing)	87	83	74

Source: Bureau of the Census.

Response rates varied by areas of the country.[2] Across all of the Bureau's 449 district offices in 1990, the mailback rate ranged from 39 percent to 83 percent. Large metropolitan areas usually experienced the lower response rates; 23 of the 32 largest cities had response rates below the national average. Boston, Chicago, Cleveland, New Orleans, New York, and Washington, D.C., all had response rates under 55 percent.

Low Response Rates Affect the Cost and Quality of the Census

The response rate as of April 19 was important, since decisions on staffing and funding resources needed for follow-up were made at that time. Over 34 million cases required follow-up by census enumerators. This amount represents a 37-percent increase over the 1980 census, when the nonresponse workload was about 25 million cases. Because of this extra workload, the Bureau obtained a supplemental appropriation of $110 million in new funding and permission to reallocate another $70 million originally appropriated for projected unemployment benefits.

The importance of a good mail response is not just that it reduces the staff, time, and money required to complete the census count. Based on its past experience and evaluations, the Bureau believes that the quality of data obtained from mail return enumerations is better than the data collected by enumerators. The Bureau's 1990 PES evaluations confirmed this

[2]Data on the 1990 mail return rates for specific areas of the country are currently being developed by the Bureau.

qualitative difference. Table 4.2 shows the higher rates of cases that were erroneous or of uncertain status derived from enumerator-filled questionnaires versus mail returns.

Table 4.2: Distribution of 1990 PES Cases

	Source of questionnaire	
Final enumeration status	Mail return	Enumerator prepared
Correct	96.74%	87.07%
Erroneous	2.46%	6.85%
Unknown	0.80%	6.08%

Note: The "unknown" category includes cases that were unmatchable or unresolved. Unmatchable cases included persons counted in the census whose records were too incomplete for the Bureau to try to resolve the enumeration status.

Source: Bureau of the Census.

The relationship between mail response rates and census errors was also illustrated in a report by four members of the special panel advising the Secretary of Commerce on census adjustment.[3] These panel members divided the persons in the PES into eight categories depending on the mailback rates for their neighborhoods. They reported that as the mail response rates decreased, the rate of errors—persons missed or erroneously included in the census—increased sharply. Their calculations showed that for persons from neighborhoods with the lowest mail response rates—under 55 percent—the PES estimated an omission rate of 18.7 percent and an erroneous enumeration rate of 9.9 percent. A high mail response is therefore important to both reduce the number of persons missed by the census and avoid overcounts and other errors.

Opportunities for Improving Public Cooperation

The environment for census-taking may worsen over the next decade, according to Bureau staff planning the 2000 census. The public cooperation problem is complex, but the Bureau's research has suggested that a number of demographic, socioeconomic, and attitudinal variables could affect public response. Among the factors that may negatively affect public cooperation in 2000 are illiteracy, non-English-speaking immigrants, concerns about privacy, the hectic nature of modern living, undocumented aliens, growth in commercial mail and telephone solicitations, lack of confidence in civic institutions, and increasing numbers of nontraditional

[3]Eugene P. Ericksen, Leobardo F. Estrada, John W. Tukey, and Kirk M. Wolter, Report on the 1990 Decennial Census and the Post-Enumeration Survey, submitted to the Secretary of Commerce (Washington, D.C.: June 21, 1991).

household and family arrangements. Many of these factors reflect larger societal changes and problems that the Bureau cannot expect to solve with a technical adjustment to the census-taking procedures. However, the Bureau must focus on addressing those components of the larger problems that it can affect.

Simplify the Questionnaire

One broad area within the Bureau's ability to address that deserves particular support is exploring ways to make it easier for people to respond to the census. The differential mail response rates for the 1990 short form and long form indicate the potential benefits of a simpler questionnaire. The short form, sent to most households, had 7 population items and 7 housing questions; the long form, which went to 1 out of 6 households, included 33 population questions and 26 housing questions.[4] The national mail response rate for the short form was 66 percent, while the rate for the long form was 60 percent.[5] In urban areas, where the Bureau traditionally has had the most difficulty securing public cooperation, the differential was somewhat greater, with a short form rate of 61 percent and a long form rate of only 53 percent.

The Bureau tested simplified, more user-friendly census questionnaires in March through May 1992, and is currently evaluating the results. We think this test was an appropriate place to begin research on addressing the declining public response. Since 1976 we have suggested that the Bureau test a streamlined questionnaire to determine whether it could improve the census response rate and thereby reduce costly follow-up efforts.[6] We also urged the Bureau to test related options that reduce dependence on costly field follow-up, such as targeting the use of reminder cards and second questionnaire mailings.

Revising the form or content of the questionnaire could promote better response by reducing the time and effort needed for respondents to understand and complete the census form. Bureau plans note that there is evidence from private sector surveys that questionnaires taking less than 5 minutes to fill in have significantly higher response rates. A simplified

[4]For population questions, a separate response was required for each person in the household. Housing questions required only one response for the entire household.

[5]The national mail return rates were 74.9 percent for the short form and 70.4 percent for the long form. Subnational data are not currently available.

[6]For example, see Programs to Reduce the Decennial Census Undercount (GAO/GGD-76-12, May 5, 1976); Decennial Census: Issues Related to Questionnaire Development (GAO/GGD-86-74BR, May 5, 1986); Decennial Census: Local Government Uses of Housing Data (GAO/GGD-87-56BR, Apr. 8, 1987); and Census Reform Needs Attention Now (GAO/T-GGD-91-13, Mar. 12, 1991).

questionnaire may also encourage cooperation by reducing or eliminating requests for information that people have been reluctant to provide, such as income.

Simplifying the census form could also generate substantial cost savings. As an indication of the magnitude of potential savings, the Bureau estimated that a radically streamlined questionnaire in 1990 could have saved about $480 million. Potential savings can result from a number of sources. A smaller nonresponse workload would cut the staff and time needed to complete follow-up operations. A shorter form could reduce the amount of materials, printing, and postage used. A simplified form would also require less time for each follow-up interview, and the time and materials needed to train enumerators could be trimmed. Finally, improved ease of handling and editing simplified forms could reduce the cost and increase the timeliness of census data processing.

The potential benefits of a simplified questionnaire would come at the cost of a reduction in census form content—that is, a reduction in the questions asked. Content decisions reflect a difficult balancing between respondents' burden and census users' data needs. To meet its constitutional requirements for congressional reapportionment and redistricting, the census would require only population information. However, because the census is the best source of detailed small area data for every geographic block in the nation, it is used to provide benchmark information on a variety of other demographic and housing characteristics.

Still, the decennial census is only one of many ways to collect the information needed by data users. A streamlined questionnaire requires rethinking which data items need to be collected through the decennial census and at what level of aggregation. Some items might be collected more appropriately—and in a more timely manner—through other sources, such as periodic surveys or administrative records. The cost savings from a simplified form might be reallocated to augment these other data collection activities.

Modify the Census to Respond to Social Changes

In anticipation of changing living patterns, the Bureau must begin revisiting some of its residency rules and definitions to ensure that these remain appropriate and understandable to the public. The census-taking definitions and procedures used in 1990 did not always conform with the actual living arrangements and relationships found across the nation's

diverse population. For example, the census tries to count every person at his or her "usual residence." But this is a difficult task for some respondents, especially with the increase in nontraditional households where it can be difficult to determine who meets census residency rules and therefore is or is not a "resident." Bureau-sponsored ethnographic studies identified cases where persons stayed at a number of different locations and perhaps used another residence entirely as an official address.

Such residential mobility is not the only problem in trying to count persons, since—despite the Bureau's instructions and examples—respondents may apply their own interpretation of who should or should not be listed as a household member. For example, evidence from Bureau studies suggests that immediate family members are more likely to be reported than distant relatives and nonrelatives. Therefore, an unrelated individual who has been staying at a particular unit for months might be left off the census roster, while a relative who had just moved in (or was actually residing somewhere else on Census Day) would be included.

As a result, the census may count some persons but miss others who are present in the same household. Results from the 1990 PES showed that persons missed by the census were more often missed through incomplete reporting of household members rather than through the Bureau missing the actual housing structure, especially in large cities and among minority populations. Persistent enumeration problems, such as the high undercount of Black males, reflect the difficulty of using traditional census methods to address these within-household misses.

The Bureau needs to reexamine census rules and definitions continuously to ensure that they are applicable to a changing society. Projected social and demographic changes by 2000 will place an even greater strain on the Bureau's ability to define and apply concepts such as "household" or "usual residence." Bureau planning documents note that such changes may require revisions in the census rules concerning who to list as household members. Bureau officials noted that social changes also may require obtaining multiple addresses from persons and dealing with the complex and expensive tasks of geographically coding, matching, and unduplicating the results.

The Bureau's ethnographic studies on the behavioral causes of undercounts should provide valuable insights into the extent to which

census rules conform with social reality. The studies done during the 1990 census focused on five groups subject to undercounts: undocumented migrants, Hispanics, Blacks (especially adult men), American Indians, and recently arrived Asians and refugees. The researchers involved in the studies will recommend methods to improve census coverage and outreach efforts that take into account cultural differences within the U.S. population.

Prepare for a Lower Response in 2000

Despite increased attention to census outreach and promotion activities in the 1990 census, with significant special efforts directed at reaching the hardest to enumerate groups, the Bureau could not maintain or improve on the level of response received in the 1980 census. Evaluations indicated that almost 93 percent of the general public was aware of the census just before Census Day. Unfortunately, awareness did not sufficiently motivate a substantial segment of the public to respond. The challenge confronting the Bureau goes well beyond merely improving and expanding the census publicity campaign.

The problem of obtaining a high rate of public cooperation is not exclusively related to the census. In the final analysis, the Bureau cannot expect that a technical adjustment will completely solve the public's declining willingness to participate in the census. Unless there is a fundamental change in the census design, the Bureau needs to plan and budget for a larger nonresponse workload in 2000 to avoid a repeat of the situation in 1990, when the lower than expected response rate required a supplemental appropriation. If the downward trend in public cooperation continues, the national mail response rate could be as low as 55 to 59 percent in 2000. This would generate a potential nonresponse workload of nearly 50 million cases. Under this scenario, the Bureau's planning staff estimated that the 2000 census could cost $4.8 billion in current dollars.

Follow-Up Efforts Are Costly, Time Consuming, and Error Prone

The Bureau relied on time-consuming and labor-intensive field activities in trying to enumerate the sizable proportion of households that did not mail back a questionnaire. These follow-up efforts are the single most expensive component of the census. If the cost of follow-up operations were just the time and money spent gathering the data, they still might be justified by the increased accuracy and equity of the final census counts. Unfortunately, results from census evaluations suggest that the cost of follow-up and other supplemental operations included adding errors to the census data. The rate of such errors appeared to increase dramatically as the time spent on data collection dragged on. Moreover, despite tremendous efforts by the Bureau staff and an army of temporary census employees, the census still missed people, and the persons missed were disproportionately members of minority groups. Such problems are inherent in the attempt to count the last and most difficult nonresponse cases using traditional enumeration methods.

Field Operations Were Used to Reach Persons Not Enumerated by Mailbacks of Census Forms

The Bureau assigned enumerators to contact those households that did not return a questionnaire in an attempt to get all requested census data. This effort, called nonresponse follow-up, was scheduled for a 6-week period running from April 26 to June 6, 1990. The Bureau established procedures to allow up to six attempts to complete an interview with a household resident. If a household resident could not be reached or refused to answer, the enumerator was permitted to use special procedures known as last resort and closeout to expedite the operation. Under those procedures, enumerators could contact persons who were not residents of the household. They could also collect less information than requested by the census short and long forms.[1] The Bureau added approximately 58.8 million persons to the population counts during nonresponse follow-up, accounting for 23.6 percent of the final census total.

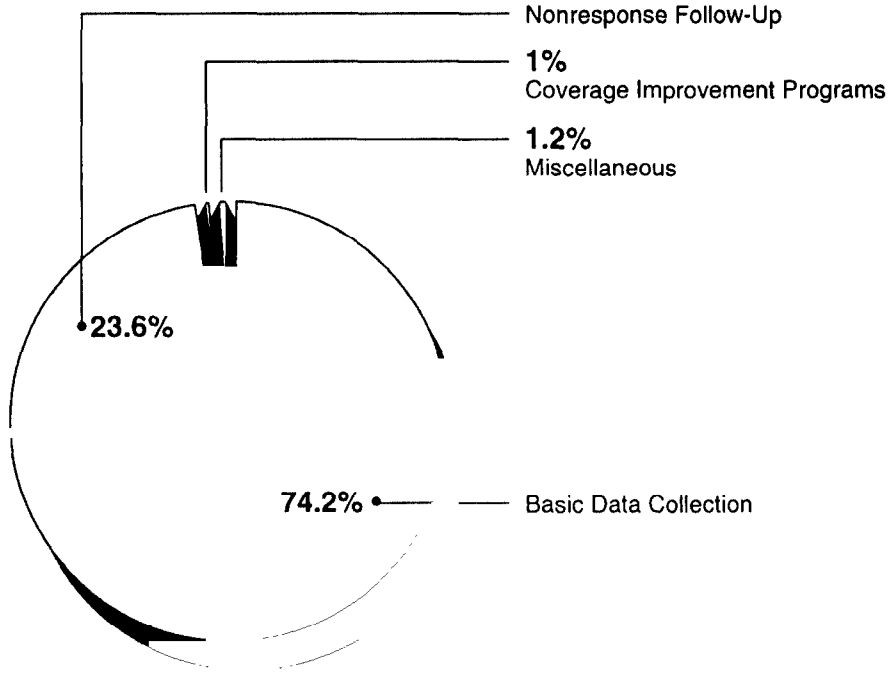
The Bureau also implemented a series of coverage improvement programs designed to count persons who may have been missed by the basic data collection and follow-up operations, such as a recheck of housing units identified as vacant or nonexistent during follow-up and a special effort designed to improve the count of parolees and probationers. The programs began in June and continued into December 1990, or just before the Bureau's mandated date for providing population figures to the President.

[1]For a last-resort response, the enumerator needed to get the name of each person in the household plus answers to three of four questions for each person—relationship, gender, race, or marital status—and a description of the housing unit. Some questionnaires completed during closeout included only a description of the unit and a count of residents.

Bureau staff processed the forms generated by these programs through an operation called search-match in an attempt to avoid counting these persons twice—for example, by checking if they had already been included on a previously received questionnaire. Approximately 2.4 million persons, about 1 percent of the reported census total, can be attributed to the various coverage improvement programs.

Figure 5.1 shows the relative proportion of the 1990 total resident population of 248.7 million persons attributable to each major census data collection activity.

Figure 5.1: Contribution to Final 1990 Residential Population Total, by Data Collection Activity



Note: Basic data collection activities included mailback (67.1 percent of the total count), list/enumerate (4.4 percent), and group quarters (2.7 percent).

Source: Bureau of the Census testimony before the Subcommittee on Census and Population, House Committee on Post Office and Civil Service, February 21, 1991, with revisions based on GAO analysis of more recent detailed records provided by the Bureau for individual programs.

Expensive Follow-Up Efforts Were Hampered by Unanticipated Workload, Staffing, and Schedule Problems

Follow-up operations in the field are considerably more expensive than other enumeration activities. Although nonresponse follow-up accounted for less than 25 percent of all census enumerations, it was the single most expensive operation of the decennial census. At a minimum, we estimate, on the basis of Bureau cost reports of district office activities, that nonresponse follow-up cost about $560 million, and other field follow-up activities cost approximately $170 million.[2] Together, these two operations required about 57 percent of the approximately $1.289 billion spent on data collection during the 1990 decennial census.

Unanticipated workload, staffing, and schedule problems added to the difficulty and cost of completing the 1990 decennial census. As a result of the unexpectedly sharp decline in the mail response rate, many census district offices had to cope with nonresponse workloads greater than those the offices were originally planned to handle. The actual 1990 nonresponse workload of over 34 million cases represented approximately 3 million more addresses than were budgeted. Higher than budgeted workloads occurred everywhere except in a cluster of states mainly in the upper Midwest. Large metropolitan areas usually experienced the greatest differences between planned and actual nonresponse workloads. The higher than expected workloads exacerbated an already difficult staffing and scheduling situation.

We raised concerns in a number of testimonies about the Bureau's ability to staff its offices adequately during nonresponse follow-up.[3] The key labor force problems were (1) difficulty filling all positions in selected areas, (2) low hours worked/low cases completed rate per enumerator, and (3) higher than expected turnover.

The Bureau's staff shortages were most apparent from the perspective of the district offices, where nonresponse work actually took place. As of early May 1990 (a few weeks into nonresponse follow-up), 171 of 447, or about 38 percent, of district offices with nonresponse cases reported that they did not have the necessary number of enumerators. In addition, since

[2]The nonresponse follow-up figure includes about $376.8 million direct and $183.5 million indirect costs. The field follow-up figure includes about $114.1 million direct and $55.7 million indirect costs. Field follow-up activities mainly consisted of rechecking units initially reported as vacant or nonexistent in the nonresponse follow-up operation.

[3]See, for example, Progress of the 1990 Decennial Census: Some Causes for Concern (GAO/T-GGD-90-44, May 21, 1990); 1990 Census: Status of Questionnaire Follow-Up Efforts (GAO/T-GGD-90-52, July 2, 1990); and Analysis of 1990 Census Operations (GAO/T-GGD-90-55, July 13, 1990).

the Bureau's staffing statistics did not account for part-time employment, its data overstated the actual staffing situation.

Filling enumerator positions was difficult due to increased competition for labor. Despite the use of geographic pay rates and legislation that enabled federal annuitants and military retirees to work on the census without reductions in their census salary or retirement benefits,[4] the Bureau still experienced widespread staff shortages. The Bureau had to raise its enumerator pay rates during the final stages of nonresponse follow-up to attract and retain adequate staff in some areas.

Productivity per enumerator was also lower than expected. Data on total staff hired by region compared to the nonresponse workload showed a national average of roughly 60 to 65 cases completed per person hired, compared to the expected 75 to 133 cases. In some areas, turnover was much higher than the budgeted rate of 50 percent (or 100 percent in hard-to-enumerate urban areas). Therefore, although according to the Bureau the total number of full-time staff positions required to handle the nonresponse workload was about 157,000, the actual number of temporary census workers used over the course of the census was approximately 551,000. About 300,000 enumerators were required during the peak of nonresponse follow-up.

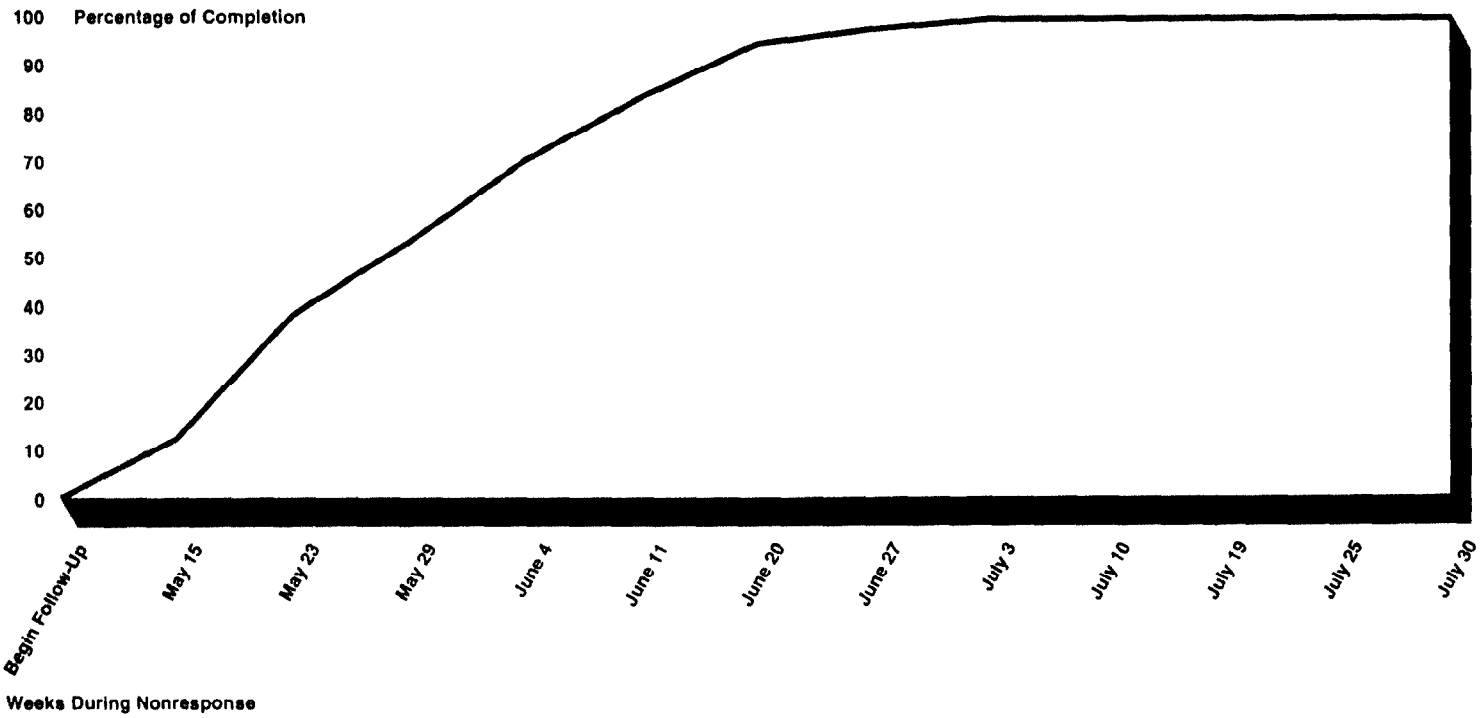
Since some offices could not fill all positions, and many enumerators were working only part time, the nonresponse follow-up operation took longer than the scheduled 6 weeks to complete. Only about 7 percent of district offices finished nonresponse by June 6, 1990, as scheduled. Most district offices finished within 10 weeks, but some took as long as 14 weeks, with the latest offices concentrated in the New York region. The last office, in West Manhattan, closed on July 28.

While the Bureau completed the enumeration of nonresponse households 8 weeks behind schedule, this was still earlier than in 1980, when nonresponse continued into September and October. Improved management flexibility and response contributed to the Bureau's ability to complete follow-up earlier than in 1980. In particular, Bureau managers used an automated management information system to track fieldwork on a daily basis, which enabled them to identify and take action in areas that were falling substantially behind schedule.

[4]For further information on these issues, see Status of Plans for the 1990 Decennial Census (GAO/T-GGD-89-20, May 5, 1989); Expanding the Decennial Census Applicant Pool (GAO/T-GGD-89-22, May 23, 1989); and 1990 Census: Costs Are Uncertain Because Wage Rates May Be Uncompetitive (GAO/GGD-90-78, May 1, 1990).

The cumulative completion rate for nonresponse cases illustrates the difficulty of reaching 100-percent completion. Bureau enumerators were able to complete about 72 percent of the follow-up workload within the scheduled 6 weeks and finished 90 percent within 8 weeks. As shown in figure 5.2, however, the attempt to resolve the remaining 10 percent lasted another 6 weeks.

Figure 5.2: Nonresponse Follow-Up Progress



Note: End of operation scheduled for June 6, 1990; operation completed July 30, 1990.

Source: Bureau of the Census' State of the Census reports.

Bureau officials said that this leveling off in production occurs because cases remaining unresolved at the end of the operation are the most difficult households to reach, either because they are uncooperative or

rarely at home and unknown to neighbors. They also note that these cases tend to be widely scattered, so that work at the end of the enumeration operation is spread out and involves more travel time between cases.

Quality of Enumerations Declined as Data Collection Efforts Were Extended

In a previous report we noted that completing fieldwork expeditiously is a key ingredient to ensuring a high-quality census.[5] Efficient fieldwork provides the Bureau with time to review census counts and resolve apparent discrepancies. The Bureau has noted that this also keeps data collection closer to the census reference date of April 1, thus minimizing the problems associated with trying to count a mobile population.[6]

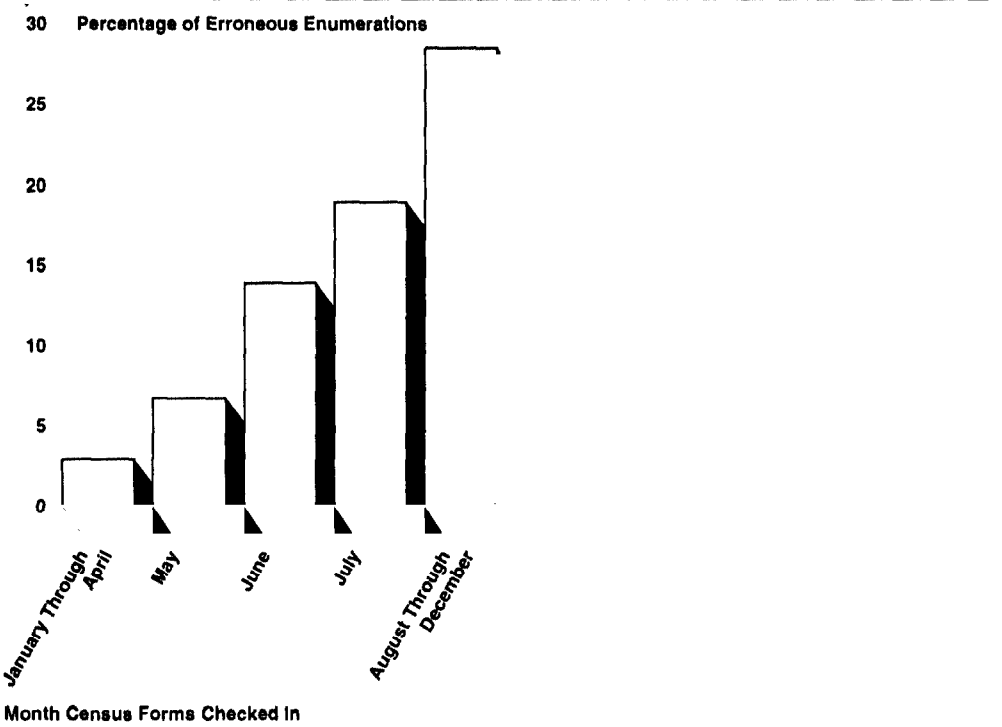
Bureau studies and evaluations provide evidence that revisiting the same housing units over time can yield very different results. Units change from vacant or uninhabitable to occupied and vice versa, enumerators may contact different respondents who provide inconsistent information, or the respondent may not recall who was or was not living there on April 1. The quality of the data collected therefore becomes more uncertain as enumeration efforts continue past Census Day.

Results from 1990 PES evaluations demonstrated that the longer census data collection activities continued, the greater the cost in terms of erroneous enumerations. Figure 5.3 shows the dramatic increase in the rate of erroneous enumerations as a percentage of persons added to the census counts over the course of the 1990 census.

[5]1990 Census: Enhanced Oversight Should Strengthen Recruitment Program (GAO/GGD-90-65, Apr. 13, 1990).

[6]For example, a recent Bureau survey found that about 18 percent of the nation's householders moved into their homes within the previous 12-month period.

Figure 5.3: Erroneous Enumeration Rates, by Month, in 1990



Note: The date of check in is, in most cases, slightly later than the actual date of enumeration. It indicates the date that a form entered the Bureau's processing system.

Source: Data from Eugene P. Ericksen, Leobard F. Estrada, John W. Tukey, and Kirk M. Wolter, Report on 1990 Decennial Census and the Post-Enumeration Survey, submitted to the Secretary of Commerce (Washington, D.C.: June 21, 1991).

During the final stages of data collection, the Bureau expends considerable effort to increase the population count, while trying to maintain the quality of that count, with limited success. The coverage improvement programs provide a vivid illustration of this problem. For example, during the Bureau's recheck of vacant or nonexistent housing units, enumerators rechecked approximately 11.9 million housing units and added about 1.5 million persons, but the Bureau's subsequent evaluations estimated that over 30 percent of the additions were erroneous. Similarly, in the parolee-probationer coverage improvement program, the Bureau received a total of approximately 1.4 million forms and added between 400,000 and 500,000 persons to the final census

figures, but about half of those persons were later estimated to have been erroneous.

One important consequence of the difficulty the Bureau experienced in trying to complete the last portion of nonresponse cases was that Bureau enumerators had to use the last resort and closeout procedures discussed on page 42. These procedures may have contributed to the decline in census data quality because the Bureau accepted less complete responses and information from nonhousehold respondents. These procedures were used most heavily in urban areas and among minority populations. For example, Bureau data showed that in large city offices an average of 20 percent of all nonresponse follow-up households were enumerated by last-resort or closeout procedures. The district office in Northeast Manhattan used last-resort procedures for approximately 42 percent of the occupied nonresponse units. The rates also varied by race, with non-Hispanic Blacks enumerated by last resort or closeout at about twice the rate of non-Hispanic whites—4.9 percent to 2.3 percent.

Opportunities to Reform Follow-Up Efforts

The results from 1990 demonstrate that adding even more resources is unlikely to allow the Bureau to enumerate that last remaining segment of the population. Furthermore, the series of field operations that attempt to count the last portion of the population are among the most costly components of the census in terms of both resources expended and errors introduced to the count. The Director of the Bureau of the Census stated in her recommendation to the Secretary of Commerce on census adjustment that:

"There is no currently identifiable methodology to attain 100 percent population coverage via enumeration in 2000. With the increasing diversity of the country, a growing diversity documented by the 1990 census, the problem could be larger in 2000."[7]

The Bureau must anticipate greater difficulties in getting the most complete and accurate census count possible in 2000. As shown in chapter 4, the potential nonresponse workload is likely to grow larger in the next census, and Bureau planners expect to encounter greater problems recruiting and retaining sufficient temporary workers in 2000 than were experienced in 1990. The results from 1990 also demonstrated that spending more time on fieldwork has questionable value. Extended reliance on field follow-up activities represents a losing trade-off between

[7]Barbara Everitt Bryant, Recommendation to Secretary of Commerce Robert A. Mosbacher on Whether or Not to Adjust the 1990 Census, Bureau of the Census, Department of Commerce, (Washington, D.C.: June 28, 1991).

augmenting the count and adding more errors. Thus, the Bureau needs to rigorously explore methods to streamline the census-taking process and reduce dependence on costly field follow-up operations in order to improve the next census.

Evaluate Use of Sampling

A major alternative that would allow the Bureau to reduce the time- and labor-intensive fieldwork of follow-up is using statistical sampling for some portion—or even all—of the nonresponse workload. In earlier reports and testimonies, we recommended that the Bureau explore if and how sampling can be used to improve the census.[8] Sampling could enable the Bureau to make major reductions in temporary staff and schedule requirements, thereby reducing census costs. In the absence of any other reforms, Bureau staff estimate that the cost of the 1990 census would have been reduced by $460 million if the Bureau had sampled 10 percent of nonresponding households rather than collecting data on all of them. In addition, the census can derive benefits from sampling in terms of a reduction in the burden on respondents and potentially increased data quality.

There is a growing appreciation that sampling may present a viable alternative to error-prone attempts to count everyone. For example, in 1985 the National Academy of Sciences' Panel on Decennial Census Methodology recommended research on using sampling in the later follow-up stages of census operations and in some coverage improvement programs. The panel concluded that:

"Limited use of sampling may effect measurable cost savings with minimal sacrifice of accuracy . . . . [and] may, in fact, improve accuracy by reducing duplications and other erroneous enumerations, in addition to identifying missed households and people."[9]

In 1991, the Commerce Department's Inspector General also recommended that the Bureau study the feasibility and cost effectiveness of sampling "the remaining nonresponse households, since a sample would appear to be as accurate as and less costly than last resort and

[8]See, for example, GAO/GGD-82-13, February 22, 1982; Decennial Census: Preliminary 1990 Lessons Learned Indicate Need to Rethink Census Approach (GAO/T-GGD-90-18, Aug. 8, 1990); GAO/T-GGD-91-8, February 21, 1991; and GAO/T-GGD-91-13, March 12, 1991.

[9]Panel on Decennial Census Methodology, National Research Council, National Academy of Sciences, The Bicentennial Census: New Directions for Methodology in 1990 (Washington, D.C.: National Academy Press, 1985), p. 18.

closeout procedures."[10] Finally, the Bureau has recognized the importance of testing sampling by including it in 1990 research evaluations and 2000 planning efforts.

Limited use of sampling methods in the decennial census would not be unprecedented. The Bureau used sampling and other statistical procedures in selected instances to augment past census data collection, both count and characteristics information. For example, the 1970 census' recheck of units reported as vacant or nonexistent during follow-up efforts was done on a sample basis, and the Bureau did follow-up work on only a 10-percent sample of 1990 short form questionnaires that failed an edit for nonpopulation count questions. The Bureau also routinely uses imputation to assign responses on questionnaires that have missing data and even to determine whether some units are occupied and by how many persons.

The Bureau is considering using the imputation models from the 1990 census and PES to simulate the impact sampling could have on data collection. Using census and PES data, these simulations would allow the Bureau to test whether alternative procedures could result in reductions in nonsampling errors, such as those caused by insufficient training or supervision of field staff, and improvements in coverage or content. The PES results suggest that sampling would not have to be perfect to produce data of equivalent quality to the last resort, closeout, and coverage improvement enumerations. A key objective of research on sampling should be to identify the point at which sampling can provide data of comparable quality to the existing follow-up procedures in a more timely and cost-effective manner.

The sampling issue will require early consideration by the Bureau and other key policymakers, however, because legislation may be needed to allow the Bureau to sample nonresponse cases. The Bureau plans to identify the potential legal barriers to the use of sampling in the census as part of its redesign effort for the 2000 census.

Assess Coverage Improvement Strategy

As part of its planning for 2000, the Bureau should also carefully evaluate the various coverage improvement operations. While they added persons to the final census counts who would otherwise have been missed, the coverage improvement programs contributed relatively little to the census counts and showed evidence of high rates of erroneous

[10]The Inspector General, U.S. Department of Commerce, Enumeration Problems Found During Nonresponse Phase of the 1990 Decennial Census, Final Audit Report No. EAD-0258-1-0007 (Washington, D.C.: Sept. 26, 1991), p. 14.

enumerations—additions that proved to be fictitious, duplications of previously counted persons, or persons counted in the wrong place. These programs also extended until almost the end of 1990, contributing to greater uncertainty in the status of persons added. The Bureau is assessing the effectiveness of coverage improvement operations and evaluating the sources of error as part of its 1990 decennial census evaluation program and is examining strategies for counting hard to reach persons as part of its 2000 redesign initiative.

The 1985 National Academy of Sciences' Panel on Decennial Census Methodology recommended pursuing a coverage improvement program only if the program:

"(1) exhibited a high yield in terms of numbers of missed persons correctly added to the count and/or contributed significantly to reducing differential undercoverage, (2) exhibited low-to-moderate costs per person correctly added, and (3) did not add many persons incorrectly."[11]

The Bureau's 1990 coverage improvement programs—such as the recheck of vacant and nonexistent units and the parolee-probationer program discussed earlier—do not appear to measure well against these criteria, although the parolee-probationer program did contribute slightly to reducing the differential undercount of Black males. Although the quality of data on the specific source of many census additions during the coverage improvement efforts allows only rough estimates of yields, it is clear that the programs added relatively few persons to the counts. Evaluations also showed that the programs exhibited relatively high rates of erroneous enumerations, despite extensive Bureau efforts to check whether each potential addition to the count was already included on a census questionnaire for his or her address.

Unfortunately, reliable data are not available to evaluate the cost effectiveness of the individual programs. However, these programs were generally labor-intensive efforts, requiring work by enumerators and extensive clerical processing. The potential additions to the census from these coverage improvement programs went through the search-match operation, which had an overall erroneous enumeration rate of approximately 44 percent.

[11]The Bicentennial Census: New Directions for Methodology in 1990, p. 25.

Develop Alternative Methodologies

In looking toward census reform beyond 2000, the Bureau should begin studying the use of multiple data collection methods, with improved search-match procedures to control duplicates and protect the integrity of census data. These additional methods could include distributing forms or collecting data at public locations, applying new technologies to data collection, using specially tailored enumeration methods for hard to count elements of the population, and making greater use of administrative records. The expanded use of administrative records may be particularly important in a future census to supplement traditional methods of enumeration and gather data that might not be collected during streamlined enumeration and follow-up operations—for example, information on types of housing units. As part of its 2000 census research and development plans, the Bureau is exploring both technical and policy issues related to the use of administrative records. The Bureau also is developing an inventory of potential administrative records.

Preparing for a Reformed Census

The decennial census is but one imperfect way to estimate the resident population; it is not an actual "headcount" of the nation's population. In 1990, the census missed several million persons, contained millions of errors, and included millions of additions from nonhousehold sources. The central policy and technical questions concern whether other, more effective ways of estimating the population can be developed to provide a better census at less or equal cost.

The success of the current census redesign effort will be determined by the extent to which the Bureau adopts a significantly different approach for planning the 2000 census. The 1990 census was characterized by conservative and incomplete planning. Potentially important improvements in the census—such as streamlining the census questionnaire to increase response rates—were not successfully pursued in planning and testing for 1990 because the Bureau was slow to appreciate the need for change, and tests were not carefully managed. We believe that vigorous and ongoing congressional oversight is critical to ensure that the Bureau overcomes its tradition of conservative census planning.

Open Redesign Effort Holds Promise for 2000

A thorough, systematic, and open census reform process involving all interested parties is essential to build consensus in areas offering the greatest potential for reform.[1] It is not sufficient that improvements to the census be technically feasible. They must also be thoroughly debated to ensure that they are publicly and politically acceptable. Many of the major opportunities for fundamental reform involve difficult trade-offs between the amount and level of data that will be collected as part of the census, the cost and quality of that data, and whether or how to collect data through other means. An open process also is essential so that the legal issues associated with census reform opportunities—for example, those resulting from the use of sampling or reducing the content of the questionnaire—can be identified and deliberated early in the decade while there is time for legislative initiatives, if needed.

The Department's census redesign effort to date shows an appreciation that the reform process must be open to a wide range of participants. For example, the three committees that form the Department's task force investigating design options for 2000 include representatives from a wide range of federal agencies and private organizations, as discussed in chapter 2. In addition to the Department-managed reform efforts, two

[1]We discussed the need for an open reform process in GAO/T-GGD-91-13, March 12, 1991.

separate but complementary panels from the National Academy of Sciences will examine aspects of the census which should also facilitate a public debate on census options. One panel, established by the Decennial Census Improvement Act of 1991, will study the means by which the federal government could achieve the most accurate count of the population and alternative ways to collect other demographic and housing data. The other panel, commissioned by the Bureau, is to provide scientific and technical evaluations of alternative designs for the 2000 census.

We believe that the Department's involvement of key external actors and the use of independent external assessments offer the prospect of an open dialogue on reforming the census process. Most critical, however, will be continuing congressional oversight of reform efforts. Active and early congressional participation in the reform process is essential because of the census' importance and political sensitivity and the scope of the changes that appear to be needed.

Census Reform Requires Strong Planning Effort

To be successful, the census redesign effort must be directed toward fundamental, rather than incremental, change. Such a focus will require a significant change in the Bureau's approach to census planning. We noted in our 1988 transition report to the Secretary of Commerce that deficiencies in the Bureau's planning activities and its failure to make timely decisions were its most serious management weaknesses.[2]

Bureau planning has traditionally been incomplete and failed to consider innovative approaches fully. For example, the Bureau's efforts to systematically investigate whether streamlining the census form would increase the public's cooperation have been very conservative. We have long advocated that the Bureau experiment with such an approach, beginning in 1976 when we suggested that the Bureau test a two-stage census.[3] The first stage would use a streamlined census form that contained only population questions and the minimum data needed to compile population counts. In the second stage, supplementary population and housing data would be obtained.

The Bureau's only test of a two-stage census, done as part of a 1985 test in Jersey City, New Jersey, failed to take full advantage of the opportunity. The Bureau did not use a streamlined form for the first stage, but rather used the short form from the 1980 census with minor modifications. The

[2]Commerce Issues (GAO/OCG-89-11TR, Nov. 1988).

[3]GGD-76-72, May 5, 1976.

second stage long form repeated 10 questions that the respondents had been asked in the first stage short form. The long form also repeated seven questions for each household member. Besides these limitations in the test design, the Bureau's evaluation of the results was poorly planned and executed. A survey of nonrespondents to the first stage was too small to provide insights, and no attempts were made to determine the reasons for nonresponse to the long form used in the second stage.

The actual 1990 census represented another missed opportunity to test a simplified form. Tests done during actual census operations represent an important once-a-decade opportunity to experiment on innovative approaches under real census conditions. However, rather than test a simplified version of the census short form, which about 83 percent of the nation's households receive, the Bureau tested minor alternatives to the long form. The test results suggest that moderate refinements in format can make forms easier to complete, thereby achieving incrementally higher mail response and data completion rates. The magnitude of potential public cooperation problems in 2000 requires a focus on opportunities for fundamental content changes. In that regard, the Bureau's 1992 test of modified short forms represents a significant departure in the Bureau's approach to census planning. The Bureau is planning to systematically survey respondents and nonrespondents to get insights into why a household did or did not respond.

Early planning is important to design and test alternative approaches to enumerating hard to reach persons. We found, for example, that the Bureau's 1987 decision to count the homeless street population at night, rather than during the day as was done in 1980, was made because time had run out and the Bureau needed to settle on an approach for 1990.[4] The Bureau decided to do a nighttime count even though it understood that the method had severe methodological limitations. After the 1980 census, the Bureau recognized that improvements in a day count method would be needed for 1990. The Bureau's 1986 test of a daytime count—the only test done before a decision was made—was not successful because the Bureau lost the completed census forms and was unable to produce the detailed results needed for evaluation. A 1989 Bureau test of a significantly different approach to a daytime count—done as part of early planning for the 2000 census—was too late to be valuable for the 1990 census.

[4]1990 Census: Limitations in Methods and Procedures to Include the Homeless (GAO/GGD-92-1, Dec. 30, 1991).

The limitations in the Bureau's planning efforts are not isolated to its failure to consider potential innovations fully. In preparing for the 1990 census, the Bureau consistently did not incorporate important lessons from its tests into census planning efforts. In our reviews of the Bureau's census field tests in preparation for the 1990 census, we found that the timing and use of tests could be improved to maximize the tests' contributions.[5] In 1985, the Bureau tested alternative data capture technologies including optical mark recognition (OMR). In 1986, the Bureau experimented with different ways of configuring its field and processing offices. In both cases, the tests were held too late in the planning process to influence the design of the 1990 census. The Bureau had to make decisions about the census design before the tests and accompanying evaluations were completed.

The nature and scope of census changes that appear to be needed require that the Bureau adopt a significantly different posture in planning the 2000 census. After the 1980 census, the Bureau waited too long before it began to plan for 1990 because it did not appear to appreciate the long lead times needed to design, test, and implement advances in the census approach. Consequently, once concerted planning began in 1984 it quickly became clear that the Bureau would be forced to rely on the same basic census approach it had used in 1980.

Inadequate Data on 1990 Census Operations May Hamper 2000 Planning

The Bureau's weaknesses in planning the 1990 census compound the challenges the Bureau faces in planning the 2000 census. We noted in our 1987 report on census tests that the Bureau needed to place more emphasis on getting the complete and accurate cost and productivity data needed for evaluation. In many cases, precision is not essential for the broad assessments that are needed as part of the reform effort. However, even generally reliable information on the costs and benefits of important 1990 census activities is extremely difficult to generate.

The design of the Bureau's automated files and the lack of quality controls over assigning source codes to the results of the various operations will hamper efforts to specify the yields from particular address list development operations—especially in cases when several operations were under way simultaneously. Similarly, the costs of various operations are difficult to specify in many cases because the Bureau's account

[5]See, for example, Decennial Census: Pretests Could Be Used More Effectively in Census Planning (GAO/GGD-87-24BR, Jan. 8, 1987).

structure allowed for commingling costs of dissimilar activities and a lack of quality control over cost recording.

Data are also lacking on the cost effectiveness of the Bureau's coverage improvement programs. These programs were the Bureau's targeted efforts to reduce the undercount. Information on yields is important to identify appropriate programs for possible use in 2000. However, the Bureau has little confidence that the codes identifying the program that resulted in a person being included in the count are accurate or complete. The absence of source data, combined with a lack of information on the costs of individual coverage improvement programs, will not allow the Bureau to reliably assess the cost effectiveness of these programs.

Agency Comments

The Bureau believes that there were some major innovations for the 1990 census. For example, the Bureau said that the development of its computer mapping database was a major technological breakthrough. The Bureau also said that its automated management information system and Address Control File were new tools that significantly enhanced its ability to plan and execute the census.

We agree that the Bureau's automation efforts represented significant improvements over the 1980 census. For example, the report acknowledges that the Bureau's advances in automation afford it the opportunity to build on its investment in developing the census address list. Similarly, the report notes that the Bureau's management information system enabled it to track the progress of fieldwork and take corrective action. In other areas, however, the Bureau did not thoroughly pursue innovative approaches. For example, as discussed in the report, the Bureau's test of alternative data capture technologies was held too late for the 1990 census. In addition, the Bureau's conservative approach to census planning contributed to limited and unsuccessful efforts to investigate streamlining the questionnaire.

Conclusions and Matter for Congressional Consideration

In the past, an increased investment in the census resulted in at least marginal improvements to its overall accuracy. However, for 1990 that pattern was broken. Using a number of broad measures of census accuracy such as net undercount, differential undercount, and gross errors, the 1990 census did not improve upon the accuracy of the 1980 census. Moreover, the Bureau has concluded that continuing demographic and social changes may make census-taking even more difficult in the future. As a result, the Department has implemented a broad research effort aimed at redesigning the census.

The consequences of failure in the census reform effort may be extreme because if the same census approach is used in 2000 as was used in 1990, the nation can expect a further reduction in the quality of census data accompanied by continuing cost escalation. The Bureau's planning staff estimated that using essentially the same census design in 2000 would cost $4.8 billion with a 55-percent response rate. We noted in chapter 4 that such a response rate could generate a follow-up workload of about 50 million cases.

The problems with the quality of the data collected as part of field efforts in the 1990 census showed that despite the Bureau's best efforts, it can ill afford such a costly and error-prone approach to the 2000 census. The major opportunities for reform for 2000 need to be carefully considered, rigorous planning and testing need to be done, and decisions must be made early in the decade while there is time for fundamental change.

One area where the Bureau has the opportunity to improve for 2000 is in moving beyond the costly and error-prone procedures it used to develop its 1990 census address list. Despite a series of redundant procedures, the 1990 census missed housing units, double-counted other units, assigned units to the wrong location, and made other errors. The continuing changes in the nation's housing stock will always make developing a complete and accurate address list a major challenge. However, building on the investment in automation it made for the 1990 census and placing far greater reliance on the Postal Service—as we have long recommended—appear to offer the opportunity for significant improvements. The Bureau recognizes that greater reliance on the Postal Service, which visits addresses regularly, offers an opportunity for substantial savings.

The Bureau faces increased difficulty in obtaining public cooperation and must explore ways to make it easier for people to respond to the census. A

high level of voluntary public cooperation is the key to getting accurate census data at a reasonable cost. However, the 1990 response rates declined from previous levels, and continuing social and demographic changes suggest even greater difficulties in the future. We have recommended in earlier reports and testimonies that the Bureau test whether simplifying the census form would promote better response. Such assessments are now a major part of the Bureau's census redesign effort that is now under way.

Streamlining the census-taking process and reducing dependence on costly field follow-up operations could also improve the next census. The follow-up operations that tried to count the last portion of the population were costly in terms of resources expended and errors introduced to the count. Follow-up efforts were the single most expensive component of the decennial census, requiring at least $730 million, or about 57 percent of all funds spent on data collection. Findings from census evaluations demonstrated that the quality of the resulting enumerations diminished dramatically as these activities extended for months past Census Day. We have long advocated that the Bureau explore the extent to which sampling at least a portion of nonresponding households would reduce the cost of the census—in terms of both the dollars spent and the quality of data gathered.

While the need and opportunity for change is great, the Bureau must adopt a different posture to census planning if reform efforts are to be successful. Planning for the 1990 census did not aggressively seek innovative approaches to the census, and the Bureau consistently did not take full advantage of its field tests. The results from the 1990 census demonstrate that the Bureau must overcome its conservative and incremental approach to planning. The Bureau's planned 1995 full field test of alternative census designs must be managed closely and evaluated promptly so that it yields maximum value.

The Department and the Bureau face a variety of daunting technical and policy challenges in planning the 2000 census. Nevertheless, the Bureau is much better positioned today for planning the 2000 census than it was at a similar point in planning the 1990 census. The initiative to redesign the census—as an early, open, and fundamental reexamination of the census—represents an important break with traditional census planning.

The primary challenge for the Bureau now is to build on its advantages, heed the lessons taught by the 1990 census, and plan for 2000 with the

discipline and inspiration needed for success. In that regard, strong and continuing congressional oversight should help ensure that the momentum for change is maintained and the redesign effort is successfully executed. To be effective, oversight efforts should focus on ensuring that the Bureau develops the critical information needed to evaluate alternatives before decisions must be made.

Matter for Congressional Consideration

We suggest that Congress maintain a schedule of oversight hearings throughout the decade to ensure that consistent progress is being made in designing and planning the 2000 census. Topics for oversight hearings should include the extent to which the Bureau is making timely progress and appropriate decisions on the major opportunities for reform identified in this report: improving address list development efforts, addressing the declining response rate, and minimizing the cost and length of follow-up efforts.

Agency Comments

According to the Bureau, it recognizes—and 1990 census data clearly demonstrate—that society has changed dramatically over the last 20 years. That is why it is currently engaged in zero-based planning of design options for the 2000 census. The Bureau agreed that minimizing cost is a major consideration in designing the 2000 census, but it noted that cost must be balanced with other goals, for example, obtaining a complete count and reducing the differential undercount.

The Bureau said the report raises a number of important issues. Many of the opportunities for reform identified in the report are already on the Bureau's research agenda, such as redesigning the short form questionnaire; examining alternative methods to obtain data now collected by the census; using sampling for nonresponding households; and using postal carriers to identify units that are vacant or nonexistent. The Bureau identified a number of policy and technical issues that need to be addressed in designing the next census. The Bureau said that in making the final design choice, many trade-offs will need to be made, such as that between cost and completeness.

We agree that the decennial census has a number of competing objectives that require careful balancing, and the report discusses some of the policy and technical decisions that must be made in designing the next census. These difficult decisions underscore the importance of an open, thorough, and rigorous reform process to ensure that a wide range of interests are

involved in determining the design of the next census. Continuing congressional involvement also is important to ensure that critical issues are raised and decisions are made in time to be implemented.

The report acknowledges that cost concerns must be balanced with data needs. For example, the savings from a streamlined census questionnaire must be balanced with the cost of losing some data or developing alternative collection methods. Furthermore, as the report states, the cost of the census is not measured only in the amount of money spent. The failure to make reductions in the net and differential undercounts are major factors suggesting a need for a reformed census. Reduced data quality therefore also is a cost of the current approach to taking the census. For example, the PES showed that the rate of error increased significantly as the Bureau tried to count the last percentage of the population. Thus, a less costly census would be one that saves money and improves data quality.

Comments From the Bureau of the Census

UNITED STATES DEPARTMENT OF COMMERCE
Bureau of the Census
Washington, D.C. 20233

OFFICE OF THE DIRECTOR

May 14, 1992

Mr. Richard L. Fogel
Assistant Comptroller General
General Accounting Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Fogel:

Thank you for the opportunity to review your draft report, "Decennial Census: 1990 Results Show Need for Fundamental Reform," so that our comments can be included in the final report to be submitted to the Congress. In addition to the major comments covered below, we have also enclosed some additional comments about specific paragraphs of the report.

This report focuses largely on cost minimization as the criterion for the 2000 census design. While we agree that cost is a major factor to consider, we believe the Administration and the Congress need to balance costs with other goals in designing the next census. Other goals to consider include (but are not limited to) completeness of the counts, differential coverage rates, data needs (of Federal, state, and local governments), public burden, operational feasibility, and timeliness.

The Census Bureau recognizes--and our 1990 data clearly demonstrate--that our society has changed dramatically over the last 20 years. That is why we are currently engaged in zero-based planning of design options for the 2000 census--planning which this report supports. The Technical Committee of the Task Force for Planning the Year 2000 Census, established by the Commerce Department, has identified 15 alternative designs that have been reviewed by, among others, the Policy and Public Advisory Committees of that Task Force, our four professional and four minority advisory committees, professional association boards, representatives of state government data centers, and the private sector. We are currently in the process of winnowing these designs down to a smaller number, either by dropping designs or combining features of several designs, in time to test the remaining designs in a large comparative study in 1995.

The winnowing process is informed by a research program that will answer many of the questions raised by sections of this report. For example,

- **Will reducing questionnaire length improve mail response rates?** A test is now in the field of three "head count only" versions of the questionnaire versus the 1990 short form and a redesigned version of the 1990 short form with the same questions. This will provide the first data on the relationship of mail response to form length. It will also provide data on the gains that can

be made by a second mailing of the questionnaire to non-respondents. A second mailing will be cost effective if it significantly reduces nonresponse follow-up.

- **If data now collected in the census are needed for Federal, state, and local programs, what will be the cost to obtain them outside the census?** The Policy Committee of the Task Force is examining data needs with its Federal agency members. If the census were reduced to a "head count" and not used as the vehicle for other Federal Government data needs, the cost to obtain the needed data should be considered. Cost modeling of design options is part of our research agenda.

- **Can sampling for nonresponse be used?** This is included in the design options and would clearly save money although the question is open whether the mean squared error (MSE) will be reduced. The Policy Committee will be seeking guidance on the legality of using sampling, or whether Title 13 would need to be changed. Will Congress and the public accept apportionment based partially on estimates? The Census Bureau will investigate the impact on the MSE.

- **How accurate would a vacant/delete check be if made by postal carriers with only one census worker follow-up?** Whether this would produce the same level of accuracy as two independent checks by census workers is a question to be examined, as are a number of ways of cooperating with the U.S. Postal Service.

Your report raises important issues, many of them amenable to empirical research. Among the more critical issues are: How much coverage is the Congress willing to pay for? Are there other ways (besides those you propose) to reduce the cost and complexity of the census, for example, by use of administrative records? In making the final design choice, many tradeoffs will need to be made. We appreciate the support expressed in this report for early planning and looking at different designs.

This report raises the issue of innovation in the 1990 census. We believe there were major innovations for the 1990 census. Development of the TIGER computer mapping database was a major technological breakthrough. The automated Management Information System and the automated Address Control File were new tools that significantly enhanced our ability to plan and conduct the census. There are many other examples.

On a separate topic, we would like to comment on the concept and use of "gross errors" in this report. As reported here, gross errors are calculated based on the 1990 Post-Enumeration Survey (PES). The PES was designed specifically for the purpose of measuring net coverage errors of the 1990 census for various geographic and demographic components of the population. The PES design was but

one of a number of reasonable alternatives that could have been selected for this purpose. However, it is likely that different designs could dramatically influence the calculation of gross errors. For example, if we had specified a different definition of "correct enumeration" for the PES, we could have lowered or raised the estimate of gross errors. In this regard, we question the validity of comparisons of gross error measurements from the 1990 PES with those calculated from the 1980 PEP, because different designs and definitions were used.

Of greater concern is whether the GAO is suggesting that gross error rates should be the primary measure of quality in comparing new design alternatives for the 2000 census. We believe this measurement tool could be misleading in examining new options. For example, a technique such as sampling for nonresponse might be shown to provide improved data for areas as small as census tracts on the basis of net error rates, yet be judged unacceptable on the basis of gross error rates. That is, if we used sampling for nonresponse, the counts and characteristics of persons for households not in the sample would be estimated from the sample households. But, by definition, a PES would classify such "estimated" persons as erroneous enumerations. Thus, while the quality of enumeration might be improved for the sample households, the overall level of gross errors would increase. There are a variety of measures we believe can more appropriately compare quality between two censuses or to assess alternatives for the 2000 census. In addition to net coverage error, these include such measures as rates of imputation (of count data), rates of substitution (of all characteristics), and rates of item allocations.

Finally, we would like to point out that results presented in this report from the 1990 Housing Unit Coverage Check are preliminary findings that have not undergone thorough review within the Census Bureau. While we were happy to comply with the GAO's request for these initial results, they should not be considered or quoted as official findings. A similar comment applies to the cost estimate for the 2000 census reported here. Again, we provided information to meet a request, but it only applies to the particular scenario and assumptions described in the report. It is not an official Census Bureau estimate of the cost of the 2000 census, and it should not be used as such.

In conclusion, we offer these comments in hopes of contributing to, not detracting from, the value of this report as we all assess the lessons from the past and apply them to the future.

Sincerely,

Barbara Everitt Bryant

Barbara Everitt Bryant
Director
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