

The USA's Bicentennial Census: New Directions for Methodology in 1990

Constance F. Citro and John W. Pratt¹

Abstract: Planning is under way for the U.S.A. bicentennial census in 1990. The U.S. Census Bureau sponsored a study panel under the U.S. Committee on National Statistics to consider key aspects of methodology for the census and to recommend priority areas for research and testing. The recommendations of the Panel on Decennial Census Methodology, which are summarized in this paper, cover four main topics: adjustment of

the census counts for coverage errors, methods of coverage evaluation, uses of sampling in obtaining the count, and uses of administrative records in improving the quality of selected content items.

Key words: Census; adjustment; undercount; coverage evaluation; sampling; administrative records.

¹ Constance F. Citro, Committee on National Statistics, National Research Council, Washington, D.C., 20418, USA, served as the panel's study director. This summary represents an abridged and reorganized version of Chapter 1 of the report of the Panel on Decennial Census Methodology, *The Bicentennial Census: New Directions for Methodology in 1990* (Constance F. Citro and Michael L. Cohen, eds., Washington, D.C.: National Academy Press, 1985). The other members of the panel were: Pastora San Juan Cafferty, University of Chicago; Ansley J. Coale, Princeton University; Donald R. Deskins, Jr., University of Michigan; Ivan P. Fellegi, Statistics Canada; Wayne A. Fuller, Iowa State University; Joseph B. Kadane, Carnegie-Mellon University; Benjamin F. King, Educational Testing Service, Princeton, NJ.; Albert Madansky, University of Chicago; Alberto Palloni, University of Wisconsin; John E. Rolph, The RAND Corporation, Santa Monica, CA.; Courtenay M. Slater, CEC Associates, Washington, D.C.; and Joseph Waksberg, Westat Inc., Rockville, MD. Michael L. Cohen served as research associate for the panel. The project was supported by funds from the Bureau of the Census, U.S. Department of Commerce. John W. Pratt, Professor of Business Administration, Graduate School of Business, Harvard University, Cambridge, Massachusetts, 02163, USA, served as chairman of the Panel on Decennial Census Methodology.

1. Introduction

The Panel on Decennial Census Methodology of the U.S. Committee on National Statistics recently completed a review of census practices and procedures in the United States and made a series of recommendations directed to planning the nation's bicentennial census in 1990. As charged by its sponsor, the U.S. Census Bureau, the panel investigated several new directions for census methodology to address the growing challenge posed by societal needs for small-area data that meet high standards of quality and yet are produced at a reasonable cost. In this paper we summarize the panel's thinking and recommendations in its report, *The Bicentennial Census: New Directions for Methodology in 1990* (Citro and Cohen (1985)). These recommendations are timely because the U.S. Census Bureau has under way an extensive program of research and testing for the 1990 Census.

2. Census-Taking in the United States of America

Periodic censuses of population are a long-established tradition in the U.S., with roots going back to the earliest years of the colonial period. The royal colony of Virginia conducted the first census in North America in the early seventeenth century, and censuses of individual colonies were frequently attempted during the colonial era (U.S. Bureau of the Census (1970, p. 3)).

Political necessity led to the requirement for a periodic complete enumeration of the population in the new nation formed after the American Revolution. In the compromise between large and small states made at the 1787 Constitutional Convention, the delegates voted to provide equal representation for each state in the Senate and representation proportional to population in the House of Representatives; the population of each state was to be determined through a decennial census. Article I, Section 2, of the Constitution stipulates:

Representatives and direct Taxes shall be apportioned among the several States which may be included within this Union, according to their respective Numbers... The actual Enumeration shall be made within three Years after the first Meeting of the Congress of the United States, and within every subsequent Term of ten Years, in such Manner as they shall by Law direct.

Although fundamental issues of the structure of government provided the motivation for the U.S. decennial census, the country's leaders recognized from the beginning that the census could be a valuable source of information for many other purposes. James Madison noted in 1789 (U.S. Bureau of the Census (1970, p. 4)) that Congress:

had now an opportunity of obtaining the most useful information for those who should hereafter be called upon to legislate for their country, if this bill was extended to embrace some other

objects besides the bare enumeration of the inhabitants; it would enable them to adapt the public measures to the particular circumstances of the community.

The first census in 1790 asked the age, sex, and race of each resident. During the next 100 years, the census became firmly established as an important information resource. The centennial census in 1890 asked questions on more subjects than any census before or since, including 30 items on the basic population questionnaire, several housing questions, and special inquiries about decedents, inmates of almshouses and prisons, Indians on and off reservations, Civil War veterans and widows of veterans, and several categories of mentally and physically disabled people (U.S. Bureau of the Census (1973, pp. 74–91)).

Work is now under way to plan for the nation's bicentennial census of population and housing, scheduled to take place on April 1, 1990. Reflecting a long-standing tradition of improvement and modification to meet changing information needs and to take advantage of technological advances, census-taking in the twentieth century has come to differ in many important respects from census-taking in the nineteenth century. Some features that have been introduced into modern U.S. censuses and will undoubtedly continue in 1990 are:

- Since 1910, the census has been directed by a permanent organization, the U.S. Bureau of the Census, with an experienced, professional staff in charge of planning and supervising the operation.
- Since 1940, statistical sampling methods have been used to obtain responses to many census items, so that a large volume of useful information can be gathered without placing the burden of responding to all questions on every household (the 1980 Census asked 7 population and 12 housing items of all households, while about 20

percent of households were asked an additional 26 population and 20 housing questions).

- Since 1970, the U.S. Postal Service has delivered most of the census questionnaires, and households have been asked to mail their completed questionnaires to census offices. Enumerators telephone or visit only those households that do not completely respond (95 percent of households were sent questionnaires by mail in 1980 and 83 percent of them returned their questionnaires by mail).
- Since 1960, large computers have been used to process the census returns in a relatively short span of time; in contrast, the 1890 Census required almost a full decade to process, even with the introduction of punchcard machines to help the clerical work force.
- Since 1950, intensive effort has been devoted to evaluating the completeness of coverage of the total population and of important subgroups and geographic areas.

Undoubtedly the 1990 Census will also differ from the most recent censuses in the United States. Most of the differences are likely to represent incremental improvements and modifications to tried and tested procedures: for example, mailout-mailback techniques may be extended to the remaining 5 percent of the population residing in sparsely settled rural areas that enumerators personally canvassed in 1980. But pressures are growing in this country, as in other Western nations, to address the problems of rising costs of traditional census practices on one hand, and to satisfy expressed needs for greater accuracy in the numbers on the other. Consequently, exploration of changes in methods and techniques that mark a greater break with tradition is under way: for example, one proposal that has received much attention is the use of statistical techniques to adjust the field counts for deficiencies in the enumeration.

Major changes in census methodology, such as the use of sampling for content and mailout-mailback enumeration, have often been made on a small scale in one census and then more fully implemented in the next. The 1990 Census will be part of a continuing evolution that may lead to a methodology in the twenty-first century that differs as significantly from current methodology as current methodology differs from that of the nineteenth century.

3. The Planning Cycle for 1990

Planning for the 1990 Census officially began in the fall of 1983 with an appropriation for fiscal 1984. Well before that date, however, the Census Bureau had carried out substantial work of direct relevance for 1990. The 1980 decennial program included several experiments and post-enumeration studies designed to help plan improvements in methodology for subsequent censuses. Pretests conducted in the late 1970s of concepts and procedures considered for 1980 also had results that are useful for planning the 1990 Census.

To the general public and many casual users of census data, it may appear that the Census Bureau has ample time to plan wisely for the 1990 Census, given the start of the planning process more than six years prior to census day, April 1, 1990, and the foundation of research already completed in connection with prior censuses. In fact, as a review of the Census Bureau's field test schedule for 1990 indicates, there are relatively few opportunities to test thoroughly changes or modifications in census procedures, particularly if the changes represent major departures from the past. Moreover, evaluation of the likely impact of important changes is hampered by the fact that pretests cannot adequately assess the effects of alternative procedures on public cooperation with the census. Only tests conducted under census conditions, that is, experiments incorporated into an actual

census as distinct from pretests, can fully address this important question.

The Census Bureau's 1990 Census testing program began in the spring of 1984 with tests of mailing list compilation methods in several localities around the country (U.S. Bureau of the Census (1984)). Two large-scale pretests were conducted in the spring of 1985. Pretests were also scheduled for 1986 and 1987. Finally, the research and testing program will culminate in 1988 in "dress rehearsals" of the procedures planned for 1990. This schedule not only compresses into a few years the opportunities to test new methodology but also compresses the time available to evaluate the results from one test and incorporate them into the design of the next.

In addition to the compressed time schedule for testing and research, two other critical factors affect the ability of the Census Bureau to modify census methodology: staff and budget resources. The Census Bureau has long been known for the high quality and dedication of its technical staff. The current budget for research on decennial census methodology, particularly for research on the undercount, is large by the standards of earlier censuses. Nevertheless, no agency of government, particularly in the constrained world of the 1980s, can expect to have sufficient staff or resources to try out more than a few promising ideas and concepts. Pressures in the next few years to reduce the federal government's large deficit may make it more than usually difficult to obtain adequate staff and funding to carry out a thorough research and testing program for 1990. To design the best census for 1990 and to lay the best foundation for design changes for 2000, it is critical that the Census Bureau make the most of the testing opportunities afforded over the next few years and carefully establish priorities for testing and research.

4. The Importance of Choice of Methodology for 1990

Controversy has always accompanied census-taking itself. According to one review (U.S. Bureau of the Census (1982a, App.IIIb, p. 73)), censuses conducted during the colonial period, generally at the direction of the Privy Council or the British Board of Trade, "were seldom regarded as complete or successful, as people perceived them being for the purposes of taxation or conscription and were evasive and uncooperative". The decennial censuses conducted in the new nation had a constitutional mandate according them legitimacy and support. Moreover, Conk (1983, p. 7) has noted that: "After the first few censuses, Americans became increasingly interested in the census results ... [which] showed that the population was growing steadily and extremely rapidly." It quickly became evident in the early nineteenth century, however, that not all areas were sharing equally in population growth and that reapportionment based on census results meant substantial shifts in political power. Conk (1983, p. 8) continues:

It is not surprising therefore that nineteenth century Americans who were pleased with the overall thrust of population change claimed that the census proved the virtue of the American way of life or the American system of government. Conversely, those who felt shortchanged by reapportionment or were concerned about the tendencies of population change challenged both the census and the apportionment system.

The first extensive criticism of the census by statisticians occurred in 1843 when the American Statistical Association (ASA) issued a lengthy report that documented glaring errors in the data on education, occupation, and especially the classification by race of persons identified as insane, idiotic, and deaf and

dumb. The ASA recommended that these results should be corrected or, at the least, disavowed. Problems with both undercount and fraudulent additions to the count were documented in many early censuses (U.S. Bureau of the Census (1982a, App.IIIb, pp. 81–83)).

Congress did not as a general rule respond directly to these criticisms, although occasionally it acted to alter the apportionment of the House when there was strong evidence of gross deficiencies in the population count. Congress gave a third representative to Alabama in 1823 when the claim was made that the 1820 Census omitted two counties and in 1860 awarded an additional seat to California because of problems with the census in that state (U.S. Bureau of the Census (1982a, App.IIIb, p. 82)). These actions were politically much more palatable than similar actions would be today, because reapportionment legislation up through 1910 added representatives to accommodate population growth rather than allocating a fixed number of seats among the states.

Despite the questions raised about the population enumeration in the past, a review of decennial census history suggests that social and political forces have converged to make modern censuses in the U.S. and other countries much more controversial than before. Several factors are involved.

On one hand lie increased concerns with the need to protect the privacy of individual citizens and a sense that the public is over-surveyed and less willing to respond to government inquiries. Indeed, in the last few years, the level of public suspicion and hostility to plans for the census caused the governments of several Western European countries to delay their census programs or cancel them entirely (see Butz (1984) and Redfern (1983)).

On the other hand, legislators have increasingly turned to statistics in making tough policy decisions. In fiscal 1984, federal grant-

in-aid programs allocated at least \$80 billion to states and localities via formulas that depended, in important ways, on census figures or on statistics based on census figures, such as current population estimates (U.S. Office of Management and Budget (1985)). As noted above, census data are used by constitutional mandate to determine the number of seats in the U.S. House of Representatives that are allotted to each state. They are also used in drawing up congressional, state, and local legislative districts to meet rigid criteria for the equitable representation of the population. Data requirements for redistricting purposes in 1980 included census tabulations of the population by race and Hispanic origin for each of several million city blocks in urban parts of the country and enumeration districts in unblocked areas (U.S. Bureau of the Census, (1982b, p. 79)).

In addition to these critical governmental needs, census data support many other major uses. Data from the latest census serve to document the social and economic condition of the country as a whole and are the single most important source of information for small areas and groups in the population. Comparative information from successive censuses illuminates trends over time. Researchers, planners, and decision makers in business, government, and academic institutions make use of census data for a wide range of important planning and analysis. Just a few of the many uses to which census data are put include:

- Site selection for public service facilities and commercial establishments based on evaluating the socioeconomic characteristics of alternative locations;
- Transportation planning using detailed data on commuting flows; and
- Research into changing rates of population growth for metropolitan versus nonmetropolitan areas and different regions of the country.

Many analyses based on census data have implications for the distribution of political power and wealth among various population groups in the country. For example, census data on the racial, ethnic, age, and sex make-up of occupational groups in labor market areas are used to assess the extent to which work forces reflect the characteristics of the local labor force. These data frequently form the basis of antidiscrimination lawsuits brought against employers. Census data on the make-up of the local population are used to assess – and challenge – the representativeness of grand and petit juries. Census data on earnings cross-tabulated by various characteristics are used to analyze wage disparities within and among occupations and important population subgroups. Findings from such studies can affect the outcomes of public policy deliberations, such as the current debate over the issue of comparable pay for jobs of comparable worth. All of these uses have underscored more than ever before the importance of obtaining a complete and accurate count of the population as well as accurate data about characteristics.

Yet, to obtain highly accurate data demands funds. The 1980 Census cost close to \$1.1 billion dollars – about \$4.75 for each inhabitant of the United States (U.S. Bureau of the Census (1983, p. 88)). The per capita amount is small compared with the per case cost of most government and private-sector sample surveys. Moreover, this total cost includes planning, collection, and processing activities that spanned most of a decade and provided data that are of value for the decade and beyond. Nonetheless, census costs exceeding \$1 billion excite comment and invite close scrutiny to determine how they might be reduced. Recently in Canada, the quinquennial census scheduled for 1986 was cancelled because of budget constraints facing the government; it was subsequently reinstated in response to widespread public expressions of concern and

its demonstrated cost-effectiveness compared with alternatives. The U.S. decennial census is constitutionally mandated; nevertheless, pressures are likely to be severe in the coming years to attempt drastic cost reductions both in census planning activities and in the enumeration.

The Census Bureau's own research has shown that there were inaccuracies in the 1980 Census, both of underenumeration (that is, persons who were missed) and overenumeration (that is, persons who were inadvertently counted twice or otherwise included when they should not have been). Evaluation studies generally point to the conclusion that the 1980 Census produced a small net undercount of the total population, that is, the census count, including erroneous enumerations, fell somewhat short compared with an independent demographic estimate. Most significantly, important race, sex, and age subgroups of the population experienced differential rates of net undercount. There is strong evidence that the black population experienced a net undercount of about 5 percent nationwide. Black men ages 25–54 appear to have had the highest net undercount rates – close to 15 percent on average (Passel and Robinson (1984, Table 3)). Coverage estimates for whites and other races are difficult to derive because of the lack of reliable estimates of net legal and illegal immigration. Making a range of reasonable assumptions about the size of the illegal alien population, it appears very likely that whites and other races experienced net undercount in the 1980 Census. However, their rate of undercount was smaller, perhaps significantly smaller than the 1.5 percent rate estimated for 1970 (see Passel et al. (1982, pp. 6–8)).

Differential net undercount means possible inequities in redistricting, fund allocation, and provision of social services based on census data as well as possibly erroneous conclusions drawn from studies used as the basis for anti-discrimination policies and other socially

important purposes. The belief that errors in the census affected representation and fund allocation gave rise to an unprecedented number of lawsuits following the 1980 Census. By October 1981, over 50 suits had been filed challenging the census results (U.S. Bureau of the Census (1983, p. 85)). Currently, the judge assigned an important case in which the State and the City of New York are suing to have the Census Bureau adjust the 1980 Census counts is reviewing testimony and preparing to hand down a decision; 23 other cases are awaiting settlement of the New York suit. Analyses by Kadane (1984) and Gilford (1983) indicate that the apportionment of congressional seats may have been affected by the differential undercount. For example, Kadane found that if one of the sets of estimates produced from the 1980 Post-Enumeration Program evaluation were used to adjust the census results, California would have received an additional seat at the expense of Pennsylvania.

5. Proposed Changes in Methodology

Not surprisingly, many ideas have been proposed by the Census Bureau and others to improve the decennial census. Some are directed principally at improving coverage and reducing differential coverage errors. One of these ideas is to match administrative records, such as driver's license lists and other sources, against the census on a scale even larger than that used in 1980 to identify people who should be followed up to determine if they were improperly omitted from the census count. Other ideas are directed principally at reducing costs. One such approach is to make use of sampling, not only to obtain information on characteristics, as is currently standard decennial census practice, but also as part of the procedure to obtain the count. For example, one could attempt contact with a

sample of households that do not mail back their questionnaires, rather than all non-respondents, in the follow-up stage of census operations. Special coverage improvement procedures could also be carried out on a sample basis.

Two important themes stand out in the current discussions of methodology for the decennial census. One relates to the degree of emphasis that should be given to counting versus estimation. A census, no matter how diligently administered, can never be complete or without error. Moreover, in current census methodology, not every record corresponds to a person actually named on a questionnaire; for example, some records (about 1 percent in recent censuses) represent imputations in situations in which there is good evidence that a housing unit is occupied but repeated efforts have failed to find the residents. Hence, a census, strictly speaking, provides an estimate of the population.

From this recognition has come a view of the decennial process that emphasizes estimation and argues that some of the resources for conducting the census should be shifted from traditional coverage improvement procedures to developing the best possible estimates of the total population and subgroups. Input to the decennial year population estimates, in one version of this view (Ericksen and Kadane (1985)), would include not only a well-conducted census, but also information obtained from various programs conducted on a sample basis that would provide a basis for adjusting the census field counts. Whatever the degree of emphasis placed on estimation, the known errors and the incompleteness of the census count mean that the issue of adjusting census figures needs to be addressed.

The other theme relates to the critical importance of evaluation programs in the methodology of the decennial census. Politicians, policy analysts, statisticians, economists,

demographers, other social scientists, and users of census data in all sectors have expressed divergent views regarding the most appropriate methodology for conducting the census. Regardless of how they view the census, there is substantial agreement on the importance of evaluating the completeness and accuracy of census statistics.

The Census Bureau has conducted formal evaluation programs for every census since 1950 (U.S. Bureau of the Census (no date)). All of the techniques used so far in the United States and abroad, including demographic analysis, reverse record checks, administrative record matches, and post-enumeration surveys (whether recanvassing selected areas or matching independent surveys to census records), have important flaws. In the United States today, the absence of adequate data for estimating net immigration, whether of legal or illegal residents (Marks (1980)), poses particularly severe problems for evaluating the census count even at the national level using the demographic method. Furthermore, if evaluation results were to be used for census adjustment purposes, then reasonably accurate information on the errors of evaluation estimates would also be needed. Nevertheless, with concern over possible inequities in political representation and the distribution of large amounts of federal dollars as well as concern over the adequacy of the data for analysis of the socioeconomic status of important population groups, there has never been a greater need for thorough evaluation of the decennial census. This evaluation is necessary whether the object is to inform users of known census errors or actually to adjust census results.

While there is widespread agreement that evaluation is important and that the issue of adjustment must be faced, many decisions on methodology for 1990 remain to be made. It is clear that there is no lack of useful ideas and suggestions to investigate. It is also clear that the process of determining a reasonable

methodology for 1990 will involve difficult choices. The Census Bureau has stated (Bailar (1984, p. 259)) that its minimum goals for 1990 are to:

- (a) Conduct the 1990 Census without increasing the per-housing-unit cost in 1980 dollars. (b) Expedite the availability of the data to users. (c) Maintain a high rate of overall coverage and improve the accuracy of small area data while reducing the overall differential for population groups and geographic areas.

It may be possible to design a methodology that makes gains in each of these aspects. The more likely situation is that it will be possible to make progress on one or two aspects, but at the price of giving up improvements on the others. Explicit trade-offs reflecting costs and benefits will need to be made in the choice of methodology for 1990 and future censuses (see Keyfitz (1979)). Because the high costs of censuses and the compressed time frame within which they are carried out make mid-course corrections impossible, it is essential that the methodology used be thoroughly tested.

6. Independent Reviews of Decennial Census Plans

The Census Bureau is actively working on methodology for the 1990 Census and has assembled staffs to plan the census and, specifically, to work on issues of undercount and the possible adjustment of census counts. For many decades, the Census Bureau has also actively sought outside independent review of its plans and proposed procedures. In addition to ongoing advisory committees involving various professional disciplines and advisory committees representing the interests of population groups for whom census results are particularly important, the Census Bureau has asked the National Research Council (NRC) and the American Statistical Association (ASA) to conduct special studies of the decen-

nial census. The report of the Panel on Decennial Census Methodology represents the fourth outside review conducted in recent years of key aspects of modern census methodology. A brief discussion of the scope and thrust of the predecessor NRC and ASA studies can help place this latest study in context.

6.1. *The 1969–1972 NRC advisory committee on problems of census enumeration*

The Census Bureau sponsored a study in 1969 by a committee of the National Research Council to provide advice on ways to improve completeness of coverage in the decennial census and intercensal household surveys. (The U.S. Office of Economic Opportunity and the Manpower Administration of the U.S. Department of Labor also contributed support for the study.) The Advisory Committee on Problems of Census Enumeration issued its final report, *America's Uncounted People*, in 1972. The report focused on the need to understand the social and psychological context in which undercount occurs. For example, the committee noted that people may be missed in central city areas because, although members of extended families, they are not attached to a family or household residence that is the basic unit of enumeration in the census and household surveys. The committee strongly recommended that the Census Bureau broaden its research strategy and knowledge base to include methods and concepts not typically embraced in survey research. The report included specific recommendations to conduct experimental studies of questionnaire wordings and formats and their effects on respondents; explore the utility of communication research for better understanding the reasons for census and survey undercoverage; and carry out localized participant-observer studies to learn more about the impediments to census data collection in different kinds of areas.

6.2. *The 1978 NRC panel on decennial census plans*

The Census Bureau asked the National Research Council again in 1978 to review decennial census methodology, specifically the plans for the upcoming 1980 Census. The NRC's Committee on National Statistics set up the Panel on Decennial Census Plans, which within a very short time span completed an assessment of:

- (1) Field procedures, questionnaire design, and special procedures designed to improve the 1980 Census coverage;
- (2) Proposed procedures for handling contested counts;
- (3) The feasibility of adjusting census counts; and
- (4) Evaluation plans for the 1980 Census.

The panel's report, *Counting the People in 1980: An Appraisal of Census Plans*, made recommendations in many areas. This panel repeated the call of the earlier committee for imaginative work on the cultural and social problems associated with census-taking. In the area of adjustment, the 1978 panel concluded (National Research Council (1978, pp. 132–133)) that: "methods of adjustment with tolerable accuracy are feasible" and "on balance an improvement in equity would be achieved." The panel supported implementation of procedures to adjust population counts for underenumeration for purposes of fund distribution and expressed confidence in the Census Bureau to determine the best technical procedures for adjustment. The panel recommended that adjustment "not be applied to the counts used for legislative apportionment nor to the body of census data on the characteristics of the population."

6.3. *The 1981–1982 ASA technical panel on the census undercount*

The Census Bureau asked the American Statistical Association in 1981 to convene an expert group to review the methods and

results of the programs used to evaluate completeness of coverage in the 1980 Census and to make recommendations regarding research in the areas of coverage evaluation and adjustment of census counts. This panel made a number of specific research suggestions and also recommended (American Statistical Association (1984, p. 256)): "that the Bureau of the Census sponsor an outside technical advisory group on undercount estimation and related problems."

6.4. The 1984 panel on decennial census methodology

In response to the recommendation of the 1981 ASA panel, the Census Bureau asked the Committee on National Statistics at the National Research Council to establish the Panel on Decennial Census Methodology. The charge to the panel was for an investigation of three major issues from a technical viewpoint, setting aside legal considerations:

- (1) Adjustment of census counts and characteristics, including exploration of formal criteria to evaluate measures of undercount and alternative adjustment procedures;
- (2) Uses of sampling in the decennial census, including investigation of whether, for a given cost, the sampling of lists and areas to improve coverage and sampling of non-respondents for follow-up can improve accuracy for the total population and for important subgroups; and
- (3) Uses of administrative records, including investigation of various types of records to determine their possible utility in improving the accuracy of census counts and the efficiency of census operations.

The panel interpreted this charge to include investigation of closely related topics, notably methods of coverage evaluation and improvement. Coverage evaluation programs provide the necessary input data for any adjustment and serve the important function of appraising

users of the quality of the census counts. Procedures for coverage improvement are necessary and desirable whether or not an adjustment procedure is incorporated into census methodology. The panel also investigated uses of census data and their dependence on the accuracy of the census figures. Proper evaluation of the consequences of changes in collection methodology requires an understanding of the important uses of the data being collected.

The panel's work related to analysis of decennial census methodology and not to other population programs of the Census Bureau. However, during the panel's work, it was clear that the census could not be considered completely in isolation. Demographic and related social and economic statistics are used continually over the decade following each census, and current information is needed for these uses. The Census Bureau has a number of formal programs for updating some of the census information. Hence, the census is the central part of a broader statistical system designed to produce data needed to implement legislation, assist in decision making both by industry and government, and help understand changes taking place in society. Although the panel did not undertake a study of population statistics programs other than the census, the panel considered the quality of census data compared with the quality of postcensal population estimates. The panel recommended that the Census Bureau assess the need for a mid-decade census in 1995 in light of the impacts of errors in postcensal population estimates on major data uses, such as fund allocation.

The work of the panel differed in several important ways from the efforts of its predecessors. This was the first panel asked explicitly to consider important changes in decennial census methodology from the perspective of cost as well as effectiveness. To design a methodology that improves accuracy compared with previous censuses but costs no more, and

ideally less, in constant dollars was a concern throughout all of the panel's work.

Other important differences have to do with the timing of the panel's work in relation to the cycle of decennial census planning. The panel was convened at a point in the cycle when it could benefit from the availability of extensive material regarding the experience in the most recent census. At the same time, the panel carried out its work in an early stage of the planning cycle for the next decennial census before decisions on methodology were fixed. Hence, the panel was in an unusually good position to provide suggestions and guidance regarding the research and testing program for 1990.

7. Major Themes of the Panel's Report

Several themes run through the report of the panel, *The Bicentennial Census: New Directions for Methodology in 1990*. The first major theme can be expressed as the need for balance between traditional and new procedures in the choice of census methodology for 1990. Indeed, balance has characterized the historical evolution of decennial census methodology. The report does not propose that the Census Bureau make radical innovations in decennial census methodology in the near term. The census is a massive and complex operation, and major changes should be made only with care and after thorough evaluation. Nonetheless, the report expresses the belief that it is important to implement changes on some aspects for 1990 and to undertake planning that may lead to further changes in the future.

Most important, the report argues for balance between efforts to achieve a complete enumeration and efforts to improve the accuracy of census figures through adjustment procedures. The panel believes that adjustment cannot be viewed as an alternative to obtaining as complete a count as possible through cost-

effective means. The United States has a long tradition of a census as a complete enumeration in which it is a civic responsibility to participate in the census process. It is important to continue this tradition and important that census methodology should strive for a complete enumeration via counting procedures, including the use of cost-effective special coverage improvement programs. However, the report also states that the ultimate goal of the census should be the accuracy of the census figures. The evidence is overwhelming that no counting process, however diligent, will in fact enumerate everyone. Hence, the report recommends that the Census Bureau carry out a vigorous program of research on coverage evaluation and adjustment methods that, if successful, would permit adjustment of census figures as part of the methodology for the 1990 Census.

A second and related theme concerns cost-effectiveness. The panel did not attempt to apply formal cost-benefit analysis to decennial census methodology, but endeavored to identify those proposed changes that show the most promise of improving accuracy without increasing costs or of reducing costs without importantly impairing accuracy. In this regard, the panel's recommendation for research designed to develop appropriate and feasible methods of adjustment of the census counts, together with the Census Bureau's stated goal to contain costs for the 1990 Census, implies that some budget resources must be shifted from coverage improvement to coverage evaluation and adjustment. Specifically, the panel argued in its report that coverage improvement programs used in previous censuses should be carefully reviewed to determine their efficacy. Costly programs that neither correctly added significant numbers of people to the count nor importantly reduced differential undercount should be dropped from the Census Bureau's plans for 1990. Effective programs should be further refined through testing and research, and the

budget should make room for testing some new ideas in this area.

While not favoring extensive use of sampling to obtain the count, the panel in its report supported research on sampling in the later follow-up stages of census operations and in some coverage improvement programs, such as the program to recheck the vacancy status of housing units. Limited use of sampling may effect measurable cost savings with minimal sacrifice of accuracy. Careful use of sampling for certain coverage improvement programs may, in fact, improve accuracy by reducing duplications and other erroneous enumerations, in addition to identifying missed households and people.

In considering cost and accuracy, the panel stated its belief that it is important to look at the characteristics data collected in the census as well as the population count. There is strong evidence that important subject items have severe reporting problems. The panel recommended a strategy of looking closely at each item proposed for inclusion on the questionnaire to determine:

- (1) The need for that item;
- (2) The level of geographic detail required by users, which dictates whether the item should be asked of all households on the short-form questionnaire, of a sample of households on the long form, or of a smaller sample in a follow-on survey; and
- (3) Whether some other source could provide higher-quality data.

The panel suggested exploring the use of administrative records together with sampling to obtain data on some housing structure characteristics. Such data could be more accurate than individual responses on the census form. Costs initially may be high, but should decline over time. This particular use of administrative records has the advantage that it should present no actual or perceived threat to individual privacy.

A third major theme of the report concerns the strategy for designing the 1990 Census,

whatever the particulars of the methodology may turn out to be. The research plans drafted by the Census Bureau staff are extremely comprehensive and ambitious. The staff has clearly tried to include all reasonable ideas for consideration in the research and testing program. The panel commended the Census Bureau's efforts to design and carry out a thorough research and testing program that will support sound decisions regarding methodology for the 1990 and later censuses.

The panel expressed its belief, however, that in most areas the Census Bureau must choose among all the ideas and procedures proposed for testing. Constraints on available staff and budget resources and the limited time available to analyze test results and use them to guide decisions on methodology restrict the range of feasible tests. The exception concerns research related to adjustment, including research on coverage evaluation methods. In this area, the panel stated that research must proceed on a broad front if effective methodologies are to be developed for 1990. In other areas, the panel endeavored to recommend strategies for choosing priority projects for inclusion in the 1990 Census research and testing program and also recommended the use of less costly research methods, where appropriate, including more detailed analysis of 1980 Census results, in place of full-scale field tests.

8. Overview of the Panel's Recommendations

In the remainder of the paper, we summarize the recommendations of the Panel on Decennial Census Methodology.

8.1. Recommendations on adjustment of population counts

The first point on the panel's agenda was that of adjustment of the census counts. Based on

review of the evidence on coverage and other kinds of errors in the census and of the literature on the important uses of census data, the panel found a need for adjustment to improve the accuracy of the census numbers. Adjustment is necessary in particular to reduce differential coverage errors across geographic locations and demographic groups. The panel was led to recommend development of adjustment procedures, but as a complement to, not a substitute for, continued efforts to improve census coverage. If public perception of the importance of being counted should deteriorate, this would have serious consequences for the accuracy of the figures, adjusted or not.

Recommendation. Completeness of the count is an important goal, both for ensuring the accuracy of the census and for establishing the credibility of the census figures among all users. Adjustment should not be viewed as an alternative to obtaining as complete a count as possible through cost-effective means. Nevertheless, the ultimate goal is that of the accuracy of the published figures. Given the likelihood that the census will continue to produce different rates of undercoverage for various population groups, and given the equity problems caused thereby, we recommend that work proceed on the development of adjustment procedures and that adjustment be implemented if there is reasonable confidence that it will reduce differential coverage errors.

The panel also investigated criteria for evaluating the numbers produced by the census (based on either unadjusted or adjusted counts), considering both the errors in the numbers themselves and the resulting loss to society due to erroneous treatment of political jurisdictions in terms of representation, fund allocation, and other uses of the data. The panel considered various loss functions, that is, numeric measures of the impact of census errors, from the viewpoint of the data user and as they relate to adjustment.² The discussion

of this topic in the panel's report notes that no adjustment procedure can be expected to simultaneously reduce the error of every piece of census information for every geographic area; rather, there is an important net social gain if differential coverage error is generally reduced. The panel expressed the belief that it is more important to reduce the overall error per person than the overall error per place and recommended that loss functions for measuring total error take into account the population size of each jurisdiction. In discussing technical considerations regarding the choice of loss functions, the panel concluded that good adjustment procedures should be expected to perform well for a range of loss functions. Moreover, no type of jurisdiction should have substantial reason to believe that its population could have been estimated more accurately some other way. Where the choice of adjustment procedure depends importantly on the choice of loss function, this suggests that the particular adjustment procedure has weaknesses that need to be addressed.

Recommendation. In measuring the total loss associated with an adjustment procedure, we recommend that the contribution to this loss attributable to a geographic region should reflect its population size. Thus, we recommend against loss functions based solely on the number of political entities losing or gaining through adjustment.

² Loss functions, as noted in the text, express numerically the impact of errors in the census in terms of the resulting loss to society due to erroneous treatment of political jurisdictions (or other uses of the data). In this case, error is the difference or relative difference between the number produced by the census count (either the raw or adjusted count) and the true value for that number in the population if the census were completely accurate. The classical loss function used by sample survey researchers to assess the accuracy of a single number, chosen principally for its convenient mathematical properties, is the square of the deviation between the number and its true value. The usual task taken to develop an overall loss function for an entire set of numbers is to sum the individual loss functions.

Recommendation. We believe that, in general, the results of an adjustment are likely to be affected more by the quality of coverage evaluation data and the models and methodology used than by the choice of loss functions. Given a family of loss functions with relatively similar objectives, it should be possible, and desirable, to determine an adjustment procedure that has good performance for most or all of them. We recommend that the Census Bureau investigate the construction of adjustment procedures that are robust to a reasonable range of loss functions.

The panel considered the problem of estimating the likely range of error introduced by the particular procedure adopted for an adjustment. Although error can be measured only imperfectly, information about the distribution of error is important in the same way that sampling variances for sample surveys provide useful information.

Recommendation. We recommend that the Census Bureau explore methods for providing estimates of errors associated with estimates of census over- and undercoverage, with a view to publishing such error estimates along with coverage evaluation results and any adjusted census data that may be issued.

Adjustment of census data could create problems of inconsistency between aggregate statistics and microdata from the census. The panel stated its belief that internal consistency is an important quality for general purpose statistics, such as those produced by the decennial census, which have a wide range of output and many uses. The report discusses reasons to carry down any adjustment of population estimates for larger geographic areas to the level of the individual micro-records and reviews methods, such as weighting and imputation, for accomplishing this.

Recommendation. The panel believes that it is important to strive for internal consistency of published census figures. Should adjustment appear feasible and effective, methods exist for distributing adjusted totals for aggregated groups down to subgroup values. We recommend that one of these methods be used to achieve internal consistency of census figures.

Adjustment also presents problems of timing. Current law requires submission of state population counts within 9 months after census day for purposes of reapportionment and of small-area counts within 12 months after census day for purposes of redistricting. The report discusses the pros and cons of various scenarios with regard to release of adjusted data if it proves impossible to implement a full-scale adjustment in time to satisfy the above constraints. Congress clearly will need to stipulate which scenario is preferable for apportionment purposes.

Recommendation. Census data used for reapportionment and redistricting are required by law to be produced no later than specific dates. It is possible that adjustment of the 1990 Census will prove feasible and effective in all respects, except for the ability to meet the required deadlines. This should not necessarily preclude the subsequent issuance of adjusted data for other uses. In this situation, we recommend that the Census Bureau ask Congress whether it wants adjusted data to be used and will therefore extend the deadlines, or wishes to adhere to current deadlines and will therefore stipulate the use of unadjusted (or partially adjusted) data for reapportionment and redistricting.

The panel reviewed possible technical approaches to the use of data from coverage evaluation programs for adjusting the raw census figures. The review covered proce-

dures for starting out, that is, for developing estimates for a limited number of large geographic areas, and procedures for carrying down, that is, for using the large-area estimates to develop adjustments for small areas and ultimately for the microdata records. The discussion of this topic in the report considers the Census Bureau's plans for research and testing of adjustment procedures in upcoming pretests and makes recommendations for priority research areas.

Recommendation. The panel recognizes that considerable work is still necessary and likely to lead to improved procedures for adjusting census data. We therefore support the Census Bureau's stated plans to pursue, internally, research and development of adjustment procedures, and we also recommend that the Census Bureau vigorously promote and support related statistical research in the academic community.

Recommendation. The panel supports the Census Bureau in its plans for a 1986 pretest of adjustment operations, including the production of mock tabulations of adjusted census data. We recommend analysis of the resulting adjusted and unadjusted data sets, to help identify the strengths and weaknesses of the particular methods tried.

Recommendation. We recommend that research on adjustment include:

- (1) investigations of the assumptions underlying the procedures,
- (2) an attempt to evaluate empirically the more important of the assumptions as well as the sensitivity of methods to violation of assumptions,
- (3) study of methods used for carrying down estimates to lower levels of aggregation, and
- (4) a study of the impact of adjustment on uses of census data.

8.2. Recommendations on methods to measure the completeness of census coverage

For adjustment to be feasible, evaluation programs must be good enough to provide estimates of net undercoverage that are reliable for at least large geographic areas and have error properties that are broadly understood. Coverage evaluation programs also provide valuable information for users of the data and for the Census Bureau in planning subsequent censuses. Although in general, the panel recommended that the Census Bureau narrow its 1990 Census research and testing objectives, in the area of coverage evaluation, the panel expressed the belief that it is too soon to focus on one method to the exclusion of others.

The report reviewed the problems associated with each of the major methods of coverage evaluation and the Census Bureau's current plans for research and testing for the coverage evaluation of the 1990 Census. The panel argued against the Census Bureau's decision to concentrate on post-enumeration (or possibly pre-enumeration) survey methodology as the principal means of coverage evaluation in 1990, and noted that the Census Bureau should not put itself in the position of lacking a means of adjustment if there are problems with the operation for matching survey with census records. The panel also urged completion of 1980-based studies related to coverage evaluation.

Recommendation. We recommend that the Census Bureau conduct research and tests of alternative coverage evaluation methodologies in addition to the post-enumeration survey, specifically reverse record checks and systematic observation.

Recommendation. We agree that matching algorithms are very important to the success of several adjustment methods. We recommend

that the Census Bureau investigate the development of a fallback position in case adequate matching is not available in 1990.

Recommendation. We recommend that the Census Bureau complete and report analyses of 1980-based tests related to coverage evaluation, especially the Census/CPS/IRS Match Study.

The panel considered possible improvements and recommended priority research areas for each major coverage evaluation method in turn. The demographic analysis method, which uses data from independent sources including birth and death records to estimate the number of persons at the time of the census in a given age-race-sex category, currently suffers from the absence of data on illegal aliens. The panel recommended research into using demographic analysis for estimates of the native-born population. The reverse record check method, which traces the current location of a representative sample of newborns, immigrants, and persons counted in the previous census or coverage evaluation program, has been widely used in Canada. Tracing is more difficult in the United States because of the 10-year interval between censuses as opposed to 5 years in Canada. The panel recommended completion of a current experiment to test alternative methods of tracing. The report discusses extensively the method of post-enumeration (or pre-enumeration) surveys, in which a sample of households is interviewed and matched with records in the census, and identifies several problem areas for particular attention in the Census Bureau's research.

Finally, the report discusses the idea of using some kind of systematic observation procedure whereby persons residing in a sample of areas would provide independent population estimates. The sample should include but not be limited to areas that have proved particularly hard to count in previous

censuses. This method might surmount the problem observed repeatedly in the history of coverage evaluation, namely that persons who are missed by the census are also likely to be missed by an independent survey or other data source.

Recommendation. We recommend that the Census Bureau conduct research into using demographic analysis to develop estimates of coverage for the native-born population. The research should consider whether these estimates could usefully be combined with other estimates of coverage.

Recommendation. We recommend that the Census Bureau move quickly to complete the Forward Trace Study to determine the feasibility of using forward trace methods in a reverse record check program for 1990. If the methodology is effective, a national sample for this purpose needs to be initiated by 1986.

Recommendation. We support the Census Bureau's research on developing the 1990 Post-Enumeration Program and recommend that such research emphasize the following areas:

- (a) Reduction of post-enumeration survey nonresponse;
- (b) Reduction of unresolved matches between records for individuals listed in the post-enumeration survey and the decennial census;
- (c) Validation of the assumptions and/or development of alternative methodologies with respect to netting-out of overcounts and undercounts with reference to the place of enumeration; and
- (d) Investigation of alternatives to the assumption that the inclusion of individuals in the post-enumeration survey is unrelated to their inclusion in the decennial census and the estimation of the strength of this relation.

Recommendation. We recommend that the Census Bureau initiate a research program on systematic observation with a view toward the use of this method for a sample of areas at the time of the 1990 Census.

In the area of adjustment-related research, including coverage evaluation methods, the panel acknowledged that many technical and operational issues need to be resolved if adjustment procedures are to be developed in time for their use in the nation's bicentennial census in 1990. Overall, while much effort will be required, the panel expressed optimism that substantial progress can be made.

8.3. Recommendations on procedures for improving the count

The panel considered not only methods for adjusting the census figures, but also procedures for improving the counts obtained in the field. Most programs for coverage improvement are expensive. They may also introduce error by duplicating or otherwise erroneously adding persons. In general, however, the panel determined that the cost of well-designed and well-executed coverage improvement programs is money well spent for improving the census figures.

The panel noted the importance of gaining an understanding of the problems of undercount and overcount in the census, as the evidence indicates that the field enumeration is not equally effective for all population groups.

Recommendation. We recommend that the Census Bureau assign a high priority to the completion of studies of undercount and overcount in the 1980 Census.

Recommendation. We recommend that the Census Bureau set up a timetable and assign staff to permit completion of the analysis of 1990 coverage evaluation results in time to be

used in planning the first pretest of the 2000 Census.

The panel considered priorities for research and testing for improvement of items on the questionnaire that relate to coverage, including the questions on race and Hispanic origin. It is important to understand what responses to the race and ethnicity questions mean to develop appropriate estimates of coverage rates for race and Hispanic groups and to relate them to vital statistics.

Recommendation. We recommend that the Census Bureau test a variety of question designs for the race and ethnicity information to be collected in the 1990 Census, including some that combine the collection of information on Hispanic origin with the other race and ethnicity information.

Recommendation. We recommend that the Census Bureau, in addition to other methods that it has traditionally employed, use the technique of focus group discussions as one means to develop questions on particularly sensitive items such as race and ethnicity.

Recommendation. We recommend that, in 1990 as it did in 1980, the Census Bureau collect, tabulate, and release data on race and ethnicity in such a way that the data can be reaggregated as necessary to obtain maximum feasible comparability with 1980 and 1970.

Recommendation. We recommend that the Census Bureau, the National Center for Health Statistics, and other relevant federal agencies work closely together to design questions and response editing rules on race and ethnicity that minimize conceptual differences between census and vital statistics records. The Office of Management and Budget should act as necessary to facilitate such coordination.

The panel evaluated experience in the 1970 and 1980 Censuses with questions on the short form designed to aid in achieving a complete

and accurate count, such as questions probing for a complete roster of household members. The mobility of the population and recent trends in living arrangements have resulted in growing numbers of persons with two or more usual residences (for example, retired people with summer and winter homes) who are harder to count. The panel suggested a question for testing directed toward improving coverage of young adults and children in hard-to-count areas.

Recommendation. We recommend that the Census Bureau give high priority in its planning for 1990 to research and testing of questions and enumeration procedures that address problems of accurately counting persons in the process of moving, households with second (vacation) homes, and persons with more than one usual place of residence.

Recommendation. We recommend, as one procedure to consider for improving coverage of hard-to-count groups, that the Census Bureau pretest a question asking parents for names and addresses of children who are not part of the household. This question should be included in the 1986 pretests.

The panel also made an overall assessment of special enumeration procedures designed to improve the count. While believing that programs such as the recheck of vacant units can make important contributions to improving coverage, the panel did not subscribe to the view that the next census should include every coverage improvement idea suggested or used in the past. The panel recommended paring down the list of programs to be considered for 1990 and the list requiring early field testing.

Recommendation. We recommend that the Census Bureau review coverage improvement programs used in past censuses and proceed with research and testing for use in 1990 of

those programs that: (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. Programs that do not satisfy these criteria should be dropped from consideration unless: (1) the program exhibited low total dollar costs and had demonstrable public relations or goodwill value in previous censuses or (2) there is some particular reason to believe a revised program will yield greatly improved results.

Recommendation. We recommend that the Census Bureau conduct full-scale pretests in 1986 only of those coverage improvement programs that require such testing. Furthermore, we recommend that the Census Bureau use focus groups that include members of hard-to-count populations as one means to explore coverage improvement techniques and to narrow the range of options to be field-tested.

8.4. Recommendations on uses of sampling and administrative records

The panel reviewed two major methods that have been proposed to improve the cost-effectiveness of the decennial census – the use of sampling in obtaining the count and the use of administrative records. With regard to sampling for the count, the panel noted problems of replacing the census with a large sample survey: sampling on the scale necessary for satisfaction of present demands for small-area data would complicate field operations, reduce costs relatively little, and probably exacerbate problems of coverage errors compared with a census. The use of sampling for follow-up of households that do not return their census questionnaires has some of the same drawbacks. However, sampling could

prove cost-effective in the final stages of follow-up in which it is very expensive to count an additional person. Although the Census Bureau has dropped plans to study the use of sampling for follow-up and for coverage improvement programs such as the recheck of vacant units in 1986, the panel expressed support for research in these areas. The panel also supported further tests of telephone follow-up of nonresponding households, which was tried experimentally in 1980. Finally, the panel underscored the need to maintain machine-readable records of the follow-up history of individual households that will permit detailed analysis and simulation of different sample designs.

Recommendation. We recommend that the Census Bureau not pursue research or testing of a sample survey as a replacement for a complete enumeration in 1990.

Recommendation. We recommend that the Census Bureau include the testing of sampling in follow-up as part of the 1987 pretest program. We recommend that in its research the Census Bureau emphasize tests of sampling for the later stages of follow-up.

Recommendation. We recommend that the Census Bureau consider the use of sampling for those coverage improvement programs that are implemented in the final stages of census operations and where there is potential for significant cost savings. We recommend that the Census Bureau simulate sampling in the Vacant/Delete Check program in an upcoming pretest.

Recommendation. We support the Census Bureau's plans for further testing of telephone follow-up procedures in 1986. We recommend that the Census Bureau review the implications for sample-based follow-up operations of the operational difficulties that were encountered in the 1980 telephone experiment.

Recommendation. We recommend that the Census Bureau keep machinereadable records on the follow-up history of individual households in the upcoming pretests and for a sample of areas in the 1990 Census, so that information for detailed analysis of the cost and error structures of conducting census follow-up operations on a sample basis will be available.

In addition to evaluating the uses of sampling for obtaining the basic head count, the panel reviewed the use of sampling for content items in the census. Historically, every census since 1940 has asked some items of only a sample of the population in order to reduce response burden and processing costs while obtaining the benefits of additional data. Sample designs and sampling fractions have differed in recent censuses. The Census Bureau considered a design for 1990 that would include a short form containing items asked on a 100 percent basis, a long form containing additional items asked of a large sample, and a follow-on survey of a small percentage of short-form households administered within a few months of census day that would obtain yet other information. The panel did not offer specific recommendations in this area, but noted that the criteria for including items in the follow-on survey have not been explicitly articulated. Clear criteria are necessary to permit thorough assessment of the need for the survey and for the inclusion of particular items.

Recommendation. We recommend that the Census Bureau refine and make more explicit its criteria for inclusion of items in the proposed follow-on survey that is being considered for the 1990 Census.

Finally, the panel investigated the use of administrative records for improving the accuracy of content items. The concern over completeness of population coverage in the census can obscure equally valid concerns over the accuracy of the content. There are

well-documented problems with the reporting of content items such as income, utility costs, and age of structure. The panel recommended research and testing directed toward improving the data quality of key items. The research program should include design of operations to verify, and possibly adjust, responses as part of the census operation and should investigate the possibility of obtaining some items, such as housing structure information, from administrative records sources.

Recommendation. We recommend that the Census Bureau conduct research and testing in the area of improved accuracy of responses to content items in the census. We recommend further that the content improvement procedures examined not be limited to reinterviews of samples of respondents, but include the use of administrative records.

Recommendation. We recommend that the Census Bureau investigate the cost and feasibility of alternative ways of obtaining data on housing structure items. Possibilities include: (1) obtaining housing structure information on a sample basis from administrative records and using this information to verify and possibly to adjust responses in the census; (2) obtaining structure information solely from administrative records and dropping these items from the census; and (3) asking structure questions of a knowledgeable respondent such as the owner or resident manager. We recommend that any trial use of a "knowledgeable" respondent procedure include a check of the data obtained from such respondents against data from administrative records.

8.5. *Recommendations on research and testing for the 1990 Census*

The panel reviewed the Census Bureau's research and testing plans for the upcoming 1990 Census, with particular emphasis on the

plans for pretests in spring 1986. The panel expressed several major concerns with the 1986 research and testing program. The plans appeared too ambitious for the time remaining before the census and for the staff and budget resources likely to be available, particularly if key data are to be analyzed in time to support major decisions. In the panel's view, the program also placed too much emphasis on field testing over other kinds of research, including further analysis of existing data. The panel suggested some ways to scale back the 1986 testing program.

Recommendation. We recommend, to ensure cost-effective field testing and preservation of adequate resources for analysis, that the Census Bureau attempt to identify research and testing proposals for 1986 that:

- (a) Can be pursued with other research methods and omitted from the 1986 field test program;
- (b) Can be safely deferred for research or testing until 1987 or until the dress rehearsals;
- (c) Are unlikely to be viable for 1990 but should be incorporated on an experimental basis into the 1990 Census as a test for future censuses; and
- (d) Should be omitted entirely from consideration for the 1990 Census, based on previous census experience or other survey research results.

Recommendation. We recommend that the Census Bureau make full use of data from the 1980 Census and from experiments carried out in 1980 to help guide planning for 1990. To this end, we recommend that the Census Bureau assign a high priority to completion of 1980 Census methodological studies, and we encourage further analysis of these data where appropriate.

Throughout its report, the panel endeavored to identify priority areas for research and

testing to support the choice of methodology for the 1990 and future censuses in the U.S.A.

9. References

- American Statistical Association (1984): Report of the ASA Technical Panel on the Census Undercount. *The American Statistician*, 38:4, pp. 252–256.
- Bailar, B. (1984): Comment from the Census Bureau. *The American Statistician*, 38:4, pp. 257–260.
- Butz, W. (1984): Data Confidentiality and Public Perceptions: The Case of the European Censuses. Paper presented to the Population Association of America, Minneapolis, Minnesota.
- Citro, C.F. and Cohen, M.L., eds. (1985): *The Bicentennial Census: New Directions for Methodology in 1990*. Panel on Decennial Census Methodology, Committee on National Statistics, National Research Council, National Academy Press, Washington, D.C.
- Conk, M.A. (1983): The 1980 Census in Historical Perspective. (To be published in W. Alonso and P. Starr, eds., *The Political Economy of National Statistics*, Basic Books, New York.)
- Ericksen, E.P. and Kadane, J.B. (1985): Estimating the Population in a Census Year: 1980 and Beyond. *Journal of the American Statistical Association*, 80, pp. 98–131.
- Gilford, L. (1983): Affidavit Presented to District Court, Southern District of New York, Mario Cuomo, et al., Plaintiff(s), Malcolm Baldrige, et al., Defendant(s), 80 Civ. 4550 (JES).
- Kadane, J.B. (1984): Allocating Congressional Seats Among the States When State Populations Are Uncertain. Technical Report No. 309 (revised), Department of Statistics, Carnegie-Mellon University, Pittsburgh, Pennsylvania.
- Keyfitz, N. (1979): Information and Allocation: Two Uses of the 1980 Census. *The American Statistician*, 33:2, pp. 45–50.
- Marks, J. (1980): Census Bureau Data Sources on Immigration. American Statistical Association, Proceedings of the Social Statistics Section, Washington, D.C., pp. 15–20.
- National Research Council (1972): *America's Uncounted People*. Advisory Committee on Problems of Census Enumeration, National Academy of Sciences, Washington, D.C.
- National Research Council (1978): *Counting the People in 1980: An Appraisal of Census Plans*. Panel on Decennial Census Plans, Committee on National Statistics, National Academy of Sciences, Washington, D.C.
- Passel, J.S. and Robinson, J.G. (1984): Revised Estimates of the Coverage of the Population in the 1980 Census Based on Demographic Analysis: A Report on Work in Progress. American Statistical Association, Proceedings of the Section on Social Statistics, Washington, D.C., pp. 160–165.
- Redfern, P. (1983): A Study of the Future of the Census of Population – Alternative Approaches. Paper commissioned by the Statistical Office of the European Communities.
- Siegel, J.S., and Robinson, J.G. (1982): Coverage of the National Population in the 1980 Census, by Age, Sex, and Race: Preliminary Estimates by Demographic Analysis. Current Population Reports, Special Studies P-23, No. 115, Bureau of the Census, U.S. Department of Commerce, Washington, D.C.
- U.S. Bureau of the Census (1970): *1970 Census User's Guide*. Part 1, U.S. Department of Commerce, Washington, D.C.
- U.S. Bureau of the Census (1973): *Population and Housing Inquiries in U.S. Decennial Censuses, 1790–1970*. Working Paper No. 39, U.S. Department of Commerce, Washington, D.C.

- U.S. Bureau of the Census (1982a): *The Meaning of Enumeration*. 1990 Planning Conference Series No. 1, U.S. Department of Commerce, Washington, D.C.
- U.S. Bureau of the Census (1982b): *User's Guide – 1980 Census of Population and Housing. Part A*, U.S. Department of Commerce, Washington, D.C.
- U.S. Bureau of the Census (1983): *Introduction and Overview of the 1980 Census*. Chapter 1 in *History of the 1980 Census of Population and Housing*, Draft, Washington, D.C.
- U.S. Bureau of the Census (1984): *1990 Census Planning*. Background Paper for the Census Advisory Committee on Population Statistics, Washington, D.C.
- U.S. Bureau of the Census (no date): *Coverage Evaluation and Coverage Improvement at the Census Bureau Since 1950*. Washington, D.C.
- U.S. Office of Management and Budget (1985): *Major Themes and Additional Budget Detail, FY 1984*. U.S. Government Printing Office, Washington, D.C.

Received February 1986
Revised October 1986