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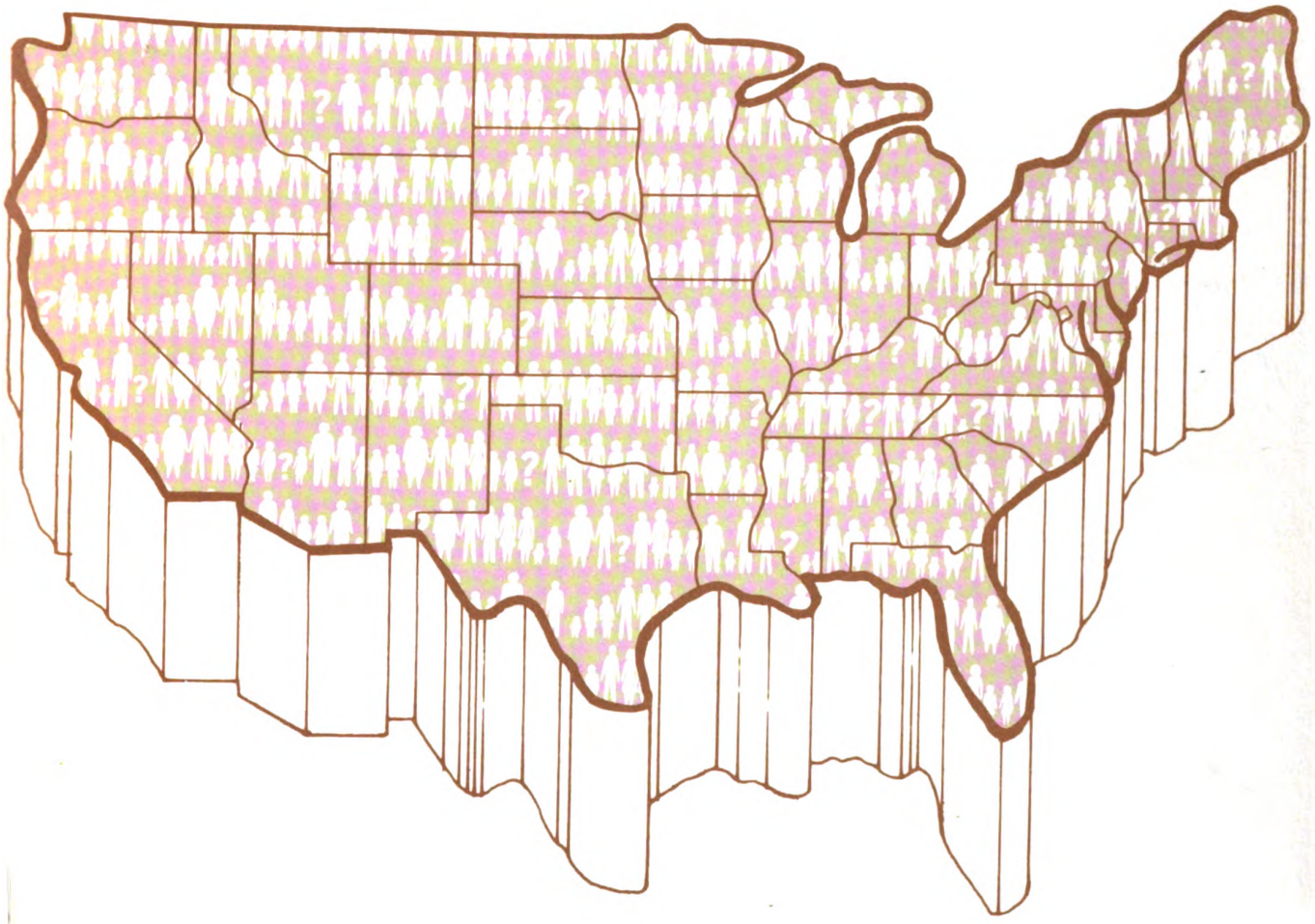

Developmental Estimates of the Coverage of the Population of States in the 1970 Census:

Demographic Analysis

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Developmental Estimates of the Coverage of the Population of States in the 1970 Census: Demographic Analysis

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Note on Rounding

Most figures in this report have been rounded independently from figures computed to the last digit. This practice accounts for the slight arithmetic discrepancies between the figures in the various columns of the tables.

Preface

There has been considerable interest in estimates of the coverage of the 1970 census for areas within the United States, such as States, counties, and major cities. This interest arises not only because of the desire to employ improved data in research and general planning but also because of the fact that considerable sums of money are distributed to governmental units on the basis of population, or population and other factors, and populaton is the key factor in determining representation in legislative bodies. Recognizing the great importance of the population counts for many programs, the Census Bureau has long been concerned about the possibility of considerable geographic variation in census coverage levels and with measuring the geographic variation. Studies on the geographic variation in census coverage have been attempted begnning with the 1950 census.

A major exploratory project for measuring the coverage of the population of States in the 1970 census has been under way at the Census Bureau in the last few years, using principally the method of demographic analysis. Demographic analysis attempts to develop an expected "true" population on the basis of demographic data generally independent of the census itself. A primary objective of this project was to develop a method that can be employed successfully alone or with other methods to estimate undercounts for States in 1980. This monograph represents the results of that project. It reflects also the Census Bureau's continuing effort to fill the request of the Census Advisory Committee on the Black Population for the 1980 Census to explore various methods which could be used to produce adequate estimates of the coverage of the population in the census for the principal racial groups at the State and local levels.

This monograph presents several sets of estimates of the completeness of coverage of the population of each State in 1970, derived by the method of demographic analysis or a combination of demographic analysis and the results of a study matching the census and the Bureau's Current Population Survey. A detailed description of the methods employed in developing the various series of estimates, including a full description of the data and the assumptions incorporated into the method, is given. The principal findings are discussed and, insofar as possible, the results are evaluated.

The monograph consists of eight chapters and seven appendixes. The first chapter discusses, in general terms, the various techniques of evaluating census data and summarizes the methods and results of the study. The next five chapters describe the methods in detail. Separate chapters are devoted to the White population under age 35, the Black-and-other-races population under 35, the White population aged 35 to 64, the Black-and-other-races population aged 35 to 64, and the total population 65 years and over. Chapter 7 presents a synthesis of the separate age-sex-race coverage estimates in the form of various series of coverage estimates for the population of all ages—all classes, total White, total Black-and-other-races, total male, and total female—and presents the estimates incorporating the results of the match study. The chapter also describes the principal results and presents an overall evaluation of them. The final chapter, chapter 8, considers the possible use of the results, some of their implications, especially for the apportionment of funds to States, and the possible refinement of the methods for use in the evaluation of the 1980 census. The several appendixes provide additional details regarding the data, methods, and assumptions, and present additional series of coverage estimates and summary data not shown in the main text.

This monograph supplements two earlier Census Bureau publications: **Estimates of Coverage of Population by Sex, Race, and Age: Demographic Analysis,** Evaluation and Research Program of the 1970 Census of Population and Housing, PHC(E)–4, February 1974; and "Coverage of Population in the 1970 Census and Some Implications for Public Programs," **Current Population Reports,** Series P–23, No. 56, August 1975. The first report presents estimates of the completeness of coverage of the population of the United States as a whole in the 1970 census, for age, sex, and race categories, developed by the method of demographic analysis. The second report summarizes the available information regarding geographic variations in census coverage and considers, illustratively, on the basis of some rough ("synthetic") estimates of coverage for States, some of the implications of geographic variations in undercoverage for various public programs. The present study employs presumably more refined methods of developing the coverage estimates for States than employed in **Current Population Reports,** Series P–23, No. 56, and, through the calculation of many alternative series based on alternative procedures, data, and assumptions, offers a better basis for establishing the range in which the true fig-

ures lie. Some of the conclusions given in the earlier report are reassessed in the present study on the basis of the new coverage estimates developed here.

The preparation of this monograph and the research underlying it represents a major team effort. Jacob S. Siegel, Senior Statistician for Demographic Research and Analysis, Population Division, directed the study, designed the monograph, and coordinated the writing of the report. Jeffrey S. Passel and J. Gregory Robinson, demographic statisticians on the Research and Analysis Staff of the Population Division, and Norfleet W. Rives, Jr., associate professor of urban affairs and statistics, University of Delaware, on contract to the Census Bureau, were the principal researchers; they designed the particular calculations and drafted various sections of the monograph. Mark D. Herrenbruck and Donald S. Akers, demographic statisticians on the Research and Analysis Staff of the Population Division, made important professional contributions to specific segments of the study. Rita A. Daly and Gary D. Smith assisted the professional staff in carrying out various calculations. Passel, Robinson, and Herrenbruck were responsible for computer applications and programming of the study, with the technical advice of Jerome G. Glynn and Elva Marie Pees. The assistance of Mary J. Kisner, Mary C. Bland, and Joan M. Kans, who typed the various drafts of the report, is gratefully acknowledged.

Charles D. Jones, Chief, and Richard E. Blass, mathematical statistician, Statistical Methods Division, kindly provided various unpublished statistics from the 1970 Census-CPS Match Study and gave helpful advice regarding the interpretation and use of this material. Eli S. Marks, Chief Census Research and Technical Advisor, and Paul Tomlin, mathematical statistician in the Statistical Methods Division, offered valuable comments on the preliminary draft of the report, for which the authors are grateful.

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The authors also wish to thank I. Richard Savage, professor of statistics, Yale University, William H. Kruskal, professor of statistics, University of Chicago, and Ansley J. Coale, professor of demographic studies, Princeton University, for their valuable comments on the provisional version of the study.

Finally, the Bureau of the Census would like to thank the Census Advisory Committee on Population Statistics, the Census Advisory Committee on the Black Population for the 1980 Census, the General Government Division of the U.S. General Accounting Office, and the Subcommittee on Census and Population of the Committee on Post Office and Civil Service, U.S. House of Representatives, for encouraging the Bureau to continue its research on the subject treated here and to prepare an appropriate report.

The role of the individuals and organizations named does not in any sense imply endorsement of the present monograph. Responsibility for the methods employed, interpretations made, and conclusions drawn belongs wholly to the Bureau of the Census.

August 1977

Chapter I. Introduction and Summary

The Bureau of the Census has conducted extensive research to evaluate the completeness of coverage of the United States population in the last three decennial censuses—1950, 1960, and 1970. A number of reports and papers have been written by Bureau staff members which describe the methodology employed and discuss the resulting coverage estimates.[1] The Office of Population Research, Princeton University, has also sponsored a number of important studies of the completeness of census coverage.[2] These reports generally present estimates of underenumeration for the population of the United States as a whole and occasional estimates for geographic regions, but none for States or smaller areas.

The importance of census counts of the population in determining political representation, in the disbursement of public funds, and in the planning, conduct, and evaluation of various private and public programs has aroused considerable interest in the accuracy of census counts for States and smaller political units and, particularly, in the availability of estimates of coverage for these areas in the last census. Geographic variation in census coverage and the measurement of this variation have long been a concern of the Census Bureau, but the studies of this kind which have been conducted for the last three censuses have focused primarily on the four regions and on urban and rural residence categories (with some size-of-place categories).

Recognizing the potential significance of undercoverage of State and local populations for many public and private programs, the Census Bureau initiated a major project a few years ago with the goal of developing a demographic method of measuring the coverage of the population of the principal geographic areas of the United States, particularly States, and of applying the method to the 1970 census data. This monograph presents the first published results of that research.[3]

This monograph describes principally the results of the Bureau's exploratory effort to apply the method of demographic analysis to the measurement of the coverage of the population of States in 1970. In addition, some series of estimates have been developed which also take into account the 1970 Census-CPS Match Study. The problems and issues involved in the preparation of the various series of estimates are discussed and a detailed description of the methodology is given. The quality of the results is considered in some detail, including a discussion of the sources of error and the limitations of the data, assumptions, and methods. Finally, there is a discussion of the use of the results, some of their implications, and possible adaptation of the demographic method to the development of coverage estimates for subnational areas in 1980.

Because of the limitations of the available data and the lack of empirical evidence regarding the determi-

[1] U.S. Bureau of the Census, **The Post-Enumeration Survey: 1950,** Technical Paper No. 4, Washington, D.C., 1960; U.S. Bureau of the Census, U.S. Census of Population: 1960, Vol. 1, **Characteristics of the Population,** Part 1, **United States Summary,** 1964, pp. XXXIX–XL; Conrad Taeuber and Morris H. Hansen, "A Preliminary Evaluation of the 1960 Censuses of Population and Housing," **Demography,** Vol. 1, No. 1, 1964, pp. 1–13; U.S. Bureau of the Census, Evaluation and Research Program of U.S. Censuses of Population and Housing, 1960: **Record Check Studies of Population Coverage,** Series ER 60, No. 2, Washington, D.C., 1964; Eli S. Marks and Joseph Waksberg, "Evaluation of Coverage in the 1960 Census of Population Through Case-by-Case Checking," **Proceedings of the Social Statistics Section,** 1966, American Statistical Association; Jacob S. Siegel and Melvin Zelnik, "An Evaluation of Coverage in the 1960 Census of Population by Techniques of Demographic Analysis and by Composite Methods," **Proceedings of the Social Statistics Section, 1966,** American Statistical Association; Jacob S. Siegel, "Completeness of Coverage of the Nonwhite Population in the 1960 Census and Current Estimates, and Some Implications," in David M. Heer (Ed.), **Social Statistics and the City,** Joint Center for Urban Studies of the Massachusetts Institute of Technology and Harvard University, 1968; U.S. Bureau of the Census, 1970 Census of Population and Housing, Evaluation and Research Program PHC(E)–4, **Estimates of Coverage of Population by Sex, Race, and Age: Demographic Analysis,** 1974; U.S. Bureau of the Census, "Coverage of Population in the 1970 Census and Some Implications for Public Programs," **Current Population Reports,** Series P–23, No. 56, 1975.

[2] Ansley J. Coale and Melvin Zelnik, **New Estimates of Fertility and Population in the United States,** Princeton, N. J., Princeton University Press, 1963; Ansley J. Coale, "The Population of the United States in 1950 Classified by Age, Sex, and Color—A Revision of Census Figures," **Journal of the American Statistical Association,** Vol. 50, No. 1, March 1955, pp. 16–54; Ansley J. Coale and Norfleet W. Rives, Jr., "A Statistical Reconstruction of the Black Population of the United States, 1880-1970: Estimates of True Numbers by Age and Sex, Birth Rates, and Total Fertility," **Population Index,** Vol. 39, No. 1, January 1973, pp. 3–36.

[3] An earlier unpublished report on the first phase of this study was presented at the annual meeting of the Population Association of America, Seattle, Washington, April 17–19, 1975, by J. S. Siegel, N. W. Rives, Jr., and J. G. Robinson, as "Experimental Efforts to Evaluate the Coverage of the Population of States in the 1970 Census."

nants and correlates of underenumeration, several alternative series of estimates of coverage for States were prepared. From one point of view the monograph presents many specific ("point") estimates of net underenumeration for States, each characterized by a substantial interval of possible error; from another, the monograph presents estimates of the range of net underenumeration for each State bounding much of the interval of uncertainty.

Establishing the exact or even the approximate extent of underenumeration is much more difficult than discovering that such a problem exists. Estimates of the undercoverage of the population of States in the census which could be used to correct census figures or which could serve as a basis for deriving estimates for substate areas must possess a high degree of accuracy. Some of the inquiries made of the Census Bureau concerning subnational population coverage implicitly assume that there would be no difficulty in developing a methodology capable of producing reliable estimates of coverage for States and areas within States. This presumption is unfortunate. Coverage estimates for subnational areas in 1970 similar in reliability and scope to those published for the United States as a whole cannot be prepared. The measurement problem for States is quite difficult, as this report will show, and the measurement problem for areas within States may be too difficult to be satisfactorily solvable at this time, as the report will suggest. Any estimates for metropolitan areas, counties, and cities would be subject to much greater error than those for States.

ALTERNATIVE METHODOLOGICAL APPROACHES

The methods which may be employed to measure the accuracy of the census counts of population for subnational areas, particularly States, in the census may be classified under three broad headings. These are: (1) dual-systems analysis, involving case-by-case matching, (2) demographic methods, and (3) "statistical methods." Each of these broad methods may be subclassified into two or more specific types. The first, dual-systems analysis, may employ either (a) data on individuals from a sample survey or (b) data on individuals from "demographic" or administrative records. Demographic methods may involve either (a) methods of demographic analysis or (b) comparison with aggregated data from administrative records. "Statistical methods" include a wide range of general statistical procedures, particularly (a) "synthetic" methods and (b) correlation-estimation ("regression") methods.

Matching Methods

The dual-systems approach as applied to the evaluation of census data involves a case-by-case match of census data with data from either another survey, such as a special sample survey taken just after the census (postenumeration survey) or a continuing sample survey taken about the same time as the census (e.g., Current Population Survey), or data from a set of records, such as completed questionnaires from a previous census, vital registration certificates, or "Medicare" enrollment records. One major advantage of case-by-case matching is that coverage of the population in the collection system used as a standard does not have to be complete. Under certain conditions, the survey or record system may be more incomplete than the census and still provide adequate estimates of coverage in the census.[1] A second important advantage of case-by-case matching is that the analysis has the capability of identifying the components of error separately. Ideally, the dual-systems approach can provide information on both gross coverage (or omission) and reporting (or classification) errors, and net coverage and reporting errors (which allow for the offsetting effect of the gross errors), as well as information on the characteristics of persons who are omitted from the census.

The dual-systems approach does have major limitations.[2] However carefully the data are assembled in the survey or record system, there will be omissions and these omissions, particularly those relating to the survey, tend to be correlated with omissions from the census. Thus, an evaluation based on a match of census data with survey data tends to understate the omission rate of the census because of the tendency for the same individuals to be omitted from the survey and the census (i.e., correlation bias). Furthermore, since the degree of understatement may vary from one region to another, the regional pattern of undercoverage as indicated by the match study may not reflect the true pattern of undercoverage accurately. Another important weakness centers on the mechanical problem of matching records from two statistical files. Despite all the precautions taken to insure accurate matching, there is inevitably the risk that some false matches will be made and that some true matches will not be made. Failure to effect true matches, the more likely possibility, tends to cause an

[1] Eli S. Marks, William Seltzer, and Karol J. Krotki, **Population Growth Estimation,** The Population Council, New York, 1974, esp. chapter 2. See also Eli S. Marks, "The Role of Dual System Estimation in Census Evaluation," unpublished paper presented at the meeting of the International Association of Survey Statisticians, Vienna, Aug. 18–24, 1973.

[2] U.S. Bureau of the Census, **The Methods and Materials of Demography,** by Henry S. Shryock, Jacob S. Siegel, and Associates, 2 Vols., third printing, 1975, pp. 835–836.

overstatement of the omission rate (i.e., matching bias). A further problem concerns the failure to exclude from the survey or record system persons who could not properly be included in the census, e.g., deaths, emigrants (i.e., out-of-scope bias).

Several dual-systems studies made in conjunction with the three most recent censuses provide limited information regarding regional variations in census coverage in the United States. In fact, all estimates of census coverage for regions available for these censuses are based on match studies. The results of these studies are summarized in table 1-A. One conclusion that can be reached from these studies is that the omission rate for all three censuses consistently appears to be highest in the South and lowest in the North Central region or the Northeast region, generally the former.[6] Furthermore, the 1970 Census-CPS Match Study shows that the overall regional differences are not solely the result of differences in the racial composition of the regions. The omission rates in 1970 for Whites and Blacks do show regional variation separately, even though these patterns resemble the pattern for all races combined to a large extent.

The match studies provide information about the general pattern of geographic variation in coverage, but the lack of independence between the two systems being matched suggests caution in the interpretation of the omission rates as estimates of net underenumeration. Furthermore, practical aspects of the dual-systems approach limit the utility of the method for estimating the coverage of political subdivisions of the United States directly, even States. In particular, the expense of interviewing and matching a sample large enough to provide reliable coverage estimates would be prohibitive for States, major metropolitan areas, and major cities, and considerable even for States.

Demographic Methods

Use of demographic methods represents a second possible approach to the evaluation of census counts for States in 1970. The effectiveness of the demographic method depends on the logical consistency of demographic data of different kinds obtained from different data-collection systems. The demographic method involves developing expected values for the population at the census date by the compilation, combination, and manipulation of demographic data essentially independent of the census being evaluated and comparing these expected values with the census counts. Such demographic data include birth statistics, death statistics, immigration data, data from previous censuses, etc. The method may include use of life tables, calculation of expected sex ratios, application of cohort-component analysis, etc. Another approach is to employ aggregate data from administrative records, such as "Medicare" enrollments, adjusting the data as required to achieve comparability with the census.

The demographic approach, unlike the dual-systems method, is not handicapped by problems of matching and, for the most part, the results are not affected by sampling errors. Furthermore, the demographic estimates can usually achieve a degree of independence from the census far above that for match studies. On the other hand, the demographic approach ideally calls for precision in the estimates of the expected population. In fact, the expected numbers are subject to error; the accuracy of the estimates derived by demographic methods can be adversely affected both by errors in the basic data and by errors in the methodological assumptions employed to prepare the estimates. Furthermore, the demographic method can only provide estimates of net error for age, sex, or race groups, combining coverage errors and errors of reporting these characteristics.

The demographic method is now considered by the Census staff to be more effective than the dual-systems method for developing satisfactory estimates of net census errors for the United States as a whole. The effectiveness of demographic analysis for estimating coverage of State populations is more problematic. This study is, in effect, an exploratory effort to determine the feasibility of the demographic method at the State level.

Statistical Methods

A third possible approach to the estimation of census coverage for areas within the United States involves the application of "statistical methods." There are many variations of these methods, including, in particular, synthetic methods and correlation estimating methods. The standard version of the synthetic method commonly involves application of specific rates or proportions with respect to a characteristic (e.g., coverage) at one geographic level to the population at some subordinate geographic level. (The method may also be applied in a time frame as well as in a space frame.) For estimating population coverage for States, for example, the national estimates of net census undercount rates for the various age, sex, and race categories, or race categories only, would be applied to the corresponding population figures for each State.[7] This procedure assumes no variation between

[6] A summary discussion of the results of these studies is given in U.S. Bureau of the Census, **Current Population Reports**, Series P–23, No. 56, op.cit., pp. 5–6.

[7] U.S. Bureau of the Census, **Current Populations Reports**, Series P–23, No. 56, op. cit., pp. 6–8 and table 1.

States in the undercount rates for each age-sex-race category or each race category. The resulting estimate of coverage for the population of each State is basically a weighted average of the component national net undercount rates; the weights are the population figures for each State.

The synthetic method employing race, sex, and age categories produces estimates of census coverage of State populations in 1970 which vary about the estimate for the total population of the United States (2.5 percent). This variation is essentially a joint consequence of differences in census coverage for Whites and Blacks at the national level and the variations among the States in the racial composition of the population. Where the proportion of Blacks in the population is larger than in the nation as a whole, the estimated undercoverage for that area will tend to be greater than that for the United States; where the proportion is smaller, the undercoverage will tend to be smaller. It should be noted that, when a synthetic method is used, the factors of age and sex do not appreciably contribute to variation among the States in total population coverage because the age and sex composition of State populations, unlike their racial composition, varies relatively little among the States.[8]

The synthetic method is one approach that might theoretically be considered for measuring the underenumeration of State populations. Synthetic procedures for States are computationally simple, uniformly applicable to each State, give apparently reasonable results, and are unbiased in the sense that the State estimates are consistent with the national coverage rate. Since the version of the method we have described fails to take into account possible variations among States in census coverage rates for particular age, sex, and race groups, the estimates show relatively little variation from State to State. In the Bureau's application of the method, 49 States had estimated rates of net underenumeration in the range from 1.9 percent to 3.8 percent (excluding Hawaii, 1.3 percent, and the District of Columbia, 6.4 percent).[9]

Differences in coverage between States certainly exist for the specific racial groups, however. Variations in the economic and social characteristics of respondents, the areas of origin of the population, the attitudes of respondents toward the census and government, population density, housing conditions and patterns, the quality of enumerators, and local census management, among other factors, should cause some variation in coverage in addition to that resulting from differences in age, sex, and race composition. In fact, they suggest that the differences in coverage may be substantial for each race group. As a result of the failure of the synthetic method as we have defined it to take account of these factors, the resulting estimates of corrected population may seriously overstate or understate the actual population.

To overcome this weakness of the synthetic method, one can consider modifying it to take into account possible variations in coverage resulting from factors other than age, sex, and race. Synthetic estimates might be much improved if we could employ coverage rates for city-size groups and broad income and occupation groups, by race. Various sets of estimates for States can also be developed on the basis of assumptions regarding the relation of coverage to the socioeconomic characteristics of the population. Because of the present lack of empirical evidence regarding these relations, any such estimates should be viewed as crude, even though the assumptions employed may be consistent with information from one or another match study. One such set of modified synthetic estimates was developed in connection with the Bureau's previous study on subnational coverage, on the partly arbitrary assumption that the rate of underenumeration for each race group varied inversely with the level of median family income in each State.[10] Another set was derived by assuming that the rate of underenumeration for each race group varied inversely with median years of school completed in each State. These estimates of underenumeration varied more from State to State than did the basic synthetic estimates. However, they may not be much more accurate than the basic synthetic estimates in view of the relatively arbitrary nature of the assumptions.

The basic synthetic method may be viewed as the limiting form of a correlation-estimation method in which the mean value for each variable (e.g., national net underenumeration rate for Blacks) is the estimated value for each unit in the distribution (e.g., each State). If, however, we can establish a relation between the rate of undercoverage and some characteristic of the population nationally or regionally (e.g., median family income, proportion of inmigrants, etc.), we can develop a correlation-estimating equation incorporating one or more independent variables, which may permit the "empirical" determination of a variable underenumeration rate for each State.

One possibility that may be considered for measuring State variation in coverage is the use of "proxy variables" which directly reflect the quality of State data.[11] Such proxy variables could include the percent

[8] Ibid. The percent Black in the States "explains" 98 percent of the variation in estimated undercoverage; i.e., the product-moment correlation coefficient between percent Black and the net underenumeration rate as estimated by the synthetic method is 0.989.

[9] U.S. Bureau of the Census, **Current Population Reports,** Series P–23, No. 56, op. cit., table 1.

[10] Ibid.

[11] National Academy of Sciences, **America's Uncounted People,** Carole W. Parsons, (Ed.), Report of the Advisory Committee on Problems of Census Enumeration, National Research Council, Washington, D.C., 1972, chapter 6, esp. pp. 107–108.

of the population added in the census because of nonintervieW ("imputations") and the percent of the population for which allocations of characteristics were made for nonresponse. Although these indicators for 1970 were moderately correlated with the demographic estimates of coverage for States, they would not be effective for measuring State coverage in 1970 because they did not show a sufficient degree of State-to-State variation. Moreover, because of the lack of necessary data, they could not be used to impute variation to racial groups. Any coverage estimates for States in 1970 based on the available proxy variables would be weak.

In spite of the low reliability of "statistical" procedures for estimating the coverage of State populations, they may be useful in identifying and evaluating the relevant factors in coverage by comparison with the results of other more refined methods. The corrected population figures derived by statistical methods can also be effectively used to illustrate possible changes in allocation of funds to States under various public programs (e.g., General Revenue Sharing), and possible changes in Federal, State, and local legislative representation which could result from adjusting the census counts for undercoverage.[12] Finally, the statistical method may be useful in making estimates of underenumeration for subdivisions of States when sound estimates of coverage for States and information regarding the socioeconomic and geographic correlates of underenumeration are available from demographic analyses and match studies.

SUMMARY OF METHODS

General Methodological Considerations

As mentioned previously, the estimates of net underenumeration for States in 1970 presented in this report were developed principally by the application of techniques of demographic analysis, although some series were developed by taking into account the results of the 1970 Census-CPS Match Study. Separate consideration was given in the methodological design to 12 age-sex-race segments of the population, namely those represented by males, females, White, and Black and other races,[13] and three broad age groups (under 35, 35 to 64, and 65 and over). This disaggregation of the population was not made primarily for the purpose of deriving coverage estmates for each of these groups—although such figures are important, both for themselves and for developing coverage estimates for areas within States—but for the purpose of deriving the best estimates of the coverage of the total population of States with the available methods and data. The partitioning of the age distribution at the specified ages, in particular, was made because different types of data are available for each of these groups and, hence, different methods of estimation had to be employed for them. This approach parallels the methodological design previously employed for estimating underenumeration at the national level.[14]

The estimates of the net census undercounts for each of the three age groups are not of equal importance in determining the overall level of net underenumeration for each State. The population under age 35 accounted for 58 percent of the population nationally in 1970. Consequently, errors in the estimates of net census undercounts for this age group have a greater impact on the overall estimates for States than do errors in the estimates for the other two age groups. Likewise, errors in the estimates of the coverage of the population aged 35 to 64, which accounted for roughly 32 percent of the national population in 1970, are relatively more important than errors in the estimates for the population aged 65 and over, which covered only about 10 percent of the national population. The exact proportions in each of these age groups vary from State to State but the relative importance of each in determining the level of the estimated net underenumeration of the total population of a State can be approximated by the national figures.

The coverage estimates for the component age-sex-race groups are subject to error, possibly substantial error. The magnitude and direction of these errors are not closely known and may be unknowable. Fortunately, these errors do not necessarily tend to cumulate. It is quite possible that errors in one direction for some groups for a State are offset, at least partially, by errors in the opposite direction for the other groups; hence, the estimates of net underenumeration for the total population of States may be less in error than the estimates for the component age-sex-race groups.

Assumptions had to be made at many different points in the estimation procedure in order to allow for deficiencies in the available data and to pursue alternative methodological paths. A principal problem in developing these estimates was the lack of data on lifetime interstate migration from a source external to the census and the resulting dependence on the census data on lifetime migration. As a consequence, assumptions had to be made regarding the relative

[12] U.S. Bureau of the Census, **Current Population Reports**, P–23, No. 56, op. cit., pp. 13–23 and tables 2 to 4.

[13] Estimates of net underenumeration were not developed for the Black population and the other-races population separately because the data necessary for applying the demographic method to these racial groups were not available.

[14] U.S. Bureau of the Census, 1970 Census of Population and Housing: Evaluation and Research Program PHC(E)–4, **Estimates of Coverage of Population by Sex, Race, and Age: Demographic Analysis**, 1974, pp. 4–7.

coverage of lifetime interstate migrants and nonmigrants and regarding the relative influence of an individual's State of birth and State of current residence on the likelihood of being omitted from the census. Other broad assumptions had to be made regarding the relation between the level of coverage of persons in the middle age range and that for younger persons.

For each type of assumption, a range of reasonable alternatives was investigated, but the lack of empirical evidence on, and the ultimate untestability of, many of these assumptions precluded a confident choice among them. Thus, many alternative sets of estimates of net underenumeration for States were prepared and are displayed in this report. No single set of estimates covering all States can be designated as a "preferred" set, although there are reasons, noted in the study, to prefer some series to others. More exactly, the study provides a useful range of estimates indicating the probable locus of the true figure.

Summary of Specific Methods

The estimation procedures used for the various age-sex-race groups are quite complex and involve a number of major methodological and substantive issues. These are set forth in detail in chapters 2 through 6. In order to provide a framework for the detailed presentation of the methodology, a discussion of the underlying logic of the estimation procedure and a brief summary of the methods used are given in the next several sections of this chapter.

Population under 35 years of age. The coverage estimates for the population under 35 years of age were developed by a modified cohort-component procedure in a two-stage design. First, estimates of coverage were derived for the population born in each State.[15] For each race-sex group the births in each State for five-year time periods, 1935–40 to 1965–70, corrected for underregistration, were carried forward to 1970 by life-table survival rates calculated from a series of current life tables. The survivors were then further reduced by the number of native Americans who left the country before the census date. The resulting estimates of the expected population born in each State were then compared with the census population reported as born in the State, to obtain the estimated coverage error for the population *born* in each State.

Since the census State-of-birth data were affected by a number of deficiencies, various adjustments were made in them. To distribute persons of "unknown" State of birth—the number of whom was particularly large among Blacks—two "limiting" assumptions were employed. In the first, the unknowns were distributed to each State in proportion to the total number of persons whose State of birth was reported and in the second the unknowns were distributed to each State at a rate five times greater for lifetime interstate migrants than for nonmigrants. Because of the tendency of many respondents in the census to report place of occurrence of birth rather than place of residence of the mother at the time of the birth, birth statistics tabulated by place of residence were found not to be fully consistent with the census data and, instead, an average of births tabulated by State of residence and births tabulated by State of occurrence was employed in calculating the expected populations born in each State. The underlying logic of the methodology used to derive coverage estimates for Blacks under age 35 parallels that described for Whites but, because of serious deficiencies in the 1970 census State-of-birth data for Blacks, the census data were set aside and estimated "census counts" for 1970 which were not affected by the biases of the 1970 census data with respect to reporting State of birth (but still affected by undercoverage and errors in reporting age) were developed from data in earlier censuses.

In the second stage of the model, the estimates of coverage of the population *born* in each State were converted into estimates of coverage of the population *resident* in each State. The conversion into State-of-residence coverage estimates involved making various assumptions regarding the relationship of State of birth, State of residence, and migration status to coverage levels. Coverage levels were first assumed to be a function of one's State of birth; under this assumption the estimated coverage rate for the resident population of each State was obtained as the weighted average of the coverage rates for each State of birth, the weights for each State being the proportions of the State's resident population born in each of the 51 State areas. Coverage was then, alternatively, assumed to be a function of State of residence; under this assumption the estimates of the coverage rates for the resident population of the States were derived by the solution of 51 simultaneous linear equations, each of which equated the previously established State-of-birth coverage rate for a State to the weighted average of 51 unknown State-of-residence coverage rates. The weights for each State in each equation are the proportions of the population born in each State which are resident in each State.

In the absence of pertinent empirical evidence regarding the determinants of coverage, the two types of State-of-residence coverage estimates were averaged with equal weights and the resulting average series became the basis of all other variations of the coverage estimates. Variations in this set of coverage estimates were derived by incorporating the two alternative ("limiting") assumptions noted earlier regarding the distribution of persons whose State of birth was not reported and two alternative ("limiting")

[15] In the present study, "State" or "State area" refers to the fifty States and the District of Columbia.

assumptions regarding differences between the omission rates of lifetime interstate migrants and nonmigrants. In the first assumption regarding the coverage of migrants, the missed rates of migrants and nonmigrants were assumed to be the same and, in the second, the missed rate for migrants was assumed to be twice that for nonmigrants.

These coverage estimates related initially to the native population under 35 years of age but were assumed to apply to the entire population under age 35, both native and foreign-born. An adjustment to the national undercount rate, which pertains to the total resident population of the United States, allowed in principle for this difference.

Population 35 to 64 years of age. The calculation of coverage estimates for ages 35 to 64 presents special problems because there are few relevant data bearing directly on these ages from sources other than the census. Specifically, the modified component procedure by which coverage estimates for the population under 35 years of age were prepared could not be applied effectively to the population over 35 years of age because of the lack of adequate data on births for States prior to 1935. It became necessary to develop estimates of net census error rates for these intermediate ages by more indirect methods.

Several different sets of coverage estimates for the population aged 35 to 64 were obtained by combining alternative assumptions in various ways. This modus operandi was followed because there were no satisfactory external checks on the validity of most of the assumptions and they are virtually untestable. Because of the small variation in the estimates for Whites and a moderate logical preference, a single procedure (that based on "coverage rates" and "females") was selected for combination with estimates for other age-sex-race groups; for Blacks, the variation was much greater and several series were selected for combinaton. The various assumptions that were employed are all viewed as quite reasonable, however, and, hence, any preference, as that for a single procedure for Whites, is partly arbitrary.

The estimation procedures employed for the ages 35 to 64 were designed to take into account the geographic variation in coverage estimates previously established for ages under 35. The preferred procedure for Whites was as follows: the ratio of the coverage rate for each State for White females under 35 years of age to the national rate for White females under 35 years of age was used to convert the national rate for White females 35 to 64 years of age into coverage rates for White females aged 35 to 64 for States. These coverage rates were then employed to derive estimates of the corrected White female population aged 35 to 64. Finally, the corrected White male population aged 35 to 64 was derived by applying "expected" sex ratios to the corresponding figures for females.

The expected sex ratios for the White population aged 35 to 64, for States, were calculated by an extension of the method previously employed in connection with the calculation of national expected sex ratios.[16] In brief, sex ratios of births for States for 5-year periods, 1905–10 to 1935–40, were brought forward to 1970 by sex ratios of survival rates, and further adjusted for the sex balance of net internal migration, net immigration, and war mortality. This approach required compilation of births and life table values, by sex, for all States as far back in this century as the records permitted. The adjustment of the expected sex ratios of States to allow for the effect of internal migration was based on census data on State of birth for 1970; this procedure implied that, in spite of coverage and reporting errors, the census data adequately reflected the sex balance of lifetime migrants for the present purpose.

Because of the lack of the requisite data, a different procedure was employed to estimate the coverage of the Black-and-other-races population for ages 35 to 64. First, the ratio of State-to-national net undercount rates or coverage rates for White females aged 35 to 64 years, or the ratio of State-to-national coverage rates for Black females under age 35 was applied to the national rate for Black females aged 35 to 64 years to derive estimates of net undercount rates or coverage rates for Black females aged 35 to 64. Then, estimates of the corrected Black female population aged 35 to 64 for States were derived from the net undercount rates or coverage rates for this group. Finally, the corrected Black male population was estimated by applying "expected" sex ratios to the corresponding estimates for Black females. The frequency of gaps in the required data precluded the derivation of expected sex ratios by the cohort-component procedure used for the White population. Instead, they were derived by adjusting the census sex ratios for States at ages 35 to 64 by the amount (additive procedure) or percent (ratio procedure) of error in the national sex ratio at these ages.

Population 65 years of age and over. Aggregated data on "Medicare" enrollments were used to measure net census error rates for persons 65 and over for each State, as was done for the nation previously. The raw Medicare data, representing enrollment for either part of Medicare (hospital insurance or supplementary medical insurance), understated the "true" population 65 and over in 1970 since some persons 65 and over are legally ineligible to enroll (i.e., aliens who were admitted in the last 5 years), and others did not choose to enroll (i.e., most Federal employees and annuitants,

[16] U.S. Bureau of the Census, PHC(E)–4, op. cit., pp. 18–20.

and others who did not enroll for supplementary medical insurance). Accordingly, the basic Medicare data were adusted to include these groups, following the same "low"assumption as for the national estimates.[17] An additional problem arose because many people appear to have reported a mailing address for Medicare different from the residence at which they were enumerated in the census. On the assumption that the census address was correct, this problem necessitated a major upward adjustment in the estimated "true" population 65 and over in Arizona and Florida.

Total population. Several series of estimates of net underenumeration of the total population of the States were derived by combining corrected population figures for the 12 age-sex-race groups separately considered in this study into corrected totals for States and comparing the corrected totals to the census figures. Prior to combining the corrected population figures, the State series of corrected figures for each age-sex-race group was adjusted to an estimate of the corrected national population in that age-sex-race group. The national totals used for this adjustment are consistent with the "preferred" series of estimates of net census undercounts published previously.[18] The national corrected population figures for the 12 age-sex-race categories are shown in table I–B. All of the coverage estimates for States shown in this report have been adjusted to be consistent with these totals.

The adjustments serve to achieve statistical consistency between the State estimates of coverage and the national estimates, and tend to reduce possible biases in the unadjusted figures. The magnitude of the adjustments varies from one group to another and from one series of estimates to another, but most of the adjustments are quite small. For example, the maximum adjustment for one principal series of estimates is 1.2 percent for Black-and-other-races males under age 35. The adjustments of the population under age 35 allow for several types of differences between the State estimates and the national estimates; e.g., differences resulting from the use of life tables to estimate survivorship for States rather than actual death statistics, which are employed in the derivation of the national figures; differences resulting from the fact that the estimates relate essentially to the native population rather than the resident population, as is true for the national estimates; and other differences resulting from the lack of consistency between the procedure used to derive the State estimates and the national estimates. For the ages 35 to 64, the adjustments are generally no larger than for the other ages, even though the ratio procedures which were used for this group do not parallel the procedures for the national estimates as closely as do the procedures for the age groups under age 35 and 65 and over. As would be expected, because of the consistency of the method for States and the United States as a whole, the adjustments of the State figures at ages 65 and over are commonly well below 0.5 percent. A typical set of the adjustment factors is shown in table I–C.

In the synthesis of the results of this study, five sets of estimates of net underenumeration of the total population of States derived wholly by demographic analysis are presented (table VII–D). These five series are based on various combinations of:

1. Estimates of the White and Black corrected population under age 35 derived from birth statistics, incorporating:
   a. One of the two limiting assumptions regarding the State-of-birth distribution of persons for whom State of birth was not reported in the census and
   b. One of the two limiting assumptions regarding the relative omission rates of lifetime interstate migrants and nonmigrants (1–to–1 and 2–to–1);
2. Estimates of the corrected White population aged 35 to 64 based on the pattern of coverage rates for White females under age 35 and use of expected sex ratios derived by a cohort-component method;
3. Estimates of the Black population aged 35 to 64 based either on:
   a. The pattern of net coverage rates for White females aged 35 to 64 and use of expected sex ratios derived by an "additive" procedure, or
   b. The pattern of net error rates for White females aged 35 to 64 and use of expected sex ratios derived by a "ratio" procedure, or
   c. The pattern of net coverage rates for Black females under age 35 and use of expected sex ratios derived by an "additive" procedure; and
4. "Low" corrected estimates of population 65 years and over.

Two additional series of coverage estimates were derived for the synthesis in table VII–D by combining the results of demographic analysis and the 1970 Census-CPS Match Study. In the first composite series, the match study figures were substituted for White females aged 35 to 64 for nine geographic divisions in one of the principal demographic series. One can reasonably consider this age-sex-race group the only one for which the match study results would be superior to the demographic estimates. The second composite series represents an average of (1) estimates for States derived by demographic analysis and

[17] U.S. Bureau of the Census, PHC(E)–4, op. cit., table D, p. 17.

[18] U.S. Bureau of the Census, PHC(E)–4, op. cit., table 3, p. 29.

(2) demographic estimates for States tied in to the match study figures for White females of nine geographic divisions and Black females of five divisions, as well as the figures in the four regions for each race. The sex ratios implicit in the demographic estimates were employed to derive the corrected male figures. This series was designed to secure the advantages of averaging estimates that are based on independent methods and hence may have offsetting biases, while confining the use of the Census-CPS Match results to the sex group for which they are likely to be less biased.

REVIEW AND ASSESSMENT OF RESULTS

Review of Results

Even though the application of the demographic and composite methods did not produce a single set of preferred estimates of net underenumeration for States, the several series included in the synthesis represent a plausible range of coverage estimates for the States. There is some consistency among the various sets of estimates and some general conclusions can be drawn. First, the calculations reported here support the presumed inadequacy of the synthetic procedure or its variants in reflecting the true variability in coverage among the States. The dispersion of the various sets of estimates of net underenumeration for States produced by demographic techniques is much greater than for the sets produced by the synthetic method or its variants, such as we have applied them.

In spite of the substantial variation among the States indicated by the several sets of demographic estimates, the relative level of completeness of coverage among the four regions is roughly the same, regardless of the assumptions employed. In nearly all the sets of demographic estimates, the South shows the worst coverage of the four regions; the Northeast and North Central regions generally show the best coverage; and the West is generally intermediate.

Among the divisions, there are also a number of regularities in the various series of estimates. New England has lower rates of net underenumeration than the Middle Atlantic division, the other division in the Northeast. The coverage in the East South Central division is apparently superior to that in either the South Atlantic or West South Central division, the other divisions in the South. The coverage estimates for States tend to vary from series to series more than those for regions or divisions. However, there is a sufficient degree of consistency among the various estimates so that, for a number of States, the possible net underenumeration can be specified within a narrow range. The results for States are shown in table VII–D and discussed for particular States in chapter VII.

Assessment of Results

The development of coverage estimates for the population of States required the use of data and assumptions which contain a great deal of uncertainty. Consequently, "confidence intervals" or some similar measure should be constructed to represent the range of error in the estimates. At the present time, construction of confidence intervals in the formal sense is not possible, but the derivation of a range of relative error may serve to represent the uncertainty in the estimates (ch. VIII). Without some measure of error, any estimates of coverage should be used with extreme caution because, for some of the units considered, the error in the coverage estimates may be relatively large and the corrected population implied may be even farther from the actual population than the original census counts.

The degree of error in the estimates of net underenumeration for States cannot be measured precisely or even closely. Because the true population is unknown, the accuracy of the estimates can be considered only in indirect and approximate terms. Possible criteria for assessing the degree of error include, in general, the demographic logic of the method and results, and the consistency and range of results obtained by the use of independent methods, alternative reasonable assumptions, and different data. In particular, the criteria used to assess the estimates of census coverage for States include:

1. the number and pattern of net overcounts and very large net undercounts,
2. the reasonableness of the balance of the sexes ("sex ratios") of the corrected figures,
3. the reasonableness of the age, sex, and race variation in the error rates,
4. comparison of the variation of error rates between States within divisions and the variation of error rates between divisions,
5. the quality of the basic data incorporated in the estimates,
6. the sensitivity of the coverage estimates to alternative reasonable assumptions, and
7. comparison of the demographic estimates and other independently derived estimates.

The estimates of net underenumeration for the total population of States, as well as for the component race-sex groups, are evaluated in the remaining chapters of this study by applying these criteria. Many of the assessments are in qualitative terms rather than quantitative or statistical terms, however. Even though it was not possible to construct formal confidence intervals for the estimates of net underenumeration for States, the alternative series of estimates may be used roughly to assess the error in the estimates. As we have noted, the various series may be considered

alternatively as many specific ("point") estimates of net underenumeration for States, each of which is characterized by a substantial error interval, or the series may be considered as representing estimates of the range of underenumeration which encompass much of the interval of uncertainty.

The degree of error inherent in the estimates of coverage presented is discussed in many places throughout the report. We may first note some generalities regarding the accuracy of the estimates. The more accurate the basic data used in a demographic procedure, the fewer assumptions that must be made, the greater the plausibility and the smaller the impact of the assumptions, and the smaller the size and variability of undercoverage, the less subject to error the resulting estimates are likely to be. Accordingly, the estimates for Blacks are necessarily less adequate that those for Whites; there are more gaps in the data for Blacks and, historically, the data for Whites have been of better quality. The estimates for the 35–to–64 age group are subject to much greater error than the estimates for either of the other two age groups. This is a consequence primarily of the lack of direct demographic data to estimate the coverage of this group and the resulting use of "mechanical" methods.

In spite of the shortcomings of the coverage estimates, we feel that satisfactory estimates of the range of underenumeration were secured for the White population of all but a few States. On the other hand, the estimates for the Black population are subject to such gross error because of the inadequacies of the basic data that they should not be accepted as satisfactory estimates in themselves. They are considered useful, however, in combination with the figures for the White population, to derive estimates of the coverage of the total population of States. The indicated range of the estimates for the total population as reflected in the synthesis in table VII–D is believed to be adequate for many of the States; the exceptions are those States with large proportions of Blacks, those for which the basic data for Whites were affected by special problems, and those for which the alternative procedures produced an extremely wide range.

The limitations of the available data raise serious questions regarding the capability of the methodology employed for developing coverage estimates for States which are sufficiently reliable to justify their use in connection with disbursing public funds or determining political representation. The estimates for States for 1970 which have been developed here may be adequate for some purposes, however. For example, they should be useful in providing guidance to many users in the interpretation and analysis of census data and to the Census Bureau in planning the deployment of resources—personnel, facilities, and effort—for the conduct of the 1980 census.

This study does provide evidence that the demographic method can succeed under "favorable" circumstances and supports the view that the method may be fruitfully pursued as part of the 1980 Census Evaluation Program, either alone or in combination with other methods.

Table I-A. OMISSION RATES SHOWN BY EVALUATION STUDIES, FOR REGIONS: 1940, 1950, 1960, AND 1970

(Rates for population represent the percentage missed based on corrected population. Rates for housing are units missed per 100 enumerated units)

Group and year	United States	Northeast	North Central	South	West
POPULATION					
1970 CPS-Census Match Study[1]					
All classes	2.3	2.6	1.2	3.1	1.9
White and other races	1.8	2.3	1.1	2.4	1.7
Black	6.3	7.6	3.4	6.7	6.4
1970 Medicare Record Check[2]					
65 years of age and over:					
All classes	4.7	4.4	3.6	6.4	4.2
White	4.2	4.0	3.3	5.6	3.8
Black and other races	9.9	10.7	8.7	10.0	10.6
1960 Record Check Study[3]					
All classes	4.0	3.6	3.2	4.9	4.1
1950 Post-Enumeration Study (PES)[4]					
All classes	1.4	0.8	1.3	1.8	1.5
1950 Infant Enumeration Study[5]					
Under 3 months of age:					
All classes	3.6	2.9	2.3	5.3	3.3
White	2.9	2.7	1.9	4.1	2.9
Black and other races	8.6	6.6	9.0	8.9	8.2
1940 Demographic Analysis[6]					
Under 5 years of age:					
All classes	7.6	7.3	5.0	10.1	6.7
White	6.4	6.9	4.7	7.7	6.5
Black and other races	15.2	14.4	11.4	15.9	10.4
HOUSING, OCCUPIED UNITS					
1970 Census-CPS Match Study[7]					
All occupied housing units	1.4	1.8	0.8	1.7	1.6
1960 Census Evaluation Program[7]					
All occupied housing units	2.1	2.0	1.8	2.8	2.0

[1]U.S. Bureau of the Census, Current Population Reports, Series P-23, No. 56, p.6. Match data are gross omissions adjusted for "imputations" in the census.

[2]U.S. Bureau of the Census, 1970 Census of Population and Housing: Evaluation and Research Program, PHC(E)-7, derived from missed rates shown in table 2. The figures shown represent unadjusted gross omission rates.

[3]U.S. Bureau of the Census, Evaluation and Research Program of the U.S. Censuses of Population and Housing, 1960, Series ER 60, No. 2, derived from figures shown in table 4, Estimate No. 5. This series appears to be most consistent with the national estimate of net underenumeration derived by demographic analysis. The figures shown are gross omission rates, not adjusted for persons erroneously included. The estimated net undercoverage rate for the United States, corresponding to the figures for other years, is 2.9 percent.

[4]U.S. Bureau of the Census, Technical Paper No. 4, derived from figures shown in table F. The figures shown are net omission rates.

[5]U.S. Bureau of the Census, Procedural Studies of the 1950 Censuses, No. 1, Infant Enumeration Study: 1950, table 1.

[6]U.S. Bureau of the Census, Sixteenth Census of the United States: 1940, Population, "Differential Fertility 1940 and 1910: Standardized Fertility Rates and Reproduction Rates," table A-1.

[7]U.S. Bureau of the Census, 1970 Census of Population and Housing: Evaluation and Research Program, PHC(E)-5, table G.

Table I-B. CENSUS POPULATION AND "PREFERRED" CORRECTED POPULATION, AND "PREFERRED" PERCENTS OF NET UNDERCOUNT FOR THREE BROAD AGE GROUPS, BY SEX AND RACE, FOR THE UNITED STATES: APRIL 1, 1970

(A minus sign denotes a net overcount)

Age	White		Black and other races	
	Male	Female	Male	Female
CENSUS POPULATION				
All ages	86,906,327	91,191,551	12,019,877	13,117,543
Under 35 years	51,200,969	50,516,940	8,114,754	8,492,767
35 to 64 years	28,090,121	30,017,894	3,153,458	3,676,144
65 years and over	7,615,237	10,656,717	751,665	948,632
CORRECTED POPULATION				
All ages	89,092,511	92,474,547	13,200,210	13,795,625
Under 35 years	52,462,247	51,320,317	8,832,609	8,944,552
35 to 64 years	28,921,768	30,254,252	3,636,056	3,863,052
65 years and over	7,708,496	10,899,978	731,545	988,021
PERCENT NET UNDERCOUNT[1]				
All ages	2.5	1.4	8.9	4.9
Under 35 years	2.4	1.6	8.1	5.1
35 to 64 years	2.9	0.8	13.3	4.8
65 years and over	1.2	2.2	-2.8	4.0

[1]Base of percent is corrected population.

Source: Based on figures from U.S. Bureau of the Census, Census of Population and Housing: 1970, Evaluation and Research Program PHC(E)-4, Estimates of Coverage of Population by Sex, Race, and Age: Demographic Analysis, 1974, tables 3 and 6.

Table I-C. ILLUSTRATIVE SET OF FACTORS USED TO ADJUST THE PRELIMINARY ESTIMATES OF THE CORRECTED POPULATION FOR STATES TO NATIONAL ESTIMATES OF THE CORRECTED POPULATION, BY BROAD AGE GROUPS, SEX, AND RACE: 1970

(Factors relate to estimate series SOR-3-1, WCF-1, BACF-1)

Age	White		Black and other races	
	Male	Female	Male	Female
Under 35 years	1.000692	1.002956	0.988395	0.993116
35 to 64 years	0.994358	1.003232	1.001267	1.001312
65 years and over	0.996318	0.997578	0.996281	0.997266

Source: See chapter VII for estimate series SOR-3-1, WCF-1, BACF-1, and table I-B for "control" estimates of corrected population for the United States as a whole.

Chapter II. Coverage of the White Population Under 35 Years of Age

TWO BASIC ALTERNATIVE COMPONENT MODELS

Consideration was given to two basic alternative "component" models for developing coverage estimates for the White population of States for age groups under 35 years of age for each sex in 1970. In each model separate account is taken of births and deaths in the last 35 years in order to derive expected populations of each sex in the age groups under age 35 in 1970 whch can be compared with the corresponding census counts. The first model employs the component method to estimate the corrected *resident* population of each State directly. The second model derives estimates of the corrected population *born* in each State and the corresponding coverage estimates as a preliminary step in the calculation of coverage estimates for the *resident* population of each State.

One-Stage Component Model

The first model involves direct allowances for the births to residents in a State, for the deaths of residents in the State between birth and 1970, and for net lifetime migration to the State between birth and 1970.[1] All calculations would be carried out for 5-year age cohorts, separately for males and females. The method corresponds to the simple application of the component estimating equation in which data on all the components refer to the resident population of the State, as shown symbolically in the following equation:

$$EP^{1970}_{jk} = B_{jk} - D_{jk} + I_{jk} - O_{jk} \qquad (2.1)$$

where the subscripts denote a State j and a 5-year age cohort k. In the equation, EP^{1970}_{jk}, the corrected population of cohort k resident in State j in 1970, is the result of combining four components. The first component is B_{jk}, the births occurring to residents of State j during the period when members of cohort k were born. The second is D_{jk}, the deaths occurring to members of cohort k residing in State j at the time they die; D_{jk} must be subtracted. The migrants into State j who belong to birth cohort k, I_{jk}, must be added; these migrants are counted at the time they enter State j. Then, the members of cohort k who migrate out of State j, O_{jk}, must be subtracted; these migrants are counted at the time they leave the State.

Certain substitutions can be made in this equation without affecting its theoretical correctness. Deaths estimated by applying State-of-residence life table survival rates to the births can be substituted for actual deaths, provided that certain offsetting allowances can be made in the estimate of net migration and an allowance is made for excess (i.e., war) mortality overseas. Specifically, life table survival rates may be applied to allow for deaths in the model if the statistics on net migration relate to the *survivors* of net migrants, i.e., net migrants who are still living in 1970, and if war deaths are subtracted—

$$EP^{1970}_{jk} = B_{jk}S_{jk} - D^{ow}_{jk} + I^{1}_{jk} - O^{1}_{jk} \qquad (2.2)$$

where

S_{jk} = proportion of births of cohort k surviving from birth to 1970 on the basis of life tables for State j.

D^{ow}_{jk} = overseas war deaths to cohort k born in State j.

I^{1}_{jk} = survivors in 1970 in cohort k of inmigrants to State j.

O^{1}_{jk} = survivors in 1970 in cohort k of outmigrants from *State j*.

The error of the deaths in this reformulation (erroneous exclusion of deaths of inmigrants after inmigration and erroneous inclusion of deaths of outmigrants after outmigration, except for war deaths) is offset jointly by the error in the component, surviving net inmigrants (erroneous exclusion of deaths of inmigrants and outmigrants), and by the number of war deaths.

For the purpose of estimating coverage with equation (2.2), we need data on lifetime interstate and international migration that are independent of the census. The only satisfactory source of data on lifetime interstate migration for States is the 1970 census, which provides data on *surviving* inmigrants and outmigrants for States. These data may be subject to serious coverage and reporting errors, and they can-

[1] Births classified by residence relate to the place of usual residence of the mother; births classified by occurrence relate to the place at which the birth occurred. Deaths classified by residence relate to the place of usual residence of the decedent.

not, therefore, be used to estimate the corrected population directly. Their use in the estimating model to derive the corrected resident population might be satisfactory if adequate allowances could be made for the undercoverage of migrants and misreporting of migration status, including adjustments for specific migration streams between States. Empirical evidence to make such allowances is not available.

Two-Stage Component Model

Coverage estimates for the population under age 35 for each sex in 1970 can also be developed by use of a two-stage component estimation procedure. In the first stage, coverage estimates are prepared for the 1970 census populations *born* in each State. Births for States for the period 1935–1970 classified by residence are brought forward to 1970 by life table survival rates and then further reduced by the number of native Americans who left the United States prior to the census date. In this way, estimates of the expected number of persons who should have been reported as born in each State in the 1970 census are obtained. Comparison of these figures with actual census counts then provides coverage estimates for the native population of each State in 1970.

In the second stage of the estimation procedure, the coverage rates for the population *born* in each State are transformed into estimates of coverage for the *resident* population of each State. The latter estimates are produced by applying different assumptions regarding the "residence" and "migration" correlates of underenumeration.

The two-stage model was adopted for use in this study. It appears to require additional assumptions beyond those required for the one-stage model, but it has the advantage of employing a measurement formula which is theoretically precise for estimating coverage of the bulk of the population in each State, namely, the population born in each State, and does not require any assumptions for this group except those relating to adjustment of the basic data (the allocation of nonresponses, selection and manipulation of the 1970 census sample data, etc.). Furthermore, the specific State-by-State observations on the degree of coverage for the State-of-birth populations provided by the two-stage model are then available to develop State-of-residence coverage estimates employing more restricted assumptions regarding variation in coverage relating to residence and migration. One disadvantage of the two-stage model is that it provides undercount rates directly only for the native population of each State and an assumption must be made regarding the relative coverage levels of the native and foreign-born populations.

The one-stage model has a simple design, but implementing it would have required the use of national adjustments for coverage errors for net migrants as well as the use of the other types of assumptions for adjusting net migration for undercoverage required in the two-stage model, without benefit of State-by-State indications of the level of coverage. Although the first method was not actually carried out and tested, we believe that the results would have been subject to greater error than those obtained with the second model. The following discussion provides details on the data, methods, and assumptions employed in the two-stage model.

ESTIMATING COVERAGE OF THE POPULATION BORN IN EACH STATE (SOB)

Coverage estimates for the population born in each State, under 35 years of age for each sex, were developed basically from estimates of the expected population born in each State derived by "surviving" births to 1970 and subtracting the overseas population, as shown in the following equation:

$$EP_{ik} = B_{ik} \cdot S_{ik} - OP_{ik} \qquad (2.3)$$

where

- i = State of birth (50 States and the District of Columbia)
- k = 5-year age cohort (ages 0–4, 5–9, . . ., 30–34)
- EP_{ik} = expected population at the census date born in State i
- B_{ik} = births in State i
- S_{ik} = proportion surviving from birth to current age for State of birth i (cumulative survival rate)
- OP_{ik} = overseas native population of State of birth i, or survivors at the census date of persons born in State i living overseas

The net undercount rate for the population born in each State can be computed from the equation

$$E_{ik} = \frac{EP_{ik} - CP_{ik}}{EP_{ik}} \times 100 \qquad (2.4)$$

where

EP_{ik} is defined in (2.3), and

- E_{ik} = percent net undercount for the population born in State i
- CP_{ik} = census population born in State i.

The coverage rate for the population born in a State is the complement of E_{ik}.

The birth statistics, represented by B_{ik}, are registered births for 1935–40, 1940–45, . . ., 1965–70 (covering births occurring from April 1 of the earlier year to March 31 of the later year), for each State, classified by residence of mother at time of birth and adjusted for underregistration. The years correspond to the quinquennial age groups 0–4, 5–9, . . ., 30–34 on April 1, 1970. The adjustment of the birth series for each State was derived from information provided by the birth registration tests of 1940, 1950, and 1964–1968 for births classified by race (White and Black-and-other-races) and place of occurrence (inside and outside hospitals), for States (1940 and 1950) or regions (1964–68). Estimates of the completeness of registration for the years between 1940, 1950, and 1964–1968 (centered on 1966) were derived by linear interpolation of the test results. Specifically, separate interpolations were made for births of Whites and of Blacks and other races tabulated by place of occurrence (inside and outside hospitals) for each State.

Estimates of the percent completeness of birth registration for States for the years subsequent to 1966 were derived by linear extrapolation of the test figures for 1950 and estimates for 1964–1968. Estimates of the completeness of registration for the years 1935 to 1939 were derived on the assumption that the percent completeness of birth registration for States, classified by race and place of occurrence, was the same as the 1940 test results.[2] (The estimates of the completeness of birth registration used in this study are shown in appendix A.)

The cumulative survival rates (S_{ik}) used to carry forward the number of births for each State to 1970 are based on the official decennial life tables for States for the periods 1929–31, 1939–41, 1949–51, 1959–61, and 1969–71. These tables relate to the resident population of each State and were used without adjustment for errors of coverage or age reporting in the death statistics or the population figures.[3]

Cumulative survival rates for each State were calculated as the product of 5-year survival rates, centered on the midpoints of the periods 1935–40, . . ., 1965–70, from life tables for the States. Survival rates cumulated in this manner are equivalent to rates computed from a series of generation life tables which portray the actual mortality experience of each birth cohort. The 5-year survival rates for the periods from 1935–40 to 1945–50 for the States were derived by linear interpolation of the survival rates from the State decennial life tables for 1929–31, 1939–41, and 1949–51. The survival rates for the periods 1950–55 to 1965–70 were obtained by linearly interpolating the survival rates from the State decennial life tables for 1949–51, 1959–61, and 1969–71 and then adjusting the interpolated values (specifically, the complement of 5-year survival rates) on the basis of annual changes in the corresponding rates from annual United States life tables. This adjustment serves to improve the interpolated results by allowing, to some extent, for the actual year-to-year changes in mortality within the decades. (See appendix E for a statement on the availability and sources of State life tables for the White population.)

The final component in equation (2.3), OP_{ik}, represents natives of the United States who were living abroad in 1970. This component includes persons born in the 50 States or the District of Columbia who, at the time of the census, were either assigned to military units stationed overseas or were living outside the country in a civilian capacity (i.e., persons resident in outlying areas, including Puerto Rico; dependents of military personnel; civilian employees of the United States Government and their dependents; crews of merchant vessels; other civilians living abroad). The figures for the civilian population abroad employed in this analysis are based on the 1970 census; statistics on the Armed Forces overseas were also taken from the census but figures for the bulk of the Armed Forces were provided originally by the Department of Defense. According to these sources, 1,429,000 native Americans under age 35, representing 1.2 percent of the total native population under age 35, were reported living abroad in 1970. Of this total, 67 percent were in the Armed Forces and 89 percent were native White.

Information on the State of birth of the native population living abroad was not available from the census. To secure the required figures, the native population living abroad in each age-sex-race group was distributed by State of birth by a two-step procedure. First, the native population living abroad was distributed by State of residence according to the home State of the population in the United States as reported in the 1970 census.[4] Second, the resulting figures were distributed by State of birth pro rata on the basis of the State-of-birth distribution reported for the population resident in each State in the census. This procedure implicitly assumes (1) that the number of native Americans living abroad who were not counted in the 1970 census is negligible, (2) that the State-of-birth distribution of the resident population of each State was the same for those living in the State and for those who had gone abroad from the

[2] For a discussion of the adequacy of the tests of birth registration and the sensitivity of the estimates of corrected births to the assumptions used to interpolate the tests results, for the United States as a whole, see U.S. Bureau of the Census, 1970 Census of Population and Housing, Evaluation and Research Program, **Estimates of Coverage by Sex, Race, and Age: Demographic Analysis,** PHC(E)–4, pp. 10–13.

[3] For a discussion of the accuracy of the U.S. death statistics, see U.S. Bureau of the Census, ibid, p. 14.

[4] U.S. Bureau of the Census, U.S. Census of Population: 1970, Final Report PC(1)–A1, U.S. Summary, **Number of Inhabitants,** 1971, p. vii.

State, and (3) that each State's share of the overseas population, by age, sex, and race, was the same as the State's proportion of the United States resident population. The first assumption almost certainly involves some error because the census enumeraton of the overseas population was somewhat limited in scope and, as a result, there was at least some undercounting of the native population. Any weaknesses inherent in the second and third assumptions would have a negligible effect on the coverage estimates of the female population under 35 and the male population under age 15, since relatively few persons in these groups are represented in the overseas population born in any State.

Problems of Estimating State-of-Birth Populations

Estimates of the expected population under 35 years of age in 1970 born in each of the 50 States and the District of Columbia, classified by age, sex, and race, could be derived in principle, by evaluation of equation (2.3). However, limitations of the different statistical series used to prepare the estimates and lack of some of the required data raised a number of methodological issues which necessitated elaboration of the estimation procedure. One issue relates to the quality of the data on births. Although the results of the birth registration tests proved to be adequate for estimating census coverage at the national level, the test results for some States could be subject to substantial error. For example, it appears that the estimated underregistration in 1940 is too low for Mississippi and too high for Arkansas. (See appendix A.) Other limitations of the data requiring special consideration include:

1. the lack of State-of-birth life tables, and the consequent use of State-of-residence life tables, to allow for the mortality of the population born in each State,
2. the need to depend on sample statistics on State of birth and, in particular, on a combination of the 5- and 15-percent sample tabulations from the census,
3. the absence of a response on State of birth for a large proportion of persons in the census and the need to assign a State of birth for them,
4. the frequent misreporting of State of birth resulting, to a large extent, from the tendency of respondents to report the State in which a birth occurred rather than the State in which the mother resided at the time of the birth.

The following discussion provides further information on each problem.

Measurement of mortality. The cumulative survival rates used to estimate the expected number of persons born in each State who survive to ages under 35 in 1970 were based on life tables constructed from death rates for the *resident* populations of States. The estimation procedure, however, calls for the use of survival rates derived from life tables representing the mortality experience of the population *born* in each State. At present, State-of-birth life tables do not exist, although life tables of this type could presumably be constructed either from estimates of death rates for the 51 State-of-birth populations or from death rates based on actual tabulations of deaths and population according to State of birth. If significant differences exist in the levels of mortality among States, or between migrants and nonmigrants, for a given State, then the use of conventional life tables, i.e., State-of-residence tables, for deriving estimates of the expected population born in each State, as was done in this study, produced biases in the estimated coverage rates.

The sensitivity of the coverage estimates to possible differences in mortality between State-of-residence and State-of-birth populations was investigated illustratively by developing some approximate State-of-birth survival rates, representing extreme or limiting conditions, by a "synthetic" method. This method involved weighting a set of 51 State-of-residence survival rates by the distribution of the population born in a given State according to the current State of residence of the population. Cumulative survival rates to ages under 35 in 1970 were then constructed from these synthetic estimates and compared with cumulative survival rates derived from State-of-residence life tables. Our hypothetical illustration employed data for the two States with the greatest difference in mortality (New Mexico and Hawaii). The results indicate that the differences between State-of-birth cumulative survival rates and the corresponding State-of-residence cumulative survival rates are quite small, even in an extreme case of a large difference in mortality levels and of heavy migration. These differences are discussed in greater detail, together with a fuller explanation of the method of constructing synthetic State-of-birth life tables, in appendix B.

Use of sample data on State of birth. A second problem affecting the data used to estimate State-of-birth coverage rates concerned an adjustment of the sample statistics on State of birth in the 1970 census. The 1970 census figures for the population born in each State, employed in the estimating equation, were not actual census counts, but rather modified census figures derived by combining different sample and complete-count tabulations. The State-of-birth statistics used in this study were based jointly on the 5-

and 15-percent samples from the 1970 census.[5] The 15-percent sample provided information on the distribution of the resident population of each State and the District of Columbia for age, sex, and race groups, cross-classified by (1) current State of residence for nonmigrants (persons living in the same State in which they were born), (2) region of birth for lifetime migrants (persons living in a State different from their State of birth), and (3) place of birth overseas (Puerto Rico, other outlying areas, born abroad or at sea of American parents, and foreign born). The 5-percent sample provided information on the distribution of the resident population of the 51 State areas by nativity (born in United States, native born abroad, and foreign born) and State of birth, for age, sex, and race groups. Both samples provided information on the number of native residents of each State who did not report their State of birth.

Combining these sample data involved three steps: (1) the adoption of the 15-percent sample figures for nonmigrants resident in each State, (2) the pro rata adjustment of the data from the 5-percent sample for the population resident in each State, distributed by the State of birth of lifetime migrants, to the figures from the 15-percent sample for the population resident in each State distributed by region of birth of lifetime migrants, and (3) the adjustment of the figures for the native population derived in step (2) and the figures for the foreign-born population of States from the 15-percent sample to the total resident population of the States from the complete count. The 15-percent sample was used as a control for the 5-percent sample because estimates derived from the larger sample are generally characterized by lower levels of sampling variability. There is some evidence, however, to indicate that the proportion native is inflated in the 15-percent sample; but the extent of the bias cannot be specified. Adjustment of the State-of-birth statistics in the manner described tends to reduce the errors attributable to sampling variation; these are believed to be negligible in any case.[6]

Adjustment for nonresponses. A third problem affecting coverage estimates for State-of-birth populations under age 35 in 1970 arises from the fact that a substantial proportion of persons in the 1970 census did not report a State of birth. Overall, 3,957,000, or 3.9 percent, of the resident White population under age 35 failed to report a State of birth in 1970. These "nonreports" had to be allocated to the various States and this allocation could be carried out according to a variety of assumptions. One possibility is to distribute the number of persons of unknown State of birth in a given age-sex-race group, classified by State of residence, pro rata on the basis of the reported State-of-birth distribution for each State. There is some evidence to suggest, however, that the actual State-of-birth distributions of population groups not reporting a State of birth differ from those of groups that did report their State of birth. For example, there is a positive relation between the proportion of persons not reporting State-of-birth and the proportions of inmigrants, for the States. Hence, the rate of nonresponse to the State-of-birth question could be generally greater among migrants than among nonmigrants and a disproportionately greater share of the category "State-of-birth-unknown" should probably be allocated to the migrant population in each State. (See Appendix C, "Specification of the Allocation Parameter for State-of-Birth Nonresponses.")

To investigate the potential effect on coverage rates of alternative schemes for allocating nonresponses, residents of each State who did not report a State of birth were allocated to States of birth by the following three-step procedure. First, a parameter A was defined to represent the relative difference between the nonresponse rate for migrants and nonmigrants. A parameter value of 2, for example, means that migrants failed to respond to the State-of-birth question at a rate two times that for nonmigrants. Second, the nonresponse rate (U_j) for each State of residence was disaggregated into the component rates for migrants (${}_mu_j$) and nonmigrants (${}_nu_j$), on the basis of the relative distribution of the migrant and nonmigrant populations in each State and the differential nonresponse factor A. This step can be represented mathematically by the equations

$$U_j = {}_nu_j \cdot w_{jj} + {}_mu_j(1-w_{jj}) \tag{2.5}$$

and

$${}_nu_j = \frac{U_j}{w_{jj} + A(1-w_{jj})} \tag{2.6}$$

where it is assumed that ${}_mu_j = A \cdot {}_nu_j$ and

w_{jj} = proportion of the total population living in State j that was born in State j.

Finally, persons not reporting a State of birth were allocated to the States by applying the nonresponse rate ${}_nu_j$ (from equations 2.5 and 2.6) to the nonmigrant population in each State and the nonresponse rate ${}_mu_j$ to the migrant population. The two allocation calculations are

$${}_nUNK_{jj} = CP_{jj} \cdot {}_nu_j \tag{2.7}$$

[5] U.S. Bureau of the Census, U.S. Census of Population: 1970, Subject Report PC(2)–2A: **State of Birth**, 1973, tables 30 to 33; U.S. Bureau of the Census, U.S. Census of Population: 1970, **Detailed Characteristics**, Final Report, PC(1)–D, 1973, table 140; and unpublished tabulations.

[6] U.S. Bureau of the Census, U.S. Census of Population: 1970, Subject Report PC(2)–2A; **State of Birth**, 1973, appendix D.

and $$_{m}UNK_{ij} = CP_{ij} \cdot {}_{m}u_{j} \quad (i \neq j) \qquad (2.8)$$

where

UNK_{ij} = number of State-of-birth nonresponses of persons living in State j allocated to State of birth i,

CP_{ij} = enumerated total population living in State j and born in State i.

The total number of "unknowns" allocated to each State was obtained by summing the UNK_{ij} values generated by equations (2.7) and (2.8).

The importance of the manner in which "State-of-birth unknown" is allocated can be established by testing the sensitivity of the estimated State-of-birth coverage rates for the age range under 35 in 1970 to alternative allocation schemes. If parameter A is set at 1, for example, then we have the equivalent of simple proration of "unknowns" according to the distribution of "knowns". Since, as suggested, A may actually exceed 1, values larger than 1 should be selected for alternative allocation schemes. There is no evidence to suggest a particular value of A, but a value of 5 may be viewed as a reasonable limiting case. Values of A=1 and A=5 were employed, therefore, to illustrate the sensitivity of the coverage estimates to a wide range of allocation assumptions.

The average absolute difference between the two series of net undercount rates for the States is an indicator of differences in the *level* of the two series. For the White population under age 35 in 1970, the average absolute difference over the States between State-of-birth coverage estimates for A=1 (simple proration) and coverage estimates for A=5 was approximately 0.4 percentage point (table II-B).[7] This figure indicates that the coverage estimates for this group are relatively insensitive to a wide range of assumptions concerning the differential rate of nonresponse to the census item on State of birth among migrants and nonmigrants. Given the range of variation in estimated census coverage errors from State to State, as reflected in these State series, the expected error rates under the assumptions A=1 and A=5 are not markedly different. (There are outstanding exceptions among the States, however, including California, West Virginia, and Alaska.) A similar statement can be made about the pattern of the two distributions of net undercount rates for States. The correlation coefficient between the distributions for A=1 and A=5 is 0.94[8] (table II-B). This figure indicates a very high degree of covariation. In sum, although evidence exists to suggest that simple proration may not be the optimal scheme for allocating unknown State of birth, reasonable variation from this scheme does not appear to affect the corresponding coverage estimates appreciably.

Misreporting of State of birth. The high proportion of nonresponses is only one of several problems affecting the accuracy of the State-of-birth statistics in the 1970 census. Other problems relate to errors in the reports of State of birth. Census data on State of birth for the White population are subject to two principal types of response error: (1) the tendency to report the State of occurrence of the birth, even when this State differs from the State of residence of the mother at the time of birth, and (2) the tendency, particularly on the part of foreign-born persons, to report the State of current residence rather than the State or country of birth. The identification of, and adjustment for, these types of response errors are important since the birth statistics used in the derivation of the expected population, and the census statistics, must be classified in a similar manner to maintain strict statistical comparability and avoid bias in the estimated net coverage rates.

It is difficult to specify the causes of the misreporting of census information but, in the case of the State-of-birth question in 1970, at least some of the error may be attributed to the particular form of the census question. The basic question, "Where was this person born?", does not call attention to the significant distinction regarding residence which is required and which is made only in the supplementary instructions following the question. It is entirely possible that many respondents perceived the supplementary instructions as providing information on how to answer the question in special cases and, deciding that their circumstances were not unusual, simply ignored these vital directions. Another possible problem with the question is that it is self-coding, that is, one could answer the question by simply reporting "yes" to the category, current State of residence, rather than naming a State.

Procedures to adjust the State-of-birth series reported by the census for each type of response error are not easily developed. Response errors, by their very nature, are statistically elusive. Determining precise corrections in the place-of-birth data for the tendency to misreport nativity or State of birth is virtually impossible unless the census responses can be subjected to some form of intensive verification scheme, such as matching with administrative records (e.g., birth certificates). Even then, the well known problems in matching records from different data collection systems may make it difficult to draw useful conclusions.

[7] This figure is an unweighted average, excluding the District of Columbia, Maryland, and Virginia. The corresponding weighted average absolute difference is the same, 0.4 percentage point; the weights in this case are census State-of-birth populations.

[8] This is an unweighted product-moment correlation coefficient, excluding the District of Columbia, Maryland, and Virginia. The corresponding weighted coefficient is 0.96; the weights are census State-of-birth populations.

The identification of persons who misreported migration status and nativity in 1970 is complicated by the scheme used for allocating nativity when it was not reported. According to this scheme, persons who failed to report a place of birth were assumed to be native, unless related information on the schedule clearly implied that the person was foreign born. Since the State-of-birth question was used to establish nativity, nonresponses to this question include both native and foreign-born persons. Hence, the census counts of the native populations are biased upward by an amount equal to the number of nonresponses on the part of foreign-born persons that were misclassified by the Census Bureau as native. This form of misallocation confounds any attempt to estimate the true extent of misreporting among foreign-born residents. Any bias in the coverage estimates attributable to this type of reporting error is probably greatest for States with relatively large foreign-born populations (e.g., New York, New Jersey, Florida, California).

There is some evidence of a tendency for persons, particularly foreign-born persons, to report a current State of residence rather than State or country of birth in response to the place-of-birth question in the census. Test calculations on the consistency of reporting State of birth in the last several censuses suggest small overstatements of the Northeastern States as States of birth and understatements of the North Central States as States of birth. These discrepancies were generally considered not much larger than the probable error in the estimation procedure and hence no adjustments were made for this type of error. (See chapter III for a detailed explanation of this test, as applied to the Black population.)

Comparison of Estimates Based on Residence Births (SOB-1) and Occurrence Births (SOB-2)

The suspected tendency of the native population to report State of occurrence of birth, whether or not this State was also the State of residence of the mother at the time of birth, can be investigated somewhat more rigorously than the tendency of the foreign-born population to misreport nativity. Both tendencies were first given serious consideration in the early stages of this research, when preliminary estimates of coverage error for particular age-sex groups under age 35 for the population born in several States reflected substantial "net overcounts." Such overcounts are clearly implausible. For illustrative purposes, let us consider the special case of the District of Columbia.

The preliminary estimates of net census error for the White population of the District of Columbia for various age groups under age 35 in 1970, based on tabulations of births according to place of residence, reflected net overcounts of the order of 50 percent. Such estimates are clearly incredible. One probable explanation for these results is suggested by the following pattern of reporting. Many persons born in a District of Columbia hospital to a mother living in Maryland at the time of the birth may have incorrectly reported the District of Columbia as the State of birth, rather than Maryland, in the census. Many babies are born in hospitals in central cities of metropolitan areas to mothers whose residence is located in the suburban area. The tendency to report the location of the hospital as the place of birth is particularly noticeable for Washington, D.C., where the central city is considered a State in the tabulations of births and census data. The plausibility of this explanation is further supported by the presence of large net undercounts for Maryland for the same age-sex groups for which large net overcounts were observed in the District of Columbia. A comparison of preliminary estimates of net census errors for Virginia with those for the District of Columbia suggests the possibility that Virginia may also have been involved in such misreporting, but the evidence is somewhat less conclusive.

Large apparent overcounts were found in other instances, but the case of the District of Columbia proved to be the most striking. The choice of this illustration is not meant to suggest, however, that the other cases are unimportant. Obtaining an apparent overcount for any large population group, given the nature of census enumeration, is cause for some concern about the procedure for estimating coverage. We may reasonably wonder then about the extent to which the other net overcounts also represent evidence that the census State-of-birth data reflected the State of occurrence of the birth rather than the State of the mother's residence.

Investigation of effect of occurrence bias. The procedure used to investigate the apparent occurrence bias in the census statistics for the States and the District of Columbia involved the comparison of two sets of net undercount rates for the White population under age 35 in 1970 derived from two different sets of birth statistics. The first set of estimates was based on birth statistics tabulated by place of residence (SOB-1) and the second was based on birth statistics tabulated by place of occurrence (SOB-2). The estimated undercount rates obtained by each method are shown in table II-A. Since the effect of the occurrence bias is not appreciably altered by the allocation scheme for unknown State of birth, attention should be focused primarily on the first and third columns of this table, in which simple proration ($A = 1$) was used.

The comparison of the two sets of State-of-birth coverage estimates produced by the use of the differ-

ent birth series is facilitated by the calculation of summary measures. The average absolute difference between the estimated net undercount rates based on "residence" births and the estimated net undercount rates based on "occurrence" births is approximately 1.0 percentage point (table II-B).[9] This figure clearly indicates an appreciable difference between the levels of the two distributions, viewed in the light of the range of the distributions. There are several States where the rates were grossly at variance with one another. These include Rhode Island, New Jersey, Kansas, Maryland, and Virginia. The two series are also appreciably different with respect to pattern, as indicated by a correlation coefficient of 0.66.[10] This figure corresponds to only a moderate association between the series. It is evident that the selection of the birth series, unlike the method for allocating unknown State of birth, exerts a strong influence on both the level and pattern of the estimated coverage series for States.

The decision to recalculate the expected State-of-birth populations with birth statistics tabulated by place of occurrence was based on rather straightforward logic. The intent of the census question on State of birth is to secure information on State of birth according to the place of residence of the mother at the time of the birth. When the expected population is prepared on the basis of residence birth statistics, one implicitly assumes that respondents have consistently followed the residence concept in reporting State of birth in the census. When the expected population is prepared on the basis of occurrence statistics, however, one implictly assumes that respondents have consistently followed the occurrence concept in reporting State of birth in the census. The two series of coverage estimates may be viewed as representing sets of limiting values, therefore, so far as the effect of residence allocation is concerned.

The States of birth according to both the residence and occurrence concepts coincide for most respondents but, to the extent that they do not and to the extent that the State of birth is misreported, the expected State-of-birth populations will be subject to systematic errors. Furthermore, it is almost certain that the size of any systematic errors varies among States. The use of occurrence birth statistics to derive the expected population born in the District of Columbia, for example, significantly affects the coverage estimate, converting it from a tremendous net overcount to a tremendous net undercount (table II-A). Neither the estimated net overcount nor the estimated net undercount are very plausible, but we may confidently infer that the two coverage estimates are affected by opposite biases and that the actual value falls well between the two estimates. A similar line of reasoning can be applied to the estimate secured for the 50 States although, in all cases, the difference in the coverage estimates resulting from the use of different birth series is considerably smaller.

One must now consider what combination of occurrence and residence birth statistics is appropriate for each State. Unfortunately, there is insufficient evidence upon which to base a conclusive answer to this question. Even the question of which series of coverage estimates is to be given preference or greater weight cannot be answered. Under the circumstances, if one is reasonably confident that some level of occurrence bias exists in the estimates for every State, then the most defensible course and the one that would tend to minimize the bias would be to take a simple average of the residence birth series and the occurrence birth series. This course was in fact followed. The series of birth statistics computed in this manner are designated here the composite birth series.

Final State-of-birth coverage estimates (SOB-3). As noted, the estimation of the completeness of coverage of the White State-of-birth populations under age 35 in 1970 involved a direct comparison of the population born in each State according to census statistics with the expected population born in each State as estimated from birth statistics. Final figures for the census population born in each of the 51 State areas were obtained by adjusting the sample statistics on the population born in each State so that the combined figures for the native resident population distributed by State of birth (adjusted for nonresponse) and the foreign-born populaton of each State would sum to the total resident population in each age-sex group in each State from the complete count. The adjustments required in this step were relatively minor; most corrections did not exceed 0.5 percent. Final figures for the expected population born in each of the 51 State areas were developed from equation (2.3), which employed cumulative survival rates from State-of-residence life tables and the composite series of birth statistics.

The coverage estimates based on the composite series of births are designated here the composite State-of-birth series and symbolized by SOB-3. They are shown in the fifth (SOB-3-1) and sixth (SOB-3-2) columns of table II-A. The distribution of coverage estimates based on the composite birth statistics is essentially similar to the distribution based on residence birth statistics. Excluding the District of Columbia, Maryland, and Virginia, the average absolute difference between the two distributions is 0.5 percentage point, a small difference, and the correlation co-

[9] This figure is an unweighted average, excluding the District of Columbia, Maryland, and Virginia. The corresponding weighted average absolute difference is 0.8 percentage point; the weights in this case are the census State-of-birth populations.

[10] The corresponding weighted correlation coefficient is 0.68.

efficient for the two distributions is 0.91, reflecting a considerable degree of agreement in the pattern of the two distributions (table II-B).[11]

ESTIMATING COVERAGE FOR THE POPULATION RESIDENT IN EACH STATE (SOR)

Estimates of the completeness of coverage of the population born in each State provide an interesting dimension on the coverage problem, but our principal interest in these estimates is as a point of departure for the derivation of coverage estimates for the population resident in each State. We turn next, then, to a consideration of the issues and procedures for converting State-of-birth coverage estimates to State-of-residence coverage estimates.

Issues in Converting to Coverage Rates for the Resident Population

Several alternative approaches for converting coverage estimates from a State-of-birth basis to a State-of-residence basis may be employed. The particular procedure selected depends upon the manner in which two important questions are answered. These relate to the influence of residence and migration on the risk of being omitted from the census.

Relative influence of State of birth and State of residence on coverage. The first question is whether coverage errors are a function of the State of birth, a function of the State of residence, or a function of some combination of the two. If one takes the view, for example, that the conditions of childhood and youth are the primary influences on the ability and motivation of a person to respond to the census questionnaire, then the risk of being omitted from the census is "determined" by the State of birth. If, conversely, one takes the view that this ability and motivation are primarily influenced by conditions present in the current State of residence, such as location of residence (rural, inner city residence, etc.), type of housing, and conditions of census enumeration, then the risk of being omitted from the census is determined by the State of residence. If, finally, factors related to both State of residence and the State of birth are considered important, then census errors are determined jointly by State of birth and State of residence.

Relative coverage of migrants and nonmigrants. The second question determining the procedure for converting coverage estimates to a State-of-residence basis concerns the possibility of a difference in the risk of omission from the census of migrants and nonmigrants. Specifically, one must consider whether, and to what extent, coverage rates for lifetime interstate migrants differ from those of nonmigrants. Empirical evidence on this question is not available, so that we can only speculate on the answer. It may be, for example, that it is more difficult to locate individuals who have moved and to assign a usual residence to them so that, in effect, residential mobility "produces" poorer coverage among migrants. How large could such a difference in the coverage of migrants and nonmigrants reasonably be? Conversely, since higher levels of education, employment, and occupation are generally associated with greater residential mobility, and socioeconomic status is positively associated with coverage in the census, one could even maintain that migrant status is conducive to being counted in the census; this is viewed as a less plausible hypothesis.

Since there is no concrete evidence upon the issue, several estimation models were designed which contain a parameter reflecting the assumed relative coverage of migrants and nonmigrants. Comparison of estimates based on different parameters permits an assessment of the sensitivity of the coverage estimates to variations in the differential risk of omission of migrants and nonmigrants. It will be shown that, over a plausible range of variation, the sensitivity is not great.

Alternative Models for State of-Residence Coverage Estimates with Limiting Assumptions

Since a unique methodology does not exist for converting State-of-birth coverage estimates to a State-of-residence basis, two basic models for estimating coverage were constructed, each employing limiting assumptions with respect to the "residence" factors influencing completeness of coverage of the resident population. These limiting assumptions are (1) that residence coverage is exclusively a function of the State in which a person is born and (2) that residence coverage is exclusively a function of the State in which a person currently resides. Each of these sets of estimates was further varied by employing limiting assumptions with respect to the relative rates of coverage of lifetime interstate migrants and nonmigrants. Coverage estimates which assume that coverage is jointly dependent upon State-of-birth factors and State-of-residence factors will, of course, fall between the coverage estimates produced by the limiting assumptions on these factors, given the same limiting assumptions regarding the relative coverage rates of migrants and nonmigrants.

[11] The corresponding weighted values are 0.4 percentage point and 0.96. These measures are again weighted on the basis of the census State-of-birth populations.

Coverage dependent upon State of birth (SOR-1). The basic assumption of the first model that census coverage errors are entirely a function of factors related to the State of birth implies that the population born in a given State is subject to the same risk of omission from the 1970 census regardless of the States in which members of this group were residing at the time of the census. The basic estimating equation for each State of residence is a linear equation incorporating the 51 known State-of-birth omission rates. The census omission rate for the native population resident in each State (R_j) equals the weighted average of the 51 State-of-birth omission rates (D_i), where the weights are the proportions of the native population resident in a given State that were born in each State (w_{ij}). The mathematical model is given by the expression

$$R_j = \sum_{i=1}^{51} w_{ij} D_i \qquad (2.9)$$

where

R_j = omission rate of native population resident in State j,
D_i = omission rate of native population born in State i, and
w_{ij} = proportion of native population living in State j that was born in State i.

This model implicitly assumes no difference in the risk of omission from the census among lifetime migrants and nonmigrants. Theoretically, the population weights (w_{ij}) should be based on "true" or corrected figures rather than the census figures; however, the error introduced by using the census counts to derive coverage estimates of the native resident population is negligible when the weighting factors are modified by rates whch are low (e.g., less than 10 percent).

The model incorporating a parameter for the difference in the risk of omission of lifetime migrants and nonmigrants is a variant of equation (2.9). The estimation procedure is based on a simple disaggregation of the omission rate D_i into omission rates for nonmigrants (${}_nd_i$) and migrants (${}_md_i$)—

$$D_i = {}_nd_i \cdot \omega_{ii} + {}_md_i \cdot (1-\omega_{ii}) \qquad (2.10)$$

where

${}_nd_i$ = omission rate of the native population born in State i and living in the State at the time of the census (nonmigrants),
${}_md_i$ = omission rate of the native population born in State i and living in State j, $i \neq j$ (migrants), and
ω_{ii} = proportion of the population born in State i that was living in that State at the time of the census.

If one is willing to assume that the two component omission rates are related by a differential coverage parameter B, such that ${}_md_i = B \cdot {}_nd_i$, then equation (2.10) can be rewritten in the form

$$D_i = {}_nd_i \cdot \omega_{ii} + B \cdot {}_nd_i \cdot (1-\omega_{ii}) \qquad (2.11)$$

Solving this equation for ${}_nd_i$, the omission rate for nonmigrants, yields the expression

$${}_nd_i = \frac{D_i}{\omega_{ii} + B(1-\omega_{ii})} \qquad (2.12)$$

Since D_i is known and a value for B can be assumed, equation (2.12) can be solved for each State. Clearly the value of ${}_nd_i$ depends upon the value of D_i and the differential coverage factor B. If B is set equal to 2, for example, then one would be assuming that migrants were omitted from the census count at a rate two times the rate for nonmigrants.

When explicit allowance is made for the parameter B, it is necessary to modify slightly the basic estimating equation (2.9). The modified version is given by the expression

$$R_j = w_{jj} \cdot {}_nd_j + \sum_{i=1}^{51} w_{ij} \cdot {}_md_i \quad (i \neq j) \qquad (2.13)$$

where w_{ij} is defined as the proportion of the population living in State j at the time of the census that was born in State i.

This equation follows directly from equations (2.9) and (2.10), and it can be viewed as the general form of the model incorporating the differential coverage factor. When the parameter B equals one (i.e., when no difference in the rate of omission of migrants and nonmigrants is assumed), then equation (2.13), as one might suspect, reduces to equation (2.9).

In the actual computational procedure both equations (2.9) and (2.13) were applied to the total population under age 35 for males and females.[12] These calculations produced coverage estimates for the native resident male and female populations under 35 years of age, for each of the 51 State areas in 1970, on the assumption that coverage is entirely a function of factors related to State of birth. These coverage estimates are designated SOR–1 in the notation used to differentiate the various sets of coverage estimates.

Coverage dependent upon State of residence (SOR-2). The second model considered incorporated the other limiting assumption concerning the factors affecting census coverage, i.e., the assumption that completeness of census coverage is "determined" by factors

[12] Computation for age groups under 35 would have produced consistent results.

associated with the current State of residence. Accordingly, the population born in a given State would be subject to rates of coverage which vary according to the current States of residence of the group.

The principle of the basic estimating equation is effectively the same as in the previous model (equation 2.9). The omission rate of the population born in each State (D_i) represents the weighted average of unknown State-of-residence omission rates for the States (R_j). In this case, the weights are the proportions of the population born in a State that are currently residing in each State (ω_{ji}). The mathematical model is given by the expression

$$D_i = \sum_{j=1}^{51} \omega_{ji} R_j \qquad (2.14)$$

where

D_i = omission rate of native population born in State i,
R_j = omission rate of native population residing in State j, and
ω_{ji} = proportion of native population born in State i that is living in State j.

The fundamental similarity of this equation and equation (2.9) may be noted.

The State-of-birth omission rates (D_i) and the weights (ω_{ji}) in equation (2.12) are known and the equation must be solved for the State-of-residence omission rates (R_j). Since 51 State areas are involved in the computational procedure, equation (2.14) represents a system of 51 linear simultaneous equations with 51 unknown elements. To find values of the unknown omission rates (R_j), we proceed to solve the system of equations by techniques of matrix inversion. The inversion procedure can be summarized mathematically in the form

$$R_j = \sum_{i=1}^{51} [\omega_{ji}]^{-1} \cdot D_i \qquad (2.15)$$

where the definitions follow from equation (2.14) and the square brackets are used to denote a typical element of a matrix.

Equation (2.15) is the estimation model for the case involving no difference in the rate of omission from the census of lifetime migrants and nonmigrants. The model incorporating a differential coverage parameter (B) can be derived by disaggregating the State-of-residence mission rate (R_j) into two component rates representing the different omission rates for migrants (${}_m r_j$) and nonmigrants (${}_n r_j$). If it is assumed that the two component omission rates are related by the parameter B, such that ${}_m r_j = B \cdot {}_n r_j$, then equation (2.14) can be rewritten in the form

$$D_i = \omega_{ii} \cdot {}_n r_i + B \left(\sum_{j=1}^{51} \omega_{ji} \cdot {}_n r_j \right) \quad (j \neq i) \qquad (2.16)$$

or

$$D_i = \sum_{j=1}^{51} \beta_{ji} \omega_{ji} \cdot {}_n r_j \qquad (2.17)$$

where

β_{ji} = 1 if $i = j$
B if $i \neq j$
D_i = omission rate of native population born in State i,
${}_n r_i$ = omission rate of native population living in State i born in that State (nonmigrants),
${}_m r_j$ = omission rate of native population living in State j born in State i, $j \neq i$ (migrants)
ω_{ii} = proportion of native population born in State i that is living in that State, and
ω_{ji} = proportion of native population born in State i that is living in State j ($j \neq i$).

Since there are 51 State areas involved in the computational procedure, equation (2.17) actually represents 51 linear simultaneous equations, each with 51 unknown elements (${}_n r_j$). The matrix solution to this system of equations is given by the expression

$${}_n r_i = \sum_{i=1}^{51} [\beta_{ji} \omega_{ji}]^{-1} \cdot D_i \qquad (2.18)$$

When the nonmigrant omission rates (${}_n r_j$) are known, the migrant rates can be estimated from the definitional form

$${}_m r_i = B \cdot {}_n r_i \qquad (2.19)$$

Values for the overall omission rates (R_j) of the native resident populaton of States can then be obtained by weighting the migrant and nonmigrant omission rates by the appropriate proportions of the resident populaton (w_{ij})—

$$R_j = w_{jj} \cdot {}_n r_j + (1 - w_{jj}) \cdot {}_m r_j \qquad (2.20)$$

or

$$R_j = w_{jj} \cdot {}_n r_j + B(1 - w_{jj}) \cdot {}_n r_i$$

where

R_j = omission rate of native population living in State j,
${}_n r_j$ = omission rate of native population living in State j born in that State (nonmigrants),
${}_m r_j$ = omission rate of native population living in State j born in State i (migrants), and
w_{jj} = proportion of native population living in State j that was born in that State.

Values of R_j were computed for the age range under 35 as a whole, rather than for specific age groups in

this range.[13] The series of coverage estimates for States derived by this procedure are designated as SOR-2.

Presentation and comparison of results. The two models incorporating the assumptions that coverage is entirely a function of factors related to either State of birth (SOR-1) or State of residence (SOR-2) were used to develop various sets of estimates of net undercount rates for the White male and White female populations under age 35 as a whole in 1970. The State-of-birth coverage estimates on which the State-of-residence coverage estimates were based are the composite estimates previously identified as SOB-3-1 and SOB-3-2 (table II-A, cols. 5 and 6).

The estimates of corrected population for the States derived by use of the formulas, and census data on the native resident population of States, for native resident White males and females under age 35, were adjusted pro rata to the preferred estimates of the corrected total resident White male and White female populations of the United States under 35 years of age shown in table I-B, and then the net undercount rates were recomputed in relation to the census figures for the total resident population of the States. Although the estimated net undercount rates as computed by the formulas refer to the *native* resident population of the States, this calculation assumes that they applied also to the *total* resident population of the States, that is, that the net undercount rates of the native population and the foreign-born population were the same for each State. This assumption would not affect the results perceptibly unless the State had a very large proportion of foreign-born persons and coverage rates for the two nativity groups were very different.

As was noted earlier, the State-of-birth coverage estimates based on occurrence births and the State-of-birth coverage estimates based on residence births for the District of Columbia, Maryland, and Virginia were so divergent that no confidence could be placed in them, especially the figures for the District of Columbia. Even the procedure of averaging the residence births and occurrence births did not produce estimates of the corrected White population under age 35 in 1970 which were comparable to the 1970 census counts for these States. The biases in the estimates for the District of Columbia clearly were associated with opposing biases in the estimates for Maryland and Virginia.

Accordingly, the State-of-residence coverage estimates initially derived for the District of Columbia, Maryland, and Virginia were replaced by new estimates designed to reduce the biases. A procedure was devised to redistribute the amount of undercount implied by the initial estimates among the three areas, separately for each sex. First, the corrected population for the three State areas combined was accepted without modification. Then, the District of Columbia was assigned a new undercount rate representing an average of (1) the overall undercount rate for several adjacent Atlantic seaboard States and (2) an estimate based on the relation between (a) the demographic estimates initially derived for these neighboring States and (b) the national demographic rates modified by State variations in median family income.[14] The excess of the original corrected population for the District of Columbia over the new corrected population was then assigned to Maryland and Virginia. Three-quarters of the excess was arbitrarily added to the original corrected population for Maryland and the remaining one-quarter of the excess was added to the original corrected population for Virginia. These new corrected population estimates were then used to calculate the adjusted net undercount rates for each sex. The net undercount rates for the resident White population under age 35 for the District of Columbia, Maryland, and Virginia which appear in this chapter and all subsequent chapters are these adjusted net undercount rates.

The adjusted coverage estimates for the resident population (SOR) of regions, divisions, and States are shown in table II-C. The first four columns of the table contain the estimates based on the two limiting assumptions regarding the relation of coverage to residence and the two limiting assumptions regarding the difference in the omission rates of migrants and nonmigrants (B=1 and B=2). These estimates can be used to evaluate the effect on coverage rates of alter-

[13] Calculation for age groups under 35 would have produced inconsistent and often unreasonable results and, therefore, was not carried out.

[14] The six State areas used in each of the two procedures which were averaged were Pennsylvania, Delaware, Maryland, the District of Columbia, Virginia, and North Carolina. The second procedure for obtaining the new corrected population for the District of Columbia consisted of the following steps, carried out separately for each sex:

1. Estimated percents of net underenumeration for the total White population of each State area were obtained by adjusting the national demographic rates of underenumeration for State variations in median family income. (U.S. Bureau of the Census, **Current Population Reports**, Series P–23, No. 56, table 1.)

2. The percent of net underenumeration for the whole six-State area was computed in two ways, (a) first, using the estimate of corrected population of all ages based on the results of step (1), and (b) second, using the original unadjusted demographic estimates of corrected State populations under age 35.

3. The estimated percent of net underenumeration for the District of Columbia from step (1) was multiplied by the ratio of the result in (2b) to the result in (2a).

The product in (3) was then used as one of two adjusted estimates of the percent of net undercount for the White population under age 35 in the District of Columbia.

native assumptions about the nature of the factors related to the risk of omission from the census.

The relative influence of State of birth and State of residence on coverage is illustrated by a comparison of the estimates presented in columns one and three of the table. The estimates in column one are based on the assumption that coverage is entirely a function of factors related to State of birth (SOR-1), while the estimates in column three are based on the assumption that coverage is entirely a function of factors related to State of residence (SOR-2). Both sets of estimates assume no difference in the coverage rate of migrants and nonmigrants (i.e., B=1).

The two sets of estimates can be compared with respect to level and pattern. The average absolute difference between the two sets of omission rates is approximately 0.9 percentage point [15] and the correlation coefficient is 0.95 [16] (table II-D). These two summary measures indicate that, with respect to level, the two distributions are rather different, viewed in the light of the range of the preliminary coverage errors for States but, with respect to pattern, they are quite similar. Considering these measures in combination, we conclude that the limiting assumptions on the relation of coverage to residence produce coverage rates which are somewhat different, but not markedly so.

The effect on omission rates of alternative assumptions regarding the differences in the coverage level of lifetime migrants and nonmigrants was also evaluated. The analysis was designed to determine the sensitivity of the coverage estimates to variations in the differential coverage factor *B*. Specifically, a comparison was made of coverage estimates for the case where there is no difference in coverage (B=1) and the case where migrants are omitted at a rate twice that of nonmigrants (B=2). The latter case is thought to represent a limiting one in the sense that census enumeration at the State level in 1970 was not likely to have been so uneven that migrants were missed at a rate in excess of two times the rate at which nonmigrants were missed (assuming migrants are subject to some greater risk of omission).[17] The decision to select values of *B* equal to one and two was not based on any concrete evidence concerning the actual extent of differential coverage. The decision was somewhat arbitrary and was based, instead, on intuitive considerations regarding the plausible range of differential coverage one might expect to observe were such information actually available.[18]

We can compare either the sets of estimates in the first and second columns of table II-C or the sets of estimates in the third and fourth columns of table II-C. The choice is not important because the pairs of estimates are structurally comparable and the essential findings are identical in both cases. A comparison of the first and second columns is convenient; these columns present the coverage estimates based on the assumption that omission rates are entirely a function of factors related to State of birth (SOR-1). The average absolute difference between the two sets of estimates is approximately 0.23 percentage point; the simple correlation coefficient for the two distributions is 0.97 [19] (table II-D). Both summary measures indicate no substantial differences between the two sets of coverage estimates either in level or pattern. Hence, although one might reasonably expect some difference in the coverage rates of migrants and nonmigrants among States, the assumption of no difference in coverage did not produce omission rates which are appreciably different from those produced by the assumption of a substantial difference in coverage. Since there is no empirical evidence upon which to base alternative estimates of the parameter *B* and since, in particular, there is no evidence which suggests variations in *B* among States and population subgroups, the relative insensitivity of omission rates to alternative values of *B* is clearly an important finding which permits a simplification of the task of estimation and interpretation.

Final State-of-Residence Coverage Estimates (SOR-3)

Combining the two models for State-of-residence coverage estimates. The two models previously developed (equations 2.13 and 2.17) provide "limiting" coverage estimates which generally describe the probable domain over which actual omission rates for the White population under age 35 vary. The proximity of the limiting values for many States is rather fortunate; but even if the estimated intervals are relatively small, it is still important to attempt to identify point (single-valued) estimates of omission rates. Furthermore, it is

[15] Unweighted mean covering 50 States and the District of Columbia. The corresponding weighted average absolute difference is 0.6 percentage point; the weights are the census State-of-residence populations.

[16] The corresponding weighted correlation coefficient is 0.97.

[17] If it is assumed that migrants are subject to a lesser rate of omission than nonmigrants, the test might then be designed to compare two cases where *B* equals one and some positive number less than one. The findings of this particular test would be numerically different from the one in which *B* equals one and two, but the qualitative interpretation of the findings would not be different.

[18] In view of the possibility that coverage may have a more pronounced relation to migration status than we have assumed, and in order to explore further the effect of varying the relation of coverage rates of migrants and nonmigrants, a special set of estimates for the White population under 35 years of age based on the parameter B=3 has been prepared. These figures are presented in appendix F.

[19] Weighted values are 0.15 and 0.98 for the average absolute difference and the correlation coefficient, respectively.

quite likely that coverage is not entirely a function of factors related to either State of birth or State of residence in any one State. This notion suggests that, to the extent that limiting coverage estimates define the probable range over which the actual rates vary, the true rates would fall somewhere between the limiting estimates.

One could reasonably assume that the relative contribution of State-of-birth factors and State-of-residence factors in the determination of coverage directly reflects the relative length of exposure of a given cohort to each set of factors. The weighting factors thus become "exposure" weights. Such weights can be computed through an application of life-table methods to State-of-birth statistics classified by State of residence. In this way separate estimates can be obtained for the cumulative "person-years lived" by a migrant birth cohort in the State of birth and the State of residence. The effort to assign exposure weights representing the relative contribution of State-of-birth factors and State-of-residence factors in the determination of coverage, so as to obtain point estimates of coverage, gives rise to some unanswered questions. The assumption upon which the exposure weights are based cannot be supported with empirical evidence. Furthermore, there are undoubtedly other assumptions exhibiting various degrees of intuitive appeal, and each of these assumptions would give rise to some weighting scheme for which we should like to have some form of justification.

Since empirical evidence cannot be found to support a particular weighting scheme, the most practical and technically defensible approach is to use a scheme in which the two limiting values are given equal weight. This view suggests that, under the circumstances, the "best" estimates of coverage are based on a simple arithmetic average of the limiting coverage estimates. The mathematical equivalent of this statement is given by the expression

$$R_j^c = 0.5\, R_j^a + 0.5\, R_j^b \qquad (2.21)$$

where

R_j^a = coverage rate for State j when coverage is a function of State of birth (SOR-1)

R_j^b = coverage rate for State j when coverage is a function of State of residence (SOR-2)

R_j^c = coverage rate for State j when coverage is a function of both State of birth and State of residence (SOR-3)

The estimation procedure based on equal weights was used to develop point estimates of coverage for the White population under age 35 in 1970, on the assumption that coverage is jointly and equally determined by factors related to State of birth and State of residence. Estimates obtained by this procedure are designated SOR-3 and are shown for regions, divisions, and States in the fifth, sixth, and seventh columns of table II-C. The estimates in column five (A = 1) incorporate the assumption of equality in the coverage rates of migrants and nonmigrants (B = 1) and columns six (A = 1) and seven (A = 5) incorporate the assumption of differential coverage of migrants and nonmigrants with a parameter value B = 2.

Review and evaluation of results. In the process of developing the final estimates of coverage for the White resident population of each State under 35 years of age, a number of different sets of estimates were prepared in tandem or sequence, some being discarded or merged with alternative sets of estimates because they were biased or unreasonable or because they varied too little from alternative series with contrasting assumptions. The two-stage estimation procedure called first for the preparation of coverage estimates for the population *born* in each State (SOB). Estimates employing births tabulated by place of residence (SOB-1) were found to be biased, as were estimates employing births tabulated by place of occurrence (SOB-2), even though the two series were not grossly at variance except for a few States and the District of Columbia. Inasmuch as the biases went in opposing directions and their relative magnitudes could not be determined, the two sets of State-of-birth estimates were averaged with equal weights in a composite set (SOB-3). The State-of-birth tabulations from the census showed an appreciable proportion of nonresponses and, in the absence of evidence regarding the State-of-birth distribution of the nonresponses, they were assigned according to two limiting assumptions (A = 1, A = 5). The alternative procedures for allocating the nonresponses, applied to the composite series, produced very similar estimates with only a few exceptions; the average difference between the two series was very low (0.4) and the correlation of the series was high (0.94).

The composite State-of-*birth* coverage estimates (SOB-3) were next converted to State-of-*residence* coverage estimates (SOR) according to two opposing principles regarding the determinants of coverage levels—that State of birth was the primary influence in coverage (SOR-1) and that State of residence was the primary influence in coverage (SOR-2). Here the average difference between the two series (assuming A = 1, B = 1) was more pronounced (0.9) although the correlation coefficient was quite high (0.95). Lacking an immediate empirical basis for selecting either of these series or for combining them, we averaged them with equal weights (SOR-3). The average coverage series (SOR-3) and the State-of-residence series which assumed current State of residence to be determinative of coverage (SOR-2) were, of course, more similar to each other than the two original State-of-residence

coverage series (SOR-1 and SOR-2). For the former pair the average difference was only 0.5 and the correlation coefficient was extremely high (0.99). Because of the unstable nature of the estimates for the District of Columbia, special estimates were developed by rather arbitrary methods.

Differences in coverage rates of migrants and nonmigrants (B=1, B=2) and in the distribution by State of birth of nonresponses to the census State-of-birth question (A=1, A=5) were introduced as variables, but these did not add appreciably to the variation between the series. For example, when the average State-of-residence coverage estimates (SOR-3) having the assumption that the omission rate for migrants equalled that for nonmigrants (B=1) was compared with the corresponding coverage estimates (SOR-3) having the assumption that the omission rate for migrants was twice that of nonmigrants (B=2), the average absolute difference was a mere 0.2 percentage point and the correlation coefficient was 0.99.

On the other hand, if we consider the whole range of variation in our coverage estimates, resulting from the many different assumptions we have employed, the picture of low sensitivity or "robustness" of method is modified. The differences between the high and low values for many of the States were substantial and often represented a considerable percentage of the mean estimate for the various methods and assumptions.

We believe, finally, that the best estimates of coverage of the White population under 35 years of age that we have been able to develop, given the various statistical and methodological problems confronting us in their preparation, are the estimates shown in the fifth column of table II-C, designated "SOR-3, A=1, B=1," or "SOR-3-1." Accordingly, this set of estimates may be designated "preferred." This designation does not mean, however, that they can be considered accurate. Accurate estimates are the product of a statistical procedure in which there are negligible or, at most, modest limitations of data, methods, and assumptions. As we have seen, major limitations have affected the estimates and, while these problems do not collectively preclude the estimation of usable omission rates for the White population under age 35 in 1970, they do impose obvious restrictions on the manner in which any preferred estimates are to be interpreted and applied.

Table II-A. ALTERNATIVE ESTIMATES OF THE PERCENTS OF NET UNDERCOUNT FOR THE WHITE POPULATION UNDER 35 YEARS OF AGE BORN IN EACH REGION, DIVISION, AND STATE: 1970

(See text for explanation of the alternative procedures. A minus sign denotes a net overcount)

Region, division, and State	SOB-1		SOB-2		SOB-3	
	Residence births		Occurrence births		Composite births	
	A = 1	A = 5	A = 1	A = 5	A = 1 (SOB-3-1)	A = 5 (SOB-3-2)
United States, total	1.8	2.0	1.8	2.0	1.8	2.0
Regions:						
Northeast	0.8	1.1	0.7	0.9	0.8	1.0
North Central	1.2	1.3	1.0	1.1	1.1	1.2
South	2.9	3.0	3.2	3.3	3.0	3.2
West	2.5	3.1	2.7	3.2	2.6	3.1
Northeast:						
New England	0.6	0.9	0.7	1.1	0.7	1.0
Middle Atlantic	0.9	1.1	0.7	0.9	0.8	1.0
North Central:						
East North Central	1.3	1.5	0.8	1.0	1.0	1.2
West North Central	1.1	0.9	1.5	1.3	1.3	1.1
South:						
South Atlantic	2.7	2.8	3.0	3.1	2.8	3.0
East South Central	2.3	2.1	3.2	3.0	2.7	2.5
West South Central	3.6	3.9	3.4	3.7	3.5	3.8
West:						
Mountain	2.6	2.5	3.1	3.0	2.8	2.8
Pacific	2.5	3.3	2.5	3.3	2.5	3.3
New England:						
Maine	2.5	2.0	2.3	1.8	2.4	1.9
New Hampshire	1.4	1.8	0.6	1.0	1.0	1.4
Vermont	3.5	3.2	0.7	0.4	2.1	1.8
Massachusetts	-0.2	0.2	0.8	1.2	0.3	0.7
Rhode Island	-1.1	-0.9	2.0	2.2	0.5	0.7
Connecticut	1.3	2.1	-0.6	0.2	0.3	1.2
Middle Atlantic:						
New York	0.8	1.1	1.4	1.7	1.1	1.4
New Jersey	1.6	2.1	-2.0	-1.5	-0.2	0.3
Pennsylvania	0.7	0.7	1.0	0.9	0.9	0.8
East North Central:						
Ohio	1.1	1.3	1.0	1.1	1.0	1.2
Indiana	1.3	1.2	1.7	1.7	1.5	1.5
Illinois	1.8	2.1	0.5	0.8	1.2	1.4
Michigan	1.8	2.1	1.2	1.5	1.5	1.8
Wisconsin	-0.5	-0.4	-0.9	-0.8	-0.7	-0.6
West North Central:						
Minnesota	0.1	0.2	(Z)	0.1	0.1	0.1
Iowa	1.0	0.6	2.2	1.8	1.6	1.2
Missouri	0.5	0.6	3.3	3.4	1.9	2.0
North Dakota	1.7	0.6	2.4	1.3	2.0	1.0
South Dakota	3.0	2.1	2.2	1.3	2.6	1.7
Nebraska	1.2	0.8	1.0	0.7	1.1	0.8
Kansas	3.3	2.9	-0.5	-1.0	1.4	1.0
South Atlantic:						
Delaware	1.6	2.1	2.3	2.8	1.9	2.4
Maryland	4.3	5.0	-6.8	-6.1	-0.9	-0.2
District of Columbia	-46.2	-51.9	31.7	29.1	6.9	3.3
Virginia	5.3	5.3	-1.1	-1.1	2.2	2.2
West Virginia	5.3	4.2	6.3	5.2	5.8	4.7
North Carolina	2.0	2.4	2.3	2.7	2.1	2.5
South Carolina	4.5	4.9	3.4	3.9	3.9	4.4
Georgia	2.7	3.2	3.6	4.2	3.1	3.7
Florida	3.3	3.9	3.4	3.9	3.4	3.9
East South Central:						
Kentucky	3.0	2.6	3.7	3.3	3.4	3.0
Tennessee	2.4	2.4	4.6	4.6	3.5	3.5
Alabama	2.1	2.0	1.7	1.6	1.9	1.8
Mississippi	0.5	0.2	1.1	0.8	0.8	0.5
West South Central:						
Arkansas	3.7	3.1	4.2	3.6	4.0	3.4
Louisiana	1.6	2.1	1.6	2.1	1.6	2.1
Oklahoma	2.5	2.1	1.5	1.1	2.0	1.6
Texas	4.5	5.0	4.3	4.8	4.4	4.9
Mountain:						
Montana	1.6	1.1	0.2	-0.3	0.9	0.4
Idaho	4.0	3.5	2.7	2.2	3.4	2.8
Wyoming	2.8	1.9	0.8	-0.1	1.8	0.9
Colorado	0.8	0.8	3.5	3.5	2.2	2.2
New Mexico	7.7	7.5	7.0	6.7	7.4	7.1
Arizona	3.1	3.5	4.2	4.6	3.7	4.1
Utah	-0.9	-0.6	0.3	0.5	-0.3	-0.1
Nevada	2.9	4.5	3.2	3.8	3.6	4.1
Pacific:						
Washington	0.7	1.1	1.7	2.2	1.2	1.6
Oregon	1.1	1.8	1.3	2.0	1.2	1.9
California	3.0	4.0	2.8	3.7	2.9	3.9
Alaska	3.5	1.7	2.9	1.2	3.2	1.4
Hawaii	3.7	3.9	3.7	4.0	3.7	3.9

Z Less than ± 0.05.

Table II-B. AVERAGE ABSOLUTE DIFFERENCES AND CORRELATION COEFFICIENTS FOR ALTERNATIVE ESTIMATES OF THE PERCENTS OF NET UNDERCOUNT FOR THE WHITE POPULATION UNDER 35 YEARS OF AGE BORN IN EACH STATE: 1970

(Differences and coefficients are based on 48 States; Maryland, Virginia, and the District of Columbia have been excluded from the calculations. Average absolute differences are shown above the diagonal line; product-moment correlation coefficients are shown below the diagonal line)

Series	SOB-1, residence births		SOB-2, occurrence births		SOB-3, composite births	
	A=1	A=5	A=1	A=5	A=1	A=5
SOB-1, residence births, A=1.....		.450	1.031	1.169	.517	.721
SOB-1, residence births, A=5.....	.942		1.115	1.035	.662	.521
SOB-2, occurrence births, A=1.....	.664	.625		.450	.515	.644
SOB-2, occurrence births, A=5.....	.585	.653	.950		.723	.515
SOB-3, composite births, A=1.....	.906	.853	.918	.848		.446
SOB-3, composite births, A=5.....	.831	.900	.875	.918	.935	

Source: Based on estimates shown in table II-A.

Table II-C. ALTERNATIVE ESTIMATES OF THE PERCENTS OF NET UNDERCOUNT FOR THE WHITE POPULATION UNDER 35 YEARS OF AGE RESIDENT IN EACH REGION, DIVISION, AND STATE: 1970

(See text for explanation of alternative procedures. The birth statistics used to derive all the estimates are an average of births by place of residence and births by place of occurrence. A minus sign denotes a net overcount)

Region, division, and State	SOR-1		SOR-2		SOR-3			Range		
	A=1, B=1	A=1, B=2	A=1, B=1	A=1, B=2	A=1, B=1	A=1, B=2	A=5, B=2	Low value	High value	Difference
United States, total	2.0	2.0	2.0	2.0	2.0	2.0	2.0	(X)	(X)	(X)
Regions:										
Northeast	1.0	1.0	0.7	0.4	0.8	0.7	0.7	0.4	1.0	0.6
North Central	1.4	1.5	1.1	0.8	1.3	1.1	0.9	0.8	1.5	0.7
South	3.0	2.9	3.3	3.5	3.2	3.2	3.1	2.9	3.5	0.6
West	2.6	2.7	3.0	3.5	2.8	3.1	3.5	2.6	3.5	0.9
Northeast:										
New England	0.9	1.0	0.5	0.3	0.7	0.6	0.8	0.3	1.0	0.7
Middle Atlantic	1.1	1.0	0.7	0.4	0.9	0.7	0.7	0.4	1.1	0.7
North Central:										
East North Central	1.4	1.4	1.0	0.7	1.2	1.1	1.0	0.7	1.4	0.7
West North Central	1.6	1.5	1.3	1.0	1.4	1.3	0.8	0.8	1.6	0.8
South:										
South Atlantic	2.7	2.7	3.0	3.3	2.8	3.0	3.0	2.7	3.3	0.6
East South Central	2.8	2.6	3.1	2.9	2.9	2.8	2.3	2.3	3.1	0.8
West South Central	3.5	3.3	4.0	4.1	3.8	3.7	3.8	3.3	4.1	0.8
West:										
Mountain	2.7	2.7	3.5	3.9	3.1	3.3	2.9	2.7	3.9	1.2
Pacific	2.5	2.7	2.8	3.3	2.7	3.0	3.7	2.5	3.7	1.2
New England:										
Maine	2.4	2.1	3.1	3.3	2.8	2.7	1.7	1.7	3.3	1.6
New Hampshire	1.2	1.4	1.0	0.7	1.1	1.0	1.3	0.7	1.4	0.7
Vermont	2.0	1.9	2.7	3.0	2.3	2.4	1.7	1.7	3.0	1.3
Massachusetts	0.6	0.7	0.1	-0.3	0.3	0.2	0.4	-0.3	0.7	1.0
Rhode Island	0.8	1.0	0.2	-0.1	0.5	0.4	0.4	-0.1	1.0	1.1
Connecticut	0.8	0.9	0.1	-0.2	0.4	0.4	1.0	-0.2	1.0	1.2
Middle Atlantic:										
New York	1.3	1.2	1.1	0.8	1.2	1.0	1.1	0.8	1.3	0.5
New Jersey	0.4	0.6	-0.5	-0.8	-0.1	-0.1	0.1	-0.8	0.6	1.4
Pennsylvania	1.1	1.1	0.8	0.6	1.0	0.8	0.5	0.5	1.1	0.6
East North Central:										
Ohio	1.5	1.6	0.9	0.6	1.2	1.1	1.0	0.6	1.6	1.0
Indiana	1.8	1.9	1.5	1.3	1.7	1.6	1.3	1.3	1.9	0.6
Illinois	1.5	1.5	1.1	0.8	1.3	1.2	1.2	0.8	1.5	0.7
Michigan	1.7	1.7	1.6	1.5	1.7	1.6	1.6	1.5	1.7	0.2
Wisconsin	-0.2	-0.2	-1.0	-1.2	-0.6	-0.7	-0.8	-1.2	-0.2	1.0
West North Central:										
Minnesota	0.5	0.6	-0.2	-0.4	0.2	0.1	-0.2	-0.4	0.6	1.0
Iowa	1.8	1.6	1.7	1.5	1.8	1.6	0.8	0.8	1.8	1.0
Missouri	2.1	2.0	2.0	1.8	2.1	1.9	1.9	1.8	2.1	0.3
North Dakota	2.1	1.8	2.7	2.6	2.4	2.2	0.6	0.6	2.7	2.1
South Dakota	2.6	2.2	3.5	3.6	3.0	2.9	1.5	1.5	3.6	2.1
Nebraska	1.4	1.5	0.8	0.3	1.1	0.9	0.3	0.3	1.5	1.2
Kansas	1.8	1.9	1.2	0.7	1.5	1.3	0.5	0.5	1.9	1.4
South Atlantic:										
Delaware	1.9	2.0	2.2	2.5	2.0	2.2	2.6	1.9	2.6	0.7
Maryland[1]	0.9	1.1	-1.3	-1.5	-0.2	-0.2	-0.1	-1.5	1.1	2.6
District of Columbia[1]	1.3	1.4	1.0	0.8	1.1	1.1	0.9	0.8	1.4	0.6
Virginia[1]	2.5	2.6	2.5	2.3	2.5	2.5	2.2	2.2	2.6	0.4
West Virginia	5.4	4.1	8.6	9.2	7.0	6.7	5.2	4.1	9.2	5.1
North Carolina	2.4	2.3	2.2	2.1	2.3	2.2	2.4	2.1	2.4	0.3
South Carolina	3.7	3.5	4.6	5.2	4.2	4.4	4.6	3.5	5.2	1.7
Georgia	3.1	3.1	3.5	3.7	3.3	3.4	3.7	3.1	3.7	0.6
Florida	2.8	3.0	4.0	5.1	3.4	4.1	4.5	2.8	5.1	2.3
East South Central:										
Kentucky	3.3	2.9	4.3	4.3	3.8	3.6	2.9	2.9	4.3	1.4
Tennessee	3.4	3.1	4.1	4.2	3.7	3.6	3.4	3.1	4.2	1.1
Alabama	2.2	2.1	1.8	1.3	2.0	1.7	1.3	1.3	2.2	0.9
Mississippi	1.4	1.6	0.2	-0.5	0.8	0.5	(Z)	-0.5	1.6	2.1
West South Central:										
Arkansas	3.8	3.3	5.0	5.0	4.4	4.2	3.1	3.1	5.0	1.9
Louisiana	1.9	2.0	1.4	1.0	1.7	1.5	1.9	1.0	2.0	1.0
Oklahoma	2.4	2.5	1.5	0.3	1.9	1.4	0.6	0.3	2.5	2.2
Texas	4.1	3.8	5.0	5.6	4.6	4.7	5.0	3.8	5.6	1.8
Mountain:										
Montana	1.4	1.5	0.4	-0.1	0.9	0.7	-0.1	-0.1	1.5	1.6
Idaho	3.0	2.7	4.9	6.1	3.9	4.5	3.3	2.7	6.1	3.4
Wyoming	2.1	2.2	1.7	0.8	1.9	1.5	0.2	0.2	2.2	2.0
Colorado	2.3	2.5	2.2	2.0	2.3	2.2	1.9	1.9	2.5	0.6
New Mexico	5.9	5.0	10.5	12.6	8.2	9.0	8.3	5.0	12.6	7.6
Arizona	3.0	3.3	4.3	5.0	3.7	4.1	4.2	3.3	5.0	1.7
Utah	0.5	0.8	-1.1	-1.6	-0.3	-0.4	-0.5	-1.6	0.8	2.4
Nevada	2.9	3.4	4.6	5.7	3.8	4.6	4.9	2.9	5.7	2.8
Pacific:										
Washington	1.7	1.9	1.0	0.6	1.3	1.2	1.4	0.6	1.9	1.3
Oregon	1.7	2.0	1.0	0.7	1.3	1.3	1.7	0.7	2.0	1.3
California	2.8	2.9	3.2	3.9	3.0	3.4	4.3	2.8	4.3	1.5
Alaska	2.5	3.2	5.7	7.8	4.2	5.5	1.8	1.8	7.8	6.0
Hawaii	2.7	3.3	5.5	6.2	4.2	4.7	4.2	2.7	6.2	3.5

X Not applicable.
Z Less than ± 0.05.
[1]Adjusted (see text).

Table II-D. AVERAGE ABSOLUTE DIFFERENCES AND CORRELATION COEFFICIENTS FOR ALTERNATIVE ESTIMATES OF THE PERCENTS OF NET UNDERCOUNT FOR THE WHITE POPULATION UNDER 35 YEARS OF AGE RESIDENT IN EACH STATE: 1970

(Based on 51 State areas. Average absolute differences are shown above the diagonal line; product-moment correlation coefficients are shown below the diagonal line)

Series	SOR-1		SOR-2		SOR-3	
	A=1, B=1	A=1, B=2	A=1, B=1	A=1, B=2	A=1, B=1	A=1, B=2
SOR-1, A=1, B=1		.229	.912	1.376	.459	.643
SOR-1, A=1, B=2	.966		1.024	1.484	.578	.751
SOR-2, A=1, B=1	.947	.930		.469	.453	.308
SOR-2, A=1, B=2	.909	.908	.990		.918	.733
SOR-3, A=1, B=1	.975	.955	.994	.976		.231
SOR-3, A=1, B=2	.941	.947	.992	.994	.988	

Source: Based on estimates shown in table II-C.

Chapter III. Coverage of Black-and-Other-Races Population Under 35 Years of Age

INTRODUCTION

We originally planned to use the same method to develop estimates of coverage for the Black-and-other-races population under age 35 for States as for the White population. The principal data required are available for both racial groups—registered births (adjusted for underregistration) and survival rates for developing estimates of the "expected" population born in each State, and census counts of the population classified by State of birth which can be compared with the expected figures. Largely because of the greater inadequacies in the census State-of-birth data for the Black population, however, the application to the Black-and-other-races population of the same method as employed for Whites to estimate coverage in the 1970 census produced highly unreasonable results. Accordingly, modifications had to be made in the procedure used for the White population. In this chapter, first, the procedure initially employed for the Black-and-other-races population under 35 years of age for States is described; then the problems encountered in working with the data are discussed; and, finally, an alternative methodology for producing estimates of census coverage for this group is presented.

PRELIMINARY ESTIMATION OF COVERAGE BASED ON 1970 CENSUS STATE-OF-BIRTH DATA

Method of Estimation

Preliminary estimates of the percents of net undercount for the Black-and-other-races population under 35 years of age for States in 1970 were developed by methods that parallel those described for the White population in this age group. For each State, births for the period 1935 to 1970, corrected for underregistration, were carried forward to 1970 by life table survival rates and then further reduced by the estimated number of native Americans who left the country prior to the census date. This calculation provided an estimate of the expected number of persons who should have been counted in the 1970 census as born in each State. These expected figures were then compared with State-of-birth counts from the census [1] to obtain coverage estimates for the Black-and-other-races population born in each State.

The derivation of cumulative survival rates for States used to carry forward births over the period from 1935 to 1970 presented a much greater problem for Blacks than for Whites. The set of State life tables for the Black-and-other-races population was complete for 1969–71 only; hence, additional steps had to be taken to obtain complete sets of tables for the earlier periods. For the 1949–51 and 1959–61 periods, substitutions were made for the States for which Black-and-other-races life tables were not available. Life tables for the Black-and-other-races population for all geographic divisions were available for each period, so that the tables for divisions were substituted for States within each division where State tables were missing. For 1959–61, 29 substitutions were made; for 1949–51, 34. All but two of the substitutions (Delaware and West Virginia in 1959–61) involved States outside the South. The particular States for which substitutions were made are shown in appendix D.

A few survival rates for the youngest ages were needed for 1929–31 and 1939–41 for each State, specifically 5-year survival rates for births in 1929–31 and 5-year survival rates for children under 5 and children 5–9 in 1939–41. For 1929–31 and 1939–41, life tables covering specific States or broader geographic areas were not available for the Black-and-other-races population, so that reverse extrapolation was employed to estimate the necessary life table survival rates. Specifically, the survival rates in 1929–31 and 1939–41 for the Black male and female populations of each State were obtained by reverse extrapolation from the 1949–51 rates on the basis of the percentage change, between 1929–31 or 1939–41 and 1949–51, in the complement of corresponding survival rates for the White male and female populations in each State. This relationship can be expressed as—

$$ {}_5S^{t}_{i,x,b} = 1.0 - (1.0 - {}_5S^{1949-51}_{i,x,b}) \left(\frac{1.0 - {}_5S^{t}_{i,x,w}}{1.0 - {}_5S^{1949-51}_{i,x,w}} \right) \quad (3.1) $$

[1] Persons whose State of birth was not reported were distributed by State of birth pro rata according to the distribution of persons whose State of birth was reported.

where

$_5S_{i,x}$ = 5-year sex-specific survival rate from birth to age group 0–4 or from age group (x, x+5) to age group (x+5, x+10) for State *i*

t = 1929–31 or 1939–41

w = White population

b = Black-and-other-races population

This procedure entails the assumption that the relative change in 5-year mortality rates for States was the same for each race over the estimation period. For example, it was assumed that mortality rates decreased at the same higher rate in the South relative to the national average for both Whites and Blacks over the 1929–31 to 1949–51 period. Although some variation in the relative improvement of survivorship for the races probably occurred in this period, the correspondence of geographic trends in mortality for the races since 1950 suggests that the differences in the trends in earlier years were not substantial. As a final step, the estimated survival rates for the Black population for the States in 1929–31 and 1939–41 were forced to conform to the corresponding national rates; the adjustments required in this step were small in all cases.

Description of Results

An initial set of estimates of the percents of net undercount for the Black-and-other-races population under 35 years of age born in each State was derived by the methodology described. The corresponding estimates for geographic divisions and regions are presented in table III-A. The impact of the special problems in the data for the Black population is readily apparent from this table. Several figures stand out, most notably the large "net overcounts" of the population born in the Northeast and North Central States. For example, according to this set of coverage estimates, the Black-and-other-races population aged 15–24 and 25–34 reporting a State of birth in the Northeast was overcounted by an incredible 11.8 percent and 30.3 percent, respectively, in the 1970 census; the population born in the North Central States was overcounted by 6.7 percent and 11.7 percent at the same ages. Although net undercounts of the population reported as born in the North are estimated at ages 0–4, the large net overcounts at ages over 15 produce a net overcount of the entire population under 35 reporting a State of birth in the North. Even larger net overcounts are found for geographic divisions. It can be noted that these net overcounts are totally at variance with the national net undercount rates for the Black-and-other-races population, which are 5.6 percent and 12.7 percent for ages 15–24 and 25–34, respectively. Similarly, the net undercount rates for the population at ages 15–24 and 25–34 reported as born in the South (11.6 percent and 21.3 percent, respectively) are suspiciously high relative to the corresponding national rates.

It is apparent from table III-A that the "State-of-birth" methodology used for the White population did not produce acceptable results when applied to the Black-and-other-races population. The finding of grossly unrealistic coverage estimates for the Black population indicated the presence of a serious systematic error or combination of such errors in the data or method employed to derive the coverage estimates. The apparent magnitude of the errors leading to the spurious coverage rates for Blacks clearly warranted a re-examination of the data and methods employed for this group.

Sources of Error

The inadequacy of the demographic model itself can be ruled out as the source of the problem in the coverage rates for Blacks since we have no basis for questioning it in terms of demographic logic and it produced plausible estimates of coverage for the White population. The source of the problem, then, lies in the data and in the assumptions incorporated in the model for adjusting the data.

The kinds of problems which affected the data for Whites did not appear to introduce any substantial degree of systematic error in the coverage estimates for the Black-and-other-races population. The application of sensitivity analysis, as in the previous evaluation of the data for Whites, showed that several possible sources of error did not have an appreciably adverse effect on the coverage estimates for Blacks and, therefore, could not have produced the spurious coverage estimates shown in table III-A. First, the coverage estimates were found to be relatively insensitive to possible differences between ("synthetic") State-of-birth life table survival rates and State-of-residence life table survival rates used to develop the corrected State-of-birth population. Secondly, use of alternative schemes to allocate nonresponses on State of birth in the census data (e.g., A=1 vs. A=5) did not appreciably change the level or geographic variation of the coverage estimates. Next, the coverage estimates were relatively insensitive to the use of alternative combinations of occurrence and residence births, designed to compensate for the tendency of respondents to report the State where the birth occurred rather than the State where the mother resided at the time of the birth. Finally, the use of sample data on the State of birth of the population from the census instead of complete-count data had a negligible effect on the error of the coverage estimates inasmuch as

the sampling variability of the data employed is quite small.

Nevertheless, it is quite possible that the magnitude of errors in the data for the Black population could be much greater than for the White population. The basic data for Blacks are affected by a number of possibly serious problems, such as the adequacy of the birth estimates for States from 1935 on and the adequacy of the life tables as representing the actual level of mortality in the various States. Although estimates of births for the United States as a whole since 1935 appear to be of highly acceptable quality, the figures for individual States are much less reliable. The estimates of underregistration of births in some States indicated by the test results in 1940 exceeded 25 percent (e.g., Mississippi, Louisiana, etc.) and, hence, may have had an error of several percentage points. (See appendix A.) Moreover, the values for the percent underregistration of births for years between 1940 and 1950 and between 1950 and 1966 could also have been in error because of the interpolation procedure employed. The life table survival rates may have been somewhat inaccurate because of errors in the data on deaths and the population used to compute the underlying death rates, or the survival rates substituted for States without life tables may not have been valid choices. Yet, it did not appear likely that the errors in the data on births and deaths, or the death rates, were great enough to account for the kinds of extreme errors we observed in the coverage estimates for Blacks.

This discussion of problems with the data on the Black population has included mention of problems with the quality of the State-of-birth data used in developing the coverage estimates (i.e., the numerator of the estimated coverage rate) and problems with the quality of the corrected population (i.e., the denominator of the estimated coverage rate). We have considered the quality of the State-of-birth data to some extent in our reference to the allocation of nonresponses, the allowance, in the derivation of the corrected population, for the mixed occurrence/residence reporting of State of birth in the census, and the use of sample data. We have considered the quality of the corrected population in our reference to the adequacy of the evaluation model, the choice of the type of life table, the accuracy of the estimates of births, and the accuracy of the life table survival rates. Since no empirical evidence was initially available to indicate or even suggest the existence of serious error in the census reporting of State of birth, the quality of these data was not questioned in the early stages of this project. However, since our review of the method, data, and assumptions employed in estimating the corrected State-of-birth populations effectively ruled out the corrected figures as a major source of error in the preliminary coverage estimates for the Black-and-other-races population under age 35, the census State-of-birth data were further examined for the possible presence of major errors that could account for the spurious coverage estimates obtained.

A type of error in the State-of-birth data for Blacks that could account for apparent net overcounts in the North and suspiciously large undercounts in the South is the tendency for persons who have moved from their State of birth to report a current (or past) State of residence as the place of birth. Specifically, it may be hypothesized that many southern-born Black migrants who had moved to the North or West erroneously reported their State of residence as their State of birth in the 1970 census rather than their actual State of birth. Because of the massive redistribution of the Black population from the South into the North and West over the past several decades, this form of misreporting of State of birth by migrants from the South under age 35 would lead to an overreporting of States in the North and West and a corresponding underreporting of States in the South. Thus, a spurious net overcount of population born in the North or West would appear when the inflated State-of-birth count in the census was compared with the corrected population based on birth statistics for these regions. Likewise, an excessive undercount would result when the understated census count of persons born in the South was compared with the corrected population based on birth statistics. In sum, the hypothesized source of error, the reporting of current State of residence as place of birth by "lifetime" migrants from the South, clearly seemed to provide an explanation for the occurrence of estimated net overcounts and extreme undercounts for the Black-and-other-races population in 1970.[2]

Systematic Evaluation of Census Data on State of Birth

The identification of probable major reporting biases in the State-of-birth statistics for Blacks and the seriousness of the errors in the data suggested by the resulting coverage estimates led to a more systematic investigation into the accuracy of reporting of State of birth in the 1970 census. The aim of this research was twofold: (1) to test the hypothesis that the misreporting of State of birth by lifetime migrants did indeed account for the bias observed in the preliminary coverage estimates and (2) to measure the magnitude of reporting errors in the 1970 census data on State of birth. These research efforts led to the development of an analytic procedure that was incorporated into a revised methodology for producing coverage

[2] This type of response error, the misreporting of migration status by blacks, is analogous to one type of response error affecting the State-of-birth data for the White population, namely, the misreporting of nativity and migration status by the foreign born.

estimates for the Black-and-other-races population in 1970.

Method of evaluation. The method employed to evaluate the accuracy of the reporting of State of birth for the Black-and-other-races population at ages under 35 in 1970 was to "project" the population reported as born in each State in the same age cohorts in an earlier census to 1970 and to compare the survivors of these age cohorts with the 1970 census counts of the population born in the State. More specifically, the method involved "surviving" the population at ages 0–4 or 5–9 reporting a specified State of birth in the 1940, 1950, or 1960 censuses to 1970, when the cohorts would be variously 10–14 to 30–34 years of age, and then comparing the expected numbers with the numbers reporting the same State of birth in the 1970 census. Since a person's place of birth is a fixed characteristic for the person (i.e., it does not change over time), the State of birth as reported in the previous census and the State of birth as reported in the 1970 census should be the same for the person. Hence, the expected State-of-birth count based on the tabulation given in a previous census and the State-of-birth count as tabulated in the 1970 census should be equal after adjustment of the earlier census figure for deaths and emigration.

The cohort relationship between the State-of-birth data in two censuses, excluding the effect of emigration, can be expressed in the following equation:

$$CP^{70}_{SOB(i),\,x} = CP^{70-n}_{SOB(i),\,x-n} \cdot {}_nS_{i,\,x-n} \qquad (3.2)$$

where

$CP^{70}_{SOB(i),x}$ = count of population aged x reporting State i as State of birth in 1970 census

$CP^{70-n}_{SOB(i),x-n}$ = count of population aged $x-n$ reporting State i as State of birth in the census n years prior to 1970

${}_nS_{i,\,x-n}$ = survival rate from age $x-n$ in year 1970–n to age x in 1970 for State i

All elements are for a specific race, sex, and 5-year age group. Equation (3.2) would be exactly true only under the "ideal" conditions of zero international migration and perfect enumeration in both censuses with respect to both coverage and content.

To secure comparability of the State-of-birth data for a cohort in the two censuses, the term in the equation must be modified to correct for any difference in the completeness of coverage of the censuses, the non-reporting of State of birth, and the overseas movement of the native population. For this purpose, the census figures were adjusted as follows:

a. Adjustment of the State-of-birth count in the previous census for differential completeness of coverage, non-reporting of State of birth, and overseas population—

$$\overline{CP}^{1970-n}_{SOB(i),\,x-n} = \left[CP^{1970-n}_{SOB(i),\,x-n} + UNK^{1970-n}_{SOB(i),\,x-n}\right] \cdot \frac{C^{1970}_{x}}{C^{1970-n}_{x-n}} + OP^{1970-n}_{SOB(i),\,x-n} \qquad (3.3)$$

b. Adjustment of the State-of-birth count in 1970 census for non-reporting of State of birth and overseas population—

$$\overline{CP}^{1970}_{SOB(i),\,x} = CP^{1970}_{SOB(i),\,x} + UNK^{1970}_{SOB(i),\,x} + OP^{1970}_{SOB(i),\,x} \qquad (3.4)$$

where (subscript and superscript notation for age and year omitted)

CP is defined as in equation 3.2 and

$\overline{CP}_{SOB(i)}$ = adjusted count of population reporting State i as State of birth at age x in 1970 census or age $x-n$ in previous census (year 1970–n)

$UNK_{SOB(i)}$ = number of State-of-birth nonresponses allocated to reported SOB population at age x in 1970 census and age $x-n$ in previous census (year 1970–n)

C = coverage rate (complement of net undercount rate) at age x in 1970 census and age $x-n$ in previous census (year 1970–n)

$OP_{SOB(i)}$ = estimated count of population born in State i living abroad at age x in 1970 and at age $x-n$ in previous census (year 1970–n)

Equation (3.2) was then reformulated to derive the expected State-of-birth count in 1970 ($ECP^{1970}_{SOB(i),\,x}$) on the basis of reporting of the cohort in a previous census—

$$ECP^{1970}_{SOB(i),\,x} = \overline{CP}^{1970-n}_{SOB(i),\,x-n} \cdot {}_nS_{i,\,x-n} \qquad (3.5)$$

and the adjusted count of persons reporting a State of birth in the 1970 census ($\overline{CP}^{1970}_{SOB(i),x}$) can be compared with the expected number based on a previous census—

$$I^{1970}_{SOB(i),\,x} = \overline{CP}^{1970}_{SOB(i),\,x} - ECP^{1970}_{SOB(i),\,x} \qquad (3.6)$$

where

$ECP^{1970}_{SOB(i),\,x}$ = expected population reporting State i as State of birth in 1970 census based on reporting by the cohort in previous census (year 1970–n)

$I^{1970}_{SOB(i),\,x}$ = net difference, or inconsistency, in reporting of State i as State of birth by cohort at age x in 1970 census and at age $x-n$ in previous census (year 1970–n)

The difference between the expected number in 1970 and the 1970 census count may be divided by the expected number to obtain a measure of the relative inconsistency of reporting State of birth for the same age cohort at different censuses—

$$RI^{1970}_{SOB(i),\,x} = I^{1970}_{SOB(i),\,x} \div ECP^{1970}_{SOB(i),\,x} \qquad (3.7)$$

Prior to comparing the expected 1970 State-of-birth figures ($ECP^{1970}_{SOB(i)}$ in equation 3.5 and 3.6) with the reported 1970 counts ($\overline{CP}^{1970}_{SOB(i)}$ in equation 3.6), the expected population of each age-sex group for States was adjusted pro rata to the national total for the population of that age-sex group born in the United States as shown by the 1970 census. In effect, this adjustment accepts the 1970 census figures for the United States as the "control" totals for the State figures distributed by State of birth. The adjustment factors show that inconsistencies at the national level do exist, although the differences are small for females at most age groups and for males under 10 years of age (table III–B). For males aged 20–24 to 30–34, the expected figures in 1970 fall short of the actual 1970 census count by about 4 percent. Besides representing a "correction" for imperfections in the estimation procedure, these adjustments also reflect a correction for discrepancies in the reporting of nativity, age, or race for given cohorts from one census to another.

Assumptions and limitations. To perform the operations required by the equations above, a variety of assumptions relating to the available data had to be made. First, the State-of-birth data from previous censuses which were to be compared with the 1970 census had to be selected (CP_{SOB} in equations 3.3 and 3.4). Since it was hypothesized that the misreporting of State of birth resulted from the tendency of lifetime migrants to report a State of residence as State of birth, the appropriate comparison to be made was between the 1970 census and the earliest census (and hence earliest age) in which a cohort was enumerated. At ages 0–4, for example, few persons have migrated from their State of birth; hence, at these ages misreporting of State of birth should be small. In effect, it was assumed that the reporting of State of birth was accurate at ages 0–4 in each previous census and that the figures at this age could be considered as the standard for evaluating the accuracy of reporting at a later age in the 1970 census.[3]

[3] Another form of misreporting, discussed earlier, namely the reporting of the State where the birth occurred rather than the State of mother's residence at the time of birth, affects previous census counts of the population aged 0–4 in some States, although this error will not bias comparisons with the 1970 census in a State if the "mix" of occurrence/residence reporting of State of birth by an age cohort is similar in each census.

Thus, the evaluation of the accuracy of reporting State of birth for the cohort aged 30–34 in 1970 was based on the comparison of the State-of-birth counts at ages 30–34 in the 1970 census with the counts at ages 0–4 in the 1940 census; the census counts for ages 20–24 in 1970 were compared with the counts for ages 0–4 in the 1950 census; and the counts for ages 10–14 in 1970 were related to the counts for ages 0–4 in the 1960 census. For the cohorts aged 15–19 and 25–29 in 1970, the assumption of accurate reporting was extended to ages 5–9 (the first ages of enumeration). Hence, the evaluation of the reporting of State of birth at ages 25–29 was based on a comparison of 1970 State-of-birth counts with counts at ages 5–9 in the 1950 census; the census counts for ages 15–19 in 1970 were compared with the counts for ages 5–9 in the 1960 census.[4] For the cohort aged 5–9 in 1970, a direct comparison could not be made with a previous census, and an adjustment factor was obtained by interpolation between the inconsistency measures for ages under 5 and ages 10–14 in 1970. Expected populations for each State of birth for the cohort aged 5–9 were derived by applying the interpolated inconsistency figures to the 1970 census counts.[5]

Another assumption made to secure comparability of census data for cohorts concerned the adjustment of the State-of-birth data for differences in the completeness of coverage between censuses. Since coverage rates for children and young adults for States were not available for 1970 and each of the previous censuses, national coverage rates (C in equation 3.3) at each age for each census were applied uniformly to the State-of-birth counts for each State to correct for differences in census coverage for each age cohort

[4] The census counts on State of birth in the 1940, 1950, and 1960 censuses were published in the following reports of the U.S. Bureau of the Census: Census of Population: 1940, **State of Birth of the Native Population**, 1944; Census of Population: 1950, Special Report PE–4A, **State of Birth**, 1953; Census of Population: 1960, Special Report PC(2)–2A, **State of Birth**, 1963. The State-of-birth tabulations for 1940 (under age 5) were not available for each sex separately; figures for males and females were estimated from the figures for both sexes combined on the basis of the proportionate distribution by sex of the *resident* Black-and-other-races population under 5 years of age in each State. Since few people live outside their State of birth at these ages, the distribution of the resident population by sex could be considered a close approximation to the distribution of the State-of-birth population. Comparison of sex ratios of the resident population and the State-of-birth population under 5 years of age for States from the 1950 census confirms this assumption.

[5] The census counts on State of birth in 1970 were based jointly on the 5- and 15-percent samples. The two samples were combined in the manner described in Chapter II, "Use of Sample Data on State of Birth," for the White population.

between the previous census and 1970.[6] In using the national rates, it was implicitly assumed that the relative change in completeness of coverage between censuses was the same for each State of birth for a given age cohort. Although some variation between States in the change of coverage between censuses must have occurred, small differences in coverage should not appreciably affect the comparison between the actual count of persons born in each State and the expected number represented by equations (3.3) to (3.7).

Certain other assumptions were made, analogous to those made in connection with the methodology for estimating coverage of the White population under 35 years of age (ch. II). These related to the following items:

a. The same types of 5-year life table survival rates that were cumulated to survive birth cohorts to 1970 for estimating the coverage of the population under age 35 for States were used here (${}_nS_{i,x-n}$ in equation 3.5) to survive census State-of-birth cohorts from ages 0–4 or 5–9 to 1970. Since the survival rates were derived from life tables for the resident population of States, rather than from State-of-birth life tables, it was assumed that differences between State-of-birth mortality and State-of-residence mortality were negligible (app. B).

b. Nonresponses to the State-of-birth question were allocated pro rata (*UNK* in equations 3.3 and 3.4), and it was assumed that use of alternative allocation schemes would not result in essentially different distributions of the population by State of birth (app. C).

c. The native Black-and-other-races population living abroad (*OP* in equations 3.3 and 3.4) was distributed by State of birth on the basis of the two-step proration procedures described in connection with the methodology for Whites (ch. II). It was assumed in this procedure that the undercoverage of the census figure on Americans living abroad is negligble, that the State-of-birth distribution of the overseas population from each State resembled that of the population resident in each State, and that each State's share of the overseas populaton, by age, sex, and race, was the same as the State's proportion of the United States resident population.

Findings. The inconsistencies that are shown by the comparison of the reconstructed State-of-birth figures and the reported State-of-birth data in 1970 are summarized in table III–C for data aggregated to the regional level. These figures clearly demonstrate that the reporting of State of birth in the 1970 census for Blacks was seriously inconsistent with the reporting in previous censuses. The positive signs of the differences for the Northeast, the North Central, and the West regions indicate that States in these regions were *overreported* as States of birth in the 1970 census relative to reporting in earlier censuses; the negative difference for the South reflects the *underreporting* of States in this region as States of birth in 1970. For instance, the 1970 census count of the Black-and-other-races population under 35 years of age reporting a State of birth in the Northeast (2,346,000) exceeded the expected figure based on reporting at ages 0–4 or 5–9 in previous censuses (2,113,000) by 232,000, or 11 percent. Conversely, the 1970 census count for the Black-and-other-races population under 35 born in the South (9,406,000) was 432,000, or 4.4 percent, below the expected figure (9,838,000). The amount of the deficit for the South roughly equalled the excess for the Northeast and North Central regions combined.

A comparison of the expected State-of-birth figures for geographic divisions with the 1970 census figures showed differences for the Black population under 35 years of age that exceeded 5 percent for several divisions, whereas a similar comparison for the White population showed differences under 1 percent for all divisions. As noted in chapter II, a systematic evaluation of the census data on State of birth, as described for Blacks, was also carried out for Whites.

The discrepancy in the reporting of State of birth for Blacks was substantially greater at ages 15 to 34 than at ages under 15 in all regions. For example, the 1970 census count of persons under 15 years of age born in the Northeast exceeded the expected number by 4 percent, while the count at ages 15 to 34 exceeded the expected number by nearly one-quarter. (Small inconsistencies in the two series should be interpreted with caution, since the differences may reflect the residual of other errors in the underlying data as well as the misreporting of State of birth.)

These observations all support the hypothesis that many lifetime interstate migrants reported their State of residence as their State of birth in the 1970 census. As noted earlier, a large number of southern-born Blacks live in the Northeast, the North Central, and the West regions, and the overstated State-of-birth count for these regions is almost certainly attributable to the tendency of the migrants from the South to report incorrectly their State of residence (i.e., a State in the North or West) as their State of birth. The "misreporters" responsible for the overreporting of State of birth in the North and West and the underreporting of State of birth in the South appear to be one and the same, namely, lifetime interstate migrants born in the South who reported a State in the North or West as

[6] The national rates of net census undercount used in this step were the estimates of the Census Bureau referred to earlier and published in detailed form in U.S. Bureau of the Census, 1970 Census of Population and Housing: Evaluation and Research Program PHC(E)–4, **Estimates of Coverage of Population by Sex, Race, and Age: Demographic Analysis,** 1974.

their State of birth in the 1970 census. Finally, the finding of larger discrepancies in the reporting of State of birth at ages 15 to 34 than at ages under 15 is consistent with this pattern of misreporting since the number of lifetime migrants in a birth cohort (those subject to the risk of misreporting a State of residence as State of birth) generally increases with age.

REVISED ESTIMATION OF COVERAGE BASED ON STATE-OF-BIRTH DATA FOR 1970

Method of Estimation

The magnitude of the errors in the reporting of State of birth revealed by the preceding evaluation called for the rejection of the 1970 census data on State of birth as too biased for estimating the coverage of the Black-and-other-races population of States under age 35 in 1970. The basic methodology employing census data on State of birth to derive coverage estimates could still be followed, however, by incorporating the technique of estimating the State-of-birth series for 1970 just described. Specifically, the reconstructed State-of-birth figures for 1970 can be substituted for the 1970 census data and then compared with the corrected population of the States born in each State based on birth statistics, to derive adjusted estimates of net census error rates for 1970 for the population born in each State. This alternative methodology was used here to compute revised estimates of net census undercount rates for the Black-and-other-races population under 35 years of age born in each State.

The corresponding figures aggregated for geographic divisions and regions are presented in table III–D. The denominators of the coverage estimates in tables III–A and III–D are the same, i.e., the corrected populations of States based on birth statistics. Only the numerators differ. The coverage estimates in table III–A are computed from 1970 census data on State of birth and the coverage estimates in table III–D are computed from reconstructed State-of-birth populations in 1970 derived from State-of-birth data in previous censuses.

Description of Results

The differences between the net census error rates computed with the two State-of-birth series are striking. Incorporating the reconstructed series transformed the implausible net overcounts and extremely large undercounts into undercounts that display moderate geographic variation around the national rates. In fact, with the exception of the West, the regional pattern conforms to the variation noted earlier in the net census error rates for the White population, i.e., relatively high undercount rates in the South and relatively low rates in the Northeast and North Central regions. While the level of coverage for Whites born in the West was intermediate between that of the North and that of the South, the estimates of coverage for the Black-and-other-races population born in the West, based on reconstructed State-of-birth data, indicate relatively large undercount rates, especially at ages under 15.

The net census error rates for the Black-and-other-races population under 35 years of age born in each State, derived from reconstructed 1970 "census" State-of-birth series, seem to be logical and consistent. Accordingly, the alternative methodology involving the reconstructed "census" figures and the corresponding net census error rates were accepted for use in later stages of calculation.

Conversion from State-of-Birth to State-of-Residence Coverage Estimates

A major step remained before the coverage estimates based on the reconstructed 1970 census data on State of birth for Blacks and other races could be used in combination with the coverage estimates for Whites to derive coverage estimates for the total population under 35 years of age. This step involved the conversion of the net undercount rates for Blacks from the form of State-of-birth error rates to State-of-residence error rates. To perform this conversion, a cross-classification of State-of-birth data with State-of-residence data was required to "weight" the State-of-birth coverage estimates according to the two alternative conversion assumptions (i.e., that coverage is a function of the State of birth or that coverage is a function of the State of residence). Since the reconstructed 1970 census State-of-birth series for the Black-and-other-races population did not provide a cross-classification with State of residence, such as is required for the conversion procedure, the 51 x 51 matrix had to be estimated.

The actual 1970 census cross-tabulation of State of birth with State of residence for the Black-and-other-races population under 35 years of age served as the starting point in this estimation procedure. First, the estimated number of misreports for States that were overreported as States of birth (reflected by positive measures of inconsistency) were allocated to other States according to the distribution by State of birth of the resident population reported as born in another State. In effect, this step reduced the census count of persons born in each State for the States that were overreported as places of birth to the levels for these States as reconstructed, while building up the State-of-birth counts for States that were underreported in 1970 as places of birth (reflected by negative measures of inconsistency).

After this initial allocation, the 51 x 51 State matrix was adjusted by a two-way proportionate procedure to the marginal State-of-birth totals based on the reconstructed census figures and to the marginal State-of-residence totals from the 1970 census. This procedure was repeated until additional iterations had no further effect on the distributions of the population by State of birth or State of residence. The completion of these steps produced an adjusted State-of-birth-by-State-of-residence matrix consistent with the reconstructed data on State of birth and with the census counts on State of residence. This adjusted matrix was then used for weighting the State-of-birth coverage estimates for the Black-and-other-races population under 35 years of age in the conversion to State-of-residence estimates, in accordance with the procedures described for the White population in chapter II.

Review and Evaluation of Results

Review of results. Estimates of the percents of net undercount for the Black-and-other-races resident population under 35 years of age are shown in table III-E for census regions, divisions, and States.[7] The first four columns of the table show estimates based on the two limiting assumptions regarding the difference in the omission rates of migrants and nonmigrants (B=1 and B=2) and the two limiting assumptions regarding the State-of-birth distribution of nonresponses (A=1 and A=5), for series SOR-1 and series SOR-2. Columns 5 and 6 of the table show composite estimates (SOR-3), derived by averaging the SOR-1 and SOR-2 series equally.[8] The ranges between the high and low estimates among the different series for each region, division, and State are shown in columns 7 and 8. Table III-F presents summary measures of the differences among the various sets of estimates.

[7] The coverage estimates are not shown separately in table III-E for the Black population or other-races population; however, the estimates may be viewed as reflecting the level of coverage for a separate racial group in States where this racial group comprised the bulk of the Black-and-other races population in 1970. For instance, Blacks accounted for over 95 percent of the total population of Black and other races in every southern State except Oklahoma; hence, the estimates for these States in table III-E can be considered to represent the coverage of Blacks alone.

[8] The initial estimates of the percents of net undercount for States in each series were adjusted to the preferred national estimate for the Black-and-other-races population under 35 years of age by applying the procedure described for the White population (Chapter II, "Presentation and comparison of results"). The method followed to adjust the coverage estimates for the White population in the District of Columbia, Maryland, and Virginia for biases in the "occurrence/residence" reporting of State of birth was also employed to adjust the estimates for the Black-and-other-races population in these areas.

The estimated net undercounts for the Black-and-other-races resident population under 35 years of age are much higher than the corresponding estimates for the White population and exhibit substantially more variability between the various series of estimates. For regions, the range between the high and low values is slightly under 2 percent; the range is considerably greater for several of the divisions and most States. This variability reflects the sensitivity of the estimates to differences in the assumptions regarding the relative coverage of migrants and nonmigrants (B factor) and the assumption as to whether the State of birth or State of residence is the principal determinant of coverage (SOR model). Since migration of the Black-and-other-races population has been substantial for all regions, the migration factor and SOR model have considerable effect on the coverage estimates.

The geographic patterning of the undercount of Blacks and other races for the regions varies among different series of estimates as a result of the sensitivity of the estimates to the alternative assumptions. The shift in the level of coverage in the South relative to the other regions is particularly noticeable in table III-E. The net undercount is greatest in the South according to three series of estimates and lowest in the South in two other series. The ranking of the other three regions on the basis of the level of the percent of net undercount is more consistent; the net undercount in the West is highest or second highest in all six series, the estimate of net undercount in the Northeast is intermediate in all series, and the net undercount in the North Central region is lowest in all but one of the series.

The summary measures in table III-F show that, like the regions, the alternative estimates of net undercounts for the Black-and-other-races population under age 35 for States vary considerably; the average absolute difference between the estimates for any two series is greater than 1.0 percentage point. However, the relatively high correlation coefficients (ranging from .744 to .988) show that there is an overall consistency among the various sets of estimates in the geographic pattern of the net undercounts for States. There are few cases where extreme values, either net overcounts or excessively large undercounts appear in table III-E. For the two SOR-3 sets of estimates, which are the figures used to develop net coverage estimates for the total population of States, a net overcount is estimated for only one State (Connecticut in series SOR-3, A=1, B=1), and large net undercounts (exceeding 15 percent) are estimated for only four States in series SOR-3, A=1, B=1 (South Dakota, Arkansas, Arizona, and Alaska) and for three States in series SOR-3, A=5 B=2 (South Dakota, Arizona, and Nevada).

General evaluation of results. The coverage estimates obtained for the Black-and-other-races population

under 35 years of age by the alternative procedures appear reasonable. Yet, this does not say that they are accurate. In spite of the apparent reasonableness of the estimates, we have serious reservations about their accuracy. First, the coverage estimates for the Black population under 35 years of age are subject to the many types of errors affecting the coverage estimates for the White population under age 35 as discussed in chapter II. These types of errors apply with even greater intensity to the estimates for the Black population. For example, the estimates of births and of survival rates are undoubtedly less accurate, especially for particular States where the completeness of registration of births was shown to be very low or exceptionally high in 1940.

Next, it should be evident that the estimates of the expected 1970 "census" population born in each State based on prior censuses are merely hypothetical constructs designed to show what the 1970 census counts for the population born in each State would be on the assumption that the underlying census coverage levels were the same in 1970 as before but that the bias in reporting State of birth was eliminated. Estimates of this kind are subject to considerable uncertainty of interpretation. The mere concept of measuring coverage error in a set of numbers representing census data which are estimates derived wholly independently of that census has a metaphysical quality. In deriving these estimates of 1970 "census" data, a relatively weak body of data and a number of untestable assumptions had to be utilized. A number of refinements could have been attempted in preparing the estimates but their contribution was viewed as small and uncertain. Hence, the resulting coverage estimates are subject to considerable error—substantially greater error than the corresponding estimates for the White population.

Accordingly, the coverage estimates for the Black-and-other-races population under 35 years of age for States developed here have little independent validity and are not offered as satisfactory estimates of this group considered separately. In the absence of a more reliable method for deriving coverage estimates for the Black-and-other-races population of States under age 35, however, the methodology described in this section seems to be reasonable as a vehicle for contributing to the principal objective of this study, i.e., the production of coverage estimates for the total population of States. For many States in which the Black population is small, errors in the coverage estimates for Blacks do not have much effect on the quality of the coverage estimates for the total population of States. In these cases, the accuracy of the estimates depends largely on the quality of the coverage estimates for Whites. For States with relatively large Black populations, however, the coverage estimates for the total population are subject to a greater range of error. Further discussion of the errors in the coverage estimates for the total population of States is given in chapter VII.

Table III-A. PRELIMINARY ESTIMATES OF THE PERCENTS OF NET UNDERCOUNT FOR THE BLACK-AND-OTHER-RACES POPULATION UNDER 35 YEARS OF AGE, BY AGE, BORN IN EACH REGION AND DIVISION, BASED ON STATE-OF-BIRTH DATA FROM THE 1970 CENSUS: 1970

(Percents shown are complements of coverage rates. In the coverage rates, the numerator is the State-of-birth "count" from the 1970 census and the denominator is the corrected State-of-birth "count" based on birth statistics. State-of-birth nonresponses in the 1970 census have been prorated according to the distribution of reported States of birth. The birth statistics are an average of births by place of residence and births by place of occurrence. A minus sign denotes a net overcount)

Region and division	Under 35 years	Under 5 years	5 to 14 years	15 to 24 years	25 to 34 years
United States	7.6	10.3	5.3	5.6	12.7
Regions:					
Northeast	-4.2	9.4	-0.7	-11.8	-30.3
North Central	-0.3	10.3	2.3	-6.7	-17.7
South	12.1	9.6	7.1	11.6	21.3
West	7.3	14.2	9.1	2.3	-1.6
Northeast:					
New England	-3.3	10.2	-0.9	-19.4	-19.4
Middle Atlantic	-4.2	9.3	-0.7	-11.2	-31.3
North Central:					
East North Central	-1.6	10.1	1.2	-7.7	-26.3
West North Central	4.8	11.4	6.7	-2.9	4.3
South:					
South Atlantic	12.1	10.8	7.8	11.0	20.7
East South Central	13.6	7.9	6.6	14.1	24.1
West South Central	10.6	8.9	6.2	9.9	19.4
West:					
Mountain	11.9	19.2	15.2	5.2	3.6
Pacific	6.1	13.0	7.6	1.6	-3.2

Table III-B. FACTORS USED TO ADJUST ESTIMATES FOR 1970 OF THE EXPECTED BLACK-AND-OTHER-RACES POPULATION UNDER 35 YEARS OF AGE, BY AGE, BORN IN EACH STATE, BASED ON CENSUSES PRIOR TO 1970, TO THE CORRESPONDING ASSIGNED NATIONAL TOTALS BASED ON THE 1970 CENSUS

In 1970 census	In previous census		Adjustment factor	
Age	Age	Date	Male	Female
0 to 4 years[1]	(X)	(X)	1.00000	1.00000
5 to 9 years[2]	(X)	(X)	1.00299	1.00270
10 to 14 years	0 to 4 years	1960	.99597	1.00127
15 to 19 years	5 to 9 years	1960	.99529	.99604
20 to 24 years	0 to 4 years	1950	.96366	.97869
25 to 29 years	5 to 9 years	1950	.96081	.97904
30 to 34 years	0 to 4 years	1940	.95992	.99753

X Not applicable.

[1]No adjustment was made for ages 0-4 since the 1970 census State-of-birth data were used.

[2]Although no direct comparison can be made with a previous census for the cohort aged 5 to 9 in 1970, inconsistencies in the reporting of State-of-birth at these ages were estimated by interpolating between the inconsistency measures for ages 10 to 14 and ages 0 to 4 in 1970.

Table III-C. COMPARISON OF ESTIMATES FOR 1970 OF THE BLACK-AND-OTHER-RACES POPULATION UNDER 35 YEARS OF AGE BORN IN EACH REGION, BASED ON REPORTING OF REGION OF BIRTH IN THE CENSUSES PRIOR TO 1970, WITH 1970 CENSUS DATA ON THE POPULATION REPORTING THE SAME REGION OF BIRTH

(Numbers in thousands)

Age and region of birth	Expected, 1970[1]	Reported, 1970[2]	Excess or deficit of reported number	
			Amount	Percent
UNDER 35 YEARS				
United States	15,960	15,960	-	-
Northeast	2,113	2,346	+232	+11.0
North Central	2,467	2,630	+163	+6.6
South	9,838	9,406	-432	-4.4
West	1,541	1,578	+37	+2.4
UNDER 15 YEARS				
United States	8,630	8,630	-	-
Northeast	1,376	1,432	+56	+4.1
North Central	1,584	1,606	+23	+1.4
South	4,700	4,627	-74	-1.6
West	970	965	-5	-0.6
15 TO 34 YEARS				
United States	7,330	7,330	-	-
Northeast	737	913	+176	+23.8
North Central	884	1,024	+140	+15.9
South	5,137	4,779	-358	-7.0
West	571	613	+42	+7.3

- Represents zero.

[1]State-of-birth count expected in the 1970 census based on reporting of State of birth at ages 0 to 4 or 5 to 9 in 1940, 1950, 1960, and 1970 censuses. See text for description of methodology.

[2]State-of-birth count in the 1970 census, adjusted for nonresponse by proration.

Table III-D. ADJUSTED ESTIMATES OF THE PERCENTS OF NET UNDERCOUNT FOR THE BLACK-AND-OTHER-RACES POPULATION UNDER 35 YEARS OF AGE, BY AGE, BORN IN EACH REGION AND DIVISION, BASED ON STATE-OF-BIRTH DATA FROM THE 1940, 1950, 1960, AND 1970 CENSUSES: 1970

(Percents shown are complements of coverage rates. In the coverage rates, the numerator for ages 5-14, 15-24, and 25-34 is the expected State-of-birth "census count" based on the 1940, 1950, and 1960 censuses--column 1 in table III-C, and the denominator is the corrected State-of-birth "count" based on birth statistics. The birth statistics are an average of births by place of residence a and births by place of occurrence. The percent for ages under 5 is the same as the percent identified in column 2, table III-A. A minus sign denotes a net overcount)

Region and division	Under 35 years	Under 5 years	5 to 14 years	15 to 24 years	25 to 34 years
United States	7.6	10.3	5.3	5.6	12.7
Regions:					
Northeast	6.2	9.4	5.3	3.2	8.7
North Central	5.9	10.3	4.3	3.7	8.5
South	8.1	9.6	5.0	6.3	13.7
West	9.5	14.2	8.4	6.7	10.3
Northeast:					
New England	3.0	10.2	1.2	-4.3	5.4
Middle Atlantic	6.5	9.3	5.7	3.8	9.0
North Central:					
East North Central	5.2	10.1	3.3	3.2	7.6
West North Central	8.6	11.4	8.3	5.7	10.7
South:					
South Atlantic	8.8	10.8	6.1	6.5	14.2
East South Central	6.6	7.9	2.6	5.5	12.1
West South Central	8.2	8.9	5.1	6.7	14.4
West:					
Mountain	11.9	19.2	13.2	8.4	3.4
Pacific	8.8	13.0	7.2	6.3	12.6

Table III-E. ALTERNATIVE ESTIMATES OF THE PERCENTS OF NET UNDERCOUNT FOR THE BLACK-AND-OTHER-RACES POPULATION UNDER 35 YEARS OF AGE RESIDENT IN EACH REGION, DIVISION, AND STATE: 1970

(See text for explanation of alternative procedures. The birth statistics used to derive all the estimates are an average of births by place of residence and births by place of occurrence. A minus sign denotes a net overcount)

Region, division, and State	SOR-1		SOR-2		SOR-3		Range		
	A=1, B=1	A=5, B=2	A=1, B=1	A=5, B=2	A=1, B=1	A=5, B=2	Low value	High value	Difference
United States, total	6.6	6.6	6.6	6.6	6.6	6.6	(X)	(X)	(X)
Regions:									
Northeast	5.8	7.0	5.1	6.4	5.4	6.7	5.1	7.0	1.9
North Central	5.7	6.6	4.8	5.9	5.2	6.2	4.8	6.6	1.8
The South	7.1	6.0	7.7	6.3	7.4	6.2	6.0	7.7	1.7
The West	7.0	8.0	6.9	8.8	6.9	8.4	6.9	8.8	1.9
Northeast:									
New England	4.0	6.2	2.3	2.5	3.2	4.4	2.3	6.2	3.9
Middle Atlantic	6.0	7.1	5.4	6.8	5.7	7.0	5.4	7.1	1.7
North Central:									
East North Central	5.2	6.3	4.1	5.3	4.7	5.8	4.1	6.3	2.2
West North Central	7.8	8.1	8.1	8.7	7.9	8.4	7.8	8.7	0.9
South:									
South Atlantic	7.7	6.8	8.4	7.7	8.1	7.3	6.8	8.4	1.6
East South Central	5.7	4.0	5.8	2.3	5.8	3.2	2.3	5.8	3.5
West South Central	6.9	5.8	7.8	6.5	7.4	6.2	5.8	7.8	2.0
West:									
Mountain	10.3	10.2	11.2	13.2	10.7	11.7	10.2	13.2	3.0
Pacific	6.4	7.6	6.1	8.0	6.2	7.8	6.1	8.0	1.9
New England:									
Maine	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(X)	(X)
New Hampshire	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(X)	(X)
Vermont	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(X)	(X)
Massachusetts	4.8	6.5	3.1	3.6	4.0	5.0	3.1	6.5	3.4
Rhode Island	8.4	9.2	11.3	15.8	9.9	12.6	8.4	15.8	7.4
Connecticut	2.1	5.2	-3.8	-2.8	-0.8	1.4	-3.8	5.2	9.0
Middle Atlantic:									
New York	6.0	7.1	5.1	6.4	5.5	6.8	5.1	7.1	2.0
New Jersey	6.7	8.2	6.6	9.4	6.7	8.8	6.6	9.4	2.8
Pennsylvania	5.6	6.2	5.0	5.5	5.3	5.9	5.0	6.2	1.2
East North Central:									
Ohio	3.7	4.7	2.2	2.5	2.9	3.6	2.2	4.7	2.5
Indiana	5.2	6.0	4.2	4.6	4.7	5.3	4.2	6.0	1.8
Illinois	6.9	7.6	6.8	8.8	6.9	8.2	6.8	8.8	2.0
Michigan	4.2	5.7	2.2	3.2	3.2	4.5	2.2	5.7	3.5
Wisconsin	4.4	6.3	1.3	1.8	2.9	4.1	1.3	6.3	5.0
West North Central:									
Minnesota	4.2	5.8	1.6	1.6	2.9	3.7	1.6	5.8	4.2
Iowa	4.3	6.2	0.4	-1.0	2.4	2.7	-1.0	6.2	7.2
Missouri	8.1	8.2	8.8	10.6	8.5	9.4	8.1	10.6	2.5
North Dakota	8.5	7.2	8.7	3.2	8.6	5.2	3.2	8.7	5.5
South Dakota	15.4	12.7	20.5	24.4	18.0	19.0	12.7	24.4	11.7
Nebraska	9.2	9.7	11.8	14.4	10.5	12.1	9.2	14.4	5.2
Kansas	6.5	7.6	4.5	-0.5	5.5	3.7	-0.5	7.6	8.1
South Atlantic:									
Delaware	6.2	6.9	6.1	6.5	6.2	6.7	6.1	6.9	0.8
Maryland[1]	8.4	9.6	9.5	12.6	8.9	11.1	8.4	12.6	4.2
District of Columbia[1]	5.5	5.4	5.6	5.4	11.5	5.4	5.4	11.5	6.1
Virginia[1]	5.9	5.5	5.6	4.5	5.8	5.0	4.5	5.9	1.4
West Virginia	4.8	3.4	4.4	-2.4	4.6	0.6	-2.4	4.8	7.2
North Carolina	7.0	5.6	7.3	5.2	7.2	5.4	5.2	7.3	2.1
South Carolina	9.4	6.7	11.5	8.5	10.4	7.6	6.7	11.5	4.8
Georgia	9.2	7.2	10.6	9.0	9.9	8.1	7.2	10.6	3.4
Florida	7.7	7.9	7.9	8.9	7.8	8.4	7.7	8.9	1.2
East South Central:									
Kentucky	2.6	2.8	0.8	-0.9	1.7	1.0	-0.9	2.8	3.7
Tennessee	6.0	5.1	5.9	4.3	5.9	4.7	4.3	6.0	1.7
Alabama	5.2	3.4	5.1	1.5	5.2	2.5	1.5	5.2	3.7
Mississippi	6.8	4.2	7.7	2.4	7.3	3.3	2.4	7.7	5.3
West South Central:									
Arkansas	13.9	9.2	21.7	18.0	18.0	13.8	9.2	21.7	12.5
Louisiana	6.3	4.9	6.4	4.4	6.3	4.7	4.4	6.4	2.0
Oklahoma	8.8	8.0	10.4	10.9	9.6	9.5	8.0	10.9	2.9
Texas	5.3	5.3	4.6	4.1	4.9	4.7	4.1	5.3	1.2
Mountain:									
Montana	11.1	9.6	13.4	13.9	12.3	11.8	9.6	13.9	4.3
Idaho	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(X)	(X)
Wyoming	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(X)	(X)
Colorado	4.6	7.8	-4.2	-6.9	0.4	1.0	-6.9	7.8	14.7
New Mexico	9.5	9.3	10.2	10.8	9.9	10.1	9.3	10.8	1.5
Arizona	14.1	11.9	18.1	20.1	16.1	16.2	11.9	20.1	8.2
Utah	9.3	11.1	10.0	9.4	9.7	10.3	9.3	11.1	1.8
Nevada	10.9	12.3	17.9	31.3	14.5	23.0	10.9	31.3	20.4
Pacific:									
Washington	9.5	10.1	14.0	17.6	11.8	14.0	9.5	17.6	8.1
Oregon	7.3	8.7	7.5	9.3	7.4	9.0	7.3	9.3	2.0
California	6.3	8.1	5.6	8.2	6.0	8.1	5.6	8.2	2.6
Alaska	14.0	12.1	16.6	17.6	15.4	14.9	12.1	17.6	5.5
Hawaii	3.7	2.8	2.7	0.6	3.2	1.7	0.6	3.7	3.1

B Enumerated Black-and-other-races population less than 10,000.
X Not applicable.
[1]Adjusted (see text).

Table III-F. AVERAGE ABSOLUTE DIFFERENCES AND CORRELATION COEFFICIENTS FOR ALTERNATIVE ESTIMATES OF THE PERCENTS OF NET UNDERCOUNT FOR THE BLACK-AND-OTHER-RACES POPULATION UNDER 35 YEARS OF AGE RESIDENT IN EACH STATE: 1970

(Based on 46 State areas. Average absolute differences are shown above the diagonal line; product-moment correlation coefficients are shown below the diagonal line)

Series	SOR-1		SOR-2		SOR-3	
	A=1, B=1	A=5, B=2	A=1, B=1	A=5, B=2	A=1, B=1	A=5, B=2
SOR-1, A=1, B=1		1.376	1.924	3.513	1.096	1.806
SOR-1, A=5, B=2	.836		2.978	3.833	2.237	1.939
SOR-2, A=1, B=1	.956	.744		2.263	1.085	1.930
SOR-2, A=5, B=2	.855	.830	.912		2.844	1.894
SOR-3, A=1, B=1	.957	.758	.977	.885		1.706
SOR-3, A=5, B=2	.874	.902	.893	.988	.876	

Source: Based on estimates shown in table III-E.

Chapter IV. Coverage of the White Population 35 to 64 Years of Age

GENERAL METHODS AND ISSUES

Estimation of the coverage error for the White population aged 35 to 64 for States in 1970 was carried out in two steps. First, estimates of the coverage error for one sex were derived from the coverage estimates for that sex at ages under 35 and then converted to estimates of corrected population for that sex. Second, estimates of the corrected population of the other sex were derived by applying expected sex ratios (the "true" ratio of males to females) to the estimates of the corrected population for the first sex.

Within the framework of this general procedure, a number of alternative approaches are possible. These are equally plausible and cannot easily be differentiated with respect to accuracy because of the lack of independent procedures for validating them. The options include: (a) use of alternative sets of coverage estimates for Whites under 35 years of age; (b) varying the order of derivation of coverage estimates for males or females aged 35 to 64; and (c) varying the mathematical form of the measure of coverage. The sensitivity of the coverage estimates to a range of assumptions and procedures will be illustrated in later sections of this chapter.

Coverage estimates for the ages 35 to 64 cannot be prepared by the methods used for the population under age 35 principally because of the lack of adequate data on births for States prior to 1935. The Birth Registration Area (BRA) did not encompass the 48 conterminous States and the District of Columbia until 1933 and adequate estimates of the underregistration of births for States are not available until about 1935. In addition, data on births are not available for the oldest cohorts, those aged 55 to 64 in 1970 (i.e., persons born from 1905 to 1915), for any of the States. This lack of basic data forced the "reconstruction" of the population aged 35 to 64 in 1970 on the basis of very indirect methods.

DERIVATION OF EXPECTED SEX RATIOS

As stated, estimates of the expected White population of a given sex aged 35 to 64 years of age in 1970 were derived by applying expected sex ratios to the corrected population of the other sex. The expected sex ratios were designed to relate to the resident population since they were to be applied to the resident population of one sex (rather than to the State-of-birth population) to secure estimates of the resident population of the other sex. The theoretical model for developing these ratios calls for combining allowances for the births, deaths, inmigration, and outmigration of the resident population of the State, for each sex, separately, as summarized by the equation

$$\hat{ESR}^{1970}_{jk} = \frac{EP^{m,\,1970}_{SOR(j),k}}{EP^{f,\,1970}_{SOR(j),k}} = \frac{B^m_{jk} - D^m_{jk} + I^m_{jk} - O^m_{jk}}{B^f_{jk} - D^f_{jk} + I^f_{jk} - O^f_{jk}} \qquad (4.1)$$

where the superscripts, m and f, denote male and female, respectively, and the subscripts denote a State j and a 5-year age group k. The expected sex ratio for a given age group, $\hat{ESR}^{1970}_{jk}$, is the ratio of the corrected (or expected) male population, EP^m_{jk}, to the corrected female population, EP^f_{jk}, for the age group. In the equation, the corrected population of cohort k resident in State j in 1970, $EP^{1970}_{SOR(j),k}$, is the result of combining the four components: the births occurring in State j during the period when members of cohort k were born, B_{jk}; the migrants into State j who belong to birth cohort k, counted at the time they enter State j, I_{jk}; the members of cohort k who migrate out of State j, counted at the time they leave the State, O_{jk}; and the deaths occurring to members of cohort k residing in State j at the time they die, D_{jk}.

The expected sex ratios were not actually derived according to equation (4.1), however. The data were not available to estimate the four components of this theoretical model directly. Instead, life tables rather than death statistics and data on net lifetime migration obtained in the census rather than data on gross cumulative migration were used. The use of life tables to estimate deaths to the resident population fails to allow for the deaths of inmigrants and includes an erroneous allowance for the deaths of outmigrants. Fortunately, this error is precisely offset by the use of an allowance for net lifetime migration based on census data, that is, surviving net migrants, which excludes persons who moved and died prior to 1970. Hence, the balance in the theoretical model is preserved.

To adapt the calculations to the use of life tables and to improve the quality of the results, the sex ratios of four components, or factors allowing for the components, were combined multiplicatively to de-

rive the expected sex ratios, instead of combining absolute numbers in additive fashion. These four components are: (1) the sex ratio at birth (calculated from data on registered births by sex or estimated by reverse extrapolation); (2) the sex ratio of survival rates from birth to ages in 1970 (interpolated from official or estimated life tables); (3) an adjustment for war mortality; and (4) a factor representing the effect of net lifetime migration on the balance of the sexes. Thus, the expected sex ratios for States (subscript j) were derived for 5-year age groups in the range 35 to 64 in 1970 (subscript $k=1$ for ages 35 to 39, . . . $k=6$ for ages 60 to 64) according to the following formula:

$$ESR_{jk} = (B^m_{jk}/B^f_{jk})\,(S^m_{jk}/S^f_{jk})\,(W_k)\,(M_{jk}) \qquad (4.2)$$

where

ESR_{jk} = expected sex ratio in State j for age group k

B_{jk} = registered births in State j for cohort k. (If absolute figures are unavailable, the sex ratio of births B^m_{jk}/B^f_{jk} or SRB_{jk}, is estimated directly as a unit.)

S_{jk} = cumulative (generation) survival rate from birth to age in 1970 for cohort k born in State j, estimated from various life tables for State j

W_k = adjustment for war mortality of males to cohort k (made in 1970)

M_{jk} = migration factor for cohort k in State j, representing the effect of the male-female balance of net lifetime migration from birth to age group k in 1970 (applied in 1970).

The superscripts, m and f, denote male and female, respectively.

Sex Ratios of Births

Sex ratios of births were calculated for 1930–35 1925–30, . . ., 1905–10 (covering births occurring from April 1 of the earlier year through March 31 of the later year). These years correspond to the quinquennial age groups, 35–39, 40–44, . . ., 60–64, on the census date, April 1, 1970. The sex ratios were derived from registered births for 1915 and later years, as available. For those States which were in the BRA for an entire 5-year period, the sex ratio of births was computed directly from registered births. For those States which were not in the BRA at all during a 5-year period or which entered during a 5-year period (for the periods 1930–35, 1925–30, and 1920–25), the sex ratio of births was estimated by substituting the sex ratio of births for the same period in a "guide" State or combination of States. The guide States were chosen for their similarity to the non-BRA States with respect to geographic location and fertility pattern. For 1930–35, four substitutions were made; for 1925–30, there were 17; and for 1920–25, there were 29. The particular substitutions and guide States are enumerated in appendix E.

For 1915–20, complete data are available for only nine States, a selection too small to use as guide States. Consequently, a different estimation procedure was used for the other 41 States and the District of Columbia for this period. The sex ratio of births for each State at the first available period for the State was adjusted by the difference between the sex ratios of births in the orignial BRA States for 1915–20 and that period. The formula for the adjustment can be written as

$$\hat{SRB}^{1915-20}_i = SRB^t_i + (SRB^{1915-20}_{BRA} - SRB^t_{BRA}) \qquad (4.3)$$

where

$\hat{SRB}^{1915-20}_i$ = estimated sex ratio of births for State i during 1915–20

SRB^t_i = sex ratio of births for State i during the first 5-year period (t) in which State i was in the BRA for the whole period

$SRB^{1915-20}_{BRA}$ = sex ratio of births for the original BRA during 1915–20

SRB^t_{BRA} = sex ratio of births for the original BRA during period t.

For the two periods prior to 1915–20, i.e., 1910–15 and 1905–10, no data on registered births are available. The sex ratios of births for each of 48 State areas in these periods were assumed to be the same as the State figures for 1915–20. For three States (Delaware, Arizona, and Nevada), the averages of the sex ratios at birth for the four periods 1915–20 through 1930–35 were assigned as the sex ratios for the periods 1910–15 and 1905–10, because the recorded values for 1915–20 deviated substantially from the values for later periods in each State.

The calculation of sex ratios of births on the basis of registered births of males and females for 1915 and later years implies the assumption for each State that the completeness of registration of male births and female births is the same. The adoption of this assumption obviates the need to determine the actual degree of underregistration of births of each sex. Formal evidence regarding the relative completeness of registration of boys and girls is lacking in the earlier years of this period, but there is no reason to expect a bias in the tendency for a birth to be registered as male or female in the United States milieu.

Sex Ratios of Cumulative Survival Rates

The sex ratios of births for each 5-year period, derived by the procedure just outlined, were "survived" to 1970 by the ratio of male to female survival rates for each 5-year time period from the 5-year period of birth to 1965–70. The information on lifetime mortality was derived from life tables for the White population of each State applicable to the various quinquennia during which a 5-year birth cohort lived. The life tables employed relate to the mortality experience of the *resident* population in each State although the survival rates computed from them were applied to the *births* in each State. This procedure fits the demographic exigencies of producing expected sex ratios for the *resident* population, as descrbied earlier.

The values needed from the life tables to compute the sex ratio of survival rates are 5-year survival rates for each sex which apply to the 5-year birth cohorts of 1905–10 to 1930–35. The particular ages required vary, depending on the year and the birth cohort. In conventional life table notation, the general formula for the sex ratio of survival rates between two 5-year age groups is

$$\frac{{}_5S^m_{x,\,x+5}}{{}_5S^f_{x,\,x+5}} = \left(\frac{{}_5L^m_{x+5}}{{}_5L^m_x}\right) \div \left(\frac{{}_5L^f_{x+5}}{{}_5L^f_x}\right) \qquad (4.4)$$

Such sex ratios of survival rates had to be computed, as appropriate, from a series of life tables for States. The basic set of life tables consists of tables for States for 1969–71, 1959–61, 1949–51, 1939–41, 1929–31, 1919–20, 1909–11, and 1900–1902.[1] As with the sex ratios at birth, substitutions had to be made to serve for data that were lacking.

For 1950, 1960, and 1970, complete sets of life tables for White males and females for the States were available.[2] For 1920, 1930, and 1940, substitutions were made for those States for which life tables were not available. The selection of "guide" States for the State life tables followed the procedure described for the selection of substitute States in estimating the sex ratios of births. For 1940, two substitutions were made; for 1930, three; and for 1920, twenty-six. The particular substitutions and guide States are enumerated in appendix E.

For 1900 and 1910, only five State life tables are available. These tables, which relate to the total population rather than the White population, were used for the five States themselves and as guides for eight other States. For the remaining 38 States, satisfactory guide data were not available and ratio methods were employed to derive estimates of the required survival rates. Five-year survival rates were computed from available life tables for the area comprised of the 10 Original Death Registration States and the District of Columbia (ODRS) in 1900, 1910, and 1920. The assumption employed in computing life table survival rates for the non-ODRS States which did not have guide States was that the percentage changes in the 5-year mortality rates (complements of 5-year survival rates) for the State from 1900 or 1910 to 1920 were the same as the percentage changes in mortality rates for the ODRS. This relationship can be expressed as

$${}_5S^t_{i,\,x} = 1.0 - (1.0 - {}_5S^{1920}_{i,\,x})\left(\frac{1.0 - {}_5S^t_{ODRS,\,x}}{1.0 - {}_5S^{1920}_{ODRS,\,x}}\right) \qquad (4.5)$$

where

${}_5S^t_{i,\,x}$ = the estimated 5-year survival rate from age group (x, $x+5$) to group ($x+5$, $x+10$) for State i at time t (either 1910 or 1900)

${}_5S^{1920}_{i,\,x}$ = 5-year survival rate for the same age group for State i in 1920

${}_5S^{1920}_{ODRS,\,x}$ = 5-year survival rate for the same age group for the Original Death Registration States in 1920

${}_5S^t_{ODRS,\,x}$ = 5-year survival rate for the same age group for the Original Death Registration States at time t (either 1910 or 1900)

The various procedures described produced survival rates for White males and White females for the 5-year periods centered on years ending in zero for every State from 1900 to 1970.

To derive the survival rates required for each 5-year time period 1905–1910 to 1965–1970 for each State, from the life table survival rates centered on years ending in zero, two linear interpolations between survival rates at the same ages for consecutive decennial years were carried out. For the earlier 5-year period, the estimating formula is

$${}_5S^{t+2.5}_{i,\,x} = 0.75\,{}_5S^t_{i,\,x} + 0.25\,{}_5S^{t+10}_{i,\,x} \qquad (4.6)$$

and for the later period, the formula is

$${}_5S^{t+7.5}_{i,\,x} = 0.25\,{}_5S^t_{i,\,x} + 0.75\,{}_5S^{t+10}_{i,\,x} \qquad (4.7)$$

These interpolated survival rates were then cumulated multiplicatively for each cohort in each State from the period of the cohort's birth to 1970. For example, the survival rate to 1970 for males born in State i during 1925–30 (i.e., the cohort aged 40–44 in 1970) can be expressed as

[1] The decennial life tables were assumed to apply to the years ending in zero.

[2] When the calculations were being carried out, the 1969–71 life tables for States had not been published; the unpublished tables were made available by the National Center for Health Statistics to the Census Bureau for the present purpose. Unpublished tables for Alaska and Hawaii for 1949–51 were also made available by the National Center for Health Statistics.

$$S^{m}_{i,\,40-44} = ({}_5S^{1927\frac{1}{2},\,m}_{i,\,Birth})\,({}_5S^{1932\frac{1}{2},\,m}_{i,\,0})\,({}_5S^{1937\frac{1}{2},\,m}_{i,\,5})\,({}_5S^{1942\frac{1}{2},\,m}_{i,\,10}) \times ({}_5S^{1947\frac{1}{2},\,m}_{i,\,15})\,({}_5S^{1952\frac{1}{2},\,m}_{i,\,20})\,({}_5S^{1957\frac{1}{2},\,m}_{i,\,25}) \times ({}_5S^{1962\frac{1}{2},\,m}_{i,\,30})\,({}_5S^{1967\frac{1}{2},\,m}_{i,\,35}) \qquad (4.8)$$

The survival rates for other cohorts were derived in a similar fashion. Thus, cumulative survival rates from birth to each 5-year age group, 35–39 to 60–64, in 1970, for White males and White females, became available for use in the general formula for calculating expected sex ratios.

Adjustment for War Mortality

Next, in estimating the expected sex ratios, it was necessary to adjust for war mortality since the official life tables do not allow for this element. The data on war mortality for World War II, the Korean Conflict, and the Vietnam War were combined to produce composite adjustments which could be applied to particular age groups in 1970. The procedure permitted a "one-time" correction of each 5-year age group in 1970 to allow for the effect of all war mortality. In preparing the adjustment factors, an allowance was made for the few deaths that would have occurred among U.S. Armed Forces overseas under normal conditions. Only one set of adjustment factors, based on the national experience, was prepared on the assumption that the percentage loss in population from war mortality did not vary from State to State.

In most cases, the adjustments were very small (table IV-A). Where the adjustment factor called for a reduction in the size of a male cohort of less than 0.5 percent, the adjustment was ignored; and no adjustments were made for the female cohorts. The cumulated survival rates for each of the male cohorts (from equation 4.8) were multiplied by the appropriate adjustment factor, W_k, to obtain survival rates adjusted for war mortality.

Adjustment for Net Lifetime Migration

The final step in calculating the expected sex ratios of the resident population in age groups 35–39 to 60–64 for each State was to adjust the "survived" sex ratios of births in these age groups for the sex balance of the net lifetime migration to the State. The product of the first three factors (i.e., sex ratio of births, sex ratio of survival rates, and the adjustment for war mortality) represents essentially the sex ratio of the survivors of the cohorts born in each of the States. To convert the sex ratios for States of birth into sex ratios for States of residence some method of allowing for the net lifetime interstate migration of each of the sexes was required. Any factor which allows for migration in this case must take into account the relative contribution of migration to population change as well as the sex ratio of the net lifetime migrants. The net migration of males and females at the same rate would have no effect on the sex ratio of the resident population. However, net inmigration of males at a rate greater than that of females would have the effect of raising the expected sex ratio and net inmigration of females at a greater rate would have the effect of lowering it.

The net effect of lifetime interstate migration to a State on a population age group in 1970 can be measured by the ratio of the population resident in the State in 1970 to the surviving population born in the State in 1970. Accordingly, a "migration adjustment" factor for use in deriving the expected sex ratio was calculated by taking the ratio of the migration effect of males to that of females[3]; i.e.,

$$M_{jk} = \left(\frac{P^{m}_{SOR(j),\,k}}{P^{m}_{SOB(j),\,k}}\right) \div \left(\frac{P^{f}_{SOR(j),\,k}}{P^{f}_{SOB(j),\,k}}\right) \qquad (4.9)$$

where

$P_{SOR(j),\,k}$ = population of cohort k reported as living in State j in the 1970 census

$P_{SOB(j),\,k}$ = population of cohort k reported as born in State j in the 1970 census

and the superscripts m and f denote male and female.

Such factors were computed for each of the six 5-year age cohorts for each of the States. They were based on a cross-tabulation of the population resident in each State and the population born in each State given by the 1970 Census. The population aged 35 to

[3] It can be shown that this ratio, which was applied as a multiplier of the approximate population born in the State and still living in 1970, allows for the increase or decrease of the resident population due to net lifetime migration—

$$\frac{P_{SOR(j),\,k}}{P_{SOB(j),\,k}} = \frac{P_{SOB(j),\,k} + \sum_{h \neq j} P^{SOB(h)}_{SOR(j),\,k} - \sum_{h \neq j} P^{SOB(j)}_{SOR(h),\,k}}{P_{SOB(j),\,k}} = \frac{P^{SOB(j)}_{SOR(j),\,k} + \sum_{h \neq j} P^{SOB(j)}_{SOR(h),\,k} + \sum_{h \neq j} P^{SOB(j)}_{SOR(j),\,k} - \sum_{h \neq j} P^{SOB(j)}_{SOR(h),\,k}}{P_{SOB(j),\,k}}$$

where

$P^{SOB(j)}_{SOR(j),\,k}$ = population of cohort k reported as born in State j and living in State j in the 1970 census

$P^{SOB(h)}_{SOR(j),\,k}$ = population of cohort k reported as born in State h and living in State j in the 1970 census ($h \neq j$)

$P^{SOB(j)}_{SOR(h),\,k}$ = population of cohort k reported as born in State j and living in State h in the 1970 census ($h \neq j$)

and the other elements are as defined in equation (4.9).

64 whose State of birth was not reported was assigned a State of birth by the procedure described in chapter II.

The census is the only satisfactory basis for estimating the adjustment factors for net lifetime migration even though it would be preferable to employ an independent source for this component. The quality of the migration adjustment factors and hence of the expected sex ratios may be affected by the use of uncorrected census statistics. Fortunately, the effect of any shortcomings in the census data is greatly reduced by employing them in ratio form to compute expected sex ratios. Since the migration adjustment factor is a ratio, only the relative difference of the error in the numerator (migration effect of males) and the error in the denominator (migration effect of females) would have any effect. The possibility of bias in the adjustment is further reduced because the numerator and denominator are each ratios. Thus, the extent of error resulting from the use of uncorrected census data on lifetime migration depends on the relative errors of the ratio of the State-of-birth population to the State-of-residence population as reported in the census for males and the corresponding ratio for females. It would appear that the error from this source is probably small in its effect on the expected sex ratios.

Combination of the Components

Each of the four factors just described were combined multiplicatively according to equation (4.2) for each of the six 5-year age groups in each of the States to give a set of expected sex ratios for the six age groups. (See table IV-B for examples of these calculations.) However, to estimate the coverage of the White population 35 to 64 years of age for each State, only the expected sex ratio for the entire age range in each State was required. Accordingly, expected sex ratios for Whites aged 35 to 64, $ESR^{w}_{j,\,35-64}$, were derived as weighted averages of the expected sex ratios for the component 5-year age groups, ESR^{w}_{jk}. The weights for each State, CP^{wf}_{jk}, are the numbers of White females in the State in the age groups 35–39 to 60–64; that is,

$$ESR^{w}_{j,\,35-64} = \frac{\sum ESR^{w}_{jk} CP^{wf}_{jk}}{\sum CP^{wf}_{jk}} \qquad (4.10)$$

The use of uncorrected census data in the weighting scheme introduces error only to the extent that the population in the component age groups (the weights) is differentially underenumerated. In the present case, the additional error introduced by using uncorrected census data is trivial.

DERIVATION OF COVERAGE ESTIMATES

The next step in estimating the coverage of the White population 35 to 64 years of age for each State was to apply the expected sex ratios to the corrected White population of one sex in this age group, either male or female, in order to estimate the corrected population of the other sex, or to apply the expected sex ratios to the corrected White population of both sexes in order to reestimate the corrected population of each sex. The corrected figures for the 35-to-64-year-old age group for one of the sexes were derived by a number of alternative procedures based on different assumptions regarding the relationships between the pattern of national and State census errors for the ages under 35 years and 35 to 64 years for either males, females, or both sexes. The expected sex ratios could then be applied to the corrected figures for males, females, or both sexes to secure corrected figures for females, males, or males and females, respectively.

Variants in Application of Expected Sex Ratios

We describe first an estimation procedure in which the White male estimates were derived directly from the White female estimates. The first step in the procedure was the selection of a set of undercount estimates for the White female population under 35 years of age for the States from the several sets available (ch. II). The second step in the procedure was the estimation of the census undercount rates for the White female population aged 35 to 64 for the States. The estimation procedure was based on the assumption that for every State j the ratio of the undercount rate for White females aged 35 to 64 years to the undercount rate for White females under 35 years was the same as the ratio at the national level; that is,

$$k^{wf} = \frac{E^{wf}_{j,\,35-64}}{E^{wf}_{j,\,0-34}} = \frac{E^{wf}_{n,\,35-64}}{E^{wf}_{n,\,0-34}} \qquad (4.11)$$

where E denotes the estimated percent net undercount and the subscript n denotes the United States. The national rates for White females under age 35 and aged 35 to 64 are 1.6 percent and 0.8 percent, respectively (table I-B), and their ratio, denoted in equation (4.11) by k^{wf}, is approximately equal to 0.5.[4] Thus, the estimated census undercount rate for White females aged 35 to 64 in each State was computed by multiply-

[4] In the actual computations, the corrected populations shown in table I-B were used to compute k^{wf}. The value used for k^{wf} is 0.49906.

ing the census undercount rate for White females under 35 years of age by this factor[5]

$$E^{wf}_{j,\,35-64} = k^{wf}\, E^{wf}_{j,\,0-34} = 0.49906\, E^{wf}_{j,\,0-34} \qquad (E^{wf}_{j,\,0-34} \geqq 0) \quad (4.12)$$

The corresponding corrected population for White females aged 35 to 64 in each State, $EP^{wf}_{j,\,35-64}$, was computed by dividing the census count of the population by the complement of the undercount rate—

$$EP^{wf}_{j,\,35-64} = CP^{wf}_{j,\,35-64} \div (1 - E^{wf}_{j,\,35-64}) \qquad (4.13)$$

Next, the corrected White male population aged 35 to 64 for each State was obtained by multiplying the corrected White female population at these ages in the State by the expected sex ratio for Whites aged 35 to 64—

$$EP^{wm}_{j,\,35-64} = ESR^{w}_{j,\,35-64}\, EP^{wf}_{j,\,35-64} \qquad (4.14)$$

The final step in the estimation procedure was the separate pro rata adjustment of the corrected White male and White female populations aged 35 to 64 for States so that they summed to the independently derived estimates of the national corrected White male and White female populations aged 35 to 64 as shown in table I–B. The net census undercount rates for the White population aged 35 to 64 were then obtained by dividing the difference between the corrected population and the census population by the corrected population—

$$E^{w}_{j,\,35-64} = (EP^{w}_{j,\,35-64} - CP^{w}_{j,\,35-64}) \div EP^{w}_{j,\,35-64} \qquad (4.15)$$

The estimated percents of net undercount for the White population 35 to 64 years of age for geographic divisions and for the total (all ages) White population of States, derived by the procedure described above, are shown in column 1 of tables IV-C and IV-D, respectively. This estimation procedure is designated as variant EF (also called WEF).

Five other variants of the procedure described were used to estimate the coverage of the White population aged 35 to 64 for States. Two of these variants result from different applications of the expected sex ratios to the corrected population of one or both sexes. The other three are the result of estimating the corrected population of one or both sexes by use of coverage rates (rather than undercount or error rates) and then applying the expected sex ratios in the three alternative ways.

One variant, EM (or WEM), used the ratio of the national undercount rate for White males 35 to 64 years of age to the national undercount rate for White males under 35 years of age to derive the undercount rate for White males 35 to 64 years of age in each State. This ratio, defined algebraically as

$$k^{wm} = \frac{E^{wm}_{n,\,35-64}}{E^{wm}_{n,\,0-34}} = \frac{E^{wm}_{j,\,35-64}}{E^{wm}_{j,\,0-34}} \qquad (4.16)$$

is approximately 1.2.[6] Multiplying the undercount rate for White males under age 35 in each State by this factor gave the estimated undercount rate in each State for White males aged 35 to 64—

$$E^{wm}_{j,\,35-64} = k^{wm} E^{wm}_{j,\,0-34} = 1.19605\, E^{wm}_{j,\,0-34} \qquad (4.17)$$

The corrected population for White males aged 35 to 64 in each State was computed by dividing the census count of the population by the complement of the undercount rate—

$$EP^{wm}_{j,\,35-64} = CP^{wm}_{j,\,35-64} \div (1 - E^{wm}_{j,\,35-64}) \qquad (4.18)$$

The corrected White female population of each State was then estimated by dividing the corrected White male population, obtained from equation (4.18), by the expected sex ratio

$$EP^{wf}_{j,\,35-64} = EP^{wm}_{j,\,35-64} \div ESR^{w}_{j,\,35-64} \qquad (4.19)$$

Pro rata adjustment of the corrected White male and White female populations for States to the national corrected totals for these two groups (table I-B) completed the estimation procedure for Whites aged 35 to 64 according to the variant designated as EM (or WEM). Table IV-C, column 3, shows coverage estimates for Whites 35 to 64 years of age for geographic divisions, and table IV-D, column 3, shows coverage estimates for the total White population for States, according to the variant EM.

The last variant in the application of expected sex ratios borrowed from the results the other two methods. Preliminary estimates of the corrected White female population aged 35 to 64 for States as derived from (4.12) and (4.13), and preliminary estimates of the corrected White male population aged 35 to 64 for States as derived from (4.17) and (4.18), were added together to obtain estimates of the corrected White population aged 35 to 64 for each State—

$$EP^{wt}_{j,\,35-64} = EP^{*wm}_{j,\,35-64} + EP^{*wf}_{j,\,35-64} \qquad (4.20)$$

where * denotes a preliminary estimate.

Then the corrected White male and White female populations for each State were obtained by allocating the total for both sexes combined to each of the sexes according to the expected sex ratios—

[5] If $E^{wf}_{j,\,0-34}$ is negative (denoting an estimated net overcount in State j for White females under age 35), the estimating equation is

$$E^{wf}_{j,\,35-64} = E^{wf}_{j,\,0-34} / k^{wf} = E^{wf}_{j,\,0-34} / 0.49906 \qquad (E^{wf}_{j,\,0-34} < 0)$$

[6] The value of k^{wm} used in the actual computations is 1.19605.

$$EP^{wm}_{j,\,35-64} = EP^{wt}_{j,\,35-64}\left(\frac{ESR^{w}_{j,\,35-64}}{1.0+ESR^{w}_{j,\,35-64}}\right) \qquad (4.21)$$

and

$$EP^{wf}_{j,\,35-64} = EP^{wt}_{j,\,35-64} - EP^{wm}_{j,\,35-64} \qquad (4.22)$$

Finally, to complete the estimation procedure designated as ET (or WET), the corrected White male and White female populations aged 35 to 64 for the States were each adjusted pro rata to the national totals. Table IV-C, column 5, shows undercount rates for the White population 35 to 64 years of age for geographic divisions and table IV-D, column 5, shows rates of underenumeration for the total White population for States, according to the variant ET.

Use of Coverage Rates Instead of Error Rates

The three remaining variants of the procedure used to derive estimates of the corrected White population aged 35 to 64 for States were based on the assumption that the ratio of the coverage rate (rather than the undercount rate) for White males or females aged 35 to 64 to the coverage rate for White males or females under age 35 for the United States could be applied to each State. The coverage rate is the complement of the undercount rate and is defined for White females 35 to 64 years of age as

$$C^{wf}_{j,\,35-64} = CP^{wf}_{j,\,35-64} \div EP^{wf}_{j,\,35-64} = 1.0 - E^{wf}_{j,\,35-64} \qquad (4.23)$$

Variant CF was based on the coverage rates of White females under age 35 in each State and is directly analogous to variant EF. First, the ratio of the national coverage rates for the two age groups was calculated

$$g^{wf} = \frac{C^{wf}_{n,\,35-64}}{C^{wf}_{n,\,0-34}} \qquad (4.24)$$

This ratio, which has a value of 1.00797 (table I-B), was then applied to the coverage rate for White females under age 35 in each State to obtain estimates of coverage rates and undercount rates for White females aged 35 to 64 in each State;[7] i.e.,

$$C^{wf}_{j,\,35-64} = g^{wf}\,C^{wf}_{j,\,0-34} = 1.00797\,C^{wf}_{j,\,0-34} \qquad (4.25)$$

and

$$E^{wf}_{j,\,35-64} = 1.0 - C^{wf}_{j,\,35-64} \qquad (4.26)$$

These estimated coverage or undercount rates for White females were then used in combination with the corresponding census population figures and expected sex ratios to estimate the corrected White male population (equations 4.13 and 4.14). Finally, the corrected population figures were adjusted to national totals and converted to the estimated percents of net undercount shown in column 2 of tables IV-C and IV-D as variant CF (or WCF).

Variant CM (or WCM) used the ratio of national coverage rates for White males—

$$g^{wm} = \frac{C^{wm}_{n,\,35-64}}{C^{wm}_{n,\,0-34}} \qquad (4.27)$$

to derive coverage and undercount rates for White males aged 35 to 64 in each State from the coverage rates for White males under age 35 in the States[8]

$$C^{wm}_{j,\,35-64} = g^{wm}\,C^{wm}_{j,\,0-34} = 0.99517\,C^{wm}_{j,\,0-34} \qquad (4.28)$$

and

$$E^{wm}_{j,\,35-64} = 1.0 - C^{wm}_{j,\,35-64} \qquad (4.29)$$

Use of these estimated coverage or undercount rates for White males in combination with the corresponding census population figures and expected sex ratios yielded estimates of the corrected White male and White female population aged 35 to 64 in each State (equations 4.18 and 4.19). The corrected population figures were then each adjusted pro rata to the independently derived national totals. The resulting coverage estimates are shown in column 4 of tables IV-C and IV-D.

The final variant of the procedure for estimating State populations aged 35 to 64, CT or WCT, combined elements of variants CF and CM and is directly analogous to ET. The ratios of national coverage rates for males and females, g^{wf} and g^{wm}, as defined by (4.24) and (4.27), were applied in the same manner as before (equations 4.25 and 4.28) to obtain estimated coverage and undercount rates for White males and White females aged 35 to 64 in each State. These rates were then applied in the same manner as in variant ET to obtain preliminary estimates of the corrected White male and White female populations aged 35 to 64 in each State. Next, these preliminary estimates were summed to yield the corrected total White population aged 35 to 64 for each State, which was then allocated to each of the sexes on the basis of the expected sex ratio (equations 4.20 to 4.22). As the final step in the procedure, the corrected White male and White female populations aged 35 to 64 were adjusted to the previously specified national totals. (See column 6 of tables IV-C and IV-D for the coverage estimates based on variant CT or WCT.)

[7] Because this ratio involves coverage rates, no special difficulties arise in dealing with net overcounts at ages under 35.

[8] g^{wm} has a value of 0.99517 when computed from the corrected population figures shown in table I-B.

REVIEW AND EVALUATION OF RESULTS

The six sets of coverage estimates shown in tables IV-C and IV-D illustrate the effects on the estimated coverage of the White population of States of varying the procedures used to estimate the corrected White population aged 35 to 64 years. In order to isolate these effects, the same estimates for the population under age 35 and 65 years and over were used in each of the six sets of estimates of the total White population: (1) for the population under 35, the State-of-residence model-3 estimates based on composite births, with A=1 and B=1, "SOR-3-1" (table II-C, col. 5); (2) for the population aged 65 and over, the "low" estimates based on aggregate data on Medicare enrollments (table VI-C, col. 1).

The estimated coverage rates for the White population aged 35 to 64 years for regions and divisions appear to be quite reasonable and consistent for the various estimation procedures (table IV-C). In every set of estimates, the South has the largest estimated percent net undercount for this age group, and the Northeast has the smallest, among the regions. The largest range from the low estimate to high estimate is only 0.7 percentage point for the regions. The coverage estimates for the divisions tend to vary somewhat more but only in the South Atlantic and West South Central divisions does the range exceed 1.0 percentage point.

Generally, the rates of underenumeration for States shown in table IV-D are also reasonable and quite consistent from one set to another. There are very few States with either net overcounts or extremely large net undercounts. The estimated net overcounts are confined to four States (New Jersey, Wisconsin, Maryland, and Utah) and these overcounts are all quite small (the largest being 0.8 percent). The estimated net overcounts are primarily the result of estimated net overcounts for the White population under age 35 in these States, on which the estimates for population 35 to 64 were based.

There are no very large estimated net undercounts (greater than 10 percent) in any of the sets of estimates for the total White population. Only three States (West Virginia, New Mexico, and Alaska) have estimated net undercounts in excess of 5.0 percent. Again, these large estimated net undercounts are primarily the result of large undercount estimates for Whites under age 35.

There is a substantial amount of variation from State to State within each of the sets of undercount estimates for total Whites. Comparison of the distribution of net undercounts for any of the sets shown in table IV-D with estimates derived by synthetic methods [9] reveals that there is much greater variation among the States in the estimates derived by the demographic method (table IV-E and table VII-F). The much greater variation occurs in spite of the fact that the synthetic estimates relate to the total population of each State whereas the analytic estimates relate to Whites only.

The level of estimated undercoverage for total Whites in each State shown in table IV-D is relatively insensitive to variation in the assumptions and procedures used for the White population aged 35 to 64, as would be expected. The range in the estimates of underenumeration among the various sets of estimates is generally quite small for any particular area. At the regional level, the South, which shows the largest variation, has a range from the high estimate to the low estimate of only 0.3 percentage point. Only six States (New Hampshire, West Virginia, Florida, New Mexico, Alaska, and Hawaii) have ranges which are 1.0 percentage point or larger; four of these States are among the group with large estimates of underenumeration.

The largest differences between estimates for any State generally occur between estimates derived from the three different procedures for applying the expected sex ratios rather than between those derived from the two different forms for the measure of coverage. For the States which have a relatively large range in estimated underenumeration, the expected sex ratios differ substantially from the recorded sex ratios. Most of these States have experienced relatively large sex-selective migration (either in or out). The fact that these few States show large ranges and most States show small ranges suggests that the migration adjustment factor may provide an adequate correction to the expected sex ratios when the sex difference in migration is small but that the factor provides only a rough approximation when the sex difference in migration is large.

The differences among the various sets of estimates can be examined with the two summary measures shown in table IV-F: (1) the average absolute difference in estimated percents of underenumeration for any two sets of estimates; and (2) the correlation coefficient between the two sets of estimates of underenumeration. The values of these measures show the relative insensitivity of the estimates to the different assumptions made for Whites aged 35 to 64. The correlation coefficients between pairs of distributions are all very high; the lowest is 0.92 and the highest is nearly 1.00.[10] Similarly, the average absolute differ-

[9] U.S. Bureau of the Census, **Current Population Reports,** Series P-23, No. 56, "Coverage of Population in the 1970 Census and Some Implications for Public Programs", 1975.

[10] Unweighted figures. The corresponding figures weighted for the size of the White population are 0.94 and nearly 1.00.

ences are all very small; the range is 0.06 to 0.45 percentage point.[11]

The highest correlation coefficients and the smallest average absolute differences occur in the pairs of distributions derived from the same method of applying the expected sex ratios, i.e., EF-CF, EM-CM, and ET-CT. Conversely, the lowest correlation coefficients and the largest average absolute differences occur in the pairs which were derived by opposite applications of the expected sex ratios, i.e., EF-EM, CF-CM, EF-CM, CF-EM. Intermediate values occurred in comparisons involving "M" or "F" distributions and those designated "T". Thus, in terms of the effect on the overall distribution of net undercounts for Whites, the method of applying the expected sex ratios for Whites aged 35 to 64 is much more important than the way the coverage error is expressed.

Although, as stated earlier, State coverage estimates for Whites aged 35 to 64 appear to be quite reasonable, they must be considered as very rough approximations. The paucity of data from sources independent of the census and the gaps in the data that are available prevent the construction of an estimated population from data on demographic components for this age group, as was done for the population under 35. The estimates had to be made without benefit of much data specifically bearing on the population 35 to 64 for each State; rather, they were derived on the basis of a number of mechanical assumptions which are generally untestable. Because of the rather sweeping assumptions required and the inadequacy of the data for testing these assumptions, coverage estimates for the middle age range are somewhat more tenuous and are subject to more restricted interpretation and use than corresponding estimates for either the ages under 35 or the ages 65 and over.

[11] Unweighted figures. The corresponding weighted figures are 0.05 and 0.30 percentage point.

The estimates of the White population 35 to 64 years of age developed up to this point do not represent the whole range of estimates for this group even within the framework of the alternative procedures and assumptions considered in this report. The analysis has been primarily concerned with the variations which result from the different ways in which expected sex ratios are applied and the coverage estimates are expressed. Tables IV-G, IV-H, and IV-I show the results of applying a single procedure for the White population aged 35 to 64 years, variant CF, to several series of estimates of coverage for the White population under 35.

The estimates of coverage for Whites aged 35 to 64 at the regional and divisional level show little variation when based on different sets of coverage estimates for Whites under age 35 (table IV-G). The largest range from the low estimate to the high estimate for any area is only 0.9 percentage point for the Pacific division and most of the ranges are much smaller. The estimates of coverage for the total White population of States show similar consistency (table IV-H). The areas with relatively large ranges are those for which the estimated coverage for Whites under age 35 varies considerably according to the assumptions employed (ch. II).

For purposes of later synthesis of the results, it appears desirable to select one of the many sets of coverage estimates for the White population 35 to 64 years of age as a "preferred" set, even though there is little basis for a strong preference. We have selected the set CF, based on the State-of-residence series 3. In addition to the use of coverage rates rather than undercount rates, this set of estimates accepts the directly computed estimates for White females and derives the estimates for White males by use of expected sex ratios. The White female population tends to be the group best enumerated and the group whose coverage is most accurately estimated.

Table IV-A. ADJUSTMENT FACTORS AND PERCENT REDUCTION IN COHORT SIZE FROM WAR MORTALITY FOR WHITE MALES, BY AGE: 1970

Age of cohort in 1970	Adjustment factor	Percent reduction in cohort size
35 to 39 years	1.0000	-
40 to 44 years	0.9917	0.83
45 to 49 years	0.9747	2.53
50 to 54 years	0.9776	2.24
55 to 59 years	0.9873	1.27
60 to 64 years	0.9922	0.78

- Represents zero.

Table IV-B. ILLUSTRATIONS OF THE CALCULATION OF EXPECTED SEX RATIOS FOR THE WHITE POPULATION OF A STATE 35 TO 64 YEARS OF AGE IN 1970 ON THE BASIS OF COMPONENTS OF POPULATION CHANGE, FOR MASSACHUSETTS AND CALIFORNIA

Age of cohort in 1970	Sex ratio of births (1)	Sex ratio of life table survival rates (2)	Adjustment for war mortality (3)	Sex ratio of survivors (1)x(2)x(3)= (4)	Migration adjustment factor (5)	Expected sex ratio (4)x(5)x100= (6)	Census sex ratio (per 100) (7)	Difference[1] (7)-(6)= (8)
	MASSACHUSETTS							
35 to 39 years	1.0523	.970816	1.0000	1.021590	1.013759	103.6	96.7	-6.9
40 to 44 years	1.0510	.961708	.9917	1.002366	.986092	98.8	94.6	-4.2
45 to 49 years	1.0546	.945558	.9747	.971957	.981278	95.4	92.0	-3.4
50 to 54 years	1.0540	.921005	.9776	.948995	.973007	92.3	90.3	-2.0
55 to 59 years	1.0540	.883343	.9873	.919219	.954904	87.8	87.2	-0.6
60 to 64 years	1.0540	.827470	.9922	.865351	.955778	82.7	81.1	-1.6
Weighted average[2]	(X)	(X)	(X)	(X)	(X)	93.6	90.5	-3.1
	CALIFORNIA							
35 to 39 years	1.0547	.966472	1.0000	1.019338	1.047940	106.8	101.4	-5.4
40 to 44 years	1.0580	.957821	.9917	1.004964	1.014536	102.0	97.0	-5.0
45 to 49 years	1.0549	.946457	.9747	.973158	1.023821	99.6	95.1	-4.5
50 to 54 years	1.0556	.924274	.9776	.953809	1.049179	100.1	95.7	-4.4
55 to 59 years	1.0556	.885587	.9873	.922953	1.019201	94.1	93.1	-1.0
60 to 64 years	1.0556	.830898	.9922	.870255	.992937	86.4	88.0	+1.6
Weighted average[2]	(X)	(X)	(X)	(X)	(X)	98.8	95.4	-3.4

X Not applicable.
[1]A minus sign (-) denotes a deficit, and a plus sign (+) denotes an excess, in the census sex ratios.
[2]The weights are the resident female population of each State as enumerated in the 1970 census.

Table IV-C. ALTERNATIVE ESTIMATES OF THE PERCENTS OF NET UNDERCOUNT FOR THE WHITE POPULATION 35 TO 64 YEARS OF AGE, FOR REGIONS AND DIVISIONS, ACCORDING TO ALTERNATIVE PROCEDURES FOR ESTIMATING THE COVERAGE OF THE POPULATION IN THIS AGE RANGE: 1970

(See text for explanation of the alternative procedures. All estimates are based on estimates of percent net undercount for the white population under 35 years of age according to method SOR-3, A=1, B=1, described in Chapter II)

Region and division	Variant for 35 to 64 years of age						Range		
	EF	CF	EM	CM	ET	CT	Low value	High value	Difference
United States	1.8	1.8	1.8	1.8	1.8	1.8	(X)	(X)	(X)
Regions:									
Northeast	0.9	0.5	0.7	0.9	0.8	0.7	0.5	0.9	0.4
North Central	1.1	0.8	1.3	1.5	1.2	1.1	0.8	1.5	0.7
South	2.9	3.3	2.9	2.6	2.9	3.0	2.6	3.3	0.7
West	2.6	2.9	2.5	2.4	2.5	2.6	2.4	2.9	0.5
Northeast:									
New England	0.8	0.5	0.3	0.6	0.8	0.6	0.3	0.8	0.5
Middle Atlantic	0.9	0.4	0.8	1.0	0.9	0.7	0.4	1.0	0.6
North Central:									
East North Central	1.0	0.7	1.2	1.4	1.1	1.0	0.7	1.4	0.7
West North Central	1.2	1.0	1.5	1.6	1.3	1.3	1.0	1.6	0.6
South:									
South Atlantic	3.0	3.4	2.2	1.9	2.6	2.7	1.9	3.4	1.5
East South Central	2.4	2.6	3.2	2.9	2.7	2.8	2.4	3.2	0.8
West South Central	2.9	3.6	3.9	3.5	3.3	3.6	2.9	3.9	1.0
West:									
Mountain	2.6	3.3	2.9	2.7	2.8	3.0	2.6	3.3	0.7
Pacific	2.6	2.8	2.4	2.3	2.4	2.5	2.3	2.8	0.5

X Not applicable.

Table IV-D. ALTERNATIVE ESTIMATES OF THE PERCENTS OF NET UNDERENUMERATION FOR THE TOTAL WHITE POPULATION, FOR REGIONS, DIVISIONS, AND STATES, ACCORDING TO ALTERNATIVE PROCEDURES FOR ESTIMATING THE COVERAGE OF THE POPULATION 35 TO 64 YEARS OF AGE: 1970

(See text for explanation of the alternative procedures noted. Population under 35 years of age estimated by method SOR-3, A=1, B=1 as described in chapter II; and population 65 years and over estimated from Medicare data, as described in chapter VI. A minus sign denotes a net overcount)

Region, division, and State	Variant for population 35 to 64 years of age						Range		
	EF	CF	EM	CM	ET	CT	Low value	High value	Difference
United States, total	1.9	1.9	1.9	1.9	1.9	1.9	(X)	(X)	(X)
Regions:									
Northeast	1.0	0.8	0.9	1.0	1.0	0.9	0.8	1.0	0.2
North Central	1.3	1.2	1.3	1.4	1.3	1.3	1.2	1.4	0.2
South	2.9	3.1	2.9	2.8	2.9	3.0	2.8	3.1	0.3
West	2.6	2.7	2.6	2.6	2.6	2.6	2.6	2.7	0.1
Northeast:									
New England	0.9	0.8	0.8	0.8	0.9	0.8	0.8	0.9	0.1
Middle Atlantic	1.0	0.8	0.9	1.0	1.0	0.9	0.8	1.0	0.2
North Central:									
East North Central	1.2	1.1	1.2	1.3	1.2	1.2	1.1	1.3	0.2
West North Central	1.4	1.4	1.5	1.6	1.5	1.5	1.4	1.6	0.2
South:									
South Atlantic	2.8	2.9	2.5	2.4	2.7	2.7	2.4	2.9	0.5
East South Central	2.6	2.7	2.9	2.8	2.7	2.8	2.6	2.9	0.3
West South Central	3.3	3.5	3.6	3.5	3.4	3.5	3.3	3.6	0.3
West:									
Mountain	2.9	3.1	3.0	2.9	3.0	3.0	2.9	3.1	0.2
Pacific	2.6	2.6	2.5	2.4	2.5	2.5	2.4	2.6	0.2
New England:									
Maine	3.3	3.5	2.7	2.7	3.0	3.1	2.7	3.5	0.8
New Hampshire	2.0	1.8	1.0	1.1	1.5	1.5	1.0	2.0	1.0
Vermont	2.4	2.4	2.9	2.9	2.6	2.6	2.4	2.9	0.5
Massachusetts	0.6	0.4	0.3	0.4	0.5	0.4	0.3	0.6	0.3
Rhode Island	0.9	0.7	0.5	0.6	0.7	0.7	0.5	0.9	0.4
Connecticut	0.2	0.1	0.7	0.8	0.5	0.4	0.1	0.8	0.7
Middle Atlantic:									
New York	1.3	1.2	1.3	1.3	1.3	1.2	1.2	1.3	0.1
New Jersey	(Z)	(Z)	-0.1	(Z)	0.1	(Z)	-0.1	0.1	0.2
Pennsylvania	1.0	0.8	1.1	1.2	1.1	1.0	0.8	1.2	0.4
East North Central:									
Ohio	1.4	1.3	1.0	1.1	1.2	1.2	1.0	1.4	0.4
Indiana	1.4	1.3	1.6	1.6	1.4	1.5	1.3	1.6	0.3
Illinois	1.2	1.1	1.6	1.6	1.3	1.3	1.1	1.6	0.5
Michigan	1.8	1.7	1.8	1.8	1.7	1.7	1.7	1.8	0.1
Wisconsin	-0.8	-0.6	-0.3	-0.2	-0.3	-0.4	-0.8	-0.2	0.6
West North Central:									
Minnesota	0.2	0.2	0.4	0.5	0.4	0.3	0.2	0.5	0.3
Iowa	1.7	1.6	1.8	1.9	1.7	1.7	1.6	1.9	0.3
Missouri	2.0	2.0	1.9	2.0	1.9	2.0	1.9	2.0	0.1
North Dakota	2.2	2.3	2.6	2.6	2.4	2.5	2.2	2.6	0.4
South Dakota	2.7	2.7	3.2	3.1	2.9	2.9	2.7	3.2	0.5
Nebraska	1.2	1.2	1.1	1.2	1.2	1.2	1.1	1.2	0.1
Kansas	1.5	1.3	1.7	1.7	1.6	1.5	1.3	1.7	0.4
South Atlantic:									
Delaware	2.1	2.2	2.2	2.3	2.2	2.2	2.1	2.3	0.2
Maryland[1]	-0.1	-0.1	-0.4	-0.2	(Z)	-0.1	-0.4	(Z)	0.4
District of Columbia[1]	3.9	3.7	3.3	3.3	3.6	3.5	3.3	3.9	0.6
Virginia[1]	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.5	0.1
West Virginia	5.5	6.2	7.2	6.9	6.3	6.5	5.5	7.2	1.7
North Carolina	2.1	2.0	2.2	2.2	2.1	2.1	2.0	2.2	0.2
South Carolina	3.7	3.9	4.1	3.9	3.9	3.9	3.7	4.1	0.4
Georgia	3.0	3.2	3.0	3.0	3.0	3.1	3.0	3.2	0.2
Florida	3.9	4.1	2.1	2.0	3.0	3.0	2.0	4.1	2.1
East South Central:									
Kentucky	3.4	3.5	3.8	3.7	3.6	3.6	3.4	3.8	0.4
Tennessee	3.2	3.4	3.7	3.5	3.4	3.5	3.2	3.7	0.5
Alabama	1.8	1.7	2.1	2.0	1.9	1.9	1.7	2.1	0.4
Mississippi	1.2	1.0	0.5	0.6	0.8	0.8	0.5	1.2	0.7
West South Central:									
Arkansas	3.7	4.1	4.1	4.0	3.9	4.0	3.7	4.1	0.4
Louisiana	1.5	1.5	1.7	1.8	1.6	1.6	1.5	1.8	0.3
Oklahoma	2.0	1.9	2.0	2.0	2.0	2.0	1.9	2.0	0.1
Texas	4.0	4.3	4.3	4.2	4.1	4.2	4.0	4.3	0.3
Mountain:									
Montana	1.4	1.4	0.8	0.9	1.1	1.2	0.8	1.4	0.6
Idaho	3.7	3.9	3.8	3.7	3.7	3.8	3.7	3.9	0.2
Wyoming	1.7	1.6	2.4	2.5	2.0	2.0	1.6	2.5	0.9
Colorado	2.4	2.5	1.9	1.9	2.1	2.2	1.9	2.5	0.6
New Mexico	7.1	8.0	8.3	7.9	7.7	7.9	7.1	8.3	1.2
Arizona	3.5	3.6	3.6	3.4	3.5	3.5	3.4	3.6	0.2
Utah	-0.4	-0.3	-0.1	(Z)	(Z)	-0.1	-0.4	(Z)	0.4
Nevada	3.3	3.7	3.8	3.7	3.5	3.7	3.3	3.8	0.5
Pacific:									
Washington	1.7	1.6	1.2	1.2	1.4	1.4	1.2	1.7	0.5
Oregon	1.2	1.0	1.5	1.5	1.3	1.3	1.0	1.5	0.5
California	2.8	2.9	2.8	2.7	2.8	2.8	2.7	2.9	0.2
Alaska	6.0	5.9	3.6	3.4	4.6	4.4	3.4	6.0	2.6
Hawaii	4.6	4.8	3.4	3.3	3.9	3.9	3.3	4.8	1.5

X Not applicable.
Z Less than ± 0.05.
[1]Based on adjusted figures for ages under 35.

Table IV-E. NUMBER OF STATES WITH SPECIFIED PERCENTS OF NET UNDERENUMERATION FOR THE TOTAL WHITE POPULATION, ACCORDING TO ALTERNATIVE PROCEDURES FOR ESTIMATING THE COVERAGE OF THE POPULATION 35 TO 64 YEARS OF AGE: 1970

(See text for explanation of the alternative procedures)

Percent	Variant for population 35 to 64 years of age					
	EF	CF	EM	CM	ET	CT
Total[1]	51	51	51	51	51	51
Net overcount	3	4	4	2	2	4
Net undercount:						
Less than 1.0	5	5	7	8	7	5
1.0 to 1.9	18	17	14	16	17	17
2.0 to 2.9	10	9	11	11	12	9
3.0 to 3.9	[2]11	[2]9	[2]10	[2]11	[2]9	[2]11
4.0 to 4.9	1	4	3	1	2	3
5.0 and over	3	3	2	2	2	2
Average percent net under-enumeration (unweighted)	2.2	2.3	2.2	2.2	2.2	2.2

[1]Percent for all States is 1.9 (weighted).
[2]Includes the District of Columbia.

Source: Based on estimates shown in table IV-D.

Table IV-F. AVERAGE ABSOLUTE DIFFERENCES AND CORRELATION COEFFICIENTS FOR ESTIMATES OF THE PERCENTS OF NET UNDERENUMERATION FOR THE TOTAL WHITE POPULATION OF STATES, ACCORDING TO ALTERNATIVE PROCEDURES FOR ESTIMATING THE COVERAGE OF THE POPULATION 35 TO 64 YEARS OF AGE: 1970

(Average absolute differences are shown above the diagonal line; correlation coefficients are shown below the diagonal line)

Series	Variant for population 35 to 64 years of age					
	EF	CF	EM	CM	ET	CT
EF		.157	.449	.420	.233	.245
CF	.995		.398	.388	.229	.198
EM	.921	.939		.088	.228	.216
CM	.918	.935	.999		.198	.190
ET	.975	.985	.983	.981		.059
CT	.971	.983	.985	.984	.999	

Source: Based on estimates shown in table IV-D.

Table IV-G. ALTERNATIVE ESTIMATES OF THE PERCENTS OF NET UNDERCOUNT FOR THE WHITE POPULATION 35 TO 64 YEARS OF AGE, FOR REGIONS AND DIVISIONS, ACCORDING TO ALTERNATIVE PROCEDURES FOR ESTIMATING THE COVERAGE OF THE POPULATION UNDER 35 YEARS OF AGE: 1970

(All estimates are based on procedure CF for the white population 35 to 64 years of age; see text for explanation of the procedure. See text of chapter II for explanation of the alternative procedures noted for ages under 35)

Region and division	Variant for population under 35 years of age		
	SOR-3, A=1, B=1	SOR-3, A=1, B=2	SOR-3, A=5, B=2
United States, total	1.8	1.8	1.8
Regions:			
Northeast	0.5	0.4	0.4
North Central	0.8	0.7	0.5
South	3.3	3.3	3.2
West	2.9	3.2	3.6
Northeast:			
New England	0.5	0.5	0.6
Middle Atlantic	0.4	0.3	0.3
North Central:			
East North Central	0.7	0.6	0.6
West North Central	1.0	0.9	0.5
South:			
South Atlantic	3.4	3.5	3.5
East South Central	2.6	2.4	1.9
West South Central	3.6	3.6	3.6
West:			
Mountain	3.3	3.5	3.2
Pacific	2.8	3.1	3.7

Table IV-H. ALTERNATIVE ESTIMATES OF THE PERCENTS OF NET UNDERENUMERATION FOR THE TOTAL WHITE POPULATION, FOR REGIONS, DIVISIONS, AND STATES, ACCORDING TO ALTERNATIVE PROCEDURES FOR ESTIMATING THE COVERAGE OF THE POPULATION UNDER 35 YEARS OF AGE: 1970

(All estimates are based on procedure CF for the white population 35 to 64 years of age; see text for explanation of the procedure. See text of chapter II for explanation of the alternative procedures noted for ages under 35. A minus sign denotes a net overcount)

Region, division, and State	Variant for population under 35 years of age		
	SOR-3, A=1, B=1	SOR-3, A=1, B=2	SOR-3, A=5, B=2
United States, total	1.9	1.9	1.9
Regions:			
Northeast	0.8	0.7	0.7
North Central	1.2	1.1	0.9
South	3.1	3.1	3.0
West	2.7	3.0	3.4
Northeast:			
New England	0.8	0.8	0.9
Middle Atlantic	0.8	0.7	0.7
North Central:			
East North Central	1.1	1.0	0.9
West North Central	1.4	1.3	0.8
South:			
South Atlantic	2.9	3.0	3.1
East South Central	2.7	2.5	2.1
West South Central	3.5	3.5	3.5
West:			
Mountain	3.1	3.3	3.0
Pacific	2.6	2.9	3.5
New England:			
Maine	3.5	3.5	2.6
New Hampshire	1.8	1.8	2.0
Vermont	2.4	2.5	1.8
Massachusetts	0.4	0.3	0.5
Rhode Island	0.7	0.7	0.6
Connecticut	0.1	0.1	0.6
Middle Atlantic:			
New York	1.2	1.0	1.1
New Jersey	(Z)	-0.1	0.2
Pennsylvania	0.8	0.7	0.4
East North Central:			
Ohio	1.3	1.2	1.1
Indiana	1.3	1.2	0.9
Illinois	1.1	0.9	0.9
Michigan	1.7	1.7	1.7
Wisconsin	-0.6	-0.7	-0.8
West North Central:			
Minnesota	0.2	0.1	-0.1
Iowa	1.6	1.5	0.8
Missouri	2.0	1.9	1.9
North Dakota	2.3	2.2	0.7
South Dakota	2.7	2.6	1.4
Nebraska	1.2	1.0	0.4
Kansas	1.3	1.2	0.5
South Atlantic:			
Delaware	2.2	2.3	2.7
Maryland[1]	-0.1	(Z)	(Z)
District of Columbia[1]	3.7	3.6	3.5
Virginia[1]	2.4	2.4	2.1
West Virginia	6.2	6.0	4.6
North Carolina	2.0	1.9	2.1
South Carolina	3.9	4.0	4.2
Georgia	3.2	3.2	3.5
Florida	4.1	4.6	4.9
East South Central:			
Kentucky	3.5	3.3	2.6
Tennessee	3.4	3.3	3.2
Alabama	1.7	1.5	1.1
Mississippi	1.0	0.8	0.3
West South Central:			
Arkansas	4.1	3.9	2.9
Louisiana	1.5	1.3	1.6
Oklahoma	1.9	1.4	0.8
Texas	4.3	4.4	4.7
Mountain:			
Montana	1.4	1.2	0.5
Idaho	3.9	4.4	3.4
Wyoming	1.6	1.3	0.1
Colorado	2.5	2.5	2.2
New Mexico	8.0	8.6	8.0
Arizona	3.6	3.9	4.0
Utah	-0.3	-0.4	-0.4
Nevada	3.7	4.5	4.9
Pacific:			
Washington	1.6	1.5	1.7
Oregon	1.0	1.0	1.3
California	2.9	3.2	4.0
Alaska	5.9	6.8	3.7
Hawaii	4.8	5.3	5.0

Z Less than + 0.05.
[1]Based on adjusted figures for ages under 35.

Table IV-I. AVERAGE ABSOLUTE DIFFERENCES AND CORRELATION COEFFICIENTS FOR ESTIMATES OF THE PERCENTS OF NET UNDERENUMERATION FOR THE TOTAL WHITE POPULATION OF STATES, ACCORDING TO ALTERNATIVE PROCEDURES FOR ESTIMATING THE COVERAGE OF THE POPULATION UNDER 35 YEARS OF AGE: 1970

(Average absolute differences are shown above the diagonal line; correlation coefficients are shown below the diagonal line)

Series	Variant for population under 35 years of age		
	SOR-3, A=1, B=1	SOR-3, A=1, B=2	SOR-3, A=5, B=2
SOR - 3, A = 1, B = 1		.184	.549
SOR - 3, A = 1, B = 2	.993		.486
SOR - 3, A = 5, B = 2	.924	.938	

Source: Based on estimates shown in table IV-H.

Chapter V. Coverage of the Black-and-Other-Races Population 35 to 64 Years of Age

GENERAL METHOD

As in the case of the White population, coverage estimates for the Black-and-other-races population aged 35 to 64 for States in 1970 could not be prepared by the component method because of the lack of adequate data on births for the Black population for the years prior to 1935. Consequently, an indirect procedure, based on expected sex ratios, similar to the procedure used for Whites, was employed to circumvent inadequacies in the basic data.

The estimation of census coverage for Black-and-other-races females aged 35 to 64 in each State involved, first, use of two alternative general bases, namely coverage estimates of White females aged 35 to 64 in the State and coverage estimates of Black females under age 35 in the State. Then the number of Black-and-other-races males aged 35 to 64 was estimated by applying expected sex ratios to the corresponding estimates for females. Unlike the expected sex ratios for Whites aged 35 to 64, which were derived by a component method (i.e., from data on births, life table mortality, and net migration), those for the Black-and-other-races population aged 35 to 64 were estimated from the expected sex ratios for the Black-and-other-races population under age 35 in each State or from the observed sex ratios for the Black-and-other-races population 35 to 64 years of age in each State, in combination with observed and expected sex ratios for the entire United States.

Because of the very lack of data there are many plausible alternative approaches to estimating coverage of the Black-and-other-races population aged 35 to 64 following the general method outlined. Only a few alternatives had to be applied, however, to reflect the likely variation in the results. The variants include use of (a) coverage estimates for the White population aged 35 to 64 and the Black population under age 35 for States as alternative bases, (b) alternative sets of coverage estimates for the White population 35 to 64 years of age, (c) alternative methods of estimating expected sex ratios for the Black-and-other-races population aged 35 to 64, and (d) alternative mathematical forms of the measure of coverage.

The sensitivity of the resulting coverage estimates for the Black-and-other-races population to the variations in procedure proved to be somewhat greater than for Whites. The greater degree of variation in the coverage estimates was expected and is viewed as desirable because the data for the Black population are sparser and weaker than for Whites, particularly for the period prior to 1935, and the undercount rates are on the whole higher.

ESTIMATING COVERAGE OF BLACK-AND-OTHER-RACES FEMALES AGED 35 TO 64

It was decided to favor the approach of deriving coverage estimates for Black-and-other-races *females* first and then of deriving coverage estimates for Black-and-other-races *males* from the estimates for Black-and-other-races females by applying expected sex ratios. Basically two general approaches were considered for estimating coverage of Black females: (1) to link the level of the Black-and-other-races undercount in each State directly to the level of the Black-and-other-races undercount at the national level and at ages below 35 in each State and (2) to link the level of the undercount of the Black-and-other-races population in each State to the level of the undercount of Whites aged 35 to 64 in the same States and the Nation. Linking the estimates for the Black-and-other-races population aged 35 to 64 for States to the White estimates was viewed as producing potentially sounder coverage estimates because of the generally weak nature of the estimates for the Black-and-other-races population under age 35 for States (ch. III). Consequently, a wider range of alternatives linked to the estimates for the White population are shown in this chapter.

The decision to derive coverage estimates for the Black-and-other-races male population aged 35 to 64 in each State from the coverage estimates for the Black-and-other races female population was based on similar reasoning, that is, that more accurate coverage estimates can be derived for Black females in the adult ages than for Black males. The fact that the national estimated undercount rate for Black males in the age group 35 to 64 is substantially greater than the corresponding rate for Black females strongly suggests the possibility that the estimated rates for Black males aged 35 to 64 for States would have greater error than the estimated rates for Black females.

Derivation of Coverage Estimates from the White Population Aged 35 to 64

The actual derivation of coverage estimates for the Black-and-other-races female population of States from coverage estimates for the White female population was based on the assumption that substantial similarity exists within sex groups, irrespective of race, with regard to the completeness of census coverage. The mathematical form for implementing this assumption can be varied in the same manner as was done in connection with the estimates for the White population aged 35 to 64. Two variants of the procedure for deriving coverage estimates for the Black-and-other-races population of States aged 35 to 64 were employed: (1) a variant based on *undercount rates* for White females aged 35 to 64; and (2) a variant based on *coverage rates* for White females aged 35 to 64.

Estimating coverage on the basis of undercount rates. The assumption of similarity in census coverage within sex groups was implemented in the variant based on *undercount rates* by assuming that the ratio of the Black-and-other-races net undercount rate to the White net undercount rate, for females aged 35 to 64 in each State was equal to the corresponding national ratio. The national net undercount rate for Black-and-other-races females aged 35 to 64 (symbolized here by $E^{bf}_{n,\,35-64}$) is equal to 4.8 percent, as shown in table I–B, and the corresponding rate for White females (symbolized here by $E^{wf}_{n,\,35-64}$) is equal to 0.8 percent. The ratio of these two values, denoted by $v^f_{n,\,35-64}$, is equal to

$$v^f_{n,\,35-64} = \frac{E^{bf}_{n,\,35-64}}{E^{wf}_{n,\,35-64}} = \frac{.0483835}{.0078124} = 6.19317 \qquad (5.1)$$

The estimated net undercount rates for Black-and-other-races females aged 35 to 64 for States were obtained by applying this ratio to the net undercount rate for White females aged 35 to 64 in each State, i.e.,

$$E^{bf}_{j,\,35-64} = v^f_{n,\,35-64}\, E^{wf}_{j,\,35-64} = 6.19317\, E^{wf}_{j,\,35-64} \qquad (5.2)$$

where

$v^f_{n,\,35-64}$ = is defined in equation (5.1)
$E^{bf}_{j,\,35-64}$ = estimated net undercount rate for Black-and-other-races females aged 35 to 64 in State j
$E^{wf}_{j,\,35-64}$ = estimated net undercount rate for White females aged 35 to 64 in State j.

The estimated net undercount rates for White females aged 35 to 64 in each State had previously been obtained by the methods described in chapter IV. Any of the various available sets of estimates for White females could have been employed in the estimation procedure, but only two were selected for use in this chapter—the sets designated "SOR-3, A=1, B=1, WCF" (or "SOR–3–1, WCF–1") and "SOR–3, A=1, B=1, WEF" (or "SOR–3–1, WEF–1"). Coverage estimates for the Black-and-other-races population of States based on *error or undercount* rates as indicated by equation (5.2), are designated by the letters "EF" in the notation used to identify the various sets of coverage estimates; four such sets are shown in tables V–A and V–B.

Estimating coverage on the basis of coverage rates. As for Whites, other variants of the procedure for estimating the corrected Black-and-other-races population aged 35 to 64 for States were based on *coverage rates* rather than error or undercount rates. Specifically, it was assumed that State variation in coverage rates for White females aged 35 to 64 applied to Black-and-other-races females aged 35 to 64. Accordingly, the ratio of the national coverage rate for Black-and-other-races females aged 35 to 64 to the national coverage rate for White females aged 35 to 64 was applied to each State coverage rate for White females aged 35 to 64. The national coverage rate for Black-and-other-races females aged 35 to 64 in 1970 was

$$C^{bf}_{n,\,35-64} = \frac{CP^{bf}_{n,\,35-64}}{EP^{bf}_{n,\,35-64}} = \frac{3{,}676{,}144}{3{,}863{,}052} = 0.951616 \qquad (5.3)$$

where the census population, *CP*, and the corrected population, *EP*, correspond to the figures shown in table I-B. For White females aged 35 to 64, the national coverage rate in 1970 was

$$C^{wf}_{n,\,35-64} = \frac{CP^{wf}_{n,\,35-64}}{EP^{wf}_{n,\,35-64}} = \frac{30{,}017{,}894}{30{,}254{,}252} = 0.992188 \qquad (5.4)$$

The ratio of these two coverage rates, designated as $u^f_{n,\,35-64}$, is equal to

$$u^f_{n,\,35-64} = \frac{C^{bf}_{n,\,35-64}}{C^{wf}_{n,\,35-64}} = \frac{0.951616}{0.992188} = 0.959109 \qquad (5.5)$$

The estimated coverage rates for Black-and-other-races females aged 35 to 64 in each State were obtained by multiplying the coverage rate for White females 35 to 64 in each State by the ratio of the coverage rate for Black-and-other-races females 35 to 64 to the coverage rate for White females 35 to 64, for the United States—

$$C^{bf}_{j,\,35-64} = u^f_{n,\,35-64}\, C^{wf}_{j,\,35-64} = 0.959109\, C^{wf}_{j,\,35-64} \qquad (5.6)$$

where

$u^{f}_{n,\,35-64}$ is defined in equation (5.5) and
$C^{bf}_{j,\,35-64}$ = estimated coverage rate for Black-and-other-races females aged 35 to 64 in State j
$C^{wf}_{j,\,35-64}$ = estimated coverage rate for White females aged 35 to 64 in State j.

The estimated coverage rates for White females aged 35 to 64 in each State are the complements of the net undercount rates obtained by the methods described in chapter IV. Since any of the various sets of estimates for White females could be used, a number of alternative sets of coverage estimates for the Black-and-other-races female population aged 35 to 64 for States could be derived by equation (5.6). However, two of the sets of estimates for White females aged 35 to 64, "SOR–3–1, WCF–1" and "SOR–3–1, WEF–1," were considered sufficient to represent the variation in coverage estimates resulting from this estimation procedure. Estimates for the Black-and-other-races population derived by use of equation (5.6) and based on *coverage* rates are designated by the letters "CF;" four sets of "CF" estimates are shown in tables V-A and V-B.

Derivation of Coverage Estimates from the Black-and-Other-Races Population Under Age 35

The derivation of coverage estimates for the Black-and-other-races female population of States aged 35 to 64 from the Black-and-other-races population under age 35 followed the procedures used for deriving coverage estimates of the White population aged 35 to 64, as described in chapter IV. These procedures are based on the assumption that a substantial similarity in census coverage exists for race-sex groups within a State irrespective of age. Here again the coverage estimates derived from the Black-and-other-races population can be based on two alternative mathematical expressions of census coverage for Black-and-other-races females under age 35, i.e., undercount rates and coverage rates.

Estimating coverage on the basis of undercount rates. In the first variant, it was assumed that the ratio of the *undercount* rate for Black-and-other-races females aged 35 to 64 to the undercount rate for ages under 35 for each State was equal to the corresponding ratio for the Nation. The national net undercount rate for Black-and-other-races females under age 35 (denoted by $E^{bf}_{n,\,0-34}$) was equal to 5.1 percent in 1970, as shown in table I–B, and the rate for ages 35 to 64 was 4.8 percent, as stated earlier. The ratio of these two values, denoted by v^{*bf}_{n}, is equal to

$$v^{*bf}_{n} = \frac{E^{bf}_{n,\,35-64}}{E^{bf}_{n,\,0-34}} = \frac{.0483835}{.0505095} = 0.957909 \qquad (5.7)$$

The estimated net undercount rates for Black-and-other-races females aged 35 to 64 for States were obtained by multiplying this ratio by the undercount rate for Black-and-other-races females under age 35 in each State obtained by the methods described in chapter III; i.e.,

$$E^{bf}_{j,\,35-64} = v^{*bf}_{n}\, E^{bf}_{j,\,0-34} = 0.957909\, E^{bf}_{j,\,0-34} \qquad (5.8)$$

where

v^{*bf}_{n} is defined in equation (5.7)
$E^{bf}_{j,\,k}$ = estimated net undercount rate for Black-and-other-races females in age group k (0–34 or 35–64) in State j.

Any of the various sets of estimated net undercount rates for Black-and-other-races females aged under 35 described in chapter III could have been used in equation (5.8). However, only the single set of estimates designated as "SOR–3, A = 1, B = 1" (or "SOR–3–1") was employed to develop coverage estimates on this methodological variant. Coverage estimates for the Black-and-other-races population of States aged 35 to 64 based on *undercount* rates derived from equation (5.8) have been designated by the symbol "EF*" in the notation used to identify the various sets of coverage estimates (tables V-A and V-B).

Estimating coverage on the basis of coverage rates. In a second variant, it was assumed that State variation in *coverage* rates (i.e.,complements of net undercount rates) for Black-and-other-races females aged 35 to 64 was the same as the variation for ages under 35. The national coverage rate for Black-and-other-races females aged 35 to 64 was equal to 0.951616 in 1970, as shown in equation (5.3). For Black-and-other-races females under age 35, the national coverage rate in 1970 was

$$C^{bf}_{n,\,0-34} = \frac{CP^{bf}_{n,\,0-34}}{EP^{bf}_{n,\,0-34}} = \frac{8{,}492{,}767}{8{,}944{,}552} = 0.949490 \qquad (5.9)$$

where the census population, *CP*, and the corrected population, *EP*, correspond to the figures shown in table I-B. The ratio of the two coverage rates, denoted by u^{*bf}_{n}, is equal to

$$u^{*bf}_{n} = \frac{C^{bf}_{n,\,35-64}}{C^{bf}_{n,\,0-34}} = \frac{0.951616}{0.949490} = 1.002239 \qquad (5.10)$$

The estimated coverage rates for Black-and-other-races females aged 35 to 64 in each State were ob-

tained by multiplying the coverage rate for Black-and-other-races females under age 35 for each State by the ratio of the coverage rate for Black-and-other-races females aged 35 to 64 to the coverage rate for Black-and-other-races females under age 35, for the United States—

$$C^{bf}_{j,\,35-64} = u^{*bf}_{n}\, C^{bf}_{j,\,0-34} = 1.002239\, C^{bf}_{j,\,0-34} \qquad (5.11)$$

where

u^{*bf}_{n} is defined in equation (5.10)

$C^{bf}_{j,k}$ = estimated coverage rate for Black-and-other-races females in age group k (0–34 or 35–64) in State j.

Although any of the various sets of coverage estimates for Black-and-other-races females under age 35 in each State could have been used for the present purposes, only the set designated as "SOR–3, A=1, B=1" (or "SOR–3–1") was actually employed. Estimates of coverage for the Black-and-other-races population derived from equation (5.11), based on *coverage* rates, are designated by the symbols "CF*" (tables V-A and V-B).

ESTIMATING COVERAGE OF BLACK-AND-OTHER-RACES MALES AGED 35 TO 64

We turn next to the calculation of coverage estimates for Black-and-other-races males 35 to 64 years of age in each State. This involved, first, the computation of the corrected Black-and-other-races female population aged 35 to 64 in each State, the derivation of the corresponding expected sex ratios, and then the application of these expected sex ratios to the corrected female population to obtain estimates of the corrected male population. To determine the corrected Black-and-other-races female population aged 35 to 64, the coverage rates for States derived by equation (5.6) or (5.11), or the complements of the net undercount rates derived by equation (5.2) or (5.8), were divided into the corresponding census populations, as indicated by the following equations:

$$EP^{bf}_{j,\,35-64} = \frac{CP^{bf}_{j,\,35-64}}{C^{bf}_{j,\,35-64}} = \frac{CP^{bf}_{j,\,35-64}}{1-E^{bf}_{j,\,35-64}} \qquad (5.12)$$

where

$C^{bf}_{j,\,35-64}$ is defined in equation (5.6) or (5.11),

$E^{bf}_{j,\,35-64}$ is defined in equation (5.2) or (5.8), and

$EP^{bf}_{j,\,35-64}$ = corrected Black-and-other-races female population aged 35 to 64 in State j

$CP^{bf}_{j,\,35-64}$ = census Black-and-other-races female population aged 35 to 64 in State j.

Ideally, expected (or corrected) sex ratios would be derived in the same manner as for the White population aged 35 to 64, but expected sex ratios for the Black-and-other-races population aged 35 to 64 for States could not be developed by the component method. Data on Black births prior to 1930 are not generally available for the States with the bulk of the Black population, i.e., States in the South. Very few life tables for the Black population are available for dates prior to 1940. As a result of this general lack of data, it was necessary to devise other less refined methods of estimating the expected sex ratios for the Black-and-other-races population aged 35 to 64 in each State. These methods involved certain simple arithmetic devices rather than "demographic" methods.

The methods used to develop expected sex ratios for the Black-and-other-races population aged 35 to 64 in each State in 1970 start with the expected (or corrected) sex ratios for the entire United States for Black and other races aged 35 to 64 and Black and other races under age 35. The national expected sex ratios for Black and other races in 1970 were

$$ESR^{b}_{n,\,35-64} = \frac{EP^{bm}_{n,\,35-64}}{EP^{bf}_{n,\,35-64}} = \frac{3{,}636{,}056}{3{,}863{,}052} = 0.941239$$

and

$$ESR^{b}_{n,\,0-34} = \frac{EP^{bm}_{n,\,0-34}}{EP^{bf}_{n,\,0-34}} = \frac{8{,}832{,}609}{8{,}944{,}552} = 0.987485 \qquad (5.13)$$

where

$ESR^{b}_{n,k}$ = national expected sex ratios for the Black-and-other-races population of age group k (0–34 or 35–64)

$EP^{b(m\ or\ f)}_{n,k}$ = national corrected Black-and-other-races population of age group k (0–34 or 35–64) for males or females (from table I–B).

Two alternative procedures were used to derive sex ratios for the Black-and-other-races population aged 35 to 64 for the States, one an *additive* procedure and the other a *ratio* procedure, as described in the following sections.

Additive Procedure of Estimating Expected Sex Ratios

The additive procedure of estimating expected sex ratios, designated "A" in the notation used to identify the estimation procedures, was based on the census or "enumerated" sex ratios for the Black-and-other-

races population aged 35 to 64 nationally and in each State. The assumption was made that the difference between the census sex ratio and the expected sex ratio for each State is the same as the difference for the country as a whole. The national census sex ratio and the State census sex ratios may be represented, respectively, as

$$CSR^b_{n,\,35-64} = \frac{CP^{bm}_{n,\,35-64}}{CP^{bf}_{n,\,35-64}} = \frac{3{,}153{,}458}{3{,}676{,}144} = 0.857817$$

and

$$CSR^b_{j,\,35-64} = \frac{CP^{bm}_{j,\,35-64}}{CP^{bf}_{j,\,35-64}} \qquad (5.14)$$

where

$CSR^b_{n,\,35-64}$ = national census sex ratio for the Black-and-other-races population aged 35–64

$CSR^b_{j,\,35-64}$ = census sex ratio for the Black-and-other-races population aged 35–64 for State j

$CP^{b(m\text{ or }f)}_{(n\text{ or }j),\,35-64}$ = national or State census Black-and-other-races population aged 35 to 64 (national figures shown in table I–B).

First, the difference between the census sex ratio and expected sex ratio for the United States as a whole for the age group 35–64, symbolized by $d^b_{n,\,35-64}$, was calculated

$$d^b_{n,\,35-64} = ESR^b_{n,\,35-64} - CSR^b_{n,\,35-64}$$
$$= 0.941239 - 0.857817 = 0.083422 \qquad (5.15)$$

Then, to derive the expected sex ratio for each State, the difference between the census sex ratio and the expected sex ratio for the nation was added to the census sex ratio for each State; that is,

$$ESR^b_{j,\,35-64} = CSR^b_{j,\,35-64} + d^b_{n,\,35-64}$$
$$= CSR^b_{j,\,35-64} + 0.083422 \qquad (5.16)$$

where $CSR^b_{j,35-64}$ is defined by equation (5.14), $d^b_{n,\,35-64}$ is defined by equation (5.15), and $ESR^b_{j,\,35-64}$ is the expected sex ratio for the Black-and-other-races population aged 35–64 in State j.

Accordingly, the expected sex ratio for each State is the census sex ratio for the State plus a constant, i.e., the amount of error in the national estimate of the sex ratio for ages 35 to 64. Hence, in the additive ("A") technique of estimating expected sex ratios, the primary source of State-to-State variation in the expected sex ratios is the State-to-State variation in the census sex ratios for the same age group.

Ratio Procedure of Estimating Expected Sex Ratios

Consideration was next given to deriving the expected sex ratios by the ratio procedure corresponding to the additive procedure just described. This ratio procedure involves adjusting the census or "enumerated" sex ratios for each State by the ratio of the national expected sex ratio to the national census or "enumerated" sex ratio—

$$ESR^b_{j,\,35-64} = CSR^b_{j,\,35-64} \times \frac{ESR^b_{n,\,35-64}}{CSR^b_{n,\,35-64}} \qquad (5.17)$$

Because of the narrow range of variation in the enumerated sex ratios for the States, it was recognized that this procedure would produce estimates of expected sex ratios that varied little from those produced by the additive procedure already applied and, hence, it was omitted.

A more complex and refined ratio procedure was also considered. This procedure would take account of the relative difference between the correction factors of the sex ratios for the United States and each State at ages under 35 to impute State-to-State variation to the correction factor for the United States at ages 35 to 64—

$$ESR^b_{j,\,35-64} = \frac{\dfrac{ESR^b_{j,\,0-34}}{CSR^b_{j,\,0-34}}}{\dfrac{ESR^b_{n,\,0-34}}{CSR^b_{n,\,0-34}}} \times \frac{ESR^b_{n,\,35-64}}{CSR^b_{n,\,35-64}} \times CSR^b_{j,\,35-64} \qquad (5.18)$$

Each correction factor in the formula is the ratio of the expected (or corrected) sex ratio to the census (or enumerated) sex ratio. This procedure was not actually employed because another simpler ratio procedure produced approximately the same results.

The alternative ratio procedure actually employed to derive expected sex ratios for the Black-and-other-races population aged 35 to 64 was based directly on the expected or corrected sex ratios for the age group under 35. In this procedure it was assumed that the ratio of the expected sex ratio for ages 35 to 64 to the expected sex ratio for ages under 35 in each State was the same as the national ratio. The ratio of the national expected sex ratio for the Black-and-other-races population 35 to 64 years of age to the national expected sex ratio for Black and other races under 35 years of age, designated here as $f^b_{n,\,35-64}$ was calculated as

$$f^b_{n,\,35-64} = \frac{ESR^b_{n,\,35-64}}{ESR^b_{n,\,0-34}} = \frac{0.941239}{0.987485} = 0.953168 \qquad (5.19)$$

where the expected sex ratios were based on the population figures shown in table I-B. Then, the expected sex ratios for the Black-and-other-races population under age 35 in each State were computed by use of the estimates of the corrected Black-and-other-races population derived in chapter III (table III-E). Finally, to derive the expected sex ratios for Blacks aged 35 to 64 in each State, the expected sex ratios for States at ages under 35 were multiplied by the ratio of the expected sex ratio at ages 35 to 64 for the United States to the expected sex ratio at ages under 35 for the United States; that is,

$$ESR^{b}_{j,\,35-64} = f^{b}_{n,\,35-64}\, ESR^{b}_{j,\,0-34} = 0.953168\, ESR^{b}_{j,\,0-34} \qquad (5.20)$$

where

$f^{b}_{n,\,35-64}$ is defined by equation (5.19), and

$ESR^{b}_{j,\,0-34}$ = expected sex ratio for the Black-and-other-races population under age 35 in State j.

Whenever estimates of expected sex ratios derived according to equation (5.20) were incorporated into an estimation procedure, the identification of the resulting sets of estimates of net undercount includes an "R." In the ratio ("R") set of estimates of the expected sex ratios of the Black-and-other-races population aged 35 to 64 for States, the basic source of State-to-State variation is clearly variation in the expected sex ratios of the Black-and-other-races population under 35 in each State.

Evaluation of Additive and Ratio Procedures

The choice betwen the "A" set and the "R" set of estimates of expected sex ratios for Black and other races aged 35 to 64 cannot easily be made on logical or theoretical grounds. Both sets of estimates are based on plausible assumptions which are difficult to test directly. However, a limited test of the two procedures was performed involving application of the "A" and "R" procedures to the White population and a comparison of the resulting figures with the expected sex ratios for the White population aged 35 to 64 derived by the component-survival method in chapter IV as a standard. The additive ("A") method was based on the census sex ratios for the White population of States aged 35 to 64 and the difference between the national expected sex ratio for the White population under age 35 and the national expected sex ratio for the White population aged 35 to 64; this method can be described by changing the superscript b's to w's and substituting the appropriate constant for Whites in equation (5.16). The ratio ("R") method employed the expected sex ratios for the White population of States under age 35 and the ratio of the expected national sex ratio for Whites aged 35 to 64 to the corresponding figures for ages under 35; this procedure adapted equation (5.20) to the White population. Both of the resulting sets of estimates were compared to the presumably more accurate expected sex ratios derived by the component-survival method in chapter IV (shown in table V-E).

The evidence from this limited test suggests that the "A" method gives superior results. The average absolute difference between the expected sex ratios derived by the component method and those derived by the "A" method is relatively small, 1.7, but the difference for those derived by the "R" method is much greater, 3.6. Furthermore, the "A" estimates differ from the component estimates by an amount larger than 3.5 for only 3 States (Florida, Alaska, and Hawaii). These States were all subject to heavy migration; and this is the type of State for which the component method of calculating expected sex ratios tends to give the poorest results. On the other hand, for the "R" estimates, 20 States differ by more than 3.5 from the component estimates.

The evidence of the supposed superiority of the "A" method based on the White population must be treated with caution, however, since we cannot be sure that the results apply to the Black population, particularly since most States have been subjected to heavy migration of Blacks in this age range. For the Black-and-other-races population, direct evaluation of the alternative methods does not appear to be possible. Accordingly, it was decided to employ both sets of expected sex ratios for Blacks to derive alternative coverage estimates for States.

Application of Expected Sex Ratios

The next step was the computation of preliminary estimates of the corrected Black-and-other-races male population aged 35 to 64 for each State. This was achieved, as in the case of the White population, by applying the expected sex ratios, computed according to equation (5.16) or (5.20), to the corrected female population aged 35 to 64, computed according to equation (5.12)—

$$EP^{bm}_{j,\,35-64} = ESR^{b}_{j,\,35-64}\, EP^{bf}_{j,\,35-64} \qquad (5.21)$$

The final step in the estimation procedure was the separate *pro rata* adjustment of the corrected Black-and-other-races male and female populations aged 35 to 64 for the States to the national totals shown in table I-B.

The coverage estimates for the Black-and-other-races population aged 35 to 64 derived by the methods described were designated variously as series BAEF, BACF, BREF, BRCF, BACF*, or BREF*. The "B" re-

fers to the Black-and-other-races population and the "F" signifies that females were the basis of estimation (equation 5.21). The "E" refers to the fact that the estimates were developed on the basis of the percent census *error* or *undercount* in the population (equation 5.2). The alternative to "E" is "C," which indicates that the estimates were developed on the basis of the percent *coverage* of the population (equation 5.6). The second letter, "A" or "R," designates the method by which the expected sex ratios were estimated, "A" for the *additive* procedure of equation (5.16) and "R" for the *ratio* procedure of equation (5.20). The asterisk is used to denote those sets of estimates which were based on coverage estimates for Black-and-other-races females under age 35 (equations 5.8 and 5.11) rather than on estimates for White females aged 35 to 64.

DESCRIPTION OF RESULTS

The coverage estimates shown in tables V-A and V-B demonstrate the effects, on the coverage estimates for the 35-to-64-year-old and the total Black-and-other-races population of each geographic region, division, and State, of varying the methods used to estimate the corrected Black-and-other-races population aged 35 to 64 and the corrected White population aged 35 to 64. In order to isolate these effects, the same combination of estimates for the Black-and-other-races population under 35 and 65 years and over were used in each comparison. These were: (1) the estimates for the population under 35 (table III-E, col. 5), tied to the series SOR–3–1 estimates for Whites under age 35, corresponding to the State-of-residence model 3 based on composite births, with A=1 and B=1 (table II-A, col. 5); and (2) the low Medicare estimates for the population aged 65 and over (table VI-C, col. 1). Two sets of estimates for the White population aged 35 to 64 were chosen to demonstrate the effects of alternative procedures for estimating this group. The two sets are the ones designated as WEF and WCF (ch. IV, especially tables IV-C and IV-D).

Black-and-Other-Races Population 35 to 64 Years of Age

The estimates of the percents of net undercount for the Black-and-other-races population aged 35 to 64 for regions and divisions, as shown in table V-A, are much larger than the corresponding estimates for the White population (table IV-C), and exhibit considerable variation from area to area within each series and from estimate to estimate for the same area. The difference between the low and the high estimates for every region equals 4 percentage points or more. The estimates for two of the geographic divisions (West North Central and South Atlantic) have fairly narrow ranges, but for most of the divisions the ranges are fairly large, with the range for the Mountain division reaching 12 percentage points. The levels of the estimated net undercounts for this age group exceed 20 percent in one case (Mountain division, WCF-BAEF) and many of the estimates are greater than 10 percent. These high figures may not be unrealistic in view of the high level of the estimated net undercount for the country as a whole for the Black-and-other-races population aged 35 to 64 (8.9 percent). However, the impact of the undercount figures for this age-race group on the estimates of underenumeration of the total population of States is limited because of the relatively small size of the group.

Total Black-and-Other-Races Population

The estimates of the net underenumeration of the total Black-and-other-races population of States are also much greater than the corresponding estimates for Whites and the range of variation within each set of estimates for the Black-and-other-races population is larger than the range within each set for the White population. (See table V-B for estimates of the Black underenumeration and table IV-D for estimates of the White underenumeration.) Many States show a large net underenumeration of the Black-and-other-races population; for example, between 7 and 11 States show a net underenumeration in excess of 10 percent (table V-C). Some estimates of this magnitude are to be expected, as these figures vary around a national average rate of 6.9 percent. Few of the estimates exceed 15 percent and none exceed 20 percent, however. At the other end of the scale, one or two States (Connecticut and Idaho) show an estimated net overenumeration of the total Black-and-other-races population in some of the sets of estimates. These estimates are generally quite small, however. The pattern of coverage estimates for the total Black-and-other-races population among the States reflects essentially the pattern of the estimates for the population under age 35 since the latter age group constitutes a large share of the population of all ages and, in some series, the estimates for this age group were the basis for the estimates at ages 35 to 64.

The range of variation among the various sets of estimates of total net underenumeration for any particular region, division, or State is also substantially larger for Blacks than for Whites. For example, the range of 1.1 percentage points from 7.7 percent to 8.8 percent for the Black-and-other-races population in the South (as shown in table V-B) is larger than the range for the White populaton in all but five States (as shown in table IV-C). The situation for other regions is similar. The estimates for the Northeast have a range of 1.6 percentage points, from 4.0 percent to 5.6

percent; the North Central region has a range of 1.8 percentage points, from 3.9 percent to 5.7 percent; and the West has an even wider range of 2.3 percentage points, from 6.5 percent to 8.8 percent. The ranges of the estimates for many geographic divisions and States are, of course, even greater than the ranges for regions.

EVALUATION OF RESULTS

Mainly because of the lack of adequate data, the coverage estimates for the Black-and-other-races population are based on broader and more arbitrary assumptions than are the coverage estimates for the White population. As a consequence of the greater reliance on assumed relationships, we would expect the estimates of net underenumeration of the Black-and-other-races population of States to be much more sensitive to variations in the underlying assumptions than the corresponding White estimates. This is, in fact, the case. The various sets of estimates for Blacks are much less consistent than the corresponding estimates for Whites.

The sensitivity of the coverage estimates for the Black-and-other-races population of States to the various assumptions can be partially assessed by examining the summary measures shown in table V-D for the 10 series of estimates. This table gives the average absolute differences between pairs of figures for States and the correlation coefficients based on paired distributions of the percents of net underenumeration for the States.[1] These measures show, first, that the estimates of net underenumeration of the Black-and-other-races population of States are relatively insensitive to the choice of the set of estimates for the White population on which the Black estimates are based. The correlation coefficients for those estimates which employed similar procedures to measure the coverage of the Black-and-other-races population aged 35 to 64, but different sets of White estimates, include the two largest coefficients in the table (.999 for sets BACF and BRCF); and all coefficients exceed .96. Similarly, the average absolute differences between the distribution based on the same procedures for Blacks but different estimates for Whites under age 35 are among the smallest in the table (0.128 for sets BACF and BRCF).

The estimates of coverage for the Black-and-other-races population of States are more sensitive to other variations in the procedures used to prepare them than to the choice of coverage estimates for Whites employed in their calculation. The effect of the choice of the method used to compute the expected sex ratios for the Black-and-other-races population aged 35 to 64 ("A" or "R") appears to be larger than the effect of the choice of coverage estimates for Whites, but smaller than the effect of varying the coverage factor ("C" or "E"). The average absolute differences in the percent underenumeration for distributions which differ only in the method of computing the expected sex ratios concentrate at 0.77 and 0.78; similarly, the corresponding correlation coefficients fall in a narrow range between 0.968 and 0.982 (table V-D). On the other hand, the differences for distributions which differ only in the choice of coverage factor are about 0.75 percentage point for estimates based on the WEF set of estimates and about 1.4 percentage points for estimates based on the WCF set. Finally, the greatest differences between distributions based on Whites tend to be those which differ in both the method of computing expected sex ratios and the choice of coverage factors, if not also in the choice of coverage estimates for Whites. In these cases, all of the average absolute differences in the percents of net underenumeration are well above 1 percentage point (except for the pair WEF-BRCF and WEF-BAEF). For the most part, these average absolute differences are substantially larger, and coefficients of correlation are substantially smaller, than those calculated for the White population (table IV-F).

The two sets of estimates for the total Black-and-other-races population which are based solely on the estimates for Blacks and other races under age 35, i.e., BACF* and BREF*, differ somewhat from the other estimates. The average absolute differences between these sets of estimates and the other eight range from 0.82 to 2.14; the correlation coefficients are in the range 0.77 to 0.99 (table V-D). Similarly, the two sets based solely on the estimates for Black and other races account for a disproportionate share of the extreme values of estimates of State net underenumeration shown in table V-B. For fully 26 of the 47 State areas included, either the high or low value is taken from set BACF* or BREF*.

Clearly then these two sets of estimates are different from the other eight. The estimates of the net underenumeration of the Black-and-other-races population—even the national estimates on which the BACF* and BREF* estimates are partly based—are considered to be generally weaker than the corresponding estimates for the White population. Furthermore, the estimates of the Black-and-other-races undercount for ages under 35 for States which provide the basis for State-to-State variation in sets BACF* and BREF* are considered to be much weaker than those for Whites (ch. III). Consequently, the linkage of estimates for the Black-and-other-races population of States to the White estimates for States and the United States in the 35-to-64-year age group, rather than to the State and national estimates for Black and other races at ages under 35, was viewed as

[1] These methods were first described in chapter II.

producing the sounder State coverage estimates for the Black-and-other-races population.

It is clear that the estimates of net underenumeration for the Black-and-other-races population of States are much more sensitive to variation in the underlying assumptions than are the estimates for the White population. Yet, as was the case for the White population, all of the assumptions made seemed reasonable. Furthermore, there seemed to be no sound basis for evaluating the assumptions or for discriminating among the alternatives. As a result, the various sets of coverage estimates for the Black-and-other-races population of States that were calculated here were accepted as equally plausible and reasonable.

It is believed that the coverage estimates for the Black-and-other-races population aged 35 to 64 are the weakest of all the coverage estimates for the age-sex-race categories presented in this report. This belief is based on the judgements that the estimates for ages 35 to 64 are weaker than those for either of the other age groups and the estimates for Blacks are weaker than those for Whites. If the coverage estimates for the White population aged 35 to 64 for States may be viewed as crude, as seems appropriate, then the estimates for the Black-and-other-races population aged 35 to 64 must be viewed as even more problematical, even conjectural. However, the Black-and-other-races population in the age group 35 to 64 represents only about 27 percent of the national Black-and-other-races population and about 3 percent of the total national population. Although the percentage of the total varies somewhat from State to State, it exceeds 9 percent in only two States (Hawaii, 20.2 percent, and the District of Columbia, 21.5 percent). As a result, the effect of variation in coverage estimates for the Black-and-other-races population aged 35 to 64 on the coverage estimates for the entire population of States is generally small.

Table V-A. ALTERNATIVE ESTIMATES OF THE PERCENTS OF NET UNDERCOUNT FOR THE BLACK-AND-OTHER-RACES POPULATION 35 TO 64 YEARS OF AGE, FOR REGIONS AND DIVISIONS: 1970

(See text for explanation of the alternative procedures)

Region and division	Based on White series SOR-3, A=1, B=1, WCF				Based on White series SOR-3, A=1, B=1, WEF				Based on Black-and-other-races series SOR-3, A=1, B=1		Range		
	BACF	BRCF	BAEF	BREF	BACF	BRCF	BAEF	BREF	BACF*	BREF*	Low value	High value	Difference
United States, total	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	(X)	(X)	(X)
Regions:													
Northeast	7.9	7.5	3.5	3.1	8.4	8.0	5.7	5.3	8.6	8.2	3.1	8.6	5.5
North Central	8.3	6.3	4.5	2.4	8.7	6.6	7.0	4.9	7.9	5.9	2.4	8.7	6.3
South	9.4	11.3	11.3	13.1	9.2	11.1	10.2	12.1	9.4	11.2	9.2	13.1	3.9
West	9.6	6.1	13.6	10.2	9.2	5.7	11.4	8.0	9.4	5.9	5.7	13.6	7.9
Northeast:													
New England	7.2	5.5	3.4	1.7	7.5	5.8	4.4	2.6	6.5	4.7	1.7	7.5	5.8
Middle Atlantic	8.0	7.7	3.5	3.2	8.4	8.2	5.8	5.5	8.7	8.5	3.2	8.7	5.5
North Central:													
East North Central	8.2	5.7	3.9	1.2	8.6	6.0	6.7	4.1	7.3	4.8	1.2	8.6	7.4
West North Central	8.8	9.4	7.6	8.2	8.9	9.5	8.4	9.0	10.5	11.1	7.6	11.1	3.5
South:													
South Atlantic	9.1	10.2	10.3	11.4	9.0	10.1	9.6	10.8	10.0	11.0	9.0	11.4	2.4
East South Central	9.1	12.9	8.6	12.3	9.2	12.9	9.1	12.8	7.5	11.4	7.5	12.9	5.4
West South Central	10.1	12.1	15.4	17.1	9.6	11.6	12.4	14.3	9.5	11.5	9.5	17.1	7.6
West:													
Mountain	10.4	9.4	20.6	19.6	9.6	8.6	14.3	13.3	12.3	11.1	8.6	20.6	12.0
Pacific	9.5	5.7	12.6	8.9	9.2	5.4	11.0	7.3	9.0	5.2	5.2	12.6	7.4

X Not applicable.

Table V-B. ALTERNATIVE ESTIMATES OF THE PERCENTS OF NET UNDERENUMERATION FOR THE TOTAL BLACK-AND-OTHER-RACES POPULATION, FOR REGIONS, DIVISIONS, AND STATES: 1970

(See text for explanation of the alternative procedures. A minus sign denotes a net overcount)

Region, division, and State	Based on White series SOR-3, A=1, B=1, WCF				Based on White series SOR-3, A=1, B=1, WEF				Based on Black-and-other-races series SOR-3, A=1, B=1		Range		
	BACF	BRCF	BAEF	BREF	BACF	BRCF	BAEF	BREF	BACF*	BREF*	Low value	High value	Difference
United States, total	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	(X)	(X)	(X)
Regions:													
Northeast	5.4	5.3	4.1	4.0	5.6	5.4	4.8	4.6	5.6	5.5	4.0	5.6	1.6
North Central	5.6	5.0	4.5	3.9	5.7	5.1	5.2	4.6	5.5	4.9	3.9	5.7	1.8
South	7.7	8.3	8.3	8.8	7.7	8.2	8.0	8.5	7.7	8.3	7.7	8.8	1.1
West	7.6	6.6	8.8	7.7	7.5	6.5	8.1	7.1	7.5	6.5	6.5	8.8	2.3
Northeast:													
New England	3.4	3.0	2.4	2.0	3.5	3.1	2.7	2.2	3.2	2.8	2.0	3.5	1.5
Middle Atlantic	5.6	5.5	4.3	4.2	5.8	5.7	5.0	4.9	5.9	5.8	4.2	5.9	1.7
North Central:													
East North Central	5.2	4.5	4.0	3.2	5.3	4.6	4.8	4.0	4.9	4.2	3.2	5.3	2.1
West North Central	7.4	7.6	7.1	7.3	7.5	7.6	7.3	7.5	7.9	8.1	7.1	8.1	1.0
South:													
South Atlantic	8.2	8.5	8.5	8.9	8.2	8.5	8.4	8.7	8.5	8.8	8.2	8.9	0.7
East South Central	6.7	7.7	6.5	7.6	6.7	7.7	6.7	7.7	6.2	7.3	6.2	7.7	1.5
West South Central	7.6	8.1	9.1	9.6	7.5	8.0	8.3	8.8	7.4	8.0	7.4	9.6	2.2
West:													
Mountain	10.5	10.3	13.1	12.8	10.3	10.1	11.4	11.2	11.0	10.7	10.1	13.1	3.0
Pacific	7.1	5.9	8.0	6.9	7.0	5.8	7.5	6.4	6.9	5.8	5.8	8.0	2.2
New England:													
Maine	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(X)	(X)	(X)
New Hampshire	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(X)	(X)	(X)
Vermont	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(X)	(X)	(X)
Massachusetts	4.0	3.5	3.0	2.5	4.1	3.6	3.2	2.7	3.9	3.4	2.5	4.1	1.6
Rhode Island	7.8	9.2	6.8	8.2	7.9	9.3	7.0	8.4	9.1	10.5	6.8	10.5	3.7
Connecticut	0.6	-0.4	-0.4	-1.4	0.7	-0.3	-0.2	-1.2	-0.3	-1.3	-1.4	0.7	2.1
Middle Atlantic:													
New York	5.6	5.6	4.2	4.2	5.7	5.7	5.0	5.0	5.8	5.8	4.2	5.8	1.6
New Jersey	6.1	5.9	5.1	4.9	6.1	5.9	5.3	5.1	6.7	6.5	4.9	6.7	1.8
Pennsylvania	5.4	5.2	4.0	3.8	5.6	5.4	4.6	4.4	5.5	5.3	3.8	5.6	1.8
East North Central:													
Ohio	4.0	3.4	2.5	1.9	4.1	3.5	3.4	2.8	3.1	2.5	1.9	4.1	2.2
Indiana	6.4	6.1	5.5	5.1	6.5	6.1	6.2	5.8	6.1	5.7	5.1	6.5	1.4
Illinois	6.6	5.9	5.3	4.6	6.7	6.0	6.1	5.4	7.0	6.3	4.6	7.0	2.4
Michigan	4.2	3.1	3.1	2.0	4.3	3.2	3.8	2.8	3.5	2.5	2.0	4.3	2.3
Wisconsin	3.0	2.0	2.2	1.2	2.9	1.9	2.4	1.4	3.1	2.0	1.2	3.1	1.9
West North Central:													
Minnesota	3.2	1.7	2.3	0.8	3.3	1.8	2.6	1.1	3.0	1.5	0.8	3.3	2.5
Iowa	4.2	4.1	3.7	3.6	4.3	4.1	4.1	4.0	3.2	3.1	3.1	4.3	1.2
Missouri	7.8	8.2	7.7	8.1	7.8	8.2	7.9	8.2	8.3	8.7	7.7	8.7	1.0
North Dakota	8.2	7.8	8.8	8.4	8.1	7.7	8.5	8.1	8.3	7.9	7.7	8.8	1.1
South Dakota	15.5	15.2	15.8	15.5	15.4	15.1	15.7	15.4	17.6	17.2	15.1	17.6	2.5
Nebraska	9.5	9.1	8.8	8.4	9.6	9.2	9.3	8.9	10.8	10.3	8.4	10.8	2.4
Kansas	5.7	6.4	4.6	5.2	5.9	6.5	5.0	5.6	5.8	6.5	4.6	6.5	1.9
South Atlantic:													
Delaware	6.5	5.4	6.6	5.4	6.5	5.3	6.6	5.5	6.6	5.5	5.3	6.6	1.3
Maryland[1]	7.8	7.2	6.9	6.3	7.8	7.2	7.1	6.6	8.9	8.3	6.3	8.9	2.6
District of Columbia[1]	6.0	5.4	4.6	4.1	6.2	5.6	5.3	4.7	6.0	5.5	4.1	6.2	2.1
Virginia[1]	6.7	6.6	6.1	6.0	6.7	6.6	6.5	6.4	6.3	6.2	6.0	6.7	0.7
West Virginia	7.5	9.0	16.1	17.7	6.9	8.3	10.7	12.3	5.4	6.9	5.4	17.7	12.3
North Carolina	7.6	8.3	6.8	7.5	7.6	8.3	7.3	8.0	7.8	8.5	6.8	8.5	1.7
South Carolina	10.2	11.3	11.6	12.6	10.1	11.1	10.8	11.9	10.6	11.6	10.1	12.6	2.5
Georgia	9.7	10.7	11.0	12.0	9.5	10.5	10.3	11.3	10.1	11.0	9.5	12.0	2.5
Florida	8.6	8.5	9.8	9.7	8.5	8.3	9.2	9.0	8.6	8.5	8.3	9.8	1.5
East South Central:													
Kentucky	4.4	5.8	5.5	6.9	4.3	5.7	4.9	6.4	2.6	4.1	2.6	6.9	4.3
Tennessee	7.1	7.8	8.7	9.4	6.9	7.6	7.8	8.5	6.5	7.2	6.5	9.4	2.9
Alabama	6.3	7.5	5.4	6.6	6.3	7.5	6.0	7.2	5.7	6.9	5.4	7.5	2.1
Mississippi	7.5	8.5	6.4	7.4	7.6	8.6	7.0	8.0	7.6	8.7	6.4	8.7	2.3
West South Central:													
Arkansas	14.6	15.9	17.3	18.6	14.4	15.7	15.7	17.0	16.4	17.7	14.4	18.6	4.2
Louisiana	6.7	7.3	5.9	6.6	6.8	7.4	6.5	7.1	6.6	7.2	5.9	7.4	1.5
Oklahoma	7.2	8.1	6.1	7.0	7.3	8.2	6.9	7.7	8.2	9.0	6.1	9.0	2.9
Texas	6.5	6.6	9.7	9.9	6.2	6.4	7.8	8.0	5.5	5.6	5.5	9.9	4.4
Mountain:													
Montana	10.3	9.9	9.7	9.3	10.3	9.9	10.1	9.7	11.3	10.9	9.3	11.3	2.0
Idaho	-1.2	-2.3	1.3	0.2	-1.4	-2.5	-0.1	-1.2	-4.6	-5.6	-5.6	1.3	6.9
Wyoming	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(X)	(X)	(X)
Colorado	3.1	3.7	3.6	4.2	3.0	3.6	3.4	4.0	1.2	1.8	1.2	4.2	3.0
New Mexico	11.0	10.5	19.6	19.0	10.4	9.9	13.9	13.4	10.5	10.0	9.9	19.6	9.7
Arizona	14.6	14.5	15.4	15.3	14.5	14.4	15.0	14.9	16.2	16.0	14.4	16.2	1.8
Utah	9.0	8.4	8.4	7.8	8.9	8.3	8.5	7.9	10.7	10.0	7.8	10.7	2.9
Nevada	12.8	11.7	15.2	14.0	12.6	11.5	13.8	12.7	14.3	13.0	11.5	15.2	3.7
Pacific:													
Washington	9.9	9.2	8.7	8.0	10.0	9.3	9.5	8.8	11.6	10.8	8.0	11.6	3.6
Oregon	6.2	4.6	5.0	3.4	6.4	4.7	5.4	3.8	7.2	5.5	3.4	7.2	3.8
California	6.8	5.9	7.7	6.8	6.7	5.8	7.3	6.4	6.6	5.7	5.7	7.7	2.0
Alaska	12.9	11.2	12.0	10.4	12.9	11.3	12.6	11.0	15.5	13.6	10.4	15.5	5.1
Hawaii	6.5	4.2	9.0	6.7	6.3	4.0	7.6	5.3	5.4	3.1	3.1	9.0	5.9

B Enumerated Black-and-other-races population less than 10,000.
X Not applicable.
[1]Based on adjusted estimates for the White population under 35 years of age.

Table V-C. NUMBER OF STATES WITH SPECIFIED PERCENTS OF NET UNDERENUMERATION FOR THE TOTAL BLACK-AND-OTHER-RACES POPULATION, ACCORDING TO ALTERNATIVE PROCEDURES FOR ESTIMATING THE COVERAGE OF THE POPULATION 35 TO 64 YEARS OF AGE: 1970

(See text for explanation of the alternative procedures. Four States with an enumerated Black-and-other-races population of less than 10,000 are excluded)

Percent	Based on White series SOR-3, A=1, B=1, WCF				Based on White series SOR-3, A=1, B=1, WEF				Based on Black-and-other-races series SOR-3, A=1, B=1	
	BACF	BRCF	BAEF	BREF	BACF	BRCF	BAEF	BREF	BACF*	BREF*
Total[1]	47	47	47	47	47	47	47	47	47	47
Net overcount	1	2	1	1	1	2	2	2	2	2
Net undercount:										
Under 2.5	1	2	3	6	1	2	1	2	1	4
2.5 to 4.9	8	7	[2]9	[2]8	8	7	8	[2]8	7	5
5.0 to 7.4	[2]18	[2]15	14	13	[2]18	[2]14	[2]17	13	[2]17	[2]16
7.5 to 9.9	11	13	11	10	10	15	9	13	8	8
10.0 to 14.9	7	6	3	4	8	5	8	7	8	9
15.0 and over	1	2	6	5	1	2	2	2	4	3
Average percent net under-enumeration (unweighted)	7.2	7.1	7.5	7.4	7.2	7.1	7.3	7.2	7.4	7.2

[1]Percent for all States is 6.9 (weighted).
[2]Includes the District of Columbia.

Source: Based on estimates shown in table V-B.

Table V-D. AVERAGE ABSOLUTE DIFFERENCES AND CORRELATION COEFFICIENTS FOR ALTERNATIVE ESTIMATES OF THE PERCENTS OF NET UNDERENUMERATION FOR THE TOTAL BLACK-AND-OTHER-RACES POPULATION OF STATES: 1970

(Four States with an enumerated Black-and-other-races population of less than 10,000 are excluded. Average absolute differences are shown above the diagonal line; product-moment correlation coefficients are shown below the diagonal line)

Series	Based on White series SOR-3, A=1, B=1, WCF				Based on White series SOR-3, A=1, B=1, WEF				Based on Black-and-other-races series SOR-3, A=1, B=1	
	BACF	BRCF	BAEF	BREF	BACF	BRCF	BAEF	BREF	BACF*	BREF*
Based on White series SOR-3, A=1, B=1, WCF:										
BACF		.774	1.449	1.677	.128	.766	.649	1.077	.868	1.072
BRCF	.968		1.406	1.443	.800	.128	.832	.651	1.174	.838
BAEF	.878	.866		.781	1.568	1.513	.804	1.006	1.887	1.840
BREF	.857	.894	.981		1.792	1.562	1.194	.796	2.140	1.872
Based on White series SOR-3, A=1, B=1, WEF:										
BACF	.999	.966	.854	.834		.779	.768	1.153	.851	1.055
BRCF	.968	.999	.845	.873	.968		.892	.770	1.157	.817
BAEF	.974	.952	.961	.942	.962	.942		.772	1.228	1.338
BREF	.942	.977	.942	.966	.930	.967	.974		1.536	1.213
Based on Black-and-other-races series SOR-3, A=1, B=1:										
BACF*	.984	.939	.796	.769	.990	.946	.923	.882		.792
BREF*	.975	.983	.805	.817	.979	.988	.923	.929	.978	

Source: Based on estimates shown in table V-B.

Table V-E. EVALUATION OF ALTERNATIVE PROCEDURES FOR ESTIMATING THE EXPECTED SEX RATIOS FOR THE POPULATION 35 TO 64 YEARS OF AGE, FOR STATES: 1970

(All figures pertain to the White population)

Division, region, and State	Observed sex ratios	Expected sex ratios derived by--			Deviation from component method	
		Component method	Additive ("A") method	Ratio ("R") method	"A" method	"R" method
United States, total	93.6	95.6	(X)	(X)	(X)	(X)
NORTHEAST						
New England:						
Maine	93.1	97.4	95.1	94.9	-2.3	-2.5
New Hampshire	94.3	99.3	96.3	95.9	-3.0	-3.4
Vermont	94.7	96.0	96.7	96.0	+0.7	(Z)
Massachusetts	90.5	93.6	92.5	94.1	-1.1	+0.5
Rhode Island	90.4	93.7	92.5	101.0	-1.2	+7.3
Connecticut	94.0	95.3	96.0	95.1	+0.7	-0.2
Middle Atlantic:						
New York	90.8	92.8	92.8	93.0	(Z)	+0.2
New Jersey	93.4	95.9	95.4	94.6	-0.5	-1.3
Pennsylvania	91.2	92.9	93.3	93.8	+0.4	+0.9
NORTH CENTRAL						
East North Central:						
Ohio	93.8	97.0	95.8	93.6	-1.2	-3.4
Indiana	94.4	95.9	96.4	94.7	+0.5	-1.2
Illinois	94.6	95.5	96.6	94.8	+1.1	-0.7
Michigan	95.3	97.9	97.3	94.6	-0.6	-3.3
Wisconsin	95.8	97.1	97.8	94.8	+0.7	-2.3
West North Central:						
Minnesota	96.4	98.2	98.4	94.0	+0.2	-4.2
Iowa	94.5	96.1	96.5	94.1	+0.4	-2.0
Missouri	92.1	94.4	94.1	94.5	-0.3	+0.1
North Dakota	102.0	102.6	104.0	97.2	+1.4	-5.4
South Dakota	98.8	100.9	100.8	96.8	-0.1	-4.1
Nebraska	96.0	97.5	98.0	93.7	+0.5	-3.8
Kansas	94.8	97.7	96.8	98.4	-0.9	+0.7
SOUTH						
South Atlantic:						
Delaware	95.9	97.5	97.9	93.8	+0.4	-3.7
Maryland	95.7	99.3	97.7	95.7	-1.6	-3.6
District of Columbia	82.2	85.6	84.2	92.5	-1.4	+6.9
Virginia	95.3	99.2	97.3	100.0	-1.9	+0.8
West Virginia	90.9	92.7	92.9	94.9	+0.2	+2.2
North Carolina	92.5	95.7	94.5	99.5	-1.2	+3.8
South Carolina	93.4	97.6	95.4	102.5	-2.2	+4.9
Georgia	94.3	97.7	96.4	97.3	-1.3	-0.4
Florida	87.1	95.9	89.1	96.2	-6.8	+0.3
East South Central:						
Kentucky	93.1	96.8	95.1	98.4	-1.7	+1.6
Tennessee	91.4	94.2	93.4	96.1	-0.8	+1.9
Alabama	92.7	94.9	94.7	96.0	-0.2	+1.1
Mississippi	93.1	96.2	95.1	96.5	-1.1	+0.3
West South Central:						
Arkansas	92.1	95.0	94.1	94.9	-0.9	-0.1
Louisiana	94.1	95.7	96.1	96.7	+0.4	+1.0
Oklahoma	92.7	95.7	94.7	97.7	-1.0	+2.0
Texas	94.3	97.9	96.3	96.3	-1.6	-1.6
WEST						
Mountain:						
Montana	101.2	103.7	103.2	94.1	-0.5	-9.6
Idaho	98.9	102.7	100.9	96.4	-1.8	-6.3
Wyoming	101.3	101.2	103.3	96.3	+2.1	-4.9
Colorado	95.9	99.6	97.9	95.0	-1.7	-4.6
New Mexico	95.4	99.2	97.4	95.3	-1.8	-3.9
Arizona	92.3	96.8	94.3	96.4	-2.5	-0.4
Utah	97.1	99.6	99.2	94.9	-0.4	-4.7
Nevada	106.4	108.4	108.4	95.2	(Z)	-13.2
Pacific:						
Washington	97.7	101.6	99.7	97.2	-1.9	-4.4
Oregon	95.8	98.0	97.8	94.8	-0.2	-3.2
California	95.4	98.8	97.4	97.1	-1.4	-1.7
Alaska	127.2	151.3	129.2	120.0	-22.1	-31.3
Hawaii	113.7	125.7	115.7	114.4	-10.0	-11.3
Average absolute difference (unweighted)	(X)	(X)	(X)	(X)	1.7	3.6

X Not applicable.
Z Less than ± 0.05.

Chapter VI. Coverage of the Population 65 Years and Over

USE OF AGGREGATED MEDICARE DATA

The availability of appropriate administrative record data covering substantially the entire population 65 years and over obviated the need to rely entirely on demographic analysis or purely statistical procedures to estimate the "true" population of this age group. Estimates of net census error rates for the population 65 years old and over for States, according to sex and race (White and Black-and-other-races) groups, were derived by comparing census counts for race and sex groups with corresponding estimates of the corrected population derived from aggregated Medicare data. Aggregated Medicare data, obtained from records of the Social Security Administration, were subject to certain small adjustments, additions, and corrections, designed to allow for persons not included in the Medicare rolls and to achieve comparability with the census data.

The Medicare tabulations were available for each State, for age, race (White and Black-and-other-races), and sex groups, for January 1, 1970 and July 1, 1970, for persons having hospital insurance (Part A), supplementary Medicare insurance (Part B), or both hospital and medical insurance. To determine the total number of Medicare participants without duplication, that is, the total number having hospital and/or supplementary medical insurance, those with both hospital insurance and medical insurance were subtracted from the combined number of those with either type of coverage. The adjustments, additions, and corrections were then applied to these unduplicated Medicare enrollments.

National Medicare figures which incorporate the various adjustments, additions, and corrections have been published by the Census Bureau.[1] To derive the adjusted figures for States, each component of the adjustments was distributed among the States separately and the results were then summed. The procedure of allocating the adjustments separately instead of imputing a single State distribution to the combined adjustments in the national figures was employed to improve the accuracy of the State distribution of the adjustments since each component has its own characteristic distribution among the States.

Adjustment for Nonreports and Difference in Age Classification

Persons resident in each State whose race was not reported in the Medicare data (approximately 571,000 persons, or 2.8 percent nationally) were distributed by race according to the distribution of those whose race was reported in each State. Similarly, those whose residence was not reported (approximately 9,000 persons) were distributed by State according to the distribution of those whose residence was reported. As a prior step, persons of race "unknown" among those of "unknown" residence were distributed by race according to the distribution by race of those of "unknown" residence but of "known" race. "Unknowns" in each case were distributed separately for each age and sex group.

These adjusted data were then linearly interpolated between January 1, 1970 and July 1, 1970 to April 1, 1970, the date of the census. Data obtained from the Social Security Administration were 9-month "updates" of those enrolled at the beginning and middle of the year—to October 1, 1970 for the January 1, 1970 figures, and to April 1, 1971 for the July 1, 1970 figures. The reference dates are the initial ones, that is, January 1 and July 1, 1970, but the files were adjusted to take account of information obtained in the subsequent 9 months.

Differences between the census and Medicare in the way in which age is determined necessitated a small adjustment in the Medicare data. According to the Social Security Act, a person becomes eligible for health insurance on the first day of the month in which his 65th birthday falls. Thus, if a person was born during April, 65 years prior to April, 1970, the Social Security Administration records would show the person as 65 years of age on April 1, 1970, while the census count would show the person as 64 years of age. Accordingly, the population in each age group of the Medicare data was "younged" by a month to achieve conformity with the conventional completed ages as recorded in the census. The Medicare data were available for various 2- and 5-year age groups. They were then redistributed to yield two 5-year age groups and a terminal group, that is, age groups 65–69, 70–74, and 75 and over.

[1] U.S. Bureau of the Census, Census of Population and Housing: 1970, Evaluation and Research Program PHC(E)–4, **Estimates of Coverage of Population by Sex, Race, and Age: Demographic Analysis**, 1974, pp. 11–17.

Adjustment for Population Groups Excluded

The Medicare figures required further adjustment for groups excluded from coverage by law, by preference, or for other reasons. Among the additions made to the Medicare data were approximately 151,000 Federal employees (active and retired) 65 years of age and over in 1970 who, in addition to being ineligible for Social Security benefits and, therefore, ineligible for hospital insurance, did not enroll for supplementary medical insurance. These data, which are available only for sex groups, were distributed by race nationally according to the racial distribution of all active Civil Service employees 65 years old and over in 1970 and by States within each national sex-race total according to the distribution of active Public Federal Administrative and Postal Service Employees 65 and over.

The use of these data involved assuming that these two groups of government employees adequately represent Federal employees who did not enroll for medical insurance and that government employees largely reside after retirement in the areas in which they were last employed. Furthermore, since the census data on Public Federal Administrative and Postal Service employees are not available for race groups, it was assumed that the Federal employees not enrolled in each State have the same distribution by race as all active Civil Service employees 65 years old and over. This final assumption is subject to some question. However, test calculations in which the number of Federal employees was distributed by a "test" race distribution showed that, although the percent distribution by race varied substantially for some States, the "test" numbers for most of the States (especially those with larger numbers of Federal employees, such as California and New York) were not significantly different from the actual numbers.

Another group not represented in the Medicare files were some 65,000 aliens and conditional entrants who were not eligible for Medicare benefits because of residence requirements. Aliens with less than 5 years of continuous residence in the United States and conditional entrants are ineligible to enroll in the Medicare program. Conditional entrants include persons admitted conditionally from various foreign countries (e.g., Cuba and Hong Kong) and "refugee-escapees." Two remaining groups of "immigrants," civilian citizens from overseas and arrivals from Puerto Rico, were not included in the additions to Medicare since these persons are not subject to any special regulations which would exclude them from health insurance coverage.

In addition to the adjustments just described, the Medicare data appeared to require some further corrections for underenrollment. A comparison of the sex ratios implied by these preliminary Medicare estimates and expected "true" sex ratios for the United States suggested a slight underenrollment of White women in relation to White men in Medicare and a substantial underenrollment of Black women in relation to Black men in Medicare. The preliminary Medicare estimates for States were corrected on the basis of the assumption that the rates of underenrollment in Medicare for the United States previously estimated [2] applied to each State within each race and sex group.[3] Implementation of this assumption merely involved distributing the amount of underenrollment in Medicare established nationally among the States in accordance with the State distribution of the preliminary Medicare estimates.

The principal set of corrected population estimates based on Medicare enrollments (tables VI-A, VI-B, and VI-C) employed the "low" estimates of Medicare underenrollment previously established for the United States. These national estimates were derived on the specific assumptions that: (1) White males aged 65 and over were fully accounted for by the preliminary Medicare estimates; (2) the sex ratios of the "true" population 65 and over for each race conform to the expected sex ratios; and (3) the preliminary Medicare estimates for Black-and-other-races males understate the "true" population by the same percentage as the Medicare estimates for White females. In accordance with these assumptions, the preliminary population estimates based on Medicare enrollments for White females and Black-and-other-races males 65 and over in 1970 understate the "true" population by 0.9 percent and the estimate for Black-and-other-races females understates the "true" population by 7.6 percent (table VI-A). Overall, the understatement in the preliminary Medicare estimate for the population 65 and over is merely 181,000, or 0.9 percent of the final population estimate. The understatement in the original Medicare enrollment prior to any adjustment is 397,000, or 2.0 percent of the final population estimate.

A second set of estimates with a maximal allowance for Medicare underenrollment was calculated for illustrative purposes. These estimates were based on the assumptions that (1) the preliminary Medicare estimates for White males aged 65 and over understate the "true" population by 3 percent; (2) the sex ratios of the "true" population 65 and over for each race conform to the expected sex ratios; and (3) the

[2] U.S. Bureau of the Census, op cit, PHC(E)–4, p. 17.

[3] Since additions for Federal employees, aliens, and conditional entrants were made prior to the development of corrections for underenrollment in Medicare, it was implicitly assumed that these added groups were understated to the same relative extent as the Medicare enrollments. Though there is little question that these groups were undercounted, this assumption is quite arbitrary. The effect of alternative corrections would be very small, however.

preliminary Medicare estimates for Black-and-other-races males understate the "true" population by 4.5 percent, i.e., by 50 percent more than the rate for White males. These assumptions imply an understatement of 3.9 percent in the preliminary Medicare estimates for White females and of 11 percent in the estimates for Black-and-other-races females (table VI-A). Overall, the figures imply an understatement of 824,000, or 3.7 percent, in the preliminary Medicare estimate of the total population 65 and over. The understatement in the original Medicare enrollment is 1,040,000, or 5.0 percent of the final population estimate. The illustrative estimates derived according to these assumptions are designated "high estimates" of corrected population (tables VI-A and VI-C).

Adjustment for Inconsistency in Reporting Residence

Estimates of coverage of the population 65 and over, derived as described above, showed net census "overcounts" for Arizona and Florida (table VI-B). This anomaly could be attributed in part to a large flow of aged inmigrants to these States just prior to the census date. The movement consists of both permanent and temporary ("circular") migrants. Those who moved permanently to these States during the winter months prior to 1970 might still have been carried on the Medicare rolls as residents of the State of origin on April 1, 1970, while they were enumerated in the census as residents of Florida or Arizona on this date.[4]

Moreover, those vacationing or residing at a second residence in these States around April 1, and returning to their homes in other States after the census date, might have indicated on the census questionnaire that their "usual" place of residence was the State in which they happened to be living on census day. Because the 1970 census was conducted on the basis of self-enumeration, the indication of "usual" place of residence was generally left to the respondent. To the extent that circular migrants indicated Arizona or Florida as their place of residence in the census on April 1, 1970, and some other place for the Social Security records, and that a change of address was not made in the Medicare files for the permanent migrants moving to these two States just prior to April 1970, the Medicare figures for these States are "deflated" relative to the census figures.

No data are available to quantify the movement of either circular or permanent migrants to Arizona and Florida and to measure the extent to which such persons indicated these States as places of usual residence on the census questionnaire. So far as circular migrants are concerned, the census rules called for reporting the place where the respondents spent most of their time if they had two residences. It is possible that many people reported Florida and Arizona as their States of residence who should have reported another State and that the "true" census residence was the State in the Medicare files. Then, the comparison of the census counts and the adjusted Medicare figures provides a true measure of the net error in the census counts, encompassing the net effect of undercoverage and bias in residence reporting.

On the other hand, we may want to gauge only the omissions from the census as it would affect the Florida and Arizona counts, disregarding possible residence bias in the census, or we may reason that there was a residence bias in the Medicare figures but not in the census. The latter assumption was the one made here. Allowances then had to be made for the inconsistency of reporting residence in the census and the Medicare records to arrive at satisfactory estimates of the net undercounts for these States. Accordingly, substitute census error rates were assigned to Florida and Arizona on the assumption that these States had rates of net undercount for the elderly similar to those of adjacent States. Specifically, each of these two States was assigned a rate of net undercount for the population 65 and over of each race and sex group which represented the average rates of three surrounding States. The Medicare counts for Arizona and Florida were, then, inflated by the difference between the original net overcounts in the census based on the adjusted Medicare data and the net undercounts corresponding to the assigned rates. The adjusted Medicare counts in the remaining States were correspondingly reduced so as to maintain the national total. This downward adjustment was carried out on the basis of a State distribution of persons covered in the Old-Age, Survivors, Disability and Health Insurance (OASHDI) program who had migrated in 1967.[5] These data provided information on the State of origin and destination of migrants in that year.

Summary of the Adjustments and Their Effects

In summary, the adjustments, additions, and corrections in the "raw" Medicare data were as follows. First, after the raw Medicare figures for persons having hospital and/or supplementary medical insurance were adjusted for unknown race and unknown residence, they were interpolated to the census date, and then reduced slightly for the small discrepancy in re-

[4] Because of the fact that the Medicare data were updated by 9 months, the effect of this "time" discrepancy has been mitigated somewhat.

[5] U.S. Social Security Administration, **Interstate Migration of Aged Beneficiaries,** by William J. Nelson, Research and Statistics Note No. 3, February 25, 1970.

cording age between Medicare files and census data. Second, Federal employees, to the extent that they were not already included, resident aliens of recent arrival, and conditional entrants were added. Third, the data were corrected for underenrollment of the Medicare files. Finally, the data were adjusted for the apparent net census overcounts (or, alternatively, the apparent underenrollment in Medicare) in Arizona and Florida and then "controlled" to the United States totals for each of the race-sex groups as shown in table I-B.

The effect of the second and third sets of adjustments of the Medicare data was to contribute to an increase in the net census undercount rates for most States. For several States, potential net overcount rates were converted to net undercount rates while, for Arizona and Florida, rates of net census overcount were merely lowered. The rates for Maryland, Virginia, and the District of Columbia were particularly affected because of the addition of relatively large numbers of Federal employees who were living in these areas as either workers or retirees. Hawaii showed a sizeable increase in its undercount figure because of the large number of aliens residing there. The only States showing net overcount rates after the third set of adjustments were Arizona (1.8 percent) and Florida (6.4 percent). The net census overcounts which originally appeared in the South Atlantic, West South Central, and Pacific divisions were eliminated by these adjustments, so that none of the nine divisions showed net overcounts afterwards.

The final adjustments, required mainly by the net overcounts in Arizona and Florida, generally produced rather small changes in the coverage estimates among the other States (table VI-B). As expected, for Arizona and Florida the changes were more pronounced because the net census overcounts were converted to net census undercounts for these States. The effect of this procedure was to reduce the net undercount rates slightly for most of the remaining States and the District of Columbia, but certain States in the Northeast and North Central regions—Connecticut, Illinois, Indiana, Michigan, New Jersey, and New York—States which contributed the bulk of the migrants to Florida, experienced relatively large reductions in their undercount rates. The divisions most affected by this downward adjustment were the New England, Middle Atlantic, and East North Central divisions. Undercount rates for the South Atlantic and Mountain divisions rose substantially at the same time because of the direct effect of the adjustments in Florida and Arizona.

DISCUSSION AND EVALUATION OF RESULTS

Discussion of Results

Preliminary calculations of net census error rates for age groups within the broad age range 65 and over (65–69, 70–74, and 75 and over) produced extremely large undercount rates and net overcount rates in some States. Such problematic results occurred chiefly in States of the New England division which have small numbers in the older age groups, especially among Blacks. Consequently, only the estimates for the age group 65 and over as a whole are thought to be sufficiently accurate for further consideration and use in this study.

Net census error rates for the population 65 and over for race and sex groups are shown in table VI-C for regions, divisions, and States, according to both the low and high series, but only the low series is considered here. Regionally, the South has the highest net undercount rate (2.2 percent) and the Northeast region has the lowest rate (1.3 percent). Among divisions the Mountain division shows the highest net undercount rate (3.1 percent) and the Middle Atlantic division shows the lowest rate (1.1 percent).

The estimated net undercount rates for States range from 0.5 percent in New Jersey and Connecticut to 11.9 percent in Hawaii. Rates for 37 States, however, fall in the range from 1.0 percent to 3.9 percent. States with undercount rates below 1.0 percent, in addition to Connecticut and New Jersey, are Ohio, Indiana, Maryland, and Oregon. At 4.0 percent or higher, in addition to Hawaii, are Maine, New Hampshire, Vermont, District of Columbia, Wyoming, and New Mexico.

For the White population, net undercount rates are quite similar among the regions, varying only slightly from 1.7 percent in the South to 1.9 percent in the Northeast. Net undercount rates for divisions show greater variation, of course, with the two divisions of the West having the highest (Mountain, 2.9 percent) and lowest (Pacific, 1.5 percent) rates. The net undercount rate for White males is 0.8 to 1.3 percentage points less than the rate for females in the various regions. Only a few States show larger net undercount rates for White males than for White females. These States are concentrated in the South Atlantic (Maryland, District of Columbia, and Virginia) and Mountain (New Mexico, Utah, and Nevada) divisions.

For the Black-and-other-races population 65 and over, net overcount rates and undercount rates are larger than for the White population. For the total Black-and-other-races population 65 and over, all the divisions of the Northeast and North Central regions show net overcount rates, ranging from 2.6 percent in the West North Central division to 15.2 percent in the divisions of the Northeast. The divisions of the South and West, on the other hand, show net undercount rates, varying from 1.2 percent in the West South Central division to 7.9 percent in the Mountain division. Black-and-other-races males tend to be more highly "overcounted" than females in this racial group; this was true for all but the East South Central, Mountain, and Pacific divisions.

Table VI-D shows a frequency distribution for the States for each race and sex group according to the low series of net census error rates.[6] For White males a net overcount rate appears in two States and net undercount rates are concentrated below 2 percent. For White females there are no net overcount rates and most of the undercount rates fall between 1.0 percent and 3.9 percent.

The Black-and-other-races population shows many more States with net overcount rates than the White population. For Black-and-other-races males net overcount rates occur in 17 States, concentrated in the size intervals under 15 percent. Rates of net census undercount for Black-and-other-races males are concentrated in the class under 5 percent (five States). About half as many States show net overcount rates for Black-and-other-races females as for males, with the largest concentration in the interval under 5 percent. For Black-and-other-races females most of the State undercount rates fall between 5 and 15 percent (12 States out of 17).

The indications of net overcount rates are believed generally to reflect the actual enumerative situation. They are not a result principally of duplicate counting or bias in reporting residence in the census, however. The occurrence of numerous net overcount rates for the Black-and-other-races population can be attributed mainly to age overstatement in the census.

Evaluation of Results

The estimates of census coverage for State populations aged 65 and over presented here are subject to several types of errors. The most probable source of major errors is the adjustment for underenrollment in Medicare. Because of the uncertainty about the completeness of registration of Medicare, a "low" set and a "high" set of estimates of Medicare underenrollment were generated. The "true" amount of underenrollment is believed to fall somewhere between these two estimates but closer to the smaller figure. Consequently, the estimates of the corrected population for ages 65 and over based on the low estimates of Medicare underenrollment have been selected for combination with other age-race-sex groups to produce the coverage estimates for the total population of States shown in this report.

A very likely source of error in the estimates is the inconsistency in the reporting of State of residence in the two sets of records. The occurrence of large estimated net overcounts in the preliminary estimates for Florida and Arizona necessitated a complementary adjustment which affected a great number of States. Because of the nature of the adjustments for the other States, the effect on most States is small and little or no additional error may have been introduced. However, because of the lack of data bearing on the problem, the large arbitrary adjustment applied to Florida and Arizona could have produced coverage estimates that are substantially in error for these States. Other States which may have been importantly affected by the residence adjustment are those which contributed a large number of migrants to these two States, particularly New York and Michigan. In spite of the arbitrary nature of the adjustments, the resulting coverage estimates are undoubtedly superior to any based on unadjusted numbers.

Among the less serious sources of error are those associated with the allocation of persons of unreported race, sex, or residence and the distribution of Federal annuitants and other excluded persons among the States. Only small numbers of persons were involved in these adjustments, except in a few areas.

The effect of errors in the estimates of coverage of the population aged 65 and over for States on the coverage estimates for the total population of States is not very large. Nationally the population aged 65 and over represented only 9.8 percent of the total population in 1970. At the State level, this group reaches a maximum of 14.5 percent of the total in the State of Florida. Thus, even a 10 percent error in estimating the corrected population aged 65 and over in Florida would produce an error of only 1.5 percent in the estimated net underenumeration for the total population of this State. Naturally any such errors in other States would have even smaller effects.

[6] In table VI-D the total number of States for each race, especially Black and other races, does not equal 51 (i.e., 50 States and the District of Columbia). The deficit in the total (25 for Black and other races) is due to the omission of States for which the enumerated population 65 years old and over did not exceed 10,000 persons.

Table VI-A. DERIVATION OF ALTERNATIVE ESTIMATES OF THE POPULATION 65 YEARS OLD AND OVER, BY SEX AND RACE, BASED ON MEDICARE ENROLLMENTS, SHOWING ADJUSTMENTS FOR EXCLUSION OF VARIOUS GROUPS, AND CORRESPONDING NET CENSUS ERROR RATES, FOR REGIONS: 1970

(Numbers in thousands. Net census error is based on census data which have been adjusted for race misclassification in the complete count and the overstatement of centenarians; base of percentages is the corresponding population estimate based on Medicare data. A minus sign denotes a net undercount; a plus sign denotes a net overcount)

Sex, race, and region	Medicare enrollments before adjustment[1]	Preliminary figures				Final figures								Census
						Low estimates				High estimates[6]				
		Medicare enrollments adjusted for age[2]	Adjustment for excluded persons[3]	Preliminary population estimate	Preliminary net error rate	"Low" adjustment for Medicare underenrollment[4]	Adjustment for residence bias[5]	Adjusted population estimate	Net error rate	"High" adjustment for Medicare underenrollment[4]	Adjustment for residence bias[5]	Adjusted population estimate	Net error rate	
All classes	20,051	19,931	216	20,147	-0.9	181	-	20,328	-1.8	824	-	20,971	-4.8	19,972
Northeast	5,224	5,193	56	5,249	-1.4	39	-42	5,245	-1.3	247	-88	5,408	-4.3	5,176
North Central	5,772	5,737	44	5,781	-1.4	43	-33	5,791	-1.5	259	-69	5,971	-4.5	5,703
South	5,968	5,932	69	6,000	+0.2	76	73	6,149	-2.2	198	152	6,350	-5.3	6,014
West	3,088	3,069	47	3,116	-1.2	23	2	3,142	-2.0	120	5	3,241	-5.0	3,080
Male	8,362	8,299	135	8,434	-0.8	6	-	8,440	-0.9	270	-	8,704	-3.9	8,367
Northeast	2,118	2,103	32	2,135	-1.3	1	-18	2,118	-0.5	85	-36	2,184	-3.5	2,108
North Central	2,431	2,413	27	2,440	-1.4	1	-15	2,427	-0.9	92	-29	2,503	-3.9	2,406
South	2,497	2,478	47	2,526	+0.6	4	31	2,561	-0.8	52	63	2,641	-3.8	2,540
West	1,315	1,305	28	1,333	-1.5	1	1	1,335	-1.6	42	2	1,377	-4.6	1,314
Female	11,690	11,632	81	11,713	-0.9	175	-	11,888	-2.4	553	-	12,267	-5.4	11,605
Northeast	3,105	3,090	24	3,114	-1.5	38	-24	3,128	-1.9	162	-52	3,224	-4.8	3,068
North Central	3,340	3,324	17	3,341	-1.3	42	-18	3,365	-2.0	167	-40	3,469	-4.9	3,297
South	3,471	3,453	21	3,475	-	72	42	3,588	-3.2	146	89	3,710	-6.4	3,474
West	1,773	1,765	19	1,783	-0.9	23	1	1,807	-2.2	78	3	1,864	-5.2	1,767
WHITE														
Both sexes	18,441	18,331	178	18,509	-1.3	99	-	18,608	-1.8	677	-	19,186	-4.8	18,272
Northeast	4,998	4,968	49	5,017	-2.1	27	-40	5,004	-1.9	224	-81	5,160	-4.8	4,911
North Central	5,502	5,469	37	5,506	-1.8	30	-31	5,505	-1.8	232	-63	5,675	-4.8	5,404
South	5,020	4,990	57	5,047	+0.1	27	69	5,142	-1.7	115	140	5,302	-4.7	5,054
West	2,922	2,904	35	2,939	-1.2	16	2	2,957	-1.8	105	5	3,049	-4.8	2,903
Male	7,655	7,598	110	7,708	-1.2	-	-	7,708	-1.2	236	-	7,945	-4.1	7,615
Northeast	2,022	2,007	27	2,034	-1.9	-	-17	2,017	-1.1	79	-33	2,081	-4.1	1,995
North Central	2,310	2,293	22	2,315	-1.9	-	-14	2,301	-1.3	85	-27	2,373	-4.3	2,271
South	2,095	2,079	39	2,118	+0.3	-	30	2,148	-1.1	35	58	2,210	-3.9	2,124
West	1,228	1,219	22	1,241	-1.3	-	1	1,242	-1.4	37	2	1,281	-4.3	1,226
Female	10,786	10,733	68	10,801	-1.3	99	-	10,900	-2.2	441	-	11,241	-5.2	10,657
Northeast	2,975	2,961	22	2,983	-2.2	27	-23	2,987	-2.4	145	-48	3,080	-5.3	2,916
North Central	3,192	3,176	15	3,191	-1.8	30	-17	3,204	-2.2	148	-37	3,302	-5.1	3,133
South	2,925	2,911	18	2,929	+0.1	27	39	2,995	-2.1	81	82	3,091	-5.2	2,930
West	1,693	1,685	13	1,698	-1.2	16	1	1,715	-2.2	68	3	1,768	-5.2	1,677
BLACK AND OTHER RACES														
Both sexes	1,610	1,600	38	1,638	+3.8	82	-	1,720	-1.1	147	-	1,785	-4.7	1,700
Northeast	226	224	7	232	+14.2	11	-2	241	+9.8	23	-7	248	+6.7	265
North Central	270	268	7	275	+8.5	13	-2	286	+4.2	26	-6	296	+0.8	298
South	948	942	12	954	+0.6	49	4	1,007	-4.7	83	12	1,049	-8.5	960
West	166	165	12	177	+0.2	8	-	185	-4.1	15	-	192	-7.5	178
Male	706	701	24	725	+3.6	6	-	732	+2.8	34	-	759	-1.0	752
Northeast	96	95	5	100	+12.1	1	-1	100	+12.2	6	-3	103	+9.0	113
North Central	121	121	5	125	+7.6	1	-1	125	+7.4	7	-2	129	+4.0	135
South	402	399	8	408	+2.1	4	2	413	+0.8	17	5	430	-3.3	416
West	86	86	6	92	-4.0	1	-	93	-4.9	4	-	96	-8.3	88
Female	904	899	14	912	+4.0	76	-	988	-4.0	113	-	1,025	-7.5	949
Northeast	130	129	2	131	+15.9	11	-1	141	+8.1	17	-4	145	+5.1	152
North Central	149	148	2	150	+9.2	12	-1	161	+1.6	20	-3	166	-1.6	164
South	546	543	3	546	-0.4	46	2	594	-8.5	66	7	619	-12.1	543
West	80	79	6	85	+4.7	7	-	92	-3.3	10	-	96	-6.7	89

- Represents zero.

[1]The original tabulations for January 1, 1970 and July 1, 1970 have been adjusted to include a pro rata share of Medicare enrollees whose race or residence was not reported and then interpolated to April 1, 1970.

[2]Adjustment is to allow for the small discrepancy between census data and Medicare data in the assignment of age.

[3]Adjustment is for alien residents in the United States less than 5 years and for Federal employees and annuitants who had not registered for Medicare.

[4]Adjustment for "other persons" who had not registered for Medicare.

[5]Adjustment for inconsistencies in reporting of residence between census data and Medicare data; this adjustment primarily affects Florida and Arizona.

[6]High estimates are illustrative only.

Table VI-B. PRELIMINARY AND ADJUSTED ESTIMATES OF NET CENSUS ERROR RATES FOR THE POPULATION 65 YEARS OLD AND OVER, FOR DIVISIONS AND SELECTED STATES, BY RACE AND SEX: 1970

(Adjusted estimates are the final "low" estimates; preliminary estimates do not include the adjustment for residence bias. A minus sign denotes a net census undercount; a plus sign denotes a net census overcount)

Division and State	All classes		White						Black-and-other-races					
			Total		Male		Female		Total		Male		Female	
	Preliminary	Adjusted	Preliminary	Adjusted	Preliminary	Adjusted	Preliminary	Adjusted	Preliminary	Adjusted	Preliminary	Adjusted	Preliminary	Adjusted
United States, total	-2.0	-1.8	-2.1	-1.8	-1.5	-1.2	-2.5	-2.2	-1.4	-1.1	+2.4	+2.8	-4.2	-4.0
New England	-2.9	-2.0	-3.2	-2.2	-2.6	-1.6	-3.5	-2.6	+14.0	+15.2	(B)	(B)	+18.8	+19.9
Middle Atlantic	-2.3	-1.1	-2.9	-1.8	-2.1	-0.9	-3.4	-2.3	+8.1	+9.3	+11.1	+12.4	+6.0	+7.2
New York	-2.6	-1.2	-3.4	-2.0	-2.5	-1.1	-3.9	-2.6	+10.4	+12.0	+13.0	+14.7	+8.7	+10.2
Remainder	-1.9	-1.0	-2.4	-1.5	-1.8	-0.8	-2.8	-2.0	+5.8	+6.8	+9.3	+10.3	+3.2	+4.1
East North Central	-2.4	-1.4	-2.8	-1.7	-2.4	-1.3	-3.0	-2.0	+3.4	+4.6	+6.8	+8.1	+0.8	+1.9
Michigan	-3.5	-2.2	-4.2	-3.0	-4.0	-2.6	-4.4	-3.2	+6.0	+7.4	+9.3	+10.9	+3.2	+4.6
Remainder	-2.1	-1.1	-2.4	-1.4	-2.0	-1.0	-2.7	-1.8	+2.6	+3.7	+6.0	+7.2	(Z)	+1.0
West North Central	-2.4	-1.9	-2.5	-2.0	-1.9	-1.3	-2.9	-2.5	+2.1	+2.6	+4.5	+5.1	+0.1	+0.6
South Atlantic	-0.2	-2.5	+0.8	-1.8	+1.6	-1.2	+0.2	-2.3	-5.3	-6.0	+0.8	(Z)	-9.4	-10.0
Florida	+6.4	-2.4	+7.1	-1.7	+8.5	-0.4	+6.0	-2.8	-2.7	-10.7	+1.6	-6.7	-5.9	-13.7
Remainder	-3.2	-2.5	-2.6	-1.9	-2.5	-1.7	-2.6	-2.0	-5.8	-5.1	+0.7	+1.5	-9.9	-9.3
East South Central	-3.1	-2.6	-2.3	-1.7	-1.5	-0.9	-2.8	-2.3	-6.5	-6.0	-0.6	(Z)	-10.7	-10.2
West South Central	-1.9	-1.5	-1.9	-1.6	-1.6	-1.1	-2.2	-1.9	-1.6	-1.2	+2.1	+2.6	-4.4	-4.1
Mountain	-2.4	-3.1	-2.3	-2.9	-1.9	-2.4	-2.6	-3.3	-6.5	-7.9	-9.7	-11.0	-3.0	-4.4
Arizona	+1.8	-3.0	+2.4	-2.5	+3.8	-1.0	+1.2	-3.6	(B)	(B)	(B)	(B)	(B)	(B)
Remainder	-3.6	-3.1	-3.6	-3.0	-3.4	-2.8	-3.7	-3.2	-5.8	-5.2	(B)	(B)	(B)	(B)
Pacific	-2.1	-1.6	-2.0	-1.5	-1.5	-1.0	-2.3	-1.9	-4.0	-3.5	-4.5	-4.0	-3.5	-3.1

B Enumerated population 65 years old and over less than 10,000.
Z Less than ± 0.05.

Table VI-C. ALTERNATIVE ESTIMATES OF NET CENSUS ERROR RATES FOR THE POPULATION 65 YEARS OLD AND OVER, FOR REGIONS, DIVISIONS, AND STATES: 1970

(A minus sign denotes a net census undercount; a plus sign denotes a net census overcount)

Region, division, and State	Low series							High series[1]
	All classes	White			Black-and-other races			All classes
		Total	Male	Female	Total	Male	Female	
United States, Total	-1.8	-1.8	-1.2	-2.2	-1.1	-2.8	-4.0	-4.8
Regions:								
Northeast	-1.3	-1.9	-1.1	-2.4	+9.8	+12.2	+8.1	-4.3
North Central	-1.5	-1.8	-1.3	-2.2	+4.2	+7.4	+1.6	-4.5
South	-2.2	-1.7	-1.1	-2.1	-4.7	+0.8	-8.5	-5.3
West	-2.0	-1.8	-1.4	-2.2	-4.1	-4.9	-3.3	-5.0
Northeast:								
New England	-2.0	-2.2	-1.6	-2.6	+15.2	(B)	+19.9	-4.9
Middle Atlantic	-1.1	-1.8	-0.9	-2.3	+9.3	+12.4	+7.2	-4.1
North Central:								
East North Central	-1.4	-1.7	-1.3	-2.0	+4.6	+8.1	+1.9	-4.3
West North Central	-1.9	-2.0	-1.3	-2.5	+2.6	+5.1	+0.6	-4.8
South:								
South Atlantic	-2.5	-1.8	-1.2	-2.3	-6.0	(Z)	-10.0	-5.6
East South Central	-2.6	-1.7	-0.9	-2.3	-6.0	(Z)	-10.2	-5.7
West South Central	-1.5	-1.6	-1.1	-1.9	-1.2	+2.6	-4.1	-4.6
West:								
Mountain	-3.1	-2.9	-2.4	-3.3	-7.9	-11.0	-4.4	-6.1
Pacific	-1.6	-1.5	-1.0	-1.9	-3.5	-4.0	-3.1	-4.6
New England:								
Maine	-6.0	-6.0	-5.3	-6.5	(B)	(B)	(B)	-8.8
New Hampshire	-4.8	-4.8	-4.2	-5.3	(B)	(B)	(B)	-7.7
Vermont	-5.5	-5.4	-5.4	-5.4	(B)	(B)	(B)	-8.3
Massachusetts	-1.2	-1.4	-0.7	-1.9	+12.5	(B)	(B)	-4.2
Rhode Island	-1.8	-2.2	-1.5	-2.6	(B)	(B)	(B)	-4.8
Connecticut	-0.5	-1.0	-0.3	-1.5	(B)	(B)	(B)	-3.5
Middle Atlantic:								
New York	-1.2	-2.0	-1.1	-2.6	+12.0	+14.7	+10.2	-4.2
New Jersey	-0.5	-1.0	-0.3	-1.5	+7.8	+11.8	+5.0	-3.5
Pennsylvania	-1.3	-1.8	-1.1	-2.2	+6.2	+9.6	+3.6	-4.3
East North Central:								
Ohio	-0.8	-1.3	-1.1	-1.5	+6.4	+10.3	+3.4	-3.8
Indiana	-0.7	(Z)	+0.7	-0.4	-14.1	-10.9	-16.6	-3.7
Illinois	-1.5	-2.1	-1.6	-2.5	+6.9	+10.2	+4.3	-4.5
Michigan	-2.2	-3.0	-2.6	-3.2	+7.4	+10.9	+4.6	-5.2
Wisconsin	-1.4	-1.6	-1.0	-2.1	(B)	(B)	(B)	-4.4
West North Central:								
Minnesota	-2.0	-2.1	-1.5	-2.5	(B)	(B)	(B)	-4.9
Iowa	-1.9	-1.9	-1.2	-2.4	(B)	(B)	(B)	-4.9
Missouri	-1.4	-1.8	-1.1	-2.3	+3.8	+8.8	+0.1	-4.4
North Dakota	-3.2	-3.3	-2.6	-3.9	(B)	(B)	(B)	-6.1
South Dakota	-2.6	-2.7	-1.7	-3.5	(B)	(B)	(B)	-5.6
Nebraska	-1.8	-1.8	-1.5	-2.0	(B)	(B)	(B)	-4.8
Kansas	-1.9	-1.9	-1.1	-2.5	-1.4	(B)	(B)	-4.9
South Atlantic:								
Delaware	-3.7	-4.5	-4.3	-4.6	(B)	(B)	(B)	-6.7
Maryland	-0.8	-1.0	-1.7	-0.6	+0.4	+3.5	-2.0	-3.9
District of Columbia	-7.5	-12.7	-17.0	-10.2	+0.5	+7.1	-3.7	-10.6
Virginia	-2.9	-2.2	-2.7	-1.9	-6.1	-0.9	-9.9	-5.9
West Virginia	-3.1	-3.0	-2.2	-3.6	-5.9	(B)	(B)	-6.1
North Carolina	-1.9	-0.6	+0.1	-1.1	-6.7	+0.7	-11.5	-5.0
South Carolina	-3.4	-1.5	-0.2	-2.4	-7.9	+1.0	-13.1	-6.5
Georgia	-2.1	-1.0	-0.6	-1.3	-5.4	+1.9	-9.7	-5.2
Florida	-2.4	-1.7	-0.4	-2.8	-10.7	-6.7	-13.7	-5.7
East South Central:								
Kentucky	-2.4	-2.2	-1.4	-2.8	-4.9	-0.6	-7.9	-5.4
Tennessee	-2.2	-1.6	-0.8	-2.2	-5.1	+0.6	-9.1	-5.2
Alabama	-2.6	-1.3	-0.5	-1.8	-6.2	+0.3	-10.4	-5.7
Mississippi	-3.6	-1.7	-0.7	-2.4	-6.8	-0.6	-11.4	-6.7
West South Central:								
Arkansas	-1.8	-1.8	-1.0	-2.5	-1.7	+2.9	-5.3	-4.9
Louisiana	-1.8	-1.2	-0.8	-1.5	-3.2	+2.3	-7.0	-4.9
Oklahoma	-1.0	-2.6	-2.0	-2.9	+18.0	+17.4	+18.4	-4.0
Texas	-1.5	-1.3	-0.9	-1.5	-3.2	-0.2	-5.5	-4.5
Mountain:								
Montana	-3.3	-3.8	-3.7	-3.8	(B)	(B)	(B)	-6.4
Idaho	-3.0	-3.0	-2.7	-3.3	(B)	(B)	(B)	-6.1
Wyoming	-4.1	-4.1	-3.8	-4.3	(B)	(B)	(B)	-7.2
Colorado	-2.4	-2.3	-1.7	-2.8	(B)	(B)	(B)	-5.3
New Mexico	-5.0	-4.4	-4.5	-4.3	(B)	(B)	(B)	-7.9
Arizona	-3.0	-2.5	-1.0	-3.6	(B)	(B)	(B)	-6.0
Utah	-2.6	-2.4	-2.8	-2.2	(B)	(B)	(B)	-5.7
Nevada	-2.6	-3.2	-3.3	-3.1	(B)	(B)	(B)	-5.9
Pacific:								
Washington	-1.9	-2.1	-1.7	-2.4	(B)	(B)	(B)	-4.8
Oregon	-0.8	-1.0	-0.4	-1.5	(B)	(B)	(B)	-3.7
California	-1.4	-1.4	-0.8	-1.8	-1.2	-2.4	-0.1	-4.4
Alaska	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)
Hawaii	-11.9	+0.3	(B)	(B)	-15.8	-13.3	-18.4	-15.0

B Enumerated population 65 years old and over less than 10,000.
Z Less than ± 0.05.
[1]High estimates are illustrative only.

Table VI-D. NUMBER OF STATES WITH SPECIFIED NET CENSUS ERROR RATES FOR THE POPULATION 65 YEARS OLD AND OVER, BY SEX AND RACE: 1970

(Based on "low" estimates of Medicare underenrollment. States with an enumerated population 65 years old and over of less than 10,000 for any group are excluded from the tabulations for that group)

Race and percent	Total	Male	Female
All classes[1]	50	50	50
Net overcount	-	6	-
Net undercount:			
Under 1.0	6	18	1
1.0 to 1.9	17	11	14
2.0 to 2.9	12	5	11
3.0 to 3.9	8	4	13
4.0 to 4.9	2	1	4
5.0 to 9.9	[2]4	[2]4	[2]6
10.0 and over	1	1	1
White[1]	50	49	49
Net overcount	2	2	-
Net undercount:			
Under 1.0	1	14	2
1.0 to 1.9	22	17	12
2.0 to 2.9	15	7	20
3.0 to 3.9	3	3	8
4.0 to 4.9	4	3	3
5.0 to 9.9	2	2	3
10.0 and over	[2]1	[2]1	[2]1
Black and other races[1]	28	25	25
Net overcount:			
Under 5.0	[2]3	8	5
5.0 to 9.9	5	[2]3	1
10.0 to 14.9	2	5	1
15.0 and over	1	1	1
Net undercount:			
Under 5.0	6	5	[2]3
5.0 to 9.9	8	1	7
10.0 to 14.9	2	1	5
15.0 and over	1	1	2

- Represents zero.

[1]Percent error rates for all States (weighted) are:

	Total	Male	Female
All classes	-1.8	-0.9	-2.4
White	-1.8	-1.2	-2.2
Black and other races	-1.1	+2.8	-4.0

[2]Includes District of Columbia.

Source: Based on estimates shown in table VI-C.

Chapter VII. Synthesis of Estimates of Coverage and Principal Findings

COVERAGE ESTIMATES FOR THE TOTAL POPULATION DERIVED BY DEMOGRAPHIC ANALYSIS

Estimates of the percents of net underenumeration for the total population of each of the 50 States and the District of Columbia were derived by combining estimates of the corrected population for each of the 12 age-race-sex groups which have been separately considered in this study and then comparing these totals with the 1970 census counts. The sets of State estimates for each of the 12 age-race-sex groups were adjusted pro rata so that they would sum to the previously published "preferred" estimates of the national corrected population for each group derived by demographic analysis (table I-B).[1]

The methods which have been described in the previous chapters do not produce a single definitive set of estimates of net census underenumeration for States. Rather, because of the several major but untestable assumptions which had to be made in the estimation procedure, a number of alternative sets of plausible estimates were produced for the component age-race-sex groups. These alternative sets of estimates for parts of the population can be combined in many different ways to yield many different sets of estimates of census coverage for the total population of States. In order to reduce the number of alternative series of estimates to a manageable "package," we have presented in tables VII-A to VII-D only a small number of the plausible sets of estimates, selected so as to reflect the principal variation resulting from the different assumptions. The various estimates shown in these tables were based on mid-range estimates for the age-sex-race groups where the limiting assumptions could be quantified reasonably well and the range was reasonably narrow, and on alternative, partly arbitrary methods for other subgroups of the population.

Review of Age-Sex-Race Variants

Two sets of estimates of the coverage of the population under age 35 that differ with respect to the distribution among the States of the persons of "unknown" State of birth and with respect to the relative extent of underenumeration of "lifetime" interstate migrants and nonmigrants were employed in this synthesis of the coverage estimates. These two sets of estimates are both specific variants of the State-of-residence model 3, the variant where A=1 and B=1 ("SOR–3–1") and the variant where A=5 and B=2 ("SOR–3–2"). The State-of-residence model 3 represents a mid-range estimate or average between model 1, in which coverage is assumed to be determined by the State of birth, and model 2, in which coverage is assumed to be determined by the State of current residence. In the pair of assumptions noted as A=1 and B=1, A=1 indicates that the "lifetime" migrants to a given State failed to respond to the State-of-birth question at the same rate as nonmigrants for the State and B=1 indicates that "lifetime" migrants were missed in the census at the same rate as nonmigrants. In the pair of assumptions noted as A=5 and B=2, A=5 indicates that the migrants failed to respond to the State-of-birth question at five times the rate of nonmigrants and B=2 indicates that migrants were missed at twice the rate of nonmigrants. These assumptions were applied in the combinations noted both to Whites and to Blacks and other races of each sex under 35 years of age.[2] (The designations "SOR–3–1" and "SOR–3–2" refer to the estimates for both the White population and the Black-and-other-races population under age 35.)

For Whites, a principal problem in the estimation procedure relates to the inconsistency between the reporting of residence for births in the vital registration and reporting of State of birth for the population in the census. This inconsistency is attributable to the tendency for persons to report the place where their birth occurred rather than the mother's residence. The resolution of this problem consisted in the averaging of coverage estimates based on births assigned to place of occurrence and births assigned to place of residence. For the Black population serious inadequacies in the 1970 census data forced the abandonment of these data in estimating coverage. Derivation

[1] U.S. Bureau of the Census, Census of Population and Housing: 1970, Evaluation and Research Program PHC(E)–4, **Estimates of Coverage of Population by Sex, Race, and Age: Demographic Analysis**, 1974, tables 3 and 6.

[2] Another variant of the State-of-residence model 3 employed the two paired assumptions A=5, B=3, but only the estimates for Whites were usable. A few sets of coverage estimates for the total White population employing this variant for ages under 35 are shown in appendix F (Series SOR–3–3). The assumption B=3 is viewed as generally far too extreme but it may apply to some States in some age groups under age 35.

of the final coverage estimates for the Black population under age 35 involved reconstructing the census figures on the State-of-birth distribution of the population in 1970 from earlier censuses, as described in chapter III.

As indicated in chapter VI, Medicare data are believed to represent the best basis for establishing the corrected population 65 years of age and over in 1970. Two sets of coverage estimates for this age group—a low set and a high set—were developed. Although the low and high sets differ substantially from one another, the use of the alternative figures would have a negligible effect on the coverage estimates for the total population because this age group is generally only a small fraction of the population of any State. All of the estimates shown in tables VII-A to VII-D were based on the low set of Medicare estimates for the population aged 65 and over.

The procedures and assumptions employed to produce the coverage estimates for the population aged 35 to 64, particularly for Blacks, were more arbitrary and "mechanical" than those employed for the population under age 35, since less independent information specifically relevant to the coverage of the population 35 to 64 was available for making the estimates. The estimates shown in tables VII-A to VII-D were based on a limited and partly arbitrary selection from the many alternative sets of estimates of the corrected population 35 to 64 which were possible within the framework of the method employed.

Six alternative procedures were originally employed to estimate coverage for Whites aged 35 to 64. Three ways of applying expected sex ratios (F, M, and T) were combined with two ways of mathematically structuring the coverage factor (C and E). (See chapter IV, especially tables IV-C and IV-D.) Inasmuch as the estimates of the White population 35 to 64 years of age were based in part on the estimates of the White population under 35 years of age, the number of possible sets of estimates for the 35-to-64-year-old group depends on the number of sets of estimates for the under-35-year-old group.

For the Black-and-other-races population aged 35 to 64 eight alternative procedures were initially considered. Two methods of deriving expected sex ratios (A and R) were combined with two ways of mathematically structuring the coverage factor (C and E) and with two general procedures for deriving estimates of the coverage of Black-and-other-races females from the existing coverage estimates (F and F*). (See chapter V, especially tables V-A and V-B). The possible number of sets of estimates of Black-and-other-races population aged 35 to 64 depends on the number of sets of estimates of Whites aged 35 to 64 and Blacks under age 35, on which the estimates of Blacks 35 to 64 were based.

Each of the six alternative procedures for the White population could have been paired with each of the eight alternatives for the Black-and-other-races population. Combination of all of these alternative procedures would have yielded 48 alternative sets of coverage estimates for the total population of States for *each* set of estimates of coverage for the population under age 35. All of these combinations were not considered necessary to reflect the general level of the estimates and their range of uncertainty and, hence, were not made.

Variants Employed in This Synthesis

It was noted in chapter IV that the six series of coverage estimates for Whites aged 35 to 64 obtained by varying the estimating procedures (but not the series under age 35 used in the estimation) differed little from one another for nearly all States and that it appeared satisfactory to select the single set of estimates designated "WCF" as a basis for combination with the estimates for the other age, sex, and race groups. In this series the calculations were done in terms of *coverage* rates (C), and expected sex ratios were applied to the corrected *female* population to derive estimates of corrected male population (F). Two sets of WCF estimates (WCF-1 and WCF-2), differing only in the use of different coverage estimates for the population under age 35 (SOR–3–1 and SOR–3–2), were employed in this synthesis of the various estimates for age, sex, and race groups.

On the other hand, the variation in the coverage estimates of the Black-and-other-races population aged 35 to 64, resulting from the use of alternative procedures (BAEF, BACF, BREF, BRCF) and alternative estimates of coverage for Whites aged 35 to 64 (WCF-1 and WCF-2) or Blacks under age 35 (F* variants), was much greater. It appeared desirable, therefore, to retain several of the series for Blacks aged 35 to 64 for use in combination with the coverage estimates for Whites of the same ages and the other age-sex-race groups. The R variants have been shown to have less technical merit than the A variants and the F* variants are thought to be weaker than the F variants, however. Accordingly, more prominence has been given to the A and F variants in this synthesis. Of the many possible sets of estimates for Blacks aged 35 to 64, the following eight sets were selected for our synthesis: BACF, BAEF, and BREF, each based on WCF-1 or WCF-2, and BACF* and BREF*, each based on SOR–3–1 for Blacks.

These eight series for the Black-and-other-races population aged 35 to 64 were combined in the synthesis of the coverage estimates developed for this chapter with the WCF sets of estimates for the White population aged 35 to 64 (WCF-1 or WCF-2) corresponding to each set of estimates of the White popu-

lation under age 35 (SOR–3–1 or SOR–3–2). The eight series were combined only with the appropriate (consistent) sets of estimates for the population under age 35 and with the low series of estimates for the population 65 and over. In this way, eight sets of coverage estimates for the total population of States were obtained. These correspond to two sets of estimates of the total White population, eight sets of estimates of the total Black population, and eight sets of estimates of the total male and female population.

The various sets of coverage estimates are displayed in tables VII-A to VII-D and in appendix tables F-1 to F-7. Table VII-A presents the eight sets of demographic estimates of net underenumeration for the total population, the male population, and the female population of regions and divisions. Table VII-B and table VII-C present, respectively, the two sets of demographic estimates for the White population by sex, and the eight sets of estimates for the Black-and-other-races population by sex, for regions and divisions. Table VII-D presents estimates of net underenumeration for the total population of States for five of the eight demographic series; these are the sum of (a) estimates of the total White population for two series, namely, the combination of series WCF-1 or WCF-2 with series SOR–3–1 or SOR–3–2, for Whites; and (b) estimates for the total Black-and-other-races population for five series, namely, the combination of the BACF and BREF variants (based on series WCF-1 or WCF-2) and series SOR–3–1 or SOR–3–2 for Blacks, and the combination of the BACF* variant with series SOR–3–1 for Blacks. The following paradigm presents a summary of the components of these five demographic series:

Age group	White	Black and Other Races
Under 35 years	SOR–3–1	SOR–3–1
35 to 64 years	WCF–1	BACF–1
Under 35 years	SOR–3–1	SOR–3–1
35 to 64 years	WCF–1	BREF–1
Under 35 years	SOR–3–2	SOR–3–2
35 to 64 years	WCF–2	BACF–2
Under 35 years	SOR–3–2	SOR–3–2
35 to 64 years	WCF–2	BREF–2
Under 35 years	SOR–3–1	SOR–3–1
35 to 64 years	WCF–1	BACF*–1

The other series shown in this chapter will be discussed in the next section; they were derived, in part, from match studies. The tables of appendix F show estimates of net underenumeration for the total population, the White population, and the Black-and-other-races population, by sex, for States, for many series displayed in the text only for regions or divisions and for some other series not displayed elsewhere.

COVERAGE ESTIMATES FROM THE CPS-CENSUS MATCH STUDY

Scope and Limitations

As was noted in the introductory chapter of this study, estimates of census coverage for geographic areas within the United States can also be prepared by dual systems analysis, that is, by matching a sample of cases obtained from an independent collection system to the census records. A match study linking the Current Population Survey (CPS) for March 1970 with the 1970 census was in fact conducted and estimates of coverage were obtained for regions and divisions for race (White-and-other-races and Black), sex, and broad age groups (under 35 years, 35 to 64 years). These estimates are subject to several major limitations. Two of these are related to the very nature of match studies. They are the difficulty of approximating "perfection" in the matching operation and the failure to achieve "independence" between the census and the Current Population Survey. The latter problem is the more serious and may have produced a substantial overstatement of the extent of coverage. This overstatement should be least for the White female population, the sex-race group which, from the evidence available, tends to be the best enumerated.

Next, the estimates are subject to sampling error, which varies inversely with the (square root of the) size of the population group. For the White population, the figures for regions and divisions, by sex and broad age groups (under 35 and 35 to 64), were considered sufficently reliable for presentation here; but, for the Black population, only the figures for the regions, by sex (except the West), and for some of the divisions were considered reliable. The Black figures for New England, the West North Central States, the Mountain States, and the Pacific States, for example, were based on an extremely small number of sample cases and hence are subject to extremely large sampling errors.

Next, the original match figures tended to understate census coverage because they failed to allow for the fact that the final census counts, unlike the original field counts, included many persons who could not be enumerated by direct interview. We have adjusted the "observed" omission rates from the CPS-Census Match Study downward to take account of this problem. The principal basis of the adjustment was a set of figures available from the census on the State distribution of "substitutions" due to noninter-

view.[3] In the recalculation of the omission rates, the South region received the largest downward adjustment. Limited information was also available on the race, sex, and age distribution of the substitutions. This information suggested that a disproportionate share of the substitutions was assigned to the Black population in the census but that each sex-age group received about the share of substitutions in the census expected on the basis of its proportion in the population. As a result, the omission rates for Blacks were reduced more than those for Whites but the omission rates for males were reduced by about the same amount as those for females. It should be noted that, since the adjustments for age, sex, and race categories were based on weak and incomplete information, they are subject to substantial error. Moreover, because of the possible underallowance in the omission rates for substitutions in the census figures, the final omission rates are believed to overstate somewhat the actual omission rates in the field, but the extent of this overstatement is not precisely known. A final point should be made regarding the definition of the omission rates from the CPS-Census Match Study. The match estimates, as expected, represent omissions or underenumeration for the all-ages population; they also represent only omissions for age groups (i.e., they exclude the effect of age misreporting) and, hence, do not correspond to net undercounts, which reflect both omissions and net age misreporting. Most such misreporting is "washed out" for the broad age groups employed in this study.

Table VII-G shows adjusted CPS-Census Match estimates of omission rates for the total population of regions and divisions by sex, and estimates for the two race groups for the regions and most divisions by sex. A comparison of these estimates with the estimates derived by demographic methods indicates that the geographic pattern of error reflected in the two sets of figures is different. (See illustrative figures in table VII-H.) Regardless of the series, the match figures are higher for the Northeast region (New England and Middle Atlantic divisions), lower for the North Central region (West North Central division only), lower for the South (West South Central division only), and lower for the West (Mountain and Pacific divisions). With respect to the rank of the regions on the level of underenumeration, the South remains the highest in both sets of estimates; however, the order of the other three regions differs, particularly for the Northeast, where the percent of underenumeration is second highest according to the CPS-Census Match estimates and lowest according to the demographic estimates.

[3] U.S. Bureau of the Census, Census of Population: 1970, Vol. 1, **Characteristics of the Population**, Part 1, **United States Summary**, section 1, table B-6.

Composite with Demographic Estimates

In view of our reservations regarding the quality of the demographic estimates for States and in view of the availablity of another set of coverage estimates for geographic divisions derived by a wholly independent and direct method, i.e., the CPS-Census Match estimates, it was considered desirable to prepare some sets of estimates for States which took account of the CPS-Census Match results, at least in part. Accordingly, three sets of composite estimates were developed.

Composite series 1. For the first set, the CPS-Census Match results only for White females 35 to 64 years of age for the nine divisions were employed and demographic estimates were employed for all remaining categories. In this set, the estimates for States for White females 35 to 64 years of age derived by the demographic method that we have labeled "SOR–3–1, WCF–1" were adjusted to agree with the corresponding figures from the CPS-Census Match for the nine divisions (table VII-G, col. 4). Then new estimates for White males aged 35 to 64 were obtained through the application of "expected" sex ratios (using the WCF procedures). New estimates for Blacks and other races aged 35 to 64 were derived using the BACF procedures in combination with the newly derived estimates for White females aged 35 to 64. These estimates were combined with the estimates from series SOR–3–1 for the ages under 35 and the low Medicare series for ages 65 and over. There was a final proportional adjustment to the previously established national estimates of coverage for the 12 component age-sex-race categories. This set of estimates is labeled "Composite-1" in tables VII-A through VII-D.

The substitution of the match study figures for White females 35 to 64 years of age for divisions in place of the corresponding demographic estimates was based on the reasonable possibility that the match study results for this group may be superior to the estimates derived by the demographic method. This age-sex-race group tends to have a very low coverage error and, therefore, "independence" between the census and the Current Population Survey may not be a serious problem. At the same time, the demographic estimates for the group are weak in view of the paucity of data directly pertinent to this group and the need to employ relatively "mechanical" assumptions to prepare them. The same advantage does not apply to the coverage estimates for Black females 35 to 64 years of age from the match study; they may well be of much poorer quality than the demographic estimates, both as a result of larger sampling errors and as a result of greater problems in the field, even at the regional level.

Composite series 2. The second set of composite estimates represents an average of estimates for States tied into selected results from the match study, mainly for females, and estimates derived by demographic analysis. Various match study figures for females (from table VII-G) were used sequentially as controls for the State estimates of female population in series "SOR–3–1, WCF–1, BACF–1." The estimates of the male population of States in the various age-sex-race groups were then derived by applying the "expected" sex ratios from series "SOR–3–1, WCF–1, BACF–1" to the appropriate corrected female population.[4]

The derivation of estimates for the White female population required four separate adjustments. The estimates of the corrected White female populations of States under 35 years of age and 35 to 64 years of age were adjusted to agree with the match study results for the White-and-other-races female population in the separate age groups for the nine census divisions. Then, the new estimates of White females under age 35 and aged 35 to 64 were added to the demographic estimates for White females aged 65 and over for the States and the totals of all ages were adjusted to the estimates for White females of each division from the match study. Next, the estimates for the three age groups for each State were adjusted pro rata so as to sum to the new totals for White females for each State from the previous adjustment. The corrected White male figures for each age group in each State were then obtained by multiplying the estimated population for White females by the appropriate expected sex ratios from series "SOR–3–1, WCF–1, BACF–1." Finally, the estimates for each age-sex group were adjusted pro rata so as to sum to the previously established national estimates of the corrected population in these categories (table I-B).

The procedure for Blacks and other races was somewhat more involved because coverage estimates from the match study for some of the age-sex groups were based on too few cases to be reliable. First, the estimates for the Black-and-other-races female populations of States under 35 years of age were adjusted to the match results for the five divisions with the largest numbers of Blacks: Middle Atlantic, East North Central, South Atlantic, East South Central, and West South Central. Then the Black-and-other-races female populations under age 35 of the States in the Northeast and the North Central regions were readjusted to the match results for Black females under age 35 for these regions. Next, the Black-and-other-races populations of States in the West under age 35 for both sexes combined were adjusted to agree with the match result for this group. An adjusted estimate for females under age 35 for each of the Western States was obtained from the total for both sexes by applying the expected sex ratios.

The totals of the new estimates for Black-and-other-races females under age 35 and unadjusted estimates for females aged 35 and over in each State were then readjusted to the match results for Black females according to the procedures just described for ages under 35—first, to five division totals for females; then, to two region (Northeast and North Central) totals for females; and finally, to the total for both sexes for the West and then allocated to the sexes on the basis of sex ratios. For each State, the estimates of the female population in the three age groups were adjusted pro rata to the new State totals. Then the corrected male figures for each age group were obtained with the appropriate expected sex ratios. As a last step, the estimates for each age-sex group were adjusted pro rata to the national estimates of the corrected population for these categories.

The set of figures designated "Composite-2" was obtained by averaging the estimates derived by these adjustment procedures with series "SOR–3–1, WCF–1, BACF–1." This set of composite estimates makes use of information from the Census-CPS Match Study for the sex group which is subject to the smaller net census errors (females), in the maximum detail by age and geographic level for which sampling errors are not excessive. At the same time the imposition of the expected sex ratios derived by demographic analysis assures that the final estimates will have a reasonable balance of the sexes. The composite estimates are also intended to secure the advantages of averaging estimates that are based on independent methods and data. Such averaging may reduce opposite bases inherent in the two methods and hence has the potentiality for reducing the average error over all States as well as eliminating extreme errors.

Composite series 3. The third set of composite estimates also represents an average of estimates for States tied to CPS-Census Match Study results and estimates derived by demographic analysis, but match results for each sex were employed. Estimates from series "SOR–3–1, WCF–1, BACF–1" for the total White male and total White female populations of States were adjusted to agree with the match study results for the total White-and-other-races population of each sex for the nine divisions. Then the estimates for each sex were readjusted to the national estimates of undercoverage shown in table I-B.

For the Black-and-other-races population, the adjustment procedure followed, in part, that described for Composite-2. First, the Black-and-other-races male and female populations of States were adjusted separately to the division totals for the Black male and female populations from the match study for the five

[4] For this purpose, the "expected" sex ratio for an age-race group is equal to the corrected male population in the group divided by the corrected female population.

divisions previously listed. Then, the male and female populations for States in the Northeast and North Central regions and the populations of both sexes for States in the West were adjusted to the appropriate match results. Next, the total Black-and-other-races populations of States were readjusted to the national estimate of undercoverage.

Finally, the adjusted estimates and series "SOR–3–1, WCF–1, BACF–1" were averaged. This series has been designated as "Composite-3" and is presented in appendix F. These estimates are very similar in magnitude to the Composite-2 set of coverage estimates.

PRINCIPAL FINDINGS FOR REGIONS AND DIVISIONS

Total Population

The several series of estimates of net underenumeration for the total population of regions and divisions shown in table VII-A represent a plausible range of values and are generally quite consistent with one another. The absolute difference between the low and high estimates of underenumeration for the total population of any region or division exceeds 1 percent only for the West region and the East South Central and Pacific divisions, if the composite estimates are excluded. Even if these are included, the largest ranges are 1.5 percentage points for the West region and 1.7 percentage points for the Pacific division. Since the various demographic estimates are based on a very broad range of assumptions, the consistency lends some support to the estimates.

The composite estimates of undercoverage are somewhat different from the purely demographic estimates. The composite estimates for the Northeast are higher than any of the purely demographic estimates. Similarly, the composite estimates for the West are somewhat lower than the strictly demographic estimates. The Composite-2 estimates, which take into account more information from the match results than the Composite-1 estimates, are generally more extreme than those in Composite-1. In spite of these differences, the composite estimates are not so markedly different from the demographic estimates that either set should be considered invalid or that useful generalizations cannot be made.

The relative coverage levels of the four regions are roughly similar in the various series of estimates. According to the estimates, the populations of the Northeast and North Central regions were enumerated in the 1970 census much more completely than the populations of the South and the West. In all of the purely demographic estimates, the rates of net underenumeration for the Northeast (ranging from 1.1 to 1.3 percent) are approximately equal to, but slightly lower than, the rates of net underenumeration for the North Central States (1.2 to 1.6 percent). In the composite estimates this situation is reversed, with the net omission rates for the North Central region (1.4 percent) being lower than for the Northeast (1.7 to 2.0 percent). Of the remaining two regions, the estimated undercoverage for the South (3.8 to 4.2 percent) is greater than for the West (2.7 to 4.2 percent) in the purely demographic series based on an assumption of equality in the coverage rates for lifetime migrants and nonmigrants (i.e., the SOR–3–1 estimates where A=1) and in the composite estimates. In the sets of estimates in which migrants are assumed to be missed at a rate five times that of nonmigrants (i.e., the SOR–3–2 estimates with A=5), the West and South have nearly equal estimates of net underenumeration, with the percents of net underenumeration in the West being slightly greater. This reversal is the result of higher proportions of migrants in the West.

For the divisions, the composite estimates of net underenumeration and the purely demographic estimates exhibit a number of differences. For New England, both composite estimates of net underenumeration are slightly higher than the demographic estimates. For the Middle Atlantic States, the differences are substantial, with the Composite-2 estimate being twice as large as some of the demographic estimates. The opposite relationship occurs in the Mountain division where the composite estimates are slightly lower, and in the West South Central and Pacific divisions where the composite estimates (especially Composite-2) are much lower, than any of the demographic estimates.

The relative coverage levels of the divisions reflects the pattern of the regions. The four divisions comprising the Northeast and North Central regions have much lower estimated rates of underenumeration than the other five divisions in every set of estimates, with one exception (the Middle Atlantic division in the Composite-2 set, for which the rate is nearly equal to that of the Pacific division, the next best division). The undercount rates for the New England division are generally the lowest, ranging from 0.9 to 1.4 percent, although the composite estimates for the West North Central division are very nearly the same. In the South, the East South Central division has the lowest rates of underenumeration of the three divisions in every set of estimates—2.5 to 3.7 percent. In the West, the Pacific division has lower rates of underenumeration than the Mountain division in the SOR–3–1 estimates, but higher rates in the SOR–3–2 estimates because the Pacific division has a large proportion of lifetime migrants.

White and Black-and-Other-Races Population

The relationships of the rates of net underenumeration for the White population of regions and divisions are much the same as those for the total population, as discussed in the previous section, because the White population comprises such a large percentage of the total population in nearly all States (87.6 percent nationally in 1970). The figures shown in table VII-B indicate that the coverage of the White population in the Northeast and North Central regions was greater than in the South and West for all of the estimate series. In the demographic series, coverage is slightly better in the Northeast region than in the North Central region, but the reverse is true for the composite estimates. The estimated coverage for the West exceeds that for the South in all series except the SOR–3–2 estimates. For the divisions, the estimates of coverage for Whites reflect the overall patterns of the estimates for Whites for the regions and are quite similar to those for the total population. All the estimates of net underenumeration for the four divisions comprising the Northeast and North Central regions are lower than the remaining five divisions. The estimates of percents of net underenumeration for the White population of regions and divisions are quite consistent from series to series, with the range from the low to the high estimates for any area generally being about the same as the range for the estimates for the total population of the same area.

The estimates of the percents of net underenumeration for the Black-and-other-races population of regions and divisions exhibit much more variability from area to area and much less consistency from series to series than the estimates for the White population (table VII-C). Because of the higher level of net underenumeration for Blacks and other races (6.9 percent nationally versus 1.9 percent for Whites), the same level of precision in the estimates for the Black population as in those for Whites would result in greater percentage point variation. Moreover, the estimates for the Black-and-other-races population are not of the same precision as those for Whites. The great degree of variability and lack of consistency in the estimates can be attributed partly to the lack of adequate data and partly to the smaller size of the Black-and-other-races population.

We can note some regularities in the estimated rates of underenumeration for the Black-and-other-races population in spite of their variability and imprecision. As in the estimates for the total White population, the estimated percents of net underenumeration for the Black-and-other-races population of the Northeast and North Central regions are below those for the South and West in every series shown in table VII-C. The South, the region with the largest Black-and-other-races population, has the narrowest range from the low to the high estimates (6.9 to 8.8 percent) whereas the West, the region with the smallest Black-and-other-races population, shows by far the widest range (6.3 to 11.2 percent) and, in addition, the largest estimated percent undercount (11.2 percent in series SOR–3–2, WCF–2, BAEF–2).

For the divisions, a number of regularities appear in the relative levels of underenumeration from series to series. The estimated percent of net underenumeration for the Black-and-other-races population of New England (2.0 to 4.6 percent) is less than that of the Middle Atlantic division (4.2 to 7.2 percent) for every series. Similarly, the percent of net underenumeration for the East North Central division (3.2 to 5.9 percent) is always substantially less than for the West North Central division (6.3 to 8.1 percent). In the South, despite a greater range for the estimates of Blacks and other races in the East South Central division, the estimated percents of net underenumeration for this division (4.0 to 7.6 percent) are considerably less than the estimates for either the South Atlantic or West South Central division in every set of estimates. In the West the estimates for the Mountain division (9.3 to 13.9 percent) are consistently the highest of any divison in every series.

Male and Female Population

The estimated rate of net underenumeration for the male population of every region and division exceeds the corresponding rate for the female population in every set of estimates (table VII-A). The estimated percents of net underenumeration for females in the Northeast and North Central regions are the lowest rates shown in table VII-A; those for males in the Northeast and North Central region are lower than those for either males or females in the South or West. The other relationships for the male and female population among the regions and divisions are the same as those discussed earlier for the total population of both sexes combined.

The various series of coverage estimates for each of the sexes are quite consistent. For either sex, the range from the low to the high estimate of the percent of net underenumeration for any area tends to be about the same as the range for the population of both sexes combined. The coverage patterns within each series and from series to series for White males, White females, Black-and-other-races males, and Black-and-other races females each resemble those previously discussed for the total population of the appropriate race, with females having lower rates of net underenumeration in virtually every area in every set of estimates.

Differences between census sex ratios and expected sex ratios reflect the relative underenumer-

ation of males and females (table VII-I). A negative value for the difference means that males were missed in the census at a greater rate than females and the size of the difference shows the estimated number of males omitted per 100 females enumerated. For both races, the differences between the observed and the expected sex ratios indicate that the relative omission of males was greatest in the South, particularly in the South Atlantic division. The relative omission of males was the least (0.5-0.6 males per 100 females) for Whites in the Middle Atlantic and North Central States. For Black and other races, the relative omission of males (3.5 males per 100 females) was least in the Pacific States. (See appendix G for State data on census sex ratios and expected sex ratios for each of the race groups.)

EVALUATION OF STATE ESTIMATES

Total Population of States

The estimates of the percents of net underenumeration for the total population of States, shown in table VII-D, naturally exhibit more variation than the estimates for regions or divisions. The estimates for nearly all of the States appear to be reasonable, but the quality of the estimates differ, and for some of the States the estimates are of relatively poor or doubtful quality. These States will be identifed later in this section and possible reasons for the lower reliability will be discussed.

One criterion for assessing the overall quality of a set of coverage estimates is the occurrence of estimates of net overenumeration or of excessively large estimates of net underenumeration. Very few such estimates appear in table VII-D. Only three States (Wisconsin, Minnesota, and Utah) show estimates of net overenumeration in any of the series of estimates. The largest estimated net overcount is only 0.7 percent (Wisconsin in series "SOR–3–2, WCF–2, BREF–2"). The series of coverage estimates do not show a large number of extreme rates of underenumeration either. The number of States with estimates of the percent of net underenumeration that exceed 5 percent varies between 7 and 10 States, depending on the series, with the largest underenumeration rate being 9.2 percent (for New Mexico in series SOR–3–2, WCF–2, BREF–2).

Another criterion for assessing the adequacy of the estimates is the absence of a concentration of the percents of net underenumeration in a very narrow range. Such a concentration is not likely to exist if it is assumed that age-sex-race specific coverage rates for States vary around the national figures, as they undoubtedly do. The synthetic estimates (shown in appendix table F-1, col. 13), which are based on the assumption that the age-sex-race specific rates of net undercount for the entire country can be applied to each State without variation, exhibit a great deal of concentration.[5] In these estimates, fully 42 States have estimated net underenumeration rates in the range 1.0 to 2.9 percent and 50 States have rates within the range 1.0 to 3.9 percent (table VII-F, col. 8). When the synthetic estimates are varied on the basis of median family income, they are somewhat less concentrated but, even so, 39 States fall in the range of 1.0 to 2.9 percent underenumeration.

None of the sets of demographic or composite estimates of net underenumeration exhibit this much concentration. At most 24 States fall in the range of 1.0 to 2.9 percent for any set of estimates and no more than 33 States fall within any range of 3 percentage points. Furthermore, the demographic and composite series are substantially different from the synthetic estimates. The correlation coefficients relating the basic synthetic estimates and the demographic series fall in the range of only 0.15 to 0.27, with the average absolute difference being as great as 1.42 to 1.68 percentage points. The corresponding figures relating the modified synthetic estimates to the demographic series show correlation coefficients of only 0.18 to 0.32, with average absolute differences of 1.36 to 1.62 percentage points. Substantial variation around the national underenumeration rate shown by all of the series of demographic and composite estimates suggests that the age-sex-race specific coverage rates do vary substantially from State to State.

Even with the variation that exists within each set of demographic estimates there is a great deal of consistency among the various sets of figures. The overall similarity of the various estimates is shown by the correlation coefficents and average absolute differences in table VII-E. The correlation coefficients among the three sets of estimates based on the assumption that migrants and nonmigrants are missed at the same rate (SOR–3–1) and the two sets of composite estimates are all at least 0.95, with most exceeding 0.98. Furthermore, the average absolute differences in the percents of net underenumeration among these estimates are less than 0.55; nearly all are less than 0.40, and 4 of the 10 pairs of estimates differ by less than 0.25 percentage point. These measures indicate a great deal of consistency and similarity in the geographic patterning of estimates of underenumeration based on SOR–3–1.

The estimates based on the assumption that lifetime migrants fail to report their place of birth, and are missed in the census, more often than nonmigrants

[5] See U.S. Bureau of the Census, "Coverage of Population in the 1970 Census and Some Implications for Public Programs", **Current Population Reports,** Series P-23, No. 56, August 1975, for a fuller explanation of these estimates.

(SOR–3–2) are much more similar to each other than to the other five sets of estimates. The correlation between the two SOR–3–2 sets is 0.98 and the average absolute difference is only 0.25 percentage point. On the other hand, the correlation coefficients relating the SOR–3–2 estimates with the various SOR–3–1 and composite estimates fall in the range of only 0.90 to 0.93 and the average absolute differences fall between 0.57 and 0.75. These values of the coefficients and the average differences still indicate that the geographic patterning and levels of the rates of underenumeration estimated by the methods described by SOR–3–2 show a considerable similarity to the patterning and levels estimated by the SOR–3–1 methods.

The ranges from low to high estimates and the relative differences provide a basis for assessing the quality of the estimates of net underenumeration for specific States. From an examination of the ranges for the States, it is apparent that the composite estimates for a number of States are quite different from the purely demographic estimates (table VII-D). For 29 States, one of the composite estimates is an extreme value (high for 15 States and low for 14 States). Major differences in the level of the composite estimates and the purely demographic estimates are concentrated in a few areas, e.g., the Middle Atlantic division.

For many of the States, the range of estimates provides an acceptable *interval estimate* of the percent of net underenumeration for the total population. In several States, however, the range is too broad or the estimates are not adequate to provide a good interval estimate. For 22 of 26 States with a range from low to high of less than 1 percentage point in the percent of net underenumeration for the total population, the range does provide an adequate interval estimate. In three of the 26 States, Wisconsin, Minnesota, and Utah, the interval includes percents of net overenumeration. Because a net overenumeration is extremely unlikly to have occurred for an entire State, these estimates should be disregarded as such and assumed to represent a very small net underenumeration. The net underenumeration for the one remaining State, Maryland, was based in large measure on arbitrary procedures (ch. II). Consequently, the estimate for Maryland may be subject to substantial error in addition to the range shown in table VII-D.

For the five State areas with a range of 2 percentage points or greater, the estimation procedure did not yield interval estimates of the percent of net underenumeration which could be termed wholly adequate. States that have been subject to substantial migration, either in or out, tend to have larger ranges than other States because of the effect of the A and B factors in the SOR–3–2 series of estimates. Alaska (with a range of 3.1 percentage points), Nevada (2.6 percentage points), Arkansas (2.5 percentage points), and West Virginia (2.1 percentage points) fall into this category. Furthermore, the estimates for States with a large percentage of Blacks, such as Arkansas, are subject to greater error because of the poorer quality of the estimates of the undercounts for the Black population. The estimate of net underenumeration for the District of Columbia would be subject to substantial error because of the relatively arbitrary estimation procedure used (ch. II) and the large proportion of Blacks, even if the large range (2.3 percentage points) did not make the interval estimate somewhat inadequate.

For 20 States which have a range from low to high estimates between 1 and 2 percentage points, the adequacy of the range as an interval estimate may best be judged in relation to the level of the underenumeration. Accordingly, the relative difference, which is defined here as one-half of the range divided by the average of the high and low values, expressed as a percentage, may be used to assess further the quality of the interval estimate. A relative difference greater than 25 percent and a range of estimates from 1.0 to 1.4 percentage points can be used to identify one group of States for which the range does not provide an acceptable estimate. Three of the 14 States with ranges between 1.0 to 1.4 percentage points fall into this category: Pennsylvania (range 1.3, relative difference 48 percent), Oklahoma (range 1.2, relative difference 30 percent), and Montana (range 1.0, relative difference 36 percent). For Oklahoma and Montana, the migration factors, A and B, appear to produce the relatively large ranges.

In the Middle Atlantic division, Pennsylvania (range 1.3, relative difference 48 percent) has already been identified as a State for which the range is not a wholly adequate interval estimate, while New York (range 1.0, relative difference 24 percent) and New Jersey (range 0.9, relative difference 43 percent) fall into the group of States for which the range provides a just barely adequate interval estimate of the percent of net underenumeration. In these three States, the composite estimates differ substantially from the purely demographic estimates. One possible explanation for these differences is that many immigrants (a group which makes up a large percentage of the population in these States) may have been classified as native in the 1970 census because of the misreporting of State of birth. This error would result in a census population for the Middle Atlantic States that is artificially high and an estimated net underenumeration for these States that is too low.[5] Another possibility is that the foreign-born population in these States may have been missed more often in the census than the native population. The demographic estimates are based on an assumption of the equality

[5] Possible biases attributable to errors in the reporting of State of birth and nativity are discussed in chapter II.

of the coverage of these two groups but the match study, on which the composite estimates are based, could possibly differentiate between them.

For the six States with ranges from low to high estimates between 1.5 and 1.9 percentage points, only three have small enough relative differences for the low and high estimates to be considered marginally adequate limits for interval estimates. These three States are South Dakota (range 1.5, relative difference 25 percent), Texas (range 1.6, relative difference 17 percent), and California (range 1.9, relative difference 25 percent). The wide range (1.8 percentage points) and large relative difference (33 percent) for Mississippi could be attributed to the effects of heavy migration, the factors A and B, or the large proportion of Blacks in the population. However, the interval estimate for Mississippi is believed to be inadequate for another entirely different reason. The completeness of registration of births for the State as estimated from the results of the 1940 birth registration test appears to be much too high in comparison with the figures for the surrounding States and later tests (app. A). Such an overstatement of completeness would lead to too low a corrected population, too low an estimated net undercount, and an inadequate interval estimate regardless of its size. The estimates for the remaining two States, North Dakota (range 1.7, relative difference 52 percent) and Wyoming (range 1.6, relative difference 80 percent) are very sensitive to variations in the A and B factors. Consequently, the interval estimates for these States are too broad and not wholly adequate.

Sources of Error

The coverage estimates presented in this study are subject to errors which reflect both the limitations of the various statistical series on which the estimates are based and the limitations of the methodology used to produce the estimates. The different types of errors encountered in this study are summarized in the following sections. The sensitivity of the coverage estimates to many of these types of errors has been investigated in previous chapters of this report, and the reader should consult these chapters for additional information.

Limitations of data and their assumptions. We review first the types of errors arising from limitations of the data, or assumptions related to the data. The data considered are mortality statistics, birth statistics, census statistics on State of birth, census statistics on emigration, Social Security (Medicare) statistics, and the national estimates of coverage employed in deriving the estimates of coverage.

We may identify four types of errors in the mortality statistics. The first concerns the accuracy of the tabulations of deaths for age groups, the second concerns the type of life tables used in this study, the third concerns the accuracy of the imputed life tables, and the fourth concerns the adjustment for war-related mortality.

The accuracy of the tabulations of deaths for age categories is important because they are employed in the preparation of the life tables used to "survive" births from 1935 to 1970 or to "survive" sex ratios of births from 1905 to 1935. Although there may be very little underregistration of deaths and even net misreporting of age of deaths under 35 years of age as a whole and 35 to 64 years of age as a whole, the life table survival rates were applied in 5-year age groups and they could be distorted by age-misreporting in 5-year age groups. They are also affected by the net census errors of the population bases. To the extent that the net errors of the deaths by age and of the population by age are alike, the errors in the survival rates would be reduced.

The second error arises from the use of State-of-residence life tables in deriving the estimates of the corrected population under 35 years of age born in each State in 1970 from births, 1935 to 1970. The appropriate type of life table for these calculations is a State-of-birth life table, i.e., one for persons born in a given State. The appropriateness of substituting State-of-residence life tables for the corresponding States-of-birth tables for the present purpose is evaluated in appendix B. The evidence presented suggests that discrepancies between the two types of life tables for the States in the last few decades would have been relatively small.

Life tables for States based on observed data for many early years are lacking. The sets of life tables for decennial years are incomplete for the White population for 1920 and earlier years. Life tables for 1920 are available for only 25 States, and there are only five State life tables for 1900 and 1910. To develop a complete series for the White population beginning in 1900, substitutions based on official life tables for contiguous States were made for the early years in some cases, while, in other cases, survival rates were estimated on the basis of the estimated relation of national mortality patterns and trends to the mortality patterns and trends of States. The series of State life tables for the Black-and-other-races population is complete for 1970 only. Substitutions were made for missing tables in 1950 and 1960, and life table survival rates were obtained for 1930 and 1940 by reverse extrapolation from more recent years.

Allowances had to be made for war mortality in calculating expected sex ratios for Whites 35 to 64 years of age. Official life tables do not contain such allowances; hence, it was necessary to make them separately. A special problem is the estimated allocation of these deaths to the appropriate State populations.

The coverage estimates developed in this study directly incorporate birth statistics for States for the period 1935–1970, adjusted for estimated underregistration, by use of information from the 1940, 1950, and 1964–1968 birth registration tests. Although the test results had to be interpolated to individual years and the 1964–1968 test directly provided estimates only for regions, these problems are not believed to have introduced much error in the coverage estimates. The omission of State figures from the most recent test results does not present difficulties because national birth registration was effectively complete after about 1960 and, perforce, there is now relatively little variation in completeness of birth registration among States.

Some problems do appear to exist, however, with respect to the quality of estimates of completeness of birth registration for years between 1935 and about 1950, when underregistration levels for many States were quite substantial. The mere fact that the degree of registration was very low for several States in the South, as indicated by or estimated from the 1940 and 1950 tests, suggests the possibility of a large absolute error in the test results and in the interpolated values for these States. In addition, the completeness of birth registration during this period is suspiciously high for certain Southern States, particularly those in the East South Central division. It is not easily possible to determine the extent to which these registration estimates are biased upward if, indeed, they are, but to the extent that they are biased in this way, the coverage estimates for the particular States are biased downward.

Another source of error in the State coverage estimates associated with the birth statistics concerns the lack of data on births for many States prior to 1935 and for virtually every State prior to 1915. Data on births for each sex are essential to the estimation of expected sex ratios, which were used in this study as a principal means of estimating the coverage of the White population of each State in the middle age range (35 to 64 years) in 1970. Sex ratios at birth are required, therefore, by the estimation procedure for each quinquennial birth cohort from 1905–1910 to 1930–1935. To the extent feasible, the sex ratios at birth for these periods were based on statistics of actual births for the States. Births were compiled by many States prior to their admission to the national birth registration area. If however, we found reason to question the reliability of the available information or if statistics on births were not available, substitutions were made on the basis of data for a "representative" State or data for the same State in subsequent time periods. This procedure may have produced errors in the expected sex ratios and, hence also, in the State coverage estimates.

The State-of-birth statistics from the 1970 census are centrally important to the evaluation procedure. Since they were used both in direct estimation of the coverage of the population under 35 and indirectly in the calculation of coverage estimates for the population aged 35 to 64, it was necessary to adjust these data for any indicated types of error other than coverage error per se, prior to their use in the estimation of coverage rates for the population born in each State. There are three types of error in these data which merit attention.

The first type of error is the result of the need to allocate a substantial proportion of the population under age 35 to a State of birth because of nonresponse. Evidence presented in appendix B suggests that simple proration is a defensible allocation scheme but that other schemes might actually be more appropriate. The appropriateness of simple proration has been viewed here as dependent upon the extent to which the risk of omission from the census differs for interstate migrants and nonmigrants. The effect on the coverage estimates of using proration, a potentially suboptimal scheme, is apparently rather small, if not negligible.

The second and third types of error in the census State-of-birth tabulations concern the accuracy with which State of birth was reported. There is, first, the tendency to report State of residence as State of birth, and there is, second, the tendency to report the State in which a person was born rather than the State where the mother was living at the time of birth, if the two States are different (the "residence-occurrence" problem). The evidence strongly suggests that the State-of-birth data for the Black population are subject to both types of error but that the more serious type of error in the Black data is the reporting of State of residence as State of birth. This evidence is sufficiently strong to warrant a substantial modification of the State-of-birth figures for Blacks; the figures used in this study are "expected census" figures derived from earlier censuses and not the actual 1970 counts. The State-of-birth data for the White population are affected primarily by the second problem, the "residence-occurrence" problem. These data did not appear to contain sufficient reporting error of the first type to warrant their rejection in the estimation procedure, but the suspected presence of the residence-occurrence problem necessitated the use of alternative birth series in the estimation of the corrected population under age 35. The latter procedure was also applied to the calculations for Blacks.

Furthermore, these problems affect the expected sex ratios for the White population aged 35 to 64, albeit to a much smaller extent, because census State-of-birth figures were used in the calculation of the adjustments for net lifetime migration in the ex-

pected sex ratios. The effect here depends on the extent to which the census data on net lifetime migration for the two sexes are differentially affected by errors of both coverage and reporting.

Census statistics on the population resident overseas in 1970 are used to represent surviving net emigration of native Americans in the equation for deriving the expected population born in each State in 1970. The census data may be incomplete in the coverage of such persons, particularly those who were not affiliated with the U.S. Government as employees or dependents of employees.

The aggregated Medicare statistics for States used in this study to estimate the coverage of State populations 65 and over in 1970 were subjected to certain adjustments so that they could represent the "true" number of persons 65 years old and over in each State, corresponding to census definitions. The adjustments were for (1) nonresponses with respect to race and State of residence, (2) inconsistency in the classification of age used in Medicare data and in the census data, (3) the omission of certain population groups, and (4) inconsistency in the reporting of residence in the two sets of data. Each of these adjustments is subject to error.

The first and second adjustments are small and have little potential for introducing error. The third adjustment is relatively important. In addition to aliens who arrived in the United States in the last 5 years and conditional entrants to the country, groups which are legally excluded, a substantial number of active and retired Federal employees, and other members of the population, were not enrolled in Medicare in 1970. The estimates which had to be made for the latter groups could introduce significant error. The final adjustment of the Medicare data, designed to allow for the possible inconsistency in reporting residence in the two sets of data, could have a major impact on the coverage estimates for Arizona and Florida, the two States where direct adjustments were considered necessary. The series of adjustments in the Medicare statistics may have effectively resolved known discrepancies between the Medicare data and the census data at the national level; a question still arises, however, with respect to the accuracy of the allocation of these adjustments to States.

The CPS-Census Match estimates employed in this study, being based on a sample, are subject to sampling error. They represent net omissions rather than net undercounts; that is, they exclude the effect of the balance of age reporting errors between the three broad age groups (under 35, 35 to 64, and 65 and over). The CPS-Census Match Study suggests that such residual age reporting error may be very small, but there is other evidence suggesting that the net age misreporting for the group 65 and over may be substantial, particularly for Black males. The averaging of the match results with the demographic estimates further reduces the effect of the limitation noted.

All series of coverage estimates for States were adjusted to tie in to a single set of coverage estimates for the United States as a whole. Although this set of national estimates represented the "preferred" set of estimates, the figures are subject to error and the error could be as great as 15 percent of the overall estimate of undercoverage in the United States.

Limitations of methods and their assumptions. In addition to the errors which are associated with the different series of data on which the coverage estimates for States were based, there are several types of errors which are the direct result of the methods and the methodological assumptions employed to prepare the estimates. We review these briefly here.

The methodological model for the estimation of the coverage rate of the population under 35 years of age born in each State for each sex-race group presents no special problems. However, the conversion of these coverage estimates from a State-of-birth basis to a State-of-residence basis required an assumption concerning the relative influence of State of birth and State of residence on coverage rates. Empirical evidence relating to this question is not available and the assumption actually applied, namely that the influence of State of birth and the influence of State of residence on coverage are equal, is only one of many possibilities. The difference between the effect of this assumption and the effect of the assumption that State of residence is the primary determinant of coverage is rather small.

The assumptions regarding the relative coverage of lifetime interstate migrants and nonmigrants under age 35 in the census, employed to distinguish the principal estimates for these ages, are relatively arbitrary, lacking any formal empirical basis, and yet they can have a significant effect on the estimates of coverage. A wider or narrower range in the assumptions may have been necessary to arrive at the optimal error band for the coverage estimates.

Many alternative procedures were considered for the estimation of the corrected White and Black populations aged 35 to 64 for States, but none of them is a very sophisticated demographic procedure. A mechanical procedure was employed for the White female population and the Black male and female populations, and the coverage estimates are correspondingly rough. The method of deriving the expected sex ratios for Whites was demographically meritorious but the data employed are subject to substantial error and the sex ratios are applied to rough estimates for White females.

The demographic method was designed to estimate coverage of the native resident population of each State directly. It was then assumed that coverage of the foreign-born residents of each State was the same as that for the native population. An alternative assumption was not employed both because there was a lack of appropriate empirical information and because, in a test of the effect of reasonable alternative assumptions, they had no perceptible effect in most States and only a small effect in the remaining few States. The adjustment of the preliminary estimates for States to secure consistency with the independently derived national estimates of coverage may have made some implicit allowance for the difference between the coverage of the native and foreign-born populations. The assumption employed would have a negligible effect on the estimates for the Black population since this group has been, until very recently, little affected by immigration.

The CPS-Census Match estimates of coverage were never used alone, because of the lack of State data and the deficiencies of the match figures. They were always combined with the demographic estimates. The use of equal weights in deriving Composite series 2 and 3 from the demographic figures and the CPS-Census Match figures is partly arbitrary; logically, such a weighting scheme appeared to offer the optimum choice.

Concluding Note

The estimates of coverage for States presented in this study are subject to substantial error because of the limitations of the available data, the assumptions employed to adjust them, and the estimation procedures. However, in spite of the many sources of error and the resulting possibilities for error in the coverage estimates, it appears that the figures shown in table VII-D constitute a set of reasonably accurate coverage estimates for most of the States. In particular, the estimates provide adequate or marginally adequate ranges for about three-quarters of the States. These estimates can prove to be quite useful for many practical applications, particularly if they are treated as interval estimates and if the possibilities for error are taken into account.

Table VII-A. ALTERNATIVE ESTIMATES OF THE PERCENTS OF NET UNDERENUMERATION FOR THE TOTAL POPULATION, FOR REGIONS AND DIVISIONS, BY SEX: 1970

(See text for explanation of alternative procedures)

Sex, region, and division	SOR-3-1			SOR-3-2			SOR-3-1		Composite-1	Composite-2	Range		
	WCF-1			WCF-2			WCF-1				Low value	High value	Difference
	BACF-1	BAEF-1	BREF-1	BACF-2	BAEF-2	BREF-2	BACF*-1	BREF*-1					
BOTH SEXES													
United States	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	(X)	(X)	(X)
Regions:													
Northeast	1.3	1.2	1.1	1.3	1.1	1.1	1.3	1.3	1.7	2.0	1.1	2.0	0.9
North Central	1.6	1.5	1.4	1.4	1.2	1.2	1.6	1.5	1.4	1.4	1.2	1.6	0.4
South	4.0	4.1	4.2	3.8	3.9	4.0	4.0	4.1	4.0	3.9	3.8	4.2	0.4
West	3.2	3.3	3.2	3.9	4.2	4.1	3.2	3.1	3.0	2.7	2.7	4.2	1.5
Northeast:													
New England	0.9	0.9	0.9	1.0	0.9	0.9	0.9	0.9	1.2	1.4	0.9	1.4	0.5
Middle Atlantic	1.4	1.2	1.2	1.4	1.2	1.2	1.4	1.4	1.8	2.2	1.2	2.2	1.0
North Central:													
East North Central	1.5	1.4	1.3	1.5	1.3	1.2	1.5	1.4	1.5	1.5	1.2	1.5	0.3
West North Central	1.7	1.7	1.7	1.2	1.2	1.2	1.7	1.7	1.3	1.0	1.0	1.7	0.7
South:													
South Atlantic	4.1	4.2	4.3	4.1	4.2	4.3	4.2	4.2	4.5	4.4	4.1	4.5	0.4
East South Central	3.5	3.5	3.7	2.7	2.5	2.7	3.4	3.7	3.1	3.2	2.5	3.7	1.2
West South Central	4.2	4.5	4.6	4.1	4.3	4.4	4.2	4.3	3.6	3.5	3.5	4.6	1.1
West:													
Mountain	3.6	3.7	3.7	3.5	3.7	3.7	3.6	3.6	3.3	3.1	3.1	3.7	0.6
Pacific	3.1	3.2	3.1	4.0	4.3	4.2	3.1	3.0	2.9	2.6	2.6	4.3	1.7
MALE													
United States	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	(X)	(X)	(X)
Regions:													
Northeast	1.8	1.7	1.7	1.8	1.6	1.6	1.8	1.8	2.2	2.5	1.6	2.5	0.9
North Central	2.0	1.9	1.8	1.8	1.7	1.6	2.0	1.9	1.9	1.8	1.6	2.0	0.4
South	5.1	5.2	5.4	4.9	5.0	5.2	5.1	5.3	5.1	5.0	4.9	5.4	0.5
West	4.0	4.1	3.9	4.7	5.0	4.8	4.0	3.8	3.7	3.5	3.5	5.0	1.5
Northeast:													
New England	1.5	1.5	1.4	1.6	1.5	1.5	1.5	1.5	1.8	2.0	1.4	2.0	0.6
Middle Atlantic	1.9	1.8	1.7	1.9	1.7	1.6	1.9	1.9	2.4	2.7	1.6	2.7	1.1
North Central:													
East North Central	2.0	1.9	1.7	1.9	1.8	1.6	2.0	1.8	2.0	2.0	1.6	2.0	0.4
West North Central	2.1	2.0	2.1	1.5	1.5	1.5	2.1	2.1	1.7	1.4	1.4	2.1	0.7
South:													
South Atlantic	5.3	5.4	5.6	5.4	5.4	5.6	5.4	5.5	5.7	5.7	5.3	5.7	0.4
East South Central	4.5	4.5	5.0	3.6	3.5	3.9	4.5	4.9	4.2	4.3	3.5	5.0	1.5
West South Central	5.1	5.4	5.6	5.0	5.2	5.4	5.1	5.3	4.6	4.4	4.4	5.6	1.2
West:													
Mountain	4.2	4.4	4.4	4.1	4.3	4.3	4.3	4.2	3.9	3.8	3.8	4.4	0.6
Pacific	3.9	4.0	3.7	4.9	5.2	4.9	3.9	3.6	3.7	3.4	3.4	5.2	1.8
FEMALE													
United States	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	(X)	(X)	(X)
Regions:													
Northeast	0.8	0.7	0.7	0.8	0.6	0.6	0.8	0.8	1.2	1.5	0.6	1.5	0.9
North Central	1.1	1.0	1.0	1.0	0.8	0.8	1.1	1.1	1.0	0.9	0.8	1.1	0.3
South	3.0	3.1	3.1	2.8	2.9	2.9	3.0	3.0	2.9	2.9	2.8	3.1	0.3
West	2.5	2.6	2.6	3.1	3.3	3.3	2.4	2.4	2.2	2.0	2.0	3.3	1.3
Northeast:													
New England	0.4	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.6	0.8	0.3	0.8	0.5
Middle Atlantic	0.9	0.8	0.8	0.9	0.7	0.7	0.9	0.9	1.4	1.7	0.7	1.7	1.0
North Central:													
East North Central	1.1	0.9	0.9	1.0	0.8	0.8	1.0	1.0	1.0	1.0	0.8	1.1	0.3
West North Central	1.3	1.3	1.3	0.9	0.9	0.9	1.4	1.4	1.0	0.7	0.7	1.4	0.7
South:													
South Atlantic	2.9	3.0	3.0	2.9	3.0	3.0	3.0	3.0	3.3	3.2	2.9	3.3	0.4
East South Central	2.6	2.5	2.5	1.8	1.6	1.6	2.5	2.5	2.2	2.3	1.6	2.6	1.0
West South Central	3.3	3.6	3.6	3.2	3.5	3.5	3.3	3.3	2.7	2.6	2.6	3.6	1.0
West:													
Mountain	2.9	3.1	3.1	2.9	3.1	3.1	2.9	2.9	2.6	2.5	2.5	3.1	0.6
Pacific	2.3	2.4	2.4	3.1	3.4	3.4	2.3	2.3	2.1	1.8	1.8	3.4	1.6

X Not applicable.

Table VII-B. ALTERNATIVE ESTIMATES OF THE PERCENTS OF NET UNDERENUMERATION FOR THE WHITE POPULATION, FOR REGIONS AND DIVISIONS, BY SEX: 1970

(See text for explanation of alternative procedures)

Sex, region, and division	SOR-3-1	SOR-3-2	Composite-1	Composite-2	Range		
	WCF-1	WCF-2			Low value	High value	Difference
Both Sexes							
United States	1.9	1.9	1.9	1.9	(X)	(X)	(X)
Regions:							
Northeast	0.8	0.7	1.2	1.4	0.7	1.4	0.7
North Central	1.2	0.9	1.0	1.0	0.9	1.2	0.3
South	3.1	3.0	3.0	2.9	2.9	3.1	0.2
West	2.7	3.4	2.5	2.4	2.4	3.4	1.0
Northeast:							
New England	0.8	0.9	1.1	1.2	0.8	1.2	0.4
Middle Atlantic	0.8	0.7	1.3	1.5	0.7	1.5	0.8
North Central:							
East North Central	1.1	0.9	1.0	1.1	0.9	1.1	0.2
West North Central	1.4	0.8	1.0	0.7	0.7	1.4	0.7
South:							
South Atlantic	2.9	3.1	3.4	3.4	2.9	3.4	0.5
East South Central	2.7	2.1	2.3	2.2	2.1	2.7	0.6
West South Central	3.5	3.5	2.9	2.7	2.7	3.5	0.8
West:							
Mountain	3.1	3.0	2.8	2.7	2.7	3.1	0.4
Pacific	2.6	3.5	2.4	2.2	2.2	3.5	1.3
MALE							
United States	2.5	2.5	2.5	2.5	(X)	(X)	(X)
Regions:							
Northeast	1.2	1.1	1.6	1.8	1.1	1.8	0.7
North Central	1.5	1.2	1.3	1.3	1.2	1.5	0.3
South	3.9	3.9	3.8	3.8	3.8	3.9	0.1
West	3.4	4.1	3.2	3.0	3.0	4.1	1.1
Northeast:							
New England	1.4	1.4	1.6	1.8	1.4	1.8	0.4
Middle Atlantic	1.1	1.0	1.6	1.8	1.0	1.8	0.8
North Central:							
East North Central	1.4	1.2	1.4	1.5	1.2	1.5	0.3
West North Central	1.6	1.0	1.3	1.0	1.0	1.6	0.6
South:							
South Atlantic	3.9	4.1	4.3	4.4	3.9	4.4	0.5
East South Central	3.4	2.8	3.0	2.9	2.8	3.4	0.6
West South Central	4.2	4.2	3.6	3.3	3.3	4.2	0.9
West:							
Mountain	3.7	3.5	3.4	3.3	3.3	3.7	0.4
Pacific	3.3	4.2	3.1	2.9	2.9	4.2	1.3
FEMALE							
United States	1.4	1.4	1.4	1.4	(X)	(X)	(X)
Regions:							
Northeast	0.5	0.4	0.9	1.1	0.4	1.1	0.7
North Central	0.9	0.6	0.7	0.7	0.6	0.9	0.3
South	2.3	2.2	2.2	2.1	2.1	2.3	0.2
West	2.1	2.7	1.8	1.7	1.7	2.7	1.0
Northeast:							
New England	0.3	0.4	0.6	0.7	0.3	0.7	0.4
Middle Atlantic	0.5	0.4	1.0	1.2	0.4	1.2	0.8
North Central:							
East North Central	0.8	0.6	0.7	0.8	0.6	0.8	0.2
West North Central	1.1	0.6	0.8	0.5	0.5	1.1	0.6
South:							
South Atlantic	2.0	2.1	2.4	2.5	2.0	2.5	0.5
East South Central	2.0	1.4	1.6	1.5	1.4	2.0	0.6
West South Central	2.9	2.8	2.2	2.0	2.0	2.9	0.9
West:							
Mountain	2.6	2.5	2.3	2.2	2.2	2.6	0.4
Pacific	1.9	2.7	1.7	1.6	1.6	2.7	1.1

X Not applicable.
Z Less than ± 0.05.

Table VII-C. ALTERNATIVE ESTIMATES OF THE PERCENTS OF NET UNDERENUMERATION FOR THE BLACK-AND-OTHER-RACES POPULATION, FOR REGIONS AND DIVISIONS, BY SEX: 1970

(See text for explanation of alternative procedures)

Sex, region, and division	SOR-3-1			SOR-3-2			SOR-3-1		Composite-1	Composite-2	Range		
	WCF-1			WCF-2			WCF-1				Low value	High value	Difference
	BACF-1	BAEF-1	BREF-1	BACF-2	BAEF-2	BREF-2	BACF-1	BREF-1					
BOTH SEXES													
United States	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	(X)	(X)	(X)
Regions:													
Northeast	5.4	4.1	4.0	6.2	4.5	4.5	5.6	5.5	5.8	6.9	4.0	6.9	2.9
North Central	5.6	4.5	3.9	6.2	4.8	4.3	5.5	4.9	5.5	4.9	3.9	6.2	2.3
South	7.7	8.3	8.8	6.9	7.4	7.8	7.7	8.3	7.7	7.7	6.9	8.8	1.9
West	7.6	8.8	7.7	8.7	11.2	10.3	7.5	6.5	7.3	6.3	6.3	11.2	4.9
Northeast:													
New England	3.4	2.4	2.0	4.3	2.9	2.5	3.2	2.8	3.6	4.6	2.0	4.6	2.6
Middle Atlantic	5.6	4.3	4.2	6.4	4.7	4.7	5.9	5.8	6.0	7.2	4.2	7.2	3.0
North Central:													
East North Central	5.2	4.0	3.2	5.9	4.3	3.6	4.9	4.2	5.1	4.6	3.2	5.9	2.7
West North Central	7.4	7.1	7.3	7.7	7.0	7.2	7.9	8.1	7.1	6.3	6.3	8.1	1.8
South:													
South Atlantic	8.2	8.5	8.9	7.7	8.1	8.4	8.5	8.8	8.5	8.1	7.7	8.9	1.2
East South Central	6.7	6.5	7.6	4.9	4.0	5.0	6.2	7.3	6.3	7.0	4.0	7.6	3.6
West South Central	7.6	9.1	9.6	6.8	8.3	8.8	7.4	8.0	7.1	7.6	6.8	9.6	2.8
West:													
Mountain	10.5	13.1	12.8	11.3	13.9	13.7	11.0	10.7	10.3	9.3	9.3	13.9	4.6
Pacific	7.1	8.0	6.9	8.3	10.8	9.7	6.9	5.8	6.8	5.8	5.8	10.8	5.0
MALE													
United States	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	(X)	(X)	(X)
Regions:													
Northeast	7.5	6.2	6.0	8.4	6.7	6.6	7.7	7.4	7.8	9.0	6.0	9.0	3.0
North Central	7.5	6.5	5.3	8.2	6.8	5.8	7.4	6.2	7.4	6.9	5.3	8.2	2.9
South	9.9	10.4	11.5	9.0	9.4	10.4	9.9	11.0	9.9	10.0	9.0	11.5	2.5
West	9.2	10.4	8.4	10.5	13.0	11.1	9.2	7.2	9.0	8.1	7.2	13.0	5.8
Northeast:													
New England	5.4	4.4	3.5	6.5	5.1	4.3	5.2	4.3	5.6	6.5	3.5	6.5	3.0
Middle Atlantic	7.7	6.4	6.2	8.6	6.9	6.8	7.9	7.7	8.0	9.2	6.2	9.2	3.0
North Central:													
East North Central	7.1	5.9	4.4	7.9	6.4	5.0	6.9	5.4	7.1	6.6	4.4	7.9	3.5
West North Central	9.3	9.0	9.3	9.6	8.9	9.3	9.8	10.1	9.1	8.2	8.2	10.1	1.9
South:													
South Atlantic	10.4	10.7	11.3	9.8	10.2	10.8	10.6	11.2	10.7	10.3	9.8	11.3	1.5
East South Central	8.9	8.8	10.8	6.8	6.0	7.9	8.5	10.6	8.6	9.3	6.0	10.8	4.8
West South Central	9.8	11.3	12.3	8.9	10.4	11.4	9.7	10.7	9.3	9.9	8.9	12.3	3.4
West:													
Mountain	12.7	15.1	14.6	13.6	16.1	15.7	13.1	12.7	12.5	11.6	11.6	16.1	4.5
Pacific	8.6	9.6	7.3	10.0	12.4	10.3	8.5	6.3	8.4	7.5	6.3	12.4	6.1
FEMALE													
United States	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	(X)	(X)	(X)
Regions:													
Northeast	3.6	2.2	2.2	4.2	2.5	2.5	3.8	3.8	3.9	5.1	2.2	5.1	2.9
North Central	3.7	2.7	2.7	4.2	2.8	2.8	3.6	3.6	3.6	3.0	2.7	4.2	1.5
South	5.6	6.2	6.2	4.9	5.4	5.4	5.6	5.6	5.6	5.6	4.9	6.2	1.3
West	5.8	7.1	7.1	6.9	9.4	9.4	5.8	5.8	5.6	4.6	4.6	9.4	4.8
Northeast:													
New England	1.6	0.6	0.6	2.2	0.7	0.7	1.4	1.4	1.7	2.7	0.6	2.7	2.1
Middle Atlantic	3.8	2.4	2.4	4.4	2.6	2.6	4.0	4.0	4.1	5.3	2.4	5.3	2.9
North Central:													
East North Central	3.4	2.1	2.1	3.9	2.3	2.3	3.1	3.1	3.3	2.8	2.1	3.9	1.8
West North Central	5.6	5.3	5.3	5.8	5.1	5.1	6.1	6.1	5.3	4.5	4.5	6.1	1.6
South:													
South Atlantic	6.1	6.5	6.5	5.7	6.2	6.2	6.4	6.4	6.5	6.0	5.7	6.5	0.8
East South Central	4.6	4.4	4.4	3.1	2.2	2.2	4.1	4.1	4.2	4.9	2.2	4.9	2.7
West South Central	5.5	7.0	7.0	4.8	6.4	6.4	5.3	5.3	5.0	5.5	4.8	7.0	2.2
West:													
Mountain	8.2	10.9	10.9	8.8	11.6	11.6	8.7	8.6	8.0	7.0	7.0	11.6	4.6
Pacific	5.4	6.4	6.4	6.5	9.0	9.0	5.3	5.3	5.2	4.2	4.2	9.0	4.8

X Not applicable.

Table VII-D. ALTERNATIVE ESTIMATES OF THE PERCENTS OF NET UNDERENUMERATION FOR THE TOTAL POPULATION, FOR REGIONS, DIVISIONS, AND STATES: 1970

(See text for explanation of alternative procedures. A minus sign denotes a net overcount)

Region, division, and State	SOR-3-1		SOR-3-2		SOR-3-1	Composite-1	Composite-2	Range			
	WCF-1		WCF-2		WCF-1			Low value	High value	Difference	Relative difference[1]
	BACF-1	BREF-1	BACF-2	BREF-2	BACF*-1						
United States, total	2.5	2.5	2.5	2.5	2.5	2.5	2.5	(X)	(X)	(X)	(X)
Regions:											
Northeast	1.3	1.1	1.3	1.1	1.3	1.7	2.0	1.1	2.0	0.9	29
North Central	1.6	1.4	1.4	1.2	1.6	1.4	1.4	1.2	1.6	0.4	14
South	4.0	4.2	3.8	4.0	4.0	4.0	3.9	3.8	4.2	0.4	5
West	3.2	3.2	3.9	4.1	3.2	3.0	2.7	2.7	4.1	1.4	21
Northeast:											
New England	0.9	0.9	1.0	0.9	0.9	1.2	1.4	0.9	1.4	0.5	22
Middle Atlantic	1.4	1.2	1.4	1.2	1.4	1.8	2.2	1.2	2.2	1.0	29
North Central:											
East North Central	1.5	1.3	1.5	1.2	1.5	1.5	1.5	1.2	1.5	0.3	11
West North Central	1.7	1.7	1.2	1.2	1.7	1.3	1.0	1.0	1.7	0.7	26
South:											
South Atlantic	4.1	4.3	4.1	4.3	4.2	4.5	4.4	4.1	4.5	0.4	5
East South Central	3.5	3.7	2.7	2.7	3.4	3.1	3.2	2.7	3.7	1.0	16
West South Central	4.2	4.6	4.1	4.4	4.2	3.6	3.5	3.5	4.6	1.1	14
West:											
Mountain	3.6	3.7	3.5	3.7	3.6	3.3	3.1	3.1	3.7	0.6	9
Pacific	3.1	3.1	4.0	4.2	3.1	2.9	2.6	2.6	4.2	1.6	24
New England:											
Maine	3.7	3.7	2.7	2.8	3.7	3.9	4.1	2.7	4.1	1.4	21
New Hampshire	1.9	1.9	2.0	2.0	1.8	2.1	2.3	1.8	2.3	0.5	12
Vermont	2.6	2.6	1.9	1.9	2.7	2.8	3.0	1.9	3.0	1.1	22
Massachusetts	0.6	0.5	0.6	0.6	0.6	0.9	1.0	0.5	1.0	0.5	(B)
Rhode Island	1.0	1.0	0.9	0.9	1.0	1.3	1.4	0.9	1.4	0.5	22
Connecticut	0.1	(Z)	0.7	0.5	0.1	0.4	0.6	(Z)	0.7	0.7	(B)
Middle Atlantic:											
New York	1.8	1.6	1.8	1.6	1.8	2.2	2.6	1.6	2.6	1.0	24
New Jersey	0.7	0.6	1.0	0.9	0.8	1.2	1.5	0.6	1.5	0.9	43
Pennsylvania	1.2	1.1	0.9	0.7	1.2	1.7	2.0	0.7	2.0	1.3	48
East North Central:											
Ohio	1.6	1.4	1.4	1.2	1.5	1.5	1.5	1.2	1.6	0.4	14
Indiana	1.7	1.6	1.3	1.2	1.6	1.6	1.7	1.2	1.7	0.5	17
Illinois	1.8	1.5	1.9	1.5	1.9	1.8	1.8	1.5	1.9	0.4	12
Michigan	2.0	1.7	2.1	1.8	1.9	2.0	2.0	1.7	2.1	0.4	11
Wisconsin	-0.5	-0.6	-0.6	-0.7	-0.5	-0.6	-0.5	-0.7	-0.5	0.2	(B)
West North Central:											
Minnesota	0.2	0.2	(Z)	-0.1	0.2	-0.1	-0.4	-0.4	0.2	0.6	(B)
Iowa	1.7	1.6	0.9	0.9	1.6	1.3	1.0	0.9	1.7	0.8	31
Missouri	2.7	2.7	2.6	2.6	2.7	2.3	2.0	2.0	2.7	0.7	15
North Dakota	2.5	2.5	0.8	0.8	2.5	2.1	1.8	0.8	2.5	1.7	52
South Dakota	3.5	3.5	2.3	2.2	3.7	3.2	2.9	2.2	3.7	1.5	25
Nebraska	1.5	1.4	0.8	0.7	1.5	1.1	0.8	0.7	1.5	0.8	36
Kansas	1.6	1.5	0.7	0.7	1.6	1.2	0.9	0.7	1.6	0.9	39
South Atlantic:											
Delaware	2.8	2.7	3.4	3.4	2.8	3.2	3.2	2.7	3.4	0.7	11
Maryland	1.5	1.2	1.9	1.5	1.7	1.9	1.9	1.2	1.9	0.7	23
District of Columbia	5.3	4.0	5.2	3.4	5.4	5.7	5.4	3.4	5.7	2.3	25
Virginia	3.3	3.1	2.9	2.6	3.2	3.7	3.6	2.6	3.7	1.1	17
West Virginia	6.3	6.7	4.6	4.9	6.2	6.7	6.7	4.6	6.7	2.1	17
North Carolina	3.4	3.3	3.1	3.0	3.4	3.8	3.7	3.0	3.8	0.8	12
South Carolina	5.9	6.8	5.5	6.4	6.1	6.3	6.2	5.5	6.8	1.3	11
Georgia	5.0	5.6	4.9	5.6	5.1	5.3	5.3	4.9	5.6	0.7	7
Florida	4.8	5.0	5.6	6.1	4.8	5.2	5.2	4.8	6.1	1.3	12
East South Central:											
Kentucky	3.6	3.8	2.7	2.8	3.4	3.2	3.2	2.7	3.8	1.1	17
Tennessee	4.0	4.4	3.7	4.0	3.9	3.6	3.7	3.6	4.4	0.8	10
Alabama	3.0	3.0	2.0	1.8	2.8	2.6	2.7	1.8	3.0	1.2	25
Mississippi	3.5	3.5	2.0	1.8	3.6	3.2	3.4	1.8	3.6	1.8	33
West South Central:											
Arkansas	6.2	7.2	4.7	5.1	6.6	5.6	5.6	4.7	7.2	2.5	21
Louisiana	3.1	3.1	2.8	2.8	3.1	2.5	2.5	2.5	3.1	0.6	11
Oklahoma	2.5	2.5	1.5	1.4	2.6	1.9	1.8	1.4	2.6	1.2	30
Texas	4.6	5.1	4.9	5.5	4.5	4.0	3.9	3.9	5.5	1.6	17
Mountain:											
Montana	1.8	1.8	0.9	0.9	1.9	1.5	1.4	0.9	1.9	1.0	36
Idaho	3.8	3.9	3.3	3.4	3.8	3.5	3.4	3.3	3.9	0.6	8
Wyoming	1.8	1.8	0.3	0.2	1.8	1.5	1.4	0.2	1.8	1.6	80
Colorado	2.5	2.6	2.3	2.3	2.5	2.2	2.1	2.1	2.6	0.5	11
New Mexico	8.3	9.1	8.3	9.2	8.2	8.0	7.8	7.8	9.2	1.4	8
Arizona	4.7	4.8	5.0	5.2	4.9	4.4	4.2	4.2	5.2	1.0	11
Utah	(Z)	-0.1	-0.1	-0.2	(Z)	-0.3	-0.5	-0.5	(Z)	0.5	(B)
Nevada	4.5	4.6	6.3	6.6	4.6	4.1	4.0	4.0	6.6	2.6	25
Pacific:											
Washington	2.0	1.9	2.1	2.0	2.1	1.8	1.5	1.5	2.1	0.6	17
Oregon	1.2	1.1	1.5	1.4	1.2	0.9	0.8	0.8	1.5	0.7	30
California	3.3	3.3	4.5	4.7	3.3	3.1	2.8	2.8	4.7	1.9	25
Alaska	7.5	6.9	5.6	5.0	8.1	7.3	6.9	5.0	8.1	3.1	24
Hawaii	5.9	6.0	5.5	6.3	5.2	5.6	5.0	5.0	6.3	1.3	12

B Base of percentage less than 1.0 percent.
X Not applicable.
Z Less than ± 0.05.
[1]Relative difference is defined as one-half of the difference of high and low values divided by the average of the high and low values.

Table VII-E. AVERAGE ABSOLUTE DIFFERENCES AND CORRELATION COEFFICIENTS FOR ALTERNATIVE ESTIMATES OF THE PERCENTS OF NET UNDERENUMERATION FOR THE TOTAL POPULATION OF STATES: 1970

(Average absolute differences are shown above the diagonal line; product-moment correlation coefficients are shown below the diagonal line)

Series	SOR-3-1		SOR-3-2		SOR-3-1	Composite-1	Composite-2
	WCF-1		WCF-2		WCF-1		
	BACF-1	BREF-1	BACF-2	BREF-2	BACF*-1		
SOR-3-1, WCF-1, BACF-1.....		.202	.596	.714	.096	.331	.447
SOR-3-1, WCF-1, BREF-1.....	.988		.696	.653	.243	.439	.551
SOR-3-2, WCF-2, BACF-2.....	.928	.918		.247	.606	.574	.608
SOR-3-2, WCF-2, BREF-2.....	.912	.926	.984		.743	.700	.745
SOR-3-1, WCF-1, BACF*-1.....	.996	.983	.921	.900		.345	.449
Composite-1.....	.984	.967	.929	.906	.981		.163
Composite-2.....	.969	.956	.918	.897	.967	.995	

Source: Based on estimates shown in table VII-D.

Table VII-F. NUMBER OF STATES WITH SPECIFIED PERCENTS OF NET UNDERENUMERATION FOR THE TOTAL POPULATION, ACCORDING TO ALTERNATIVE PROCEDURES FOR ESTIMATING COVERAGE: 1970

(See text for explanation of alternative procedures)

Percent	SOR-3-1		SOR-3-2		SOR-3-1	Composite-1	Composite-2	Synthetic estimates	
	WCF-1		WCF-2		WCF-1			Basic (age, sex, and race)	Modified (median family income)
	BACF-1	BREF-1	BACF-2	BREF-2	BACF*-1				
Total[1].....	51	51	51	51	51	51	51	51	51
Net overcount.....	2	2	3	3	1	3	3	-	-
Net undercount:									
Less than 1.0.....	5	4	10	11	5	3	4	-	1
1.0 to 1.9.....	15	16	11	11	15	15	15	15	14
2.0 to 2.9.....	7	6	10	9	8	8	9	27	25
3.0 to 3.9.....	9	[2]11	4	[2]5	10	10	9	8	4
4.0 to 4.9.....	6	4	5	2	4	3	3	-	[2]5
5.0 and over.....	[2]7	8	[2]8	10	[2]8	[2]9	[2]8	[2]1	2
Average percent net underenumeration (unweighted).....	2.9	2.9	2.6	2.6	3.0	2.9	2.8	2.5	2.6

- Represents zero.
[1] Percent for all States is 2.5 (weighted).
[2] Includes the District of Columbia

Source: Based on estimates shown in tables VII-D and F-1.

Table VII-G. ADJUSTED OMISSION RATES BASED ON THE CPS-CENSUS MATCH STUDY, FOR REGIONS AND DIVISIONS, BY SEX AND RACE, AND BY SEX AND BROAD AGE GROUPS OF THE WHITE POPULATION: 1970

(Omission rates as originally compiled have been adjusted downward to reflect the inclusion of "imputations" in the census counts as published)

Region and division	All races	White-and-other-races			Black	
		Total	Under 35 years	35 to 64 years	Total	Under 35 years
BOTH SEXES						
United States	2.3	1.8	2.0	1.6	6.3	7.0
Regions:						
Northeast	2.6	2.3	2.5	1.9	7.6	8.6
North Central	1.2	1.1	1.3	0.7	3.4	2.8
South	3.1	2.4	2.6	2.3	6.7	7.5
West	1.9	1.7	1.6	1.6	6.4	8.3
Northeast:						
New England	1.9	1.4	1.5	1.3	(1)	(1)
Middle Atlantic	2.9	2.6	2.8	2.1	6.7	6.6
North Central:						
East North Central	1.6	1.4	1.7	0.9	4.0	3.2
West North Central	0.2	0.3	0.3	0.2	(1)	(1)
South:						
South Atlantic	3.9	3.2	3.3	3.4	7.3	7.9
East South Central	2.5	1.4	1.6	1.2	6.1	8.3
West South Central	2.3	1.8	2.1	1.3	6.1	5.7
West:						
Mountain	2.1	2.3	2.7	1.6	(1)	(1)
Pacific	1.9	1.5	1.3	1.6	(1)	(1)
MALE						
United States	2.3	1.8	2.0	1.5	6.2	7.0
Regions:						
Northeast	2.8	2.4	2.7	2.0	7.6	10.0
North Central	1.2	1.1	1.3	0.7	3.3	3.2
South	3.1	2.3	2.6	2.1	6.7	7.3
West	1.8	1.7	1.5	1.4	(1)	(1)
Northeast:						
New England	1.8	1.3	1.2	1.4	(1)	(1)
Middle Atlantic	3.1	2.8	3.3	2.2	6.5	8.6
North Central:						
East North Central	1.7	1.4	1.8	0.9	3.9	3.7
West North Central	0.2	0.3	0.2	0.2	(1)	(1)
South:						
South Atlantic	3.8	3.0	3.1	3.2	7.6	7.8
East South Central	2.3	1.3	1.3	1.3	5.9	8.0
West South Central	2.4	1.9	2.5	1.2	5.4	5.3
West:						
Mountain	2.2	2.4	2.9	1.3	(1)	(1)
Pacific	1.7	1.5	1.0	1.5	(1)	(1)
FEMALE						
United States	2.3	1.8	1.9	1.6	6.5	7.1
Regions:						
Northeast	2.5	2.1	2.2	1.8	7.7	7.1
North Central	1.2	1.0	1.3	0.7	3.5	2.3
South	3.2	2.4	2.7	2.4	6.7	7.8
West	2.0	1.8	1.8	1.7	(1)	(1)
Northeast:						
New England	2.0	1.5	1.9	1.2	(1)	(1)
Middle Atlantic	2.7	2.3	2.3	2.0	6.7	4.7
North Central:						
East North Central	1.5	1.3	1.6	0.9	4.1	2.7
West North Central	0.3	0.3	0.4	0.2	(1)	(1)
South:						
South Atlantic	4.0	3.4	3.5	3.7	6.9	8.0
East South Central	2.6	1.5	1.9	1.1	6.3	8.5
West South Central	2.3	1.6	1.8	1.4	6.6	6.1
West:						
Mountain	2.1	2.2	2.5	1.9	(1)	(1)
Pacific	2.0	1.6	1.5	1.7	(1)	(1)

[1]Figure is unreliable because of excessive sampling error.

Table VII-H. COMPARISON OF ADJUSTED OMISSION RATES BASED ON THE CPS-CENSUS MATCH STUDY AND PERCENTS OF NET UNDERCOUNT BASED ON DEMOGRAPHIC ANALYSIS, FOR REGIONS, BY SEX AND RACE: 1970

(Percents for demographic analysis are based on Series SOR-3-1, WCF-1, BACF-1. See text for explanation of methods)

Region and sex	All races				White				Black and other races	
	Total		Under 35		Total		Under 35		Total	
	CPS-Census Match	Demo-graphic analysis	CPS-Census Match	Demo-graphic analysis	CPS-Census Match[1]	Demo-graphic analysis	CPS-Census Match[1]	Demo-graphic analysis	CPS-Census Match[2]	Demo-graphic analysis
BOTH SEXES										
United States	2.3	2.5	2.5	2.7	1.8	1.9	2.0	2.0	6.1	6.9
Northeast	2.6	1.3	2.9	1.4	2.3	0.8	2.5	0.8	7.6	5.4
North Central	1.2	1.6	1.4	1.7	1.1	1.2	1.3	1.3	3.4	5.6
South	3.1	4.0	3.6	4.1	2.4	3.1	2.6	3.2	6.7	7.7
West	1.9	3.2	2.0	3.2	1.7	2.7	1.6	2.8	6.4	7.6
MALE										
United States	2.3	3.3	2.6	3.2	1.9	2.5	2.0	2.4	6.0	8.9
Northeast	2.8	1.8	3.3	1.8	2.4	1.2	2.7	1.2	7.6	7.5
North Central	1.2	2.0	1.5	2.0	1.1	1.5	1.3	1.5	3.3	7.5
South	3.1	5.1	3.5	5.0	2.3	3.9	2.6	3.7	6.7	9.9
West	1.8	4.0	1.8	3.7	1.7	3.4	1.5	3.2	(3)	9.2
FEMALE										
United States	2.3	1.8	2.5	2.1	1.8	1.4	2.0	1.6	6.3	4.9
Northeast	2.5	0.8	2.6	1.0	2.1	0.5	2.2	0.5	7.7	3.6
North Central	1.2	1.1	1.4	1.3	1.0	0.9	1.3	1.0	3.5	3.7
South	3.2	3.0	3.7	3.2	2.4	2.3	2.7	2.6	6.7	5.6
West	2.0	2.5	2.2	2.8	1.8	2.1	1.8	2.3	(3)	5.8
POPULATION SEX RATIO[4]										
United States	92.6	96.3	97.6	101.7	93.1	96.3	97.9	102.2	88.4	95.7
Northeast	92.0	93.5	99.8	99.7	92.5	93.6	99.3	100.5	85.3	91.9
North Central	92.4	95.9	96.7	100.6	92.2	95.9	95.9	101.1	94.9	95.3
South	93.8	97.1	98.9	103.1	94.8	97.6	100.7	103.9	88.9	95.4
West	91.6	99.3	94.4	103.5	92.4	98.9	95.2	103.6	(3)	102.8

[1]White and other races.
[2]Black.
[3]Figure is unreliable because of excessive sampling error.
[4]Sex ratios represent males per 100 females.

Table VII-I. EXPECTED SEX RATIOS AND CENSUS SEX RATIOS, FOR REGIONS AND DIVISIONS, BY AGE AND RACE: 1970

(Expected sex ratios based on estimate series SOR-3-1, WCF-1, BACF-1; expected sex ratios based on other series would be similar. Sex ratios represent males per 100 females)

Region and division	All ages			Under 35 years			35 to 64 years			65 years and over		
	Expected sex ratio	Census sex ratio	Difference[1]	Expected sex ratio	Census sex ratio	Difference[1]	Expected sex ratio	Census sex ratio	Difference[1]	Expected sex ratio	Census sex ratio	Difference[1]
ALL CLASSES												
United States	96.3	94.8	-1.4	101.7	100.5	-1.2	95.4	92.7	-2.7	71.0	72.1	+1.1
Regions:												
Northeast	93.5	92.5	-1.0	99.7	98.9	-0.8	92.8	90.8	-2.0	67.7	68.7	+1.0
North Central	95.9	95.0	-0.9	100.6	99.9	-0.8	95.9	94.2	-1.7	72.1	73.0	+0.8
South	97.1	95.0	-2.2	103.1	101.2	-1.9	95.0	91.1	-3.9	71.4	73.1	+1.8
West	99.2	97.7	-1.6	103.5	102.4	-1.0	99.5	96.3	-3.2	73.9	74.4	+0.5
Northeast:												
New England	94.4	93.3	-1.1	101.5	100.6	-1.0	94.0	91.8	-2.2	64.7	65.3	+0.6
Middle Atlantic	93.2	92.2	-0.9	99.2	98.4	-0.8	92.4	90.5	-1.9	68.7	69.8	+1.1
North Central:												
East North Central	95.9	94.9	-0.9	100.3	99.6	-0.8	95.9	94.1	-1.8	71.7	72.5	+0.8
West North Central	95.9	95.2	-0.7	101.4	100.7	-0.7	95.9	94.4	-1.5	72.9	73.8	+0.9
South:												
South Atlantic	97.4	95.0	-2.4	103.6	101.6	-2.0	95.5	90.9	-4.6	70.9	72.8	+1.8
East South Central	96.2	94.3	-2.0	102.8	100.6	-2.2	93.3	90.1	-3.2	71.0	73.4	+2.4
West South Central	97.2	95.4	-1.8	102.6	101.0	-1.6	95.4	92.3	-3.2	72.3	73.5	+1.2
West:												
Mountain	99.5	98.1	-1.3	102.2	101.3	-0.9	99.4	96.7	-2.8	81.3	81.8	+0.5
Pacific	99.2	97.6	-1.6	103.9	102.8	-1.0	99.5	96.2	-3.3	71.8	72.4	+0.5
WHITE												
United States	96.3	95.3	-1.0	102.2	101.4	-0.9	95.6	93.6	-2.0	70.7	71.5	+0.7
Regions:												
Northeast	93.6	93.0	-0.7	100.5	99.8	-0.7	93.0	91.6	-1.4	67.5	68.4	+0.9
North Central	95.9	95.4	-0.6	101.1	100.6	-0.6	95.8	94.7	-1.2	71.8	72.5	+0.6
South	97.6	95.9	-1.6	103.9	102.6	-1.2	95.7	92.7	-3.0	71.7	72.5	+0.8
West	98.9	97.6	-1.3	103.6	102.7	-0.9	99.0	96.3	-2.7	72.5	73.1	+0.6
Northeast:												
New England	94.4	93.4	-1.0	101.8	100.8	-0.9	94.0	92.0	-2.0	64.4	65.1	+0.7
Middle Atlantic	93.4	92.8	-0.6	100.0	99.4	-0.6	92.6	91.4	-1.2	68.6	69.6	+1.0
North Central:												
East North Central	96.0	95.3	-0.6	101.0	100.4	-0.6	95.8	94.6	-1.2	71.4	71.9	+0.5
West North Central	95.9	95.4	-0.5	101.6	101.0	-0.6	96.0	94.9	-1.2	72.7	73.5	+0.8
South:												
South Atlantic	97.9	96.0	-1.9	104.6	103.2	-1.3	96.0	92.2	-3.8	71.8	72.6	+0.8
East South Central	96.9	95.6	-1.4	103.5	102.1	-1.4	94.5	92.4	-2.1	71.3	72.3	+1.0
West South Central	97.5	96.2	-1.3	103.1	102.1	-1.0	96.1	93.8	-2.3	71.8	72.4	+0.6
West:												
Mountain	99.2	98.2	-1.1	102.0	101.4	-0.7	99.3	96.8	-2.5	80.4	81.2	+0.7
Pacific	98.8	97.4	-1.4	104.2	103.2	-1.0	98.9	96.2	-2.7	70.2	70.8	+0.6
BLACK AND OTHER RACES												
United States	95.7	91.6	-4.0	98.8	95.6	-3.2	(X)	(X)	(X)	(X)	(X)	(X)
Regions:												
Northeast	91.9	88.2	-3.7	94.2	92.2	-2.0	(X)	(X)	(X)	(X)	(X)	(X)
North Central	95.2	91.5	-3.8	96.4	93.9	-2.5	(X)	(X)	(X)	(X)	(X)	(X)
South	95.4	91.1	-4.3	100.5	96.2	-4.2	(X)	(X)	(X)	(X)	(X)	(X)
West	102.8	99.1	-3.7	102.1	100.2	-1.9	(X)	(X)	(X)	(X)	(X)	(X)
Northeast:												
New England	95.5	91.8	-3.7	96.4	94.8	-1.5	(X)	(X)	(X)	(X)	(X)	(X)
Middle Atlantic	91.5	87.8	-3.7	94.0	91.9	-2.0	(X)	(X)	(X)	(X)	(X)	(X)
North Central:												
East North Central	95.0	91.3	-3.7	95.8	93.4	-2.5	(X)	(X)	(X)	(X)	(X)	(X)
West North Central	96.2	92.5	-3.8	99.4	96.7	-2.7	(X)	(X)	(X)	(X)	(X)	(X)
South:												
South Atlantic	96.0	91.6	-4.3	100.6	96.5	-4.1	(X)	(X)	(X)	(X)	(X)	(X)
East South Central	93.6	89.3	-4.3	100.3	95.5	-4.8	(X)	(X)	(X)	(X)	(X)	(X)
West South Central	95.8	91.4	-4.4	100.5	96.4	-4.1	(X)	(X)	(X)	(X)	(X)	(X)
West:												
Mountain	104.4	99.3	-5.1	104.7	100.8	-3.9	(X)	(X)	(X)	(X)	(X)	(X)
Pacific	102.5	99.0	-3.5	101.6	100.1	-1.5	(X)	(X)	(X)	(X)	(X)	(X)

X Not applicable.

[1]A minus sign (-) denotes a deficit, and a plus sign (+) denotes an excess, in the census sex ratio.

Chapter VIII. Application of Coverage Estimates and Directions of Future Research

APPLICATION OF COVERAGE ESTIMATES FOR STATES

Levels of Error

We have seen that it is possible to develop many different sets of estimates of the coverage of the population of States in the 1970 census, each taking account of the available body of data, utilizing appropriate demographic methods, and employing reasonable, albeit partly arbitrary, assumptions. The usefulness and practical application of such estimates of underenumeration depend jointly on the degree of error in the estimates and on the degree of error which a specific use of the estimates allows.

We have attempted, insofar as we could, to evaluate the estimates presented in this report, segmentally and globally, in connection with the description of the data, methods, and assumptions employed in preparing them.[1] At the present juncture, satisfactory quantitative statements of error cannot be made for coverage estimates derived either by demographic analysis or by dual systems analysis. It is not possible to determine the degree of error in the estimates with any great degree of confidence because we have no way of empirically evaluating the methods or assumptions. Since we do not know the "true" values, we cannot measure the accuracy of the estimates closely. We have, however, examined the estimates from the point of view of reasonableness, consistency, and demographic logic. We have tried to suggest the range of uncertainty in the estimates by applying alternative reasonable or limiting assumptions and by comparing estimates derived by essentially independent methods employing different data and assumptions.

Measures of error may be either summary measures for a set of coverage estimates or they may relate to the individual figures in the set. Several different summary measures of accuracy relating to a set of State estimates are theoretically possible, but these summary measures may not provide consistent indications of error. Moreover, the errors for the individual States necessarily vary from the summary value. We can consider as summary measures for each set of State estimates, for example, the average percentage difference between the estimates of the "true" populations and the (unknown) true populations, the quadratic mean percentage difference (corresponding essentially to the "least squares" criterion), the proportion of the States for which the estimate of the true population differs from the (unknown) true figures by some stated large percentage (e.g., 5 percent). One State distribution of the coverage estimates may have a lower average percent error than a second distribution, while the second distribution may have a lower proportion of extreme errors. We may wish to be more concerned about an overestimate of 5 percent for some area than the fact that the average error of the method is lowest. Note, however, that the real errors are unknown and may be unknowable.

For a set of general-purpose coverage estimates for States, we need to pose the question, what levels of error in the individual estimates should be regarded as acceptable? For some purposes we may wish the estimates to be accurate within 0.5 percentage point; that is, an estimate of 1.0 percent should reflect a true figure between 0.5 and 1.5 percent and an estimate of 5.0 percent should reflect a true figure between 4.5 percent and 5.5 percent. For other purposes, however, we may be able to tolerate different absolute or relative errors at different levels of estimated underenumeration. On the basis of the array of figures presented in this report, it appears that the estimates of the net underenumeration of the total population of States could vary up to about 10 percent. One could then consider, for example, a 50 percent relative error in the estimate to be acceptable at the 1 percent level of estimated underenumeration, a 15 percent relative error to be acceptable at the 5 percent level of estimated underenumeration, and a 10 percent relative error to be acceptable at the 10 percent level.[2] Other levels of acceptability of

[1] See, for example, W. Edwards Deming, "The Logic of Evaluation," pp. 53–68, in Elmer L. Struening and Marcia Guttentag (Eds.), **Handbook of Evaluation Research**, Vol. 1, Sage Publications, Beverly Hills, California, 1975; and E. S. Marks, W. Seltzer, and K. J. Krotki, **Population Growth Estimation: A Handbook of Vital Statistics Measurement**, The Population Council, New York, 1974, chapter 3.

[2] These figures would correspond to the following ranges of error: .01±.0050, or 0.50 percent to 1.50 percent; .05±.0075, or 4.25 percent to 5.75 percent; and .10±.010, or 9.0 percent to 11.0 percent.

the estimates might be set, as was done, in effect, in chapter VII. One would next have to consider whether estimates of census undercoverage with such relative errors are achievable.

The decision as to acceptable levels of error is a policy decision which should be made independently of the estimates themselves and should be made in relation to specific uses. Some uses make a greater demand on the accuracy of the coverage estimates than do others and, in these cases, narrower bands of acceptability should be set.

Levels of Usage

The most stringent general demand would be made on the quality of the coverage estimates if they are used to correct census data on population that are employed in a formula for apportioning funds among the States on the basis of population alone. This use calls for a single "best", or preferred, set of rates of underenumeration for *all* the States, characterized by uniformly low errors. Clearly we have not met these requirements in our estimates for 1970. The quality of the estimates in any set is quite variable from State to State and the errors of the rates for some States are quite large. Hence, it would appear that the rates are not satisfactory for practical use in an apportionment formula.

Nearly similar demands would be placed on the quality of a set of coverage estimates if they are used to correct population figures for allocating funds to States on a per capita basis, or to correct population figures for apportioning funds among the States in a formula involving factors in addition to population (e.g., per capita income). In the first case, the requirement for uniformity in quality may be relaxed somewhat since the allocation is not competitive. In the second case, because of the reduced weight of the population factor, the need for precision in the coverage estimates for population may be relaxed somewhat, provided essential uniformity is maintained and adequate allowance is made for underreporting in the other factors.

We may identify another much less stringent level of usage of the estimates of census underenumeration for States. We could simply designate a series or a few series as preferred or working series and offer them to users of census data (or current population estimates) for adjusting the data as they deem appropriate. Such adjustments could be made, for example, in connection with various research studies so as to increase the validity of the research findings (e.g., to establish whether or not research conclusions would be affected by the underenumeration of population). We believe that some of the estimates of coverage we have developed qualify for this level of usage. Among these are the estimates for the total population of the four regions and nine geographic divisions, the total population of many of the States, and the White population of most of the States. The corresponding figures for males and females would also fit in this category (e.g., White males of all ages), as would the corresponding estimates for ages under 35 (e.g., Whites under 35). None of the figures for Blacks and other races could qualify here.[3]

Finally, some of the estimates of census underenumeration may be subject to such large errors that it would be misleading to the user public to offer them as preferred or working data. They are useful only for rough qualitative description of the coverage situation. In general, although the results would be of limited practical value to users under such circumstances, they could still serve as rough guides in the broad interpretation of census data. For example, the figures could be of use to the Census Bureau in planning and conducting the 1980 census. We feel that the estimates of coverage of the total population for several States (those not included earlier), the estimates for the White population for a few States (those not included earlier), and the figures for the Black-and-other-races population of all the States merit this restricted use. The corresponding estimates for males and females would also fit in this category (e.g., Black males of all ages), as would the corresponding estimates for ages 35 and over (e.g., Whites 35 and over). All the coverage estimates for the States we have prepared qualify *at least* for this level of usage.

SOME IMPLICATIONS FOR PUBLIC PROGRAMS

Undercoverage in the census, particularly State differences in undercoverage, may have a significant effect on political representation and the distribution of public funds. The effect of census underenumeration on representation in legislative bodies at various levels of government and on the distribution of funds under various public programs can be assessed illustratively by employing various series of corrected figures.[4] For our present illustrative analysis, we consider only two aspects of this question—the possible effect on apportionment of representatives in Congress and the effect on the distribution of funds among the States under a simple apportionment for-

[3] There is no statistical illogicality in accepting the estimates for the total population and the estimates for the White population, while rejecting the estimates for the Black-and-other-races population. The relative error for the smaller part of a population may be vastly greater than the relative error for the larger part or the total.

[4] For additional discussion of this subject, see U.S. Bureau of the Census, **Current Population Reports**, Series P-23, No. 56, "Coverage of Population in the 1970 Census and Some Implications for Public Programs," 1975, pp. 19–23.

mula—and employ three of the series of corrected population figures developed here, those designated as "SOR–3–1, WCF–1, BACF–1," "SOR–3–2, WCF–2, BACF–2," and "Composite-2."

Political Representation

Under the method of "equal proportions," the method used to determine the number of Congressmen from each State in the U.S. House of Representatives, the shift in the population of a State required to produce a change in the State's representation may be merely a few hundred persons or a few hundred thousand persons, depending on the precise populations of all the States. One Congressional seat is shifted (that is, Congressional apportionment changes for two States) when the census populations are corrected for underenumeration by the series designated as "SOR–3–1, WCF–1, BACF–1," with Tennessee gaining one representative (8 to 9) and Oklahoma losing one representative (6 to 5). Two Congressional seats are shifted and four States are affected when the population figures are corrected by the series designated as "SOR–3–2, WCF–2, BACF–2," with California (43 to 44) and Texas (24 to 25) each gaining one representative and Ohio (23 to 22) and Oklahoma (6 to 5) each losing one representative. When the correction series designated as "Composite-2" is applied, the result is the same as with Series "SOR–3–1, WCF–1, BACF–1;" one Congressional seat is shifted (and apportionment changes for two States), with Tennessee gaining one representative (8 to 9) and Oklahoma losing one representative (6 to 5).

Distribution of Public Funds

Types of distributions. Many Federal programs involve disbursement of funds to States on the basis of population. There are many different ways in which these funds may be distributed. They may be allotted as capitation grants, i.e., on a per capita basis. They may be apportioned to the States on the basis of a fixed national total. The allocation or apportionment may be made on the basis of some segment of the population (e.g., school-age children) or factors other than, in addition to, or involving population (e.g., per capita income). Sometimes population figures are used to determine the areas that qualify for certain funds, which may then be distributed on the basis of various factors other than, in addition to, or involving population.

Funds may be distributed on a per capita basis and, hence, the total amount distributed depends on the number of persons in the population, without reference to the number in other areas. There are some State programs in which funds are allocated on a per capita basis. Under such circumstances any allocation of funds is directly affected by the underenumeration of population and, as a result, the population in the geographic areas that are undercounted may receive less than their proper share of funds and, hence, of public services.

Typically, however, Federal funding programs have an apportionment feature, that is, a preestablished sum of money is distributed to a class of governmental units such as States or States and political subdivisions. It is apparent that, if money is distributed solely on the basis of population under an apportionment formula and if the population of the coordinate governmental units is adjusted for underenumeration by a common percentage, however large, the funds apportioned to each governmental unit would not be affected by the adjustment. It should be recognized, therefore, that shifts in the funds apportioned to States depend on the variation in the underenumeration rates among the States. The several sets of estimates of underenumeration prepared in this study reflect substantial variation between the States and, hence, distributions of funds should be substantially altered for some States by use of corrected population figures instead of census figures.

Illustration of effect of population adjustment. We have employed the same three series of coverage estimates as before to illustrate the effect of underenumeration on the apportionment of funds among the States. We have compared the distribution of $1 billion among the States on the basis of the census counts and the distribution of $1 billion among the States on the basis of three sets of corrected population figures (table VIII-A). The illustrative comparison shows that the size and variation of the percentage shifts in the funds apportioned among the States on the basis of the corrected population, as compared with the distribution on the basis of the census population, are much smaller than the size and variation of the rates of underenumeration (that is, percentage shifts in population among the States) used to correct the population. Correction of the population figures by the coverage estimates developed in this study makes little difference in the funds allocated to most States, but for some States the change in funds would be substantial, either upward or downward. Half or more of the States would receive less money if the population figures were corrected.

The population corrected under the "SOR–3–1, WCF–1, BACF–1" assumption would shift by less than 2 percent in 20 States and by 4 percent or more in 14 States, but the funds apportioned would shift by less than 2 percent in 36 States and by 4 percent or more in only 2 States. Population would shift by 3.1 percent on the average (unweighted), but the funds apportioned among the States would shift by

an average of only 1.6 percent (table VIII-B). In general, simple apportionment formulas dampen considerably the effect of any variable adjustment of a set of data.

A nearly equal number of States would lose money (25) as would gain money (26) under the changed apportionment resulting from use of series "SOR–3–1, WCF–1, BACF–1." Under the assumption that the total sum to be apportioned is $1 billion, four States would experience gains in excess of $500,000 and six States would experience losses in excess of $500,000. In this illustrative calculation the States which would experience large absolute gains are all located in the South and West—Florida, Georgia, Texas, and California—and the States which would experience large absolute losses are all located in the North—Massachusetts, New Jersey, New York, Ohio, Pennsylvania, and Wisconsin (table VIII-A).

With series "SOR–3–2, WCF–2, BACF–2" and series Composite-2 an even greater proportion of States would experience a loss of funds. With the Composite-2 series in particular, the change in funds received would be smaller in relation to the population correction than for the other two series; for example, when this series is used, only 19 States would gain less than 2 percent in population but 38 States would gain or lose less than 2 percent in funds.

Some issues in adjusting official data. Given the requirements of law regarding the form of the distribution of funds, problems arise because the data employed in implementing the law are not perfect. On what basis should a set of figures be considered optimal, or at least satisfactory, for carrying out the terms of the law? An important criterion for determining the adequacy of a given distribution of funds is the equity of that distribution within the terms set by the law. Complete equity would be achieved if the allocation of funds were based on perfect data but, since perfect data are not available and a perfect distribution is not attainable, the principal of equity is not easy to apply. Application of the principal of equity then requires consideration of the accuracy of the data and some criteria for measuring it.[5]

Just as there is more than one way of measuring the accuracy of a set of population estimates or of a set of coverage estimates, so there is more than one way of measuring the accuracy of a set of figures on fund allotments. Should the preference go to the set of allotments with the lowest average error, the set with the fewest extreme errors, or the set with the "least squares" error? Under one criterion of equity, we may prefer to reduce the funds allotted to several areas and even raise the average error, in order to increase substantially the funds assigned to a single area for which the allocation is presumed to be excessively low.

If the formula calls for an apportionment of funds on the basis of factors in addition to population and a maximal degree of equity is to be achieved, it is necessary to incorporate corrections for the components other than population in the apportionment formula since they affect the final distribution. For example, the State and Local Fiscal Assistance Act of 1976 (General Revenue Sharing) calls for use of data on per capita income (and "tax effort," the ratio of taxes to income) in addition to population in the formula for the State distributions. Here it may be equally or more important to develop and apply accurate corrections for the data on per capita income if the cause of equity is to be served since the corrections for the different components may partly or wholly offset one another for some States and be additive for others.[6] In the absence of adequate estimates of error for all factors in the formula, it may be appropriate not to correct the population factor at all. On the other hand, it is possible that correction of the population factor alone would produce a more equitable disbursement *on the average* (if not for many individual States) than no correction at all.

Another example is the use of the estimated unemployment rate for States in implementing the Comprehensive Employment and Training Act of 1973. If unemployed persons in each age-sex-race group were undercounted at the same rate or nearly the same rate as employed persons, the overall unemployment rate would not be significantly affected. Without specific knowledge of the relative coverage of employed and unemployed persons, the best estimate of the unemployment rate may be the observed rate, without correction for undercount of the population.

FUTURE DIRECTIONS OF RESEARCH ON COVERAGE ESTIMATION

Plans for 1980 for States

In line with its responsibility, the Census Bureau will try to enumerate all residents of the United States in the 1980 census, including illegal residents. A corollary goal is to reduce sharply, if not eliminate, the geographic variation in census coverage levels. As for 1970, studies of the coverage of the population in the census will be undertaken to measure the Bureau's success or failure in achieving these goals.

[5] See, for example, Thomas Jabine, "Equity in the Allocation of Funds Based on Sample Data," pp. 2–8, and Wray Smith, "On Allocation Schemes and the Interface Between Statistics and Policy," pp. 9–11, in U.S. Bureau of the Census, **Small Area Statistics Papers, Series GE–41, No. 3, Statistical Issues in Allocating Federal Funds and Estimation of Local Finances,** 1977.

[6] U.S. Bureau of the Census, Series P-23, No. 56, op. cit., pp. 19–22.

In view of the limitations of the coverage estimates for States for 1970, whether derived by the demographic method or by a composite of dual systems analysis and the demographic method, and in view of the pressing need to secure adequate estimates of this kind, we are considering possible modifications in the data, methods, and assumptions employed in 1970 that may contribute to greater success for 1980. This effort will include the refinement of the demographic method and its underlying assumptions, the improvement of the census data and the external data required by the method, the use and elaboration of dual systems analysis, and experimentation with alternative procedures for combining these methods.

As the foregoing discussion has indicated, the quality of the census data plays an important role in the measurement process when the demographic method or dual systems analysis is applied. The major areas for improving the census data used in the demographic method include both the general aspects of census-taking and the specific aspects relating to the State-of-birth item. Improvement of census field work, extension and improvement of field editing and allocation procedures, improvement in the quality of the data on State of birth, and improvement and expansion of the coverage of the overseas population would contribute both to the coverage and accuracy of the census and to the improvement of our evaluation of the census.

We are making specific plans designed to improve the reporting and tabulation of State-of-birth data in the census, testing new questions and seeking ways to assign a State of birth when it is not reported. In particular, we are seeking to achieve a reduction in the large proportion of respondents not reporting their nativity or State of birth, to improve the allocation of nativity when it is not reported, to extend allocation procedures to include State of birth, and to reduce the biases in the reporting of State of birth noted earlier. Reduction in the biases in reporting State of birth may be achieved by the modification of the question and the field instructions now being considered. New questions and instructions on State of birth are being tested in an attempt uniformly to secure information on the State of usual residence of mothers (at the time of the birth) in reply to the question on State of birth. The changes to be instituted are also designed to achieve a reduction in the tendency, principally on the part of Blacks and foreign-born persons, to report current State of residence in reply to the question on State of birth. At the same time, if estimates of census counts of the population born in each State must be made, as was the case for Blacks in the present study, improvements in the method for doing this may be secured through use of available coverage estimates for States by age in an iterative "feedback" procedure.

The passage of an additional decade for which satisfactory birth and death statistics will be available will not only contribute to the possibility of sound estimates of coverage for children under age 10 in 1980, but will mean that the age band for which estimates can be prepared on the basis of birth statistics will have been widened to cover the ages up to age 45. In 1980, about 69 percent of the national population is expected to be in the age range under 45 years.

Further declines in, and further possible convergence of, mortality rates for States since 1970 should put less dependence on the assumption that the mortality levels of conventional life tables relating to the resident population of each State satisfactorily reflect the mortality levels of persons born in the State. On the other hand, there is the possibility that we shall have State-of-birth or region-of-birth life tables, or, at least, a "lifetime" migrant life table and a "nonmigrant" table. We will seek also to improve our measurement of emigration from the United States through a more complete count of the overseas population, particularly the civilian non-Federally affiliated population.

Since, as in 1970, ages 65 and over can be covered by Medicare enrollments, only ages 45 to 64, or some 10 percent of the population, may have to be estimated by indirect "ratio" procedures in the framework of the demographic method. Even for this age group a more direct procedure may be applied, at least for the White population, since some research now underway is designed to produce usable estimates of births for States from 1915 to 1935. Moreover, the procedure for analytically calculating expected sex ratios for these intermediate ages may be applied to the Black population as well as to the White population. The initial expected sex ratios for these ages for States could conceivably be adjusted by a feedback procedure that takes account of the effect of net census errors on the life tables used to derive the expected sex ratios.

Medicare enrollments are expected to cover the population 65 and over more completely in 1980 than in 1970. Yet, we will have to allow for the small number of persons who are not enrolled. A match of the census, the postenumeration survey, and Medicare enrollments may aid in this task, as described later.

The effort to evaluate the coverage of State populations in 1980 will include an expanded application of matching studies. The use of the results of these studies in relation to the results obtained by demographic analysis remains to be determined but, in principle, they may be employed independently to represent the coverage of the total population or the coverage of some age, sex, or race subgroup (e.g.,

White females, 45 to 64) for divisions or States; or they may be averaged with the results of the analytic method for the total population of divisions or States or some subgroup of the population of these areas. Finally, the match studies may provide information regarding the geographic and socioeconomic correlates of census coverage that may offer an empirical basis for the types of assumptions employed in the application of the demographic method; in this way we hope to replace the relatively arbitrary assumptions employed in the demographic method for the coverage estimates of 1970. The several collection systems being considered for matching are the 1980 census, the Current Population Survey (CPS), a postenumeration survey (PES), the Social Security Administration (SSA) files, Internal Revenue Service (IRS) records, and Medicare enrollments.

One specific proposal being considered involves the application of a three-way match, or treble systems analysis, in two stages. First, a postenumeration survey would be taken and matched to the census to provide coverage estimates for large States (and large metropolitan areas) by age, sex, and race. Then, a sample from the Social Security files would be matched to the census and the postenumeration survey. The first stage would provide initial estimates of the coverage of the census based on the postenumeration survey. The estimates of coverage of the census based on the postenumeration survey would tend to be understatements because of the lack of independence between the two collection systems, particularly for males and Blacks. The further matching of the census and the postenumeration survey with the Social Security (IRS) files should provide coverage estimates for the postenumeration survey which should tend to overcome in large part the limitations of the first estimates resulting from correlation bias and which should provide improved estimates of undercoverage in the census. A test of such a procedure is being carried out in connection with the Oakland, California test census which was taken in the spring of 1977. This proposal is based on the assumption that at least a small proportion of the hard-to-enumerate groups (e.g., Black male youth, illegal aliens) are included in the postenumeration survey and that these groups are included in large numbers in the Social Security files.

The project outlined could provide direct measures of coverage for the principal geographic subdivisions of the country, including the four regions, the nine divisions, the large States (and the large metropolitan areas) and for the principal residence categories of the population, including urban and rural, metropolitan and nonmetropolitan, central city, and suburban ring. Information will also be sought from the match studies on coverage of the principal racial and ethnic groups (White, Black, Hispanic origin), and coverage according to nativity, citizenship, (lifetime) interstate migration status, and socioeconomic status (broad income, occupation, and educational attainment groups).

A Census-PES-Medicare Match Study may be conducted in 1980 as part of the Census-PES-SSA (IRS) match studies. To derive information on the coverage of Medicare enrollments, we would match a sample drawn from the census and the postenumeration survey with the Medicare file in 1980. Reporting of a person's age below 65 in the census and above 65 in the Medicare files should be minimal, as in 1970. No persons will appear in the Medicare files below age 65, since systematic checks on age are carried out for Medicare enrollees. A problem to be resolved is the presence of persons erroneously reported as 65 or more in the census sample; they would not appear in the Medicare files. Finally, the rates of net omissions for Medicare would be used to adjust the aggregate Medicare figures for underenrollment and, then, the corrected Medicare figures would be compared with the census figures for ages 65 and over to establish the census net error rates for this age group.

In addition to the use of demographic analysis and match studies for evaluating the 1980 census, the Census Bureau may also employ a variety of other techniques, such as participant observer studies, low altitude aerial photography, intensive coverage of experimental areas, and use of local lists of many kinds (e.g., drivers licenses), as measures of evaluation or coverage improvement. The use of participant observers may provide insight into the causes of underenumeration in various types of ethnic, racial, or residential situations. These other methods are designed to provide a maximum amount of information on the problem of coverage that can be used to supplement and extend the results of the demographic and dual systems methods, even though they do not provide quantitative results which can be directly employed in measuring geographic variations in coverage.

Extension to Areas Within States

As suggested in the previous section, we should also like to expand the range of areas for which estimates are prepared. We now plan to attempt to measure the coverage of the large metropolitan areas in addition to States in 1980. Derivation of adequate estimates of census coverage for such areas will not be possible by use of the demographic method alone or the dual systems method alone. It will depend partly on success in the effort to measure coverage for States, although a different method would have to be applied. The types of data employed for the State coverage estimates are not available for areas within States.

For example, data on net lifetime migration (i.e., census data on place of birth) for these areas are lacking. Synthetic and regression procedures may be applied, taking account of the results of both demographic analysis and matching studies for broader areas. For example, the demographic method may provide estimates of the demographic characteristics of omitted persons for the United States, regions, divisions, and, possibly, the larger States, and of expected sex ratios for the areas within States, and the match studies may provide some direct information on the demographic, geographic, social, and economic correlates of undercoverage for the United States, regions, and, possibly, divisions.

We plan to secure tabulations of additions to the census field counts required because of noninterviews, for the United States by age, sex, and race and for the States and larger metropolitan areas by race. Such figures will supplement the other information available regarding the extent of enumeration problems in the census and may be useful as proxy variables in estimating underenumeration for geographic subdivisions of States.

Table VIII-A. DISTRIBUTION OF ONE BILLION DOLLARS BY REGIONS, DIVISIONS, AND STATES ACCORDING TO THE 1970 CENSUS POPULATION AND THE 1970 CENSUS POPULATION CORRECTED FOR NET UNDERENUMERATION BY VARIOUS METHODS

(See text for explanation of the alternative procedures. Numbers in thousands of dollars)

Region, division, and State	Census	SOR-3-1 WCF-1 BACF-1	SOR-3-2 WCF-2 BACF-2	Composite-2	Difference from census distribution: SOR-3-1 Amount	SOR-3-1 Percent	SOR-3-2 Amount	SOR-3-2 Percent	Composite-2 Amount	Composite-2 Percent
United States, total	1,000,000	1,000,000	1,000,000	1,000,000	(Z)	(Z)	(Z)	(Z)	(Z)	(Z)
Regions:										
Northeast	241,348	238,243	238,249	239,957	-3,105	-1.3	-3,099	-1.3	-1,391	-0.6
North Central	278,382	275,604	275,079	275,044	-2,778	-1.0	-3,303	-1.2	-3,338	-1.2
South	308,993	313,709	313,015	313,387	+4,716	+1.5	+4,022	+1.3	+4,394	+1.4
West	171,276	172,444	173,657	171,612	+1,168	+0.7	+2,381	+1.4	+336	+0.2
Northeast:										
New England	58,293	57,334	57,375	57,585	-959	-1.6	-918	-1.6	-708	-1.2
Middle Atlantic	183,056	180,908	180,874	182,373	-2,148	-1.2	-2,182	-1.2	-683	-0.4
North Central:										
East North Central	198,059	195,984	195,857	195,945	-2,075	-1.0	-2,202	-1.1	-2,114	-1.1
West North Central	80,323	79,619	79,222	79,100	-704	-0.9	-1,101	-1.4	-1,223	-1.5
South:										
South Atlantic	150,915	153,355	153,364	153,902	+2,440	+1.6	+2,449	+1.6	+2,987	+2.0
East South Central	63,004	63,642	63,088	63,451	+638	+1.0	+84	+0.1	+447	+0.7
West South Central	95,074	96,713	96,563	96,034	+1,639	+1.7	+1,489	+1.6	+960	+1.0
West:										
Mountain	40,759	41,189	41,161	40,992	+430	+1.1	+402	+1.0	+233	+0.6
Pacific	130,518	131,255	132,497	130,620	+737	+0.6	+1,979	+1.5	+102	+0.1
New England:										
Maine	4,889	4,946	4,899	4,967	+57	+1.2	+10	+0.2	+78	+1.6
New Hampshire	3,630	3,604	3,611	3,619	-26	-0.7	-19	-0.5	-11	-0.3
Vermont	2,188	2,189	2,173	2,198	+1	(Z)	-15	-0.7	+10	+0.5
Massachusetts	27,993	27,437	27,455	27,557	-556	-2.0	-538	-1.9	-436	-1.6
Rhode Island	4,673	4,599	4,596	4,619	-74	-1.6	-77	-1.6	-54	-1.2
Connecticut	14,920	14,559	14,641	14,626	-361	-2.4	-279	-1.9	-294	-2.0
Middle Atlantic:										
New York	89,754	89,037	89,078	89,771	-717	-0.8	-676	-0.8	+17	(Z)
New Jersey	35,270	34,614	34,733	34,897	-656	-1.9	-537	-1.5	-373	-1.1
Pennsylvania	58,031	57,257	57,062	57,705	-774	-1.3	-969	-1.7	-326	-0.6
East North Central:										
Ohio	52,412	51,880	51,799	51,875	-532	-1.0	-613	-1.2	-537	-1.0
Indiana	25,555	25,323	25,242	25,324	-232	-0.9	-313	-1.2	-231	-0.9
Illinois	54,685	54,285	54,302	54,256	-400	-0.7	-383	-0.7	-429	-0.8
Michigan	43,669	43,421	43,463	43,410	-248	-0.6	-206	-0.5	-259	-0.6
Wisconsin	21,738	21,075	21,051	21,080	-663	-3.0	-687	-3.2	-658	-3.0
West North Central:										
Minnesota	18,722	18,284	18,241	18,167	-438	-2.3	-481	-2.6	-555	-3.0
Iowa	13,900	13,773	13,666	13,687	-127	-0.9	-234	-1.7	-213	-1.5
Missouri	23,015	23,038	23,027	22,881	+23	+0.1	+12	+0.1	-134	-0.6
North Dakota	3,040	3,037	2,987	3,017	-3	-0.1	-53	-1.7	-23	-0.8
South Dakota	3,278	3,310	3,269	3,289	+32	+1.0	-9	-0.3	+11	+0.3
Nebraska	7,301	7,221	7,170	7,174	-80	-1.1	-131	-1.8	-127	-1.7
Kansas	11,066	10,955	10,862	10,884	-111	-1.0	-204	-1.8	-182	-1.6
South Atlantic:										
Delaware	2,697	2,704	2,720	2,715	+7	+0.3	+23	+0.9	+18	+0.7
Maryland	19,300	19,091	19,171	19,164	-209	-1.1	-129	-0.7	-136	-0.7
District of Columbia	3,722	3,832	3,825	3,832	+110	+3.0	+103	+2.8	+110	+3.0
Virginia	22,872	23,040	22,950	23,127	+168	+0.7	+78	+0.3	+255	+1.1
West Virginia	8,582	8,922	8,769	8,964	+340	+4.0	+187	+2.2	+382	+4.5
North Carolina	25,006	25,216	25,149	25,304	+210	+0.8	+143	+0.6	+298	+1.2
South Carolina	12,746	13,204	13,149	13,244	+458	+3.6	+403	+3.2	+498	+3.9
Georgia	22,583	23,153	23,131	23,229	+570	+2.5	+548	+2.4	+646	+2.9
Florida	33,407	34,193	34,500	34,322	+786	+2.4	+1,093	+3.3	+915	+2.7
East South Central:										
Kentucky	15,840	16,007	15,867	15,939	+167	+1.1	+27	+0.2	+99	+0.6
Tennessee	19,308	19,601	19,532	19,534	+293	+1.5	+224	+1.2	+226	+1.2
Alabama	16,947	17,016	16,846	16,974	+69	+0.4	-101	-0.6	+27	+0.2
Mississippi	10,908	11,017	10,843	11,004	+109	+1.0	-65	-0.6	+96	+0.9
West South Central:										
Arkansas	9,463	9,834	9,673	9,770	+371	+3.9	+210	+2.2	+307	+3.2
Louisiana	17,926	18,026	17,980	17,921	+100	+0.6	+54	+0.3	-5	(Z)
Oklahoma	12,593	12,583	12,453	12,491	-10	-0.1	-140	-1.1	-102	-0.8
Texas	55,092	56,270	56,457	55,852	+1,178	+2.1	+1,365	+2.5	+760	+1.4
Mountain:										
Montana	3,417	3,391	3,361	3,375	-26	-0.8	-56	-1.6	-42	-1.2
Idaho	3,508	3,555	3,537	3,540	+47	+1.3	+29	+0.8	+32	+0.9
Wyoming	1,636	1,623	1,598	1,616	-13	-0.8	-38	-2.3	-20	-1.2
Colorado	10,861	10,858	10,829	10,808	-3	(Z)	-32	-0.3	-53	-0.5
New Mexico	4,999	5,310	5,313	5,282	+311	+6.2	+314	+6.3	+283	+5.7
Arizona	8,721	8,921	8,950	8,875	+200	+2.3	+229	+2.6	+154	+1.8
Utah	5,212	5,078	5,072	5,055	-134	-2.6	-140	-2.7	-157	-3.0
Nevada	2,405	2,453	2,500	2,441	+48	+2.0	+95	+4.0	+36	+1.5
Pacific:										
Washington	16,774	16,674	16,704	16,603	-100	-0.6	-70	-0.4	-171	-1.0
Oregon	10,290	10,145	10,179	10,104	-145	-1.4	-111	-1.1	-186	-1.8
California	98,178	98,949	100,170	98,473	+771	+0.8	+1,992	+2.0	+295	+0.3
Alaska	1,487	1,565	1,535	1,556	+78	+5.2	+48	+3.2	+69	+4.6
Hawaii	3,788	3,922	3,908	3,884	+134	+3.5	+120	+3.2	+96	+2.5

Z Rounds to less than ± $500 or to less than ± 0.05 percent.

Table VIII-B. NUMBER OF STATES WITH SPECIFIED PERCENTAGE SHIFTS IN POPULATION AND IN APPORTIONED FUNDS ACCORDING TO THE 1970 CENSUS POPULATION CORRECTED FOR NET UNDERENUMERATION BY VARIOUS METHODS

(See text for explanation of the various methods)

Percent shift	SOR-3-1, WCF-1, BACF-1				SOR-3-2, WCF-2, BACF-2				Composite-2			
	Population	Funds			Population	Funds			Population	Funds		
		Total	Gain	Loss		Total	Gain	Loss		Total	Gain	Loss
Total	51	51	26	25	51	51	22	29	51	51	25	26
Under 1.0	7	22	10	12	13	19	8	11	7	20	9	11
1.0 to 1.9	13	14	5	9	9	15	1	14	13	19	7	12
2.0 to 2.9	8	8	5	3	12	10	7	3	10	5	4	1
3.0 to 3.9	9	5	4	1	4	6	5	1	8	4	2	2
4.0 and over	14	2	2	-	13	1	1	-	13	3	3	-
Average percent shift[1]	3.1	1.6	2.0	1.2	2.7	1.6	2.0	1.3	2.9	1.6	1.9	1.2

[1]Unweighted figures. The weighted percent shift in population is 2.6 percent for all series (where the base is the census population).

Appendix A

Percent Completeness of Birth Registration as Shown in the Birth Registration Tests of 1940, 1950, and 1964 to 1968 and as Estimated for 5-year Periods, 1935-40 to 1965-70, for Regions, Divisions, and States, by Race

Table A-1. Percent Completeness of Birth Registration for Births in Hospitals and Not in Hospitals, for the White Population, for Regions, Divisions, and States: 1940, 1950, and 1964 to 1968

Region, division, and State	Total			In hospital			Not in hospital		
	1940[1]	1950[1]	1964-1968[2]	1940[1]	1950[1]	1964-1968[2]	1940[1]	1950[1]	1964-1968[2]
United States, total	94.0	98.6	99.5	98.6	99.5	99.5	88.2	88.2	94.4
Regions:									
Northeast	98.3	99.6	99.1	99.4	99.8	99.1	95.1	99.5	100.0
North Central	96.2	99.2	99.7	98.7	99.6	99.8	92.9	90.5	96.6
South	87.7	96.8	99.4	97.0	99.1	99.4	83.4	87.2	94.9
West	96.4	98.9	99.6	98.9	99.5	99.7	89.1	81.7	86.7
Northeast:									
New England	98.6	99.7	99.2	99.5	99.9	99.2	95.8	93.9	100.0
Middle Atlantic	98.2	99.6	99.1	99.3	99.8	99.1	94.9	94.6	100.0
North Central:									
East North Central	96.8	99.2	99.7	98.8	99.6	99.7	93.8	89.6	95.9
West North Central	95.1	99.2	99.8	98.4	99.7	99.8	91.5	91.7	98.5
South:									
South Atlantic	89.0	97.2	99.5	96.8	99.0	99.4	84.4	87.5	95.7
East South Central	86.9	96.6	99.7	98.3	99.4	99.7	83.8	89.0	96.4
West South Central	87.1	96.6	99.2	96.6	98.9	99.3	81.7	84.7	94.3
West:									
Mountain	93.7	97.9	99.3	98.0	99.2	99.4	87.9	83.2	88.5
Pacific	98.0	99.2	99.7	99.2	99.6	99.8	91.4	78.5	85.4
New England:									
Maine	96.3	99.0	98.9	98.7	99.6	98.9	94.5	93.3	100.0
New Hampshire	98.6	99.7	99.1	99.4	99.8	99.1	96.3	96.9	100.0
Vermont	97.3	99.4	99.1	96.8	99.8	99.1	97.7	95.5	100.0
Massachusetts	98.9	99.8	99.2	99.6	99.9	99.2	95.5	92.7	100.0
Rhode Island	98.8	99.9	99.2	99.7	99.9	99.2	96.1	94.9	100.0
Connecticut	99.4	100.0	99.3	99.7	100.0	99.3	97.3	100.0	100.0
Middle Atlantic:									
New York	98.8	99.6	99.1	99.5	99.8	99.1	94.8	90.6	100.0
New Jersey	99.0	99.7	99.1	99.6	99.8	99.1	96.1	95.1	100.0
Pennsylvania	97.2	99.5	99.0	99.0	99.7	99.0	94.7	95.8	100.0
East North Central:									
Ohio	95.3	99.0	99.8	98.5	99.7	99.8	90.9	88.3	95.3
Indiana	96.6	99.0	99.5	98.0	99.4	99.5	95.5	93.9	100.0
Illinois	97.3	99.2	99.8	99.2	99.7	99.8	93.0	87.1	94.2
Michigan	97.9	99.2	99.6	98.9	99.5	99.6	96.3	87.7	94.8
Wisconsin	96.9	99.6	99.9	98.9	99.8	99.9	94.4	93.9	100.0
West North Central:									
Minnesota	99.3	99.9	100.0	99.9	100.0	100.0	98.2	97.4	100.0
Iowa	94.7	99.3	99.6	97.7	99.5	99.6	91.0	93.8	100.0
Missouri	90.7	98.1	99.5	97.2	99.4	99.5	85.8	90.8	98.0
North Dakota	94.6	99.4	100.0	98.9	100.0	100.0	88.9	90.5	94.1
South Dakota	96.6	99.2	99.6	98.3	99.5	99.6	94.7	91.5	97.7
Nebraska	97.0	99.6	100.0	98.2	99.9	100.0	95.8	93.0	100.0
Kansas	95.6	99.4	100.0	97.9	99.9	100.0	93.3	88.9	96.2
South Atlantic:									
Delaware	97.2	99.5	100.0	99.5	99.9	100.0	91.8	91.9	100.0
Maryland	97.8	99.3	100.0	99.3	99.8	100.0	95.1	93.8	100.0
District of Columbia	98.5	99.8	99.9	99.2	99.9	100.0	77.8	89.2	75.0
Virginia	92.5	97.8	100.0	98.9	99.6	100.0	89.0	90.1	98.8
West Virginia	86.7	94.5	100.0	95.9	98.6	100.0	84.9	87.5	95.1
North Carolina	88.4	97.6	99.1	96.4	98.7	99.1	85.0	91.1	98.8
South Carolina	82.7	93.5	97.4	93.9	97.1	97.5	78.9	76.6	82.9
Georgia	83.6	96.7	99.1	96.5	98.7	99.1	77.4	82.3	89.2
Florida	91.3	98.8	99.8	92.1	99.4	99.8	89.9	91.8	100.0
East South Central:									
Kentucky	89.2	94.7	98.9	97.6	98.6	99.0	87.7	88.2	95.7
Tennessee	81.4	97.2	100.0	97.8	99.6	100.0	75.6	89.1	96.6
Alabama	86.4	97.1	100.0	98.8	99.7	100.0	82.9	88.9	96.5
Mississippi	93.8	98.6	100.0	99.7	99.9	100.0	92.0	93.5	100.0
West South Central:									
Arkansas	79.6	92.3	97.8	95.0	97.8	98.2	76.6	75.5	81.9
Louisiana	87.7	97.0	99.1	97.8	98.7	99.1	79.8	79.4	87.5
Oklahoma	87.0	97.3	99.6	95.9	99.2	99.6	82.4	85.6	92.8
Texas	89.3	97.2	99.3	96.7	99.1	99.5	84.0	88.1	95.5
Mountain:									
Montana	98.0	99.5	99.9	98.8	99.8	100.0	94.9	86.8	94.1
Idaho	95.1	98.6	99.3	97.6	99.2	99.4	91.6	80.8	88.2
Wyoming	95.9	98.8	99.6	98.9	99.4	99.6	89.2	85.5	94.7
Colorado	89.8	96.7	99.2	98.0	99.1	99.4	79.6	69.9	75.7
New Mexico	91.2	96.9	99.1	94.7	98.9	99.1	89.7	91.3	98.9
Arizona	93.8	97.5	99.1	97.6	99.1	99.3	87.6	80.0	86.3
Utah	97.1	99.1	99.5	98.6	99.4	99.6	94.2	81.7	88.7
Nevada	97.5	98.8	99.1	98.3	98.9	99.1	95.7	83.3	91.3
Pacific:									
Washington	98.0	99.4	99.8	99.1	99.7	99.9	91.6	78.7	85.2
Oregon	97.3	99.1	99.4	98.7	99.3	99.5	91.6	83.6	90.6
California	98.1	99.2	99.7	99.2	99.6	99.8	91.3	77.7	84.3
Alaska	(NA)	98.4	99.1	(NA)	98.9	99.2	(NA)	76.9	82.8
Hawaii	97.9	99.8	100.0	(NA)	99.9	100.0	(NA)	98.5	100.0

NA Not available.

[1]U.S. Public Health Service, National Office of Vital Statistics, Vital Statistics of the United States, 1950, Vol. I, 1954, Chapter 6, Table 6.43.

[2]Based on U.S. Bureau of the Census, Census of Population and Housing: 1970, Evaluation and Research Program, PHC(E)-2, Test of Birth Registration Completeness: 1964 to 1968, 1973. Figures for States were estimated in part from those given for regions in the source, which may differ slightly from the estimates shown here because of different weighting procedures. The regional figures are based on a sample and hence are subject to sampling error; figures for States, especially those for "not in hospitals," are subject to large sampling and estimating errors.

Table A-2. Percent Completeness of Birth Registration for Births in Hospitals and Not in Hospitals, for the Black-and-Other-Races Population, for Regions, Divisions, and States: 1940, 1950, and 1964 to 1968

Region, division, and State	Total			In hospital			Not in hospital		
	1940[1]	1950[1]	1964-1968[2]	1940[1]	1950[1]	1964-1968[2]	1940[1]	1950[1]	1964-1968[2]
United States, total	82.0	93.5	98.1	96.3	98.2	98.6	77.2	88.2	93.4
Regions:									
Northeast	95.4	98.5	98.2	97.9	99.0	98.2	88.6	92.1	96.6
North Central	90.8	96.7	98.7	95.6	98.8	98.8	85.4	87.6	93.3
South	79.3	92.1	97.7	95.7	97.7	98.3	77.0	88.8	94.3
West	75.0	92.7	99.3	96.4	98.1	100.0	56.2	54.0	60.5
Northeast:									
New England	96.9	99.3	98.8	99.1	99.7	98.8	90.8	83.3	100.0
Middle Atlantic	95.4	98.5	98.1	97.8	98.9	98.1	88.4	92.3	96.5
North Central:									
East North Central	92.8	97.1	98.6	96.4	98.6	98.7	88.7	89.8	95.2
West North Central	86.1	95.7	98.8	93.7	99.1	99.1	77.0	80.1	85.7
South:									
South Atlantic	81.4	92.1	97.6	95.8	97.4	98.1	78.7	89.1	94.2
East South Central	83.1	95.5	99.7	97.4	98.9	99.7	81.0	94.1	100.0
West South Central	73.3	88.3	96.1	94.3	97.3	97.8	68.1	79.1	82.9
West:									
Mountain	56.2	78.2	96.6	95.0	93.9	100.0	37.1	43.8	43.1
Pacific	94.9	98.3	99.9	97.1	99.2	100.0	91.7	79.7	90.3
New England:									
Maine	63.2	100.0	99.2	100.0	100.0	99.2	36.4	100.0	100.0
New Hampshire	100.0	100.0	98.8	100.0	100.0	98.8	100.0	-	-
Vermont	100.0	100.0	100.0	-	100.0	100.0	-	-	-
Massachusetts	98.0	98.7	98.4	98.6	99.3	98.4	96.2	76.9	100.0
Rhode Island	100.0	100.0	99.2	100.0	100.0	99.2	100.0	100.0	-
Connecticut	97.9	100.0	99.2	99.3	100.0	99.2	94.7	100.0	100.0
Middle Atlantic:									
New York	96.3	98.5	98.0	97.5	98.8	98.0	88.8	92.0	96.4
New Jersey	98.7	98.7	98.5	99.5	99.3	98.5	96.2	91.9	96.5
Pennsylvania	92.9	98.4	98.2	97.1	99.0	98.2	85.9	92.8	97.2
East North Central:									
Ohio	93.7	98.0	99.3	97.0	99.2	99.3	90.5	88.2	93.6
Indiana	94.0	98.5	99.0	96.3	98.9	99.0	92.6	97.4	100.0
Illinois	90.6	96.6	98.5	96.1	98.5	98.6	82.2	90.5	96.0
Michigan	94.0	96.1	98.0	96.2	98.0	98.1	92.3	82.8	87.4
Wisconsin	93.2	98.7	99.6	96.3	99.6	99.7	85.2	88.9	94.3
West North Central:									
Minnesota	97.2	96.8	99.9	100.0	100.0	100.0	91.9	82.9	90.9
Iowa	90.1	98.1	99.3	88.9	99.3	99.4	92.6	75.0	80.0
Missouri	82.7	96.5	98.8	91.4	98.9	99.0	72.2	86.6	91.6
North Dakota	95.2	95.7	99.0	100.0	99.0	99.1	82.4	71.4	66.7
South Dakota	79.8	82.7	95.3	93.4	97.1	97.2	61.4	51.6	54.5
Nebraska	93.1	96.7	99.9	96.8	100.0	100.0	85.7	66.7	75.0
Kansas	92.9	96.7	99.5	100.0	99.5	99.6	89.5	83.3	87.0
South Atlantic:									
Delaware	98.6	98.0	100.0	100.0	99.4	100.0	97.7	95.3	100.0
Maryland	94.1	98.2	100.0	97.2	99.4	100.0	92.0	95.6	100.0
District of Columbia	96.6	97.4	98.7	98.6	98.1	98.8	92.1	81.6	86.4
Virginia	90.2	95.0	99.6	97.1	99.0	99.7	89.3	92.8	98.6
West Virginia	81.3	90.9	98.7	87.5	98.1	98.8	81.0	88.3	94.1
North Carolina	81.0	93.4	97.6	94.1	97.0	97.7	79.4	91.6	97.3
South Carolina	71.8	85.1	93.7	85.3	95.0	95.7	70.3	82.9	88.0
Georgia	77.6	91.0	96.0	95.2	95.7	96.4	74.5	88.9	94.4
Florida	86.4	94.1	98.7	97.5	98.1	98.9	84.1	91.7	97.4
East South Central:									
Kentucky	87.6	95.0	99.2	98.4	98.5	99.2	85.3	91.5	100.0
Tennessee	75.1	94.4	99.7	97.5	99.0	99.7	66.9	90.4	100.0
Alabama	82.4	94.0	99.9	97.4	99.1	99.8	80.3	92.1	100.0
Mississippi	86.2	97.2	99.7	96.7	98.9	99.6	85.3	96.9	100.0
West South Central:									
Arkansas	63.2	77.9	87.6	94.9	91.7	92.3	62.1	74.8	79.4
Louisiana	83.7	93.3	98.3	96.0	98.0	98.7	78.9	85.8	91.1
Oklahoma	66.9	86.3	98.4	95.2	98.4	99.1	59.4	71.9	76.3
Texas	68.7	88.9	96.6	90.8	97.3	98.0	63.5	78.8	83.7
Mountain:									
Montana	91.1	98.9	100.0	97.7	99.3	100.0	74.1	96.0	100.0
Idaho	79.3	98.0	100.0	86.7	100.0	100.0	66.7	75.0	100.0
Wyoming	85.4	100.0	100.0	96.2	100.0	100.0	61.5	100.0	-
Colorado	90.4	97.7	100.0	95.7	98.5	100.0	83.7	90.5	100.0
New Mexico	40.3	68.7	97.7	83.3	81.5	100.0	30.9	52.5	60.2
Arizona	48.4	69.6	93.1	98.8	94.9	100.0	32.9	29.1	33.5
Utah	59.6	83.3	99.5	91.7	98.5	100.0	26.1	50.0	57.1
Nevada	80.9	88.6	100.0	96.6	86.4	100.0	55.6	100.0	100.0
Pacific:									
Washington	88.7	97.0	99.6	89.6	100.0	100.0	84.1	46.4	53.3
Oregon	84.1	99.4	100.0	95.8	99.4	100.0	55.6	100.0	100.0
California	96.5	98.4	100.0	98.5	99.1	100.0	94.0	83.3	95.1
Alaska	(NA)	84.0	98.9	(NA)	96.4	100.0	(NA)	76.5	89.2
Hawaii	97.6	100.0	100.0	(NA)	100.0	100.0	(NA)	96.7	100.0

- The base is too small to compute a meaningful percent.

NA Not available.

[1]U.S. Public Health Service, National Office of Vital Statistics, Vital Statistics of the United States, 1950, Vol. I, 1954, Chapter 6, Table 6.43.

[2]Based on U.S. Bureau of the Census, Census of Population and Housing: 1970, Evaluation and Research Program, PHC(E)-2, Test of Birth Registration Completeness: 1964 to 1968, 1973. Figures for States were estimated in part from those given for regions in the source, which may differ slightly from the estimates shown here because of different weighting procedures. The regional figures are based on a sample and hence are subject to sampling error; figures for States, especially those for "not in hospitals," are subject to large sampling and estimating errors.

Table A-3. Estimates of the Percent Completeness of Birth Registration for the White Population, for Regions, Divisions, and States: Five-Year Periods, 1935-40 to 1965-70

(Figures relate to 5-year periods from April 1 of initial year to March 31 of terminal year)

Region, division, and State	1935-1940	1940-1945	1945-1950	1950-1955	1955-1960	1960-1965	1965-1970
United States, total	93.2	95.5	97.8	99.0	99.3	99.4	99.5
Regions:							
Northeast	98.1	98.8	99.4	99.6	99.5	99.3	99.1
North Central	95.7	97.2	98.7	99.5	99.6	99.7	99.7
South	86.5	90.6	95.3	97.9	98.9	99.3	99.4
West	95.4	97.3	98.5	99.1	99.3	99.5	99.6
Northeast:							
New England	98.2	99.0	99.5	99.7	99.6	99.4	99.1
Middle Atlantic	98.1	98.7	99.4	99.6	99.4	99.2	99.0
North Central:							
East North Central	96.4	97.6	98.8	99.4	99.6	99.7	99.7
West North Central	94.5	96.4	98.5	99.5	99.7	99.8	99.8
South:							
South Atlantic	87.8	91.7	95.8	98.2	99.0	99.3	99.5
East South Central	85.8	89.5	94.8	97.9	99.1	99.5	99.7
West South Central	85.6	90.2	94.9	97.5	98.6	99.0	99.2
West:							
Mountain	92.4	94.9	97.1	98.4	99.0	99.2	99.3
Pacific	97.4	98.5	99.1	99.3	99.5	99.6	99.7
New England:							
Maine	96.0	97.5	98.7	99.2	99.2	99.1	98.9
New Hampshire	97.7	99.1	99.6	99.7	99.5	99.3	99.1
Vermont	97.3	97.5	98.8	99.6	99.5	99.3	99.1
Massachusetts	98.6	99.3	99.6	99.8	99.6	99.4	99.2
Rhode Island	98.5	99.2	99.7	99.8	99.6	99.4	99.2
Connecticut	99.3	99.6	99.9	99.9	99.7	99.5	99.3
Middle Atlantic:							
New York	99.0	99.1	99.5	99.6	99.5	99.3	99.1
New Jersey	98.7	99.3	99.6	99.7	99.5	99.3	99.1
Pennsylvania	96.8	98.0	99.1	99.5	99.4	99.2	99.0
East North Central:							
Ohio	94.6	96.6	98.5	99.4	99.7	99.7	99.8
Indiana	96.5	97.4	98.5	99.3	99.4	99.5	99.5
Illinois	97.0	98.1	99.0	99.5	99.6	99.7	99.8
Michigan	97.6	98.2	98.9	99.4	99.5	99.6	99.6
Wisconsin	96.6	98.0	99.3	99.8	99.8	99.9	99.9
West North Central:							
Minnesota	99.2	99.6	99.9	100.0	100.0	100.0	100.0
Iowa	93.9	96.3	98.7	99.4	99.5	99.6	99.6
Missouri	89.8	93.0	96.9	98.7	99.3	99.4	99.5
North Dakota	93.0	96.4	98.9	99.8	100.0	99.9	99.9
South Dakota	96.2	97.3	98.7	99.4	99.5	99.6	99.6
Nebraska	96.8	97.6	99.0	99.8	99.9	100.0	100.0
Kansas	95.2	96.7	98.7	99.7	99.9	100.0	100.0
South Atlantic:							
Delaware	96.6	98.4	99.4	99.8	99.9	100.0	100.0
Maryland	97.3	98.2	99.0	99.6	99.9	100.0	100.0
District of Columbia	97.8	98.6	99.5	99.8	99.7	99.8	99.9
Virginia	91.4	94.4	97.2	98.8	99.6	99.9	100.0
West Virginia	86.2	88.9	93.2	96.7	98.7	99.5	100.0
North Carolina	87.2	91.4	96.2	98.3	98.8	99.0	99.1
South Carolina	81.7	86.3	91.7	95.4	96.8	97.2	97.4
Georgia	81.5	88.0	94.7	97.9	98.6	98.9	99.1
Florida	90.8	92.9	96.8	99.2	99.5	99.7	99.8
East South Central:							
Kentucky	88.8	90.6	93.6	96.5	98.2	98.7	99.0
Tennessee	79.3	85.5	94.4	98.5	99.5	99.8	100.0
Alabama	85.4	89.9	95.4	98.4	99.5	99.8	100.0
Mississippi	93.2	95.5	97.9	99.3	99.9	100.0	100.0
West South Central:							
Arkansas	78.6	82.6	89.4	94.4	96.9	97.8	98.0
Louisiana	85.4	90.8	95.6	98.0	98.7	98.9	99.0
Oklahoma	85.6	90.5	95.7	98.3	99.2	99.4	99.6
Texas	87.8	92.0	95.7	97.7	98.7	99.1	99.4
Mountain:							
Montana	97.4	98.4	99.3	99.7	99.8	99.9	100.0
Idaho	94.4	96.3	98.3	99.0	99.1	99.2	99.3
Wyoming	92.1	96.9	98.4	99.2	99.4	99.5	99.6
Colorado	87.7	91.9	95.7	97.6	98.7	99.0	99.2
New Mexico	90.6	92.3	95.1	97.6	98.6	99.0	99.1
Arizona	91.6	94.8	96.8	98.0	98.6	98.9	99.2
Utah	96.5	97.6	98.8	99.2	99.4	99.5	99.6
Nevada	97.5	98.0	98.5	98.8	98.9	99.0	99.1
Pacific:							
Washington	97.2	98.7	99.2	99.6	99.7	99.8	99.9
Oregon	96.6	98.3	99.0	99.1	99.3	99.4	99.4
California	97.5	98.5	99.0	99.3	99.5	99.6	99.7
Alaska	(a)	(a)	98.0	98.6	98.9	98.9	99.1
Hawaii	97.4	98.3	99.3	99.9	99.9	100.0	100.0

a Comparable estimates not available.
Source: Based on the figures presented in table A-1 and annual birth statistics.

Table A-4. Estimates of the Percent Completeness of Birth Registration for the Black-and-Other-Races Population, for Regions, Divisions, and States: Five-Year Periods, 1935-40 to 1965-70

(Figures relate to 5-year periods from April 1 of initial year to March 31 of terminal year)

Region, division, and State	1935-1940	1940-1945	1945-1950	1950-1955	1955-1960	1960-1965	1965-1970
United States, total	80.9	84.5	91.1	95.1	96.9	97.7	98.3
Regions:							
Northeast	95.1	96.4	98.1	98.8	98.7	98.4	98.1
North Central	90.0	92.3	95.7	97.9	98.5	98.6	98.7
South	78.6	82.1	89.1	93.8	96.0	97.1	97.9
West	83.3	88.5	92.5	94.5	96.7	98.2	99.4
Northeast:							
New England	95.6	97.7	98.9	99.5	99.4	99.1	98.8
Middle Atlantic	95.1	96.3	98.0	98.8	98.6	98.3	98.1
North Central:							
East North Central	92.3	94.2	96.4	98.1	98.5	98.6	98.7
West North Central	84.7	87.4	93.0	97.0	98.3	98.6	98.9
South:							
South Atlantic	80.0	83.3	89.6	93.8	95.9	97.0	97.7
East South Central	82.1	85.4	92.3	96.7	98.4	99.2	99.8
West South Central	71.4	75.9	84.6	90.8	94.0	95.4	96.6
West:							
Mountain	54.0	63.9	72.6	79.3	86.9	92.8	97.1
Pacific	96.0	97.3	97.8	98.7	99.3	99.6	99.9
New England:							
Maine	44.1	72.5	96.5	100.0	99.9	99.4	99.2
New Hampshire	100.0	100.0	100.0	100.0	100.0	99.1	98.8
Vermont	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Massachusetts	97.8	97.6	98.1	98.9	98.9	98.6	98.3
Rhode Island	100.0	100.0	100.0	100.0	99.8	99.4	99.2
Connecticut	98.2	99.1	99.8	100.0	99.8	99.4	99.1
Middle Atlantic:							
New York	95.7	96.9	98.2	98.7	98.5	98.2	97.9
New Jersey	98.5	98.5	98.6	99.0	98.9	98.7	98.4
Pennsylvania	92.7	94.6	97.5	98.8	98.7	98.4	98.1
East North Central:							
Ohio	93.6	94.9	97.3	99.0	99.3	99.3	99.3
Indiana	93.6	95.1	97.6	98.9	99.1	99.0	99.0
Illinois	89.7	93.0	95.9	97.6	98.2	98.4	98.5
Michigan	94.3	94.6	95.7	97.4	97.9	97.9	98.0
Wisconsin	92.1	94.2	97.6	99.4	99.6	99.6	99.7
West North Central:							
Minnesota	97.3	96.4	95.4	99.0	99.8	99.9	100.0
Iowa	90.5	91.0	95.8	98.7	98.9	99.2	99.3
Missouri	82.0	85.5	92.9	97.2	98.2	98.6	98.8
North Dakota	93.1	94.5	95.0	96.3	98.1	98.0	97.8
South Dakota	74.7	78.2	82.1	88.7	91.8	93.5	95.6
Nebraska	82.5	93.2	95.0	98.5	99.6	99.6	99.9
Kansas	92.7	93.4	95.3	97.8	99.3	99.4	99.5
South Atlantic:							
Delaware	98.4	98.6	98.7	98.9	99.6	99.9	100.0
Maryland	93.7	94.9	96.8	99.0	99.6	99.8	100.0
District of Columbia	97.0	96.9	97.5	97.9	98.2	98.4	98.8
Virginia	89.9	91.4	94.0	96.5	98.2	99.1	99.7
West Virginia	81.4	83.9	89.0	94.6	97.6	98.3	98.7
North Carolina	80.2	83.8	90.5	94.7	96.4	97.2	97.7
South Carolina	70.7	74.1	81.4	87.3	90.4	92.4	94.2
Georgia	76.3	80.1	87.6	92.4	94.4	95.4	96.2
Florida	85.2	87.8	92.4	95.6	97.5	98.3	98.8
East South Central:							
Kentucky	87.5	89.7	93.5	96.8	98.4	99.0	99.3
Tennessee	72.4	78.5	89.7	96.5	98.5	99.3	99.8
Alabama	81.3	84.5	91.1	95.6	97.7	99.0	99.9
Mississippi	85.5	88.3	94.3	97.9	98.8	99.4	99.8
West South Central:							
Arkansas	62.3	66.2	74.2	80.3	84.4	86.9	88.9
Louisiana	82.2	85.5	90.8	95.2	97.1	97.8	98.5
Oklahoma	65.7	71.8	82.2	90.1	95.2	97.2	98.7
Texas	66.9	72.7	84.0	91.5	94.6	95.8	97.0
Mountain:							
Montana	88.2	93.0	97.6	99.4	99.7	99.8	100.0
Idaho	75.5	84.3	91.8	98.8	99.9	100.0	100.0
Wyoming	71.7	91.4	97.0	100.0	100.0	100.0	100.0
Colorado	89.2	93.7	97.0	98.7	99.3	99.7	100.0
New Mexico	40.6	52.3	65.7	75.7	85.1	93.2	98.2
Arizona	45.6	52.3	61.6	69.8	79.8	87.8	94.0
Utah	46.9	72.3	91.4	91.3	92.5	95.9	98.6
Nevada	73.2	84.0	90.2	89.9	93.0	97.0	99.9
Pacific:							
Washington	86.6	89.5	95.4	98.1	98.9	99.2	99.6
Oregon	76.0	91.2	97.7	99.7	99.8	99.9	100.0
California	96.4	97.4	98.1	99.0	99.5	99.7	100.0
Alaska	(a)	(a)	84.1	87.3	92.5	96.1	99.0
Hawaii	96.9	98.1	99.4	99.9	100.0	100.0	100.0

a Comparable estimates not available.

Source: Based on the figures presented in table A-2 and annual birth statistics.

Appendix B. Comparison of State-of-Birth Life Tables and State-of-Residence Life Tables

The methodology employed here for estimating the completeness of census coverage for States in 1970 requires the use of State-of-birth life tables (i.e., tables based on the population born in each State) to estimate the number of survivors in 1970 of the population born in each State. The only life tables routinely available, however, are State-of-residence life tables, i.e., tables based on the population resident in each State. If State-of-residence life tables are used to estimate the survivorship of the population born in each State, then, to the extent that the two sets of life tables are different, biases will be introduced in the estimates of census coverage for States. The purpose of this appendix is to suggest possible differences between survival rates based on State-of-birth life tables and survival rates based on State-of-residence life tables and to indicate the potential effect of these differences on estimates of census coverage for States.

As noted, State-of-residence life tables are based on the mortality experience of the population resident in each State and State-of-birth life tables, if they were available, would be based on the mortality experience of the population born in each State. If the population of a given State were unaffected by migration, the State-of-birth population and the State-of-residence population of each State would be the same, then the two life tables would be identical and no bias would be introduced by the use of State-of-residence life tables. There would also be no bias in the use of State-of-residence life tables if there were no differences in the mortality levels of the resident populations of the various States. It is well known, however, that the levels of mortality of the resident populations differ from State to State and that interstate migration distributes the population born in each State among other States at different rates, bestowing on the resident population of each State its own particular composition with respect to State of birth. Interstate migration and interstate variation in the level of mortality are the necessary and sufficient conditions for differences between State-of-birth life tables and State-of-residence life tables. There would be a strong resemblance between the two types of life tables when relatively little migration has occurred between States or when migration has occurred between States with generally similar levels of mortality. When neither of these two situations prevails, differences between the two life tables would be of a more substantial magnitude.

To investigate possible differences between survival rates based on State-of-birth life tables and State-of-residence life tables, cumulative "synthetic" State-of-birth survival rates could be developed for each of the States and compared with the corresponding cumulative State-of-residence survival rates. (Cumulative survival rates measure the probability of surviving from birth to specific ages or age groups.) Estimated State-of-birth survival rates for a given State can be derived by weighting State-of-residence survival rates over all States in accordance with the distribution by State of residence of the population born in the given State. In order to derive rates for each 5-year age group under age 35 in 1970, State-of-residence survival rates for quinquennial periods from 1935–40 to 1965–70 and State-of-birth census data for 1940, 1950, 1960, and 1970 can be employed. The State-of-residence survival rates would be based on the official decennial life tables for States, and the population proportions would be derived from census cross-tabulations on the State of birth and the State of residence of the population. Synthetic State-of-birth survival rates could be computed in this manner for each State for each age-sex-race group for each quinquennial period. Cumulative synthetic State-of-birth survival rates for age cohorts could then be calculated from the product of the 5-year survival rates.

The synthetic State-of-birth 5-year survival rate for State i in period t may be represented by the expression

$$ {}_bS_i^t = \sum_{j=1}^{51} \omega_{ij}^t \cdot {}_rS_j^t $$

where ${}_rS_j$ is the State-of-residence survival rate for State j and ω_{ij} is the proportion of the population born in State i that is living in State j. The synthetic procedure is based on the assumption that the mortality level for the population born in a given State is governed jointly by the distribution of that population according to State of residence and by the conditions of mortality in each State of residence. The bias introduced by the use of this procedure of estimating State-of-birth survival rates can be written in the form

$$ \text{Bias} = \sum_{j=1}^{51} \omega_{ij} \cdot {}_rS_j - {}_iS_i $$

where the first term is the synthetic State-of-birth survival rate and the second term, ${}_{t}S_{i}$, is the true State-of-birth survival rate for a particular population group. If there were no differences in mortality between a given State of birth and the State of residence to which at least part of the State-of-birth population had migrated, then every value of ${}_{r}S_{j}$ would equal ${}_{t}S_{i}$, the bias would be eliminated, and ${}_{b}S_{i}$ would become an unbiased estimate of ${}_{t}S_{i}$. The same result would be achieved if the weighted variation of the ${}_{r}S_{j}$ values about ${}_{t}S_{i}$ were perfectly symmetrical; the sum of the component biases in which ${}_{t}S_{i}$ exceeded ${}_{r}S_{j}$ would be equal to, but opposite in sign from, the sum of the component biases in which ${}_{r}S_{j}$ exceeded ${}_{t}S_{i}$. Uncertainty surrounding the direction and magnitude of the bias term is the price of using synthetic estimates, even though an intuitive assessment of the extent of the bias can serve to reduce the uncertainty to tolerable levels.

Since the calculation of synthetic State-of-birth survival rates for all of the States would require a considerable investment of time and effort, with the possibility that the results would exhibit only minuscule differences from State-of-residence survival rates, a more limited investigation was conducted to identify the maximum range of the discrepancy that one could expect to observe between two sets of tables. This investigation consisted in the preparation of cumulative synthetic State-of-birth survival rates for the State of New Mexico on the extreme assumption that native migrants from New Mexico were all bound for Hawaii. New Mexico was chosen because it has experienced both high mortality and substantial outmigration of its native population, and Hawaii was selected because it has relatively low mortality and substantial inmigration.

Given this hypothetical situation, we can estimate the extreme degree of error in cumulative State-of-residence survival rates by comparing the cumulative survival rates based on State-of-residence life tables for New Mexico and synthetic State-of-birth life tables for New Mexico. The following table presents the comparison of survival rates cumulated to 1970 for the population resident in New Mexico and the population born in New Mexico on the assumption that all outmigrants from New Mexico went to Hawaii and that the actual rate of outmigration of the population born in New Mexico prevailed for each age cohort (with a maximum of 55 percent for the cohort aged 30–34 in 1970):

Comparison of Cumulative Survival Rates

Age in 1970	State-of-residence survival rate	Synthetic State-of-birth survival rate	Percent error
0 to 4 years	.972620	.973245	−0.06
5 to 9 years	.962991	.964067	−0.11
10 to 14 years	.952105	.953912	−0.19
15 to 19 years	.932684	.935510	−0.30
20 to 24 years	.899869	.905673	−0.64
25 to 29 years	.862248	.870773	−0.99
30 to 34 years	.828380	.837832	−1.14

The differences between the two series are relatively small, particularly at the younger ages. Consider the cohort aged 20–24 in 1970, for example. If the two survival rates were used to compute net census coverage rates, then the *coverage* rates would differ by only 0.64 percent. (The net census *error* rates would be in error roughly by the *amount* of the relative difference between the two survival rates.) A more detailed analysis carried out by race leads to the same conclusion regarding the relative insensitivity of census coverage rates to differences in State-of-birth and State-of-residence survival rates. Neither State-of-residence life tables nor synthetic State-of-birth life tables are perfect substitutes for actual State-of-birth life tables, but it appears that the use of State-of-residence life tables to "survive" State-of-birth populations has not seriously distorted the estimated coverage rates or error rates for States.

Appendix C. Specification of the Allocation Parameter For State-of-Birth Nonresponses

Preparation of estimates of coverage for the native population under 35 years of age in 1970 required the allocation to particular States of persons whose State of birth was not reported. Residents of a State not reporting a State of birth were allocated on the basis of a three-step procedure which is explained in the text. The purpose of this appendix is to present evidence bearing on the use of allocation schemes other than simple proration (that is, distributing the "unknowns" by State of birth in proportion to the "knowns").

A single parameter (A) was used to allocate "unknown" State of birth for each age-sex group under age 35 in 1970. It may be recalled that the State-of-birth nonresponse rate (U_j) for each State of residence was disaggregated in our previous analysis into the component rates for migrants (${}_mu_j$) and nonmigrants (${}_nu_j$). The allocation scheme is summarized by the identity

$$U_j = w_{jj} \cdot {}_nu_j + (1-w_{jj})({}_mu_j) \qquad \text{(C–1)}$$

The coefficient w_{jj} is the proportion of the total resident population living in State j who were born in the State; the coefficient ($1-w_{jj}$) is the proportion of those living in State j who were born in another State (one of the other 50 States, the District of Columbia, a U.S. possession, or a foreign country). The allocation identity can be reduced to one equation in one unknown (${}_nu_j$) by substituting $A \cdot {}_nu_j$ for ${}_mu_j$ in equation (C–1), and then defining the relationship

$${}_nu_j = \frac{U_j}{w_{jj} + A(1-w_{jj})} \qquad \text{(C–2)}$$

where A is the allocation parameter.

An actual numerical value must be assigned to the parameter A. The most common approach is to assign A a value of 1; this amounts to simple proration. In the absence of information to the contrary, proration is a logically and mathematically defensible procedure. It is also easy to apply and interpret. The method of proration implicitly assumes, however, that the pertinent characteristics of the population which did not respond to a question are the same as those of the population which did respond. Evidence presented in the following discussion, while not conclusive, raises a question regarding the appropriateness of simple proration to allocate unknown State-of-birth as an unvarying practice.

The correlation between the rate of nonresponse to the State-of-birth question and the proportion of lifetime migrants (persons born outside of State of residence) in States, +0.53, is one indication of the probable difference in the nonresponse rate of migrants and nonmigrants (table C–1). States with high nonresponse rates tend to be States in which lifetime inmigrants comprise a larger percentage of the resident population; likewise, low nonresponse rates are found in States with relatively small inmigrant populations. Although the evidence is indirect, the moderately large correlation coefficient suggests that the nonresponse rate for migrants may be higher than the nonresponse rate for nonmigrants and that variations in the rates among States may be attributable in part to differences in the proportions of migrants and nonmigrants in the resident population.

These findings led to an experiment to determine analytically an "optimal" value of A for allocating State-of-birth nonresponses. The experiment involved the use of (1) information on State-of-birth nonresponse rates and the migrant-nonmigrant distribution of the population in each State, (2) assumptions concerning the source of variation among States in nonresponse rates for migrants and nonmigrants, and (3) statistical methods to determine the value of A which minimizes the total variation in the nonresponse rates of migrants and nonmigrants among States.

The first assumption employed in the experiment attributes variation in State-of-birth nonresponse rates among the States to two sources: (1) a "controlled" source, representing the differences in the migrant-nonmigrant distributions of State populations, and (2) a source representing "uncontrolled" factors. The controlled variation can be eliminated by using an allocation scheme (such as equation C–1) which identifies separate migrant and nonmigrant nonresponse components and employs the actual migrant-nonmigrant distribution of the population along with an assumed parameter A. Variations in the nonresponse rates for migrants and for nonmigrants that remain after this disaggregation procedure can be assumed to reflect actual differences among States.

The disaggregation of the total State nonresponse rate into migrant and nonmigrant components permits

the specification of a value for the parameter A which minimizes the State variation in both ${}_nu_j$ and ${}_mu_j$ due to uncontrolled factors. The procedure is based on the coefficient of variation, a measure representing the ratio of the standard deviation of a statistical distribution to its mean and designed to compare distributions with respect to relative variation. In this particular application, the coefficient of variation is used to find the value of A which minimizes the variation among the States in both the migrant and nonmigrant nonresponse rates, given the total variation in the overall nonresponse rate U_j and the migrant-nonmigrant distribution of the population in each State. To solve for ${}_nu_j$ in equation C–2, values for U_j and w_{ij} are derived from census data and values of the parameter A were assumed. Different values of A produce different distributions for both ${}_nu_j$ and ${}_mu_j$. Since ${}_mu_j$ is simply a linear transformation of ${}_nu_j$, the value of A which minimizes the coefficient of variation for ${}_nu_j$ will also be the value which minimizes the coefficient of variation for ${}_mu_j$. Therefore, it is necessary to apply the optimization technique only to ${}_nu_j$. The value of A which minimizes the variation among the States in both ${}_nu_j$ and ${}_mu_j$ may be considered a logical choice to implement the allocation scheme for State-of-birth nonresponses.

The optimization procedure for the parameter A involves the solution of the following function for various values of σ and $\overline{X}$, corresponding to various values of A, and the selection of the value of A corresponding to the minimum value of the function

$$CV = \frac{\sigma}{\overline{X}} \qquad \text{(C–3)}$$

where CV is the coefficient of variation, $\overline{X}$ is the expected value of ${}_nu_j$, and σ is the corresponding standard deviation. In applying the procedure, consecutive values of A are inserted in equation C–2 to generate a series of distributions for ${}_nu_j$. The mean, standard deviation, and coefficient of variation are then computed for each distribution. The value of A which produces the smallest coefficient of variation is the value of A desired.

The minimization technique can be applied separately to each age-sex-race group. The following table illustrates the results of applying the procedure to census data for white males aged 30–34 in 1970 for 50 States and the District of Columbia:

Measures for Nonmigrant Nonresponse Rates for White Males Aged 30–34

Parameter A	Mean (X)	Standard deviation (σ)	Coefficient of Variation (CV)[a]
1	4.1	1.8	43.3
2	2.9	0.9	31.9
3	2.3	0.7	29.6
3.2	2.2	0.6	29.5
3.4	2.1	0.6	29.5
3.6	2.0	0.6	29.6
3.8	1.9	0.6	29.7
4	1.9	0.6	29.8
5	1.6	0.5	30.6

[a] Per hundred. Computed on the basis of equation C–3.

It may be noted that simple proration produces a coefficient of variation equal to 43.3 and that the value of A for which the coefficient of variation is a minimum falls between 3 and 4 for this age-sex-race group. This finding suggests that, for this particular population group, the migrant State-of-birth nonresponse rate may be 3 to 4 times greater than the corresponding nonmigrant rate. The initial evidence from our experiment to determine an optimal allocation scheme for State-of-birth nonresponse appears to question the conventional wisdom of allocating nonresponses by simple proration.

These initial findings do not, however, warrant general rejection of simple proration as an appropriate scheme and adoption of an alternative scheme corresponding to the results of the experiment. Extension of the experiment produced different values of A for different age, sex, and race groups, and in some cases the optimum value of A approximated 1. In the present study, therefore, both proration and an extreme alternative allocation scheme ($A=5$) were adopted. Simple proration was viewed preferentially as an allocation scheme, however, because of the advantages noted earlier in this appendix.

Table C-1. Comparison of Percent of Resident Population of States Not Reporting State of Birth in the 1970 Census and Percent of Resident Population Born Outside of State of Residence: 1970

State	Percent of resident population		State	Percent of resident population	
	State of birth not reported	Born outside State of residence[1]		State of birth not reported	Born outside State of residence[1]
United States	4.4	32.2	Massachusetts	4.2	26.0
			Arkansas	4.2	24.1
			North Carolina	4.2	17.7
District of Columbia	11.5	51.1	Pennsylvania	4.2	16.6
Nevada	9.2	74.9	Colorado	4.1	52.8
Alaska	5.7	67.1	Virginia	4.0	34.7
Delaware	5.7	45.0	Michigan	4.0	28.3
Connecticut	5.6	39.7	Ohio	4.0	27.5
Hawaii	5.5	37.4	Kentucky	4.0	16.1
Arizona	5.4	63.3	Oklahoma	3.9	34.8
Rhode Island	5.4	32.4	Utah	3.9	28.1
Florida	5.3	63.3	Alabama	3.8	16.5
Oregon	5.1	52.0	Mississippi	3.8	15.8
Maryland	5.1	42.8	Kansas	3.6	34.2
Missouri	5.0	26.9	Wyoming	3.5	54.6
Louisiana	4.9	18.6	Indiana	3.5	27.7
California	4.8	54.6	Wisconsin	3.5	19.9
New Jersey	4.8	40.4	Idaho	3.4	46.0
New Nexico	4.7	45.0	Vermont	3.3	31.1
Illinois	4.7	29.0	Nebraska	3.3	26.6
New York	4.7	28.6	Minnesota	3.2	23.1
Georgia	4.7	23.0	Montana	3.1	39.9
Tennessee	4.7	22.5	West Virginia	3.1	16.8
New Hampshire	4.5	42.1	South Dakota	3.0	27.2
Texas	4.5	25.8	Maine	3.0	21.7
Washington	4.4	50.1	Iowa	2.9	20.0
South Carolina	4.3	20.4	North Dakota	2.3	25.3

[1]Computed as a percent of the resident population with State of birth reported.

Source: Based on U.S. Bureau of the Census, Census of Population: 1970, Vol. I, Characteristics of the Population, 1973, Part 1 (U.S. Summary), Chapter D, Table 191, and Parts 2 to 52 (State reports), Chapter D, Table 140.

Appendix D. Source of Life Table Survival Rates for the Black-and-Other-Races Population for States, 1930 to 1970

The procedure used to compute the cumulative survival rates from birth to 1970 for the Black-and-other-races cohorts aged 0–4 to 30–34 in 1970 is described in chapter III. The cumulative survival rates were derived from a series of 5-year life table survival rates for the years 1970, 1960, 1950, 1940, and 1930. Since life tables for the Black-and-other-races population were not available for many States for 1960 or 1950 and were lacking for all States for 1940 and 1930, estimates were derived by substitution and extrapolation of existing life tables to complete the required set of 5-year survival rates. This appendix contains a description of the sources of the life tables and identifies the substitutions made for each State.

1970

Life tables for Black-and-other-races males and females for each of the 50 States and the District of Columbia were available from prepublication tables for **State Life Tables: 1969–71,** provided by the National Center for Health Statistics.

1960

Life tables for 21 States and the District of Columbia were obtained from **State Life Tables: 1959–61,** published by the National Center for Health Statistics. For each of the 29 states for which life tables were lacking, the life table for the geographic division in which the State is located was substituted. The particular substitutions made are shown in table D-1. Life tables for divisions were available from **Life Tables for the Geographic Divisions of the United States: 1959–61,** published by the National Center for Health Statistics.

1950

Life tables for 16 Southern States and the District of Columbia were obtained from **State Life Tables: 1949–51,** published by the National Office of Vital Statistics. Life tables for geographic divisions were substituted for the 34 States for which State tables were not available. The substitutions made are shown in table D-1. The life tables for divisions were obtained from **Life Tables for the Geographic Divisions of the United States: 1949–51,** published by the National Office of Vital Statistics.

1940 and 1930

Life tables for States or divisions for the Black-and-other-races population for 1940 or 1930 were not available. For these periods, the extrapolation procedure described in chapter III was used to estimate 5-year survival rates for each State.

Table D-1. Sources of Life Table Survival Rates for the Black-and-Other-Races Population for States: 1930 to 1970

(An abbreviation of a division name means that the life table for the division was substituted for the State; New England--N.ENG., Middle Atlantic--M.ATL., East North Central--E.N.C., West North Central--W.N.C., South Atlantic--S.ATL., Mountain--MTN., Pacific--PAC.)

Region, division, and State	1970 (1969-71)	1960 (1959-61)	1950 (1949-51)	1940 (1939-41)	1930 (1929-31)
UNITED STATES					
Northeast					
New England		(2)	(4)		
Maine	(1)	N.ENG.	N.ENG.	(R)	(R)
New Hampshire	(1)	N.ENG.	N.ENG.	(R)	(R)
Vermont	(1)	N.ENG.	N.ENG.	(R)	(R)
Massachusetts	(1)	N.ENG.	N.ENG.	(R)	(R)
Rhode Island	(1)	N.ENG.	N.ENG.	(R)	(R)
Connecticut	(1)	N.ENG.	N.ENG.	(R)	(R)
Middle Atlantic		(2)	(4)		
New York	(1)	M.ATL.	M.ATL.	(R)	(R)
New Jersey	(1)	M.ATL.	M.ATL.	(R)	(R)
Pennsylvania	(1)	M.ATL.	M.ATL.	(R)	(R)
North Central					
East North Central		(2)	(4)		
Ohio	(1)	(3)	E.N.C.	(R)	(R)
Indiana	(1)	(3)	E.N.C.	(R)	(R)
Illinois	(1)	(3)	E.N.C.	(R)	(R)
Michigan	(1)	(3)	E.N.C.	(R)	(R)
Wisconsin	(1)	E.N.C.	E.N.C.	(R)	(R)
West North Central		(2)	(4)		
Minnesota	(1)	W.N.C.	W.N.C.	(R)	(R)
Iowa	(1)	W.N.C.	W.N.C.	(R)	(R)
Missouri	(1)	(3)	W.N.C.	(R)	(R)
North Dakota	(1)	W.N.C.	W.N.C.	(R)	(R)
South Dakota	(1)	W.N.C.	W.N.C.	(R)	(R)
Nebraska	(1)	W.N.C.	W.N.C.	(R)	(R)
Kansas	(1)	W.N.C.	W.N.C.	(R)	(R)
South					
South Atlantic		(2)			
Delaware	(1)	S.ATL.	(5)	(R)	(R)
Maryland	(1)	(3)	(5)	(R)	(R)
District of Columbia	(1)	(3)	(5)	(R)	(R)
Virginia	(1)	(3)	(5)	(R)	(R)
West Virginia	(1)	S.ATL.	(5)	(R)	(R)
North Carolina	(1)	(3)	(5)	(R)	(R)
South Carolina	(1)	(3)	(5)	(R)	(R)
Georgia	(1)	(3)	(5)	(R)	(R)
Florida	(1)	(3)	(5)	(R)	(R)
East South Central:					
Kentucky	(1)	(3)	(5)	(R)	(R)
Tennessee	(1)	(3)	(5)	(R)	(R)
Alabama	(1)	(3)	(5)	(R)	(R)
Mississippi	(1)	(3)	(5)	(R)	(R)
West South Central:					
Arkansas	(1)	(3)	(5)	(R)	(R)
Louisiana	(1)	(3)	(5)	(R)	(R)
Oklahoma	(1)	(3)	(5)	(R)	(R)
Texas	(1)	(3)	(5)	(R)	(R)
West					
Mountain	(1)	(2)	(4)		
Montana	(1)	MTN.	MTN.	(R)	(R)
Idaho	(1)	MTN.	MTN.	(R)	(R)
Wyoming	(1)	MTN.	MTN.	(R)	(R)
Colorado	(1)	MTN.	MTN.	(R)	(R)
New Mexico	(1)	MTN.	MTN.	(R)	(R)
Arizona	(1)	MTN.	MTN.	(R)	(R)
Utah	(1)	MTN.	MTN.	(R)	(R)
Nevada	(1)	MTN.	MTN.	(R)	(R)
Pacific	(1)	(2)	(4)		
Washington	(1)	PAC.	PAC.	(R)	(R)
Oregon	(1)	PAC.	PAC.	(R)	(R)
California	(1)	(3)	PAC.	(R)	(R)
Alaska	(1)	PAC.	PAC.	(R)	(R)
Hawaii	(1)	(3)	PAC.	(R)	(R)

R Prepared by the extrapolation procedure described in chapter III.

[1]U.S. Public Health Service, National Center for Health Statistics, State Life Tables: 1969-71, 1978, forthcoming. [2]U.S. Public Health Service, National Center for Health Statistics, Life Tables for the Geographic Divisions of the United States: 1959-61, Life Tables: 1959-61, Vol. 1, No.3, 1966. [3]U.S. Public Health Service, National Center for Health Statistics, State Life Tables: 1959-61, Life Tables: 1959-61, Vol. 2, Nos. 1-51, 1966. [4]U.S. Public Health Service, National Office of Vital Statistics, Life Tables for the Geographic Divisions of the United States: 1949-51, Vital Statistics - Special Reports, Vol. 41, No. 4, 1956. [5]U.S. Public Health Service, National Office of Vital Statistics, State Life Tables: 1949-51, Vital Statistics - Special Reports, Vol. 41 Supplement, 1956.

Appendix E. Sources of Data for Computation of Expected Sex Ratios for the White Population of States 35 to 64 Years of Age

The procedures used to compute the expected sex ratios of the White population of States 35 to 64 years of age are described in detail in chapter IV. The expected sex ratios were calculated as the product of four components: (1) sex ratios of births; (2) sex ratios of survival rates to 1970; (3) adjustment factors for war mortality; and (4) migration adjustment factors. The calculation of components (1), (2), and (4) required the compilation of the various data separately for each State. The sources of the data employed for the components (3) and (4) have been described in chapter IV. This appendix contains a description of the sources for birth statistics and life tables used in computing components (1) and (2).

SEX RATIOS OF BIRTHS

The sex ratios of births for each of the 50 States and the District of Columbia were compiled (when possible) from data on registered births for each of the six 5-year periods, 1930–1935, 1925–1930, 1920–1925, 1915–1920, 1910–1915, and 1905–1910 (from April 1 of the earlier year through March 31 of the later year in each case). The basic sources of data are the annual volumes, **Births, Stillbirths, and Infant Mortality Statistics,** published by the U.S. Bureau of the Census for the years 1922 through 1935, and the annual volumes, **Birth Statistics for the Birth Registration Area of the United States,** published by the U.S. Bureau of the Census for the years 1915 through 1921.

For the period 1920–1935, if a State was not a member of the Birth Registration Area (BRA) for an entire 5-year period, the sex ratio of births in a "guide" State or the average from two or more guide States was substituted. For 1915–1920, the ratio methods explained in chapter IV were used when necessary. For the two earliest periods, 1910–1915 and 1905–1910, no data on registered births were available, so that the value of the sex ratio of births for each State in 1915–1920 was used, with the three exceptions of Delaware, Arizona, and Nevada, as noted in chapter IV.

1930–1935

Statistics on births for the entire period were available for 46 States and the District of Columbia; the guide States for the other 4 States are:

Non-BRA State	"Guide" State(s)
South Dakota	North Dakota
Texas	Kansas and Mississippi
Alaska	Washington
Hawaii	California

1925–1930

Statistics on births for the entire period were available for 33 States and the District of Columbia; the guide States for the other 17 States are:

Non-BRA State	"Guide" State(s)
Missouri	Kansas and Illinois
South Dakota	North Dakota
South Carolina	North Carolina
Georgia	North Carolina
Tennessee	Kentucky and Mississippi
Alabama	Mississippi
Arkansas	Mississippi and North Carolina
Louisiana	North Carolina
Oklahoma	Kansas
Texas	Kansas, North Carolina, and Mississippi
Idaho	Montana
Colorado	Kansas and Utah
New Mexico	Utah
Arizona	Utah
Nevada	Utah
Alaska	Washington
Hawaii	California

1920–1925

Statistics on births for the entire period were available for only 22 States; the guide States for the other 28 States and the District of Columbia are:

Non-BRA State	"Guide" State(s)
Rhode Island	Connecticut and Massachusetts
New Jersey	New York
Illinois	Ohio
Iowa	Minnesota
Missouri	Kansas
North Dakota	Minnesota
South Dakota	Minnesota

1920–1925—Continued

Non-BRA State	"Guide" State(s)
Delaware	Maryland
District of Columbia	Maryland and Virginia
West Virginia	Kentucky
South Carolina	North Carolina
Georgia	North Carolina
Florida	North Carolina
Tennessee	Kentucky
Alabama	North Carolina
Mississippi	North Carolina
Arkansas	North Carolina
Louisiana	North Carolina
Oklahoma	Kansas
Texas	Kansas and North Carolina
Montana	Minnesota and Utah
Idaho	Minnesota and Utah
Wyoming	Minnesota and Utah
Colorado	Kansas and Utah
New Mexico	Utah
Arizona	Utah
Nevada	Utah
Alaska	Washington
Hawaii	California

1915–1920

Statistics on births for the entire period were available only for the 9 States that were in the Original Birth Registration Area. The sex ratios of births for the remaining 41 States and the District of Columbia were derived by applying the ratio methods explained in chapter IV to the data from one of the later 5-year periods. The sources are:

SEX RATIOS OF CUMULATIVE SURVIVAL RATES

The sex ratios of cumulative survival rates from birth to 1970 for the cohorts aged 35–39 to 60–64 in 1970 were computed from 5-year life table survival rates—

$$ {}_5S_x = \frac{{}_5L_{x+5}}{{}_5L_x} $$

for males and females from a series of current life tables by the methods described in chapter IV. The 5-year survival rates centered on 1970 for White males and females were computed for each of the 50 States and the District of Columbia from prepublication tables for **State Life Tables: 1969–71** supplied to the Census Bureau by the National Center for Health Statistics. For 1960, the survival rates for each of the 51 "States" were obtained from **State Life Tables: 1959–61** published by the National Center for Health Statistics. The survival rates for each of the conterminous 48 States and the District of Columbia in 1950 were obtained from **State Life Tables: 1949–51** published by the National Office of Vital Statistics. The values for Alaska were obtained from unpublished tables for the White population of each sex supplied by the National Center for Health Statistics; for the White population of Hawaii, unpublished tables for the total population of each sex provided by the National Center for Health Statistics were used. Survival rates for the White population of each sex for each of the 48 conterminous States and the District of Columbia in 1940 were computed from **State and Regional Life Tables: 1939–41** published by the National Office of Vital Statistics. For Alaska, the values from the table for the Pacific Region from the same source were used; for Hawaii, the values were obtained from the table for California.

	Ratios based on:		
BRA States	1930–1935	1925–1930	1920–1925
Maine	Missouri	Rhode Island	Ohio
New Hampshire	South Dakota	New Jersey	Indiana
Vermont	South Carolina	Illinois	Wisconsin
Massachusetts	Georgia	Iowa	Nebraska
Connecticut	Tennessee	North Dakota	Kansas
New York	Alabama	Delaware	Maryland
Pennsylvania	Arkansas	District of Columbia	Virginia
Michigan	Louisiana	West Virginia	North Carolina
Minnesota	Oklahoma	Florida	Kentucky
	Texas	Mississippi	Utah
	Idaho	Montana	Washington
	Colorado	Wyoming	Oregon
	New Mexico		California
	Arizona		
	Nevada		
	Alaska		
	Hawaii		

The 1929–1931 State life tables as published did not contain ${}_5L_x$ values, required for calculating 5-year survival rates. These were computed from the e_x and l_x values given in the source by the equations

$$T_x = e_x l_x$$
$${}_5L_x = T_x - T_{x+5}$$

and substituted into the standard formula for calculating survival rates. The values for 47 States and the District of Columbia were available from **Population Statistics–2. State Data** published by the U.S. National Resources Committee. For the remaining three States, survival rates from a guide State or the unweighted averages of survival rates from two or more guide States were substituted. The particular guide States used are shown in table E-1.

The 1919–1920 life tables for White males and females as published in **United States Abridged Life Tables: 1919–1920** contained e_x and l_x values for ages 2, 7, and subsequent pivotal ages at 5-year intervals. The required e_x and l_x values for ages ending in 0 and 5 were obtained by osculatory interpolation and then employed as described earlier to obtain survival rates for White males and females. Values were computed in this manner for the White population of 23 States and the District of Columbia and for all races combined in Hawaii as shown in table E-1. For the remaining 26 States, the survival rates from one or more guide States were substituted.

State life tables for 1900–02 and 1909–11 are available only for the total male and female population of five States (Massachusetts, New York, New Jersey, Indiana, and Michigan). They were published by the U.S. Bureau of the Census in **United States Life Tables: 1890, 1901, 1910, and 1901–1910.** In the present project these life tables were assumed to apply to the White population of these five States and were used as guides in eight other States (table E-1). For the remaining 37 States and the District of Columbia, the ratio methods described in chapter IV were employed to estimate survival rates for the White male and female population.

Table E-1. Sources of Life Table Survival Rates for the White Population of States: 1900 to 1970

(An abbreviation of a State means that the State was used as a "guide")

Region, division, and State	1970 (1969-1971)	1960 (1959-1961)	1950 (1949-1951)	1940 (1939-1941)	1930 (1929-1931)	1920 (1919-1920)	1910 (1909-1911)	1900 (1900-1902)
UNITED STATES								
Northeast								
New England:								
Maine	(1)	(2)	(3)	(5)	(6)	MA	MA	MA
New Hampshire	(1)	(2)	(3)	(5)	(6)	MA	MA	MA
Vermont	(1)	(2)	(3)	(5)	(6)	MA	MA	MA
Massachusetts	(1)	(2)	(3)	(5)	(6)	(7)	(8)	(8)
Rhode Island	(1)	(2)	(3)	(5)	(6)	CT + MA	MA	MA
Connecticut	(1)	(2)	(3)	(5)	(6)	(7)	MA	MA
Middle Atlantic:								
New York	(1)	(2)	(3)	(5)	(6)	(7)	(8)	(8)
New Jersey	(1)	(2)	(3)	(5)	(6)	(7)	(8)	(8)
Pennsylvania	(1)	(2)	(3)	(5)	(6)	(7)	NJ + NY	NJ + NY
North Central								
East North Central:								
Ohio	(1)	(2)	(3)	(5)	(6)	(7)	IN + MI	IN + MI
Indiana	(1)	(2)	(3)	(5)	(6)	(7)	(8)	(8)
Illinois	(1)	(2)	(3)	(5)	(6)	(7)	IN + MI	IN + MI
Michigan	(1)	(2)	(3)	(5)	(6)	(7)	(8)	(8)
Wisconsin	(1)	(2)	(3)	(5)	(6)	(7)	(R)	(R)
West North Central:								
Minnesota	(1)	(2)	(3)	(5)	(6)	(7)	(R)	(R)
Iowa	(1)	(2)	(3)	(5)	(6)	MN	(R)	(R)
Missouri	(1)	(2)	(3)	(5)	(6)	(7)	(R)	(R)
North Dakota	(1)	(2)	(3)	(5)	(6)	MN	(R)	(R)
South Dakota	(1)	(2)	(3)	(5)	(6)	MN	(R)	(R)
Nebraska	(1)	(2)	(3)	(5)	(6)	KS	(R)	(R)
Kansas	(1)	(2)	(3)	(5)	(6)	(7)	(R)	(R)
South								
South Atlantic:								
Delaware	(1)	(2)	(3)	(5)	(6)	MD	(R)	(R)
Maryland	(1)	(2)	(3)	(5)	(6)	(7)	(R)	(R)
District of Columbia	(1)	(2)	(3)	(5)	(6)	(7)	(R)	(R)
Virginia	(1)	(2)	(3)	(5)	(6)	(7)	(R)	(R)
West Virginia	(1)	(2)	(3)	(5)	(6)	KY	(R)	(R)
North Carolina	(1)	(2)	(3)	(5)	(6)	(7)	(R)	(R)
South Carolina	(1)	(2)	(3)	(5)	(6)	(7)	(R)	(R)
Georgia	(1)	(2)	(3)	(5)	(6)	SC	(R)	(R)
Florida	(1)	(2)	(3)	(5)	(6)	SC	(R)	(R)
East South Central:								
Kentucky	(1)	(2)	(3)	(5)	(6)	(7)	(R)	(R)
Tennessee	(1)	(2)	(3)	(5)	(6)	(7)	(R)	(R)
Alabama	(1)	(2)	(3)	(5)	(6)	SC	(R)	(R)
Mississippi	(1)	(2)	(3)	(5)	(6)	SC	(R)	(R)
West South Central:								
Arkansas	(1)	(2)	(3)	(5)	(6)	NC	(R)	(R)
Louisiana	(1)	(2)	(3)	(5)	(5)	NC	(R)	(R)
Oklahoma	(1)	(2)	(3)	(5)	(6)	KS	(R)	(R)
Texas	(1)	(2)	(3)	(5)	KS+NC+SC	KS+NC+SC	(R)	(R)
West								
Mountain:								
Montana	(1)	(2)	(3)	(5)	(6)	MN+UT	(R)	(R)
Idaho	(1)	(2)	(3)	(5)	(6)	MN+UT	(R)	(R)
Wyoming	(1)	(2)	(3)	(5)	(6)	MN+UT	(R)	(R)
Colorado	(1)	(2)	(3)	(5)	(6)	KS+UT	(R)	(R)
New Mexico	(1)	(2)	(3)	(5)	(6)	UT	(R)	(R)
Arizona	(1)	(2)	(3)	(5)	(6)	UT	(R)	(R)
Utah	(1)	(2)	(3)	(5)	(6)	(7)	(R)	(R)
Nevada	(1)	(2)	(3)	(5)	(6)	UT	(R)	(R)
Pacific:								
Washington	(1)	(2)	(3)	(5)	(6)	(7)	(R)	(R)
Oregon	(1)	(2)	(3)	(5)	(6)	(7)	(R)	(R)
California	(1)	(2)	(3)	(5)	(6)	(7)	(R)	(R)
Alaska	(1)	(2)	(4)	PAC	WA+MN	WA+MN	(R)	(R)
Hawaii	(1)	(2)	(4)	CA	CA	(7)	(R)	(R)

R Prepared by ratio methods described in chapter IV.

[1]U.S. Public Health Service, National Center for Health Statistics, State Life Tables: 1969-71, 1978, forthcoming. [2]U.S. Public Health Service, National Center for Health Statistics, State Life Tables: 1959-61, Life Tables: 1959-61, Vol. 2, Nos. 1-51, 1966. [3]U.S. Public Health Service, National Office of Vital Statistics, State Life Tables: 1949-51, Vital Statistics-Special Reports, Vol. 41 Supplement, 1956. [4]Unpublished tables supplied by the National Center for Health Statistics. (Hawaii, total male and female population only.) [5]U.S. Public Health Service, National Office of Vital Statistics, State and Regional Life Tables: 1939-41, 1948. [6]U.S. National Resources Committee, Population Statistics: 2.State Data, 1937. [7]U.S. Bureau of the Census, United States Abridged Life Tables: 1919-20, prepared by Elbertie Foudray, 1923. (Hawaii, total male and female population only.) [8] U.S. Bureau of the Census, United States Life Tables: 1890, 1901, 1910, and 1901-10, prepared by James W. Glover, 1921. (Total male and female population only.)

Appendix F

Additional Series of Estimates of Percents of Net Underenumeration for the Total, White, and Black-and-Other-Races Population, by Sex, for Regions, Divisions, and States, in 1970

Table F-1. Alternative Estimates of the Percents of Net Underenumeration for the Total Population, Derived by Demographic Analysis, a Composite of Demographic Analysis and Dual Systems Analysis, and Synthetic Methods, for Regions, Divisions, and States: 1970

(See text for explanation of alternative procedures. A minus sign denotes a net overcount)

Region, division, and State	SOR-3-1						SOR-3-2					Composite-3	Basic synthetic (age, race, and sex)	Modified "synthetic" (median family income)
	WCF-1			WEF-1			WCF-2		WEF-2					
	BACF-1	BAEF-1	BREF-1	BACF-1	BAEF-1	BREF-1	BACF-2	BAEF-2	BACF-2	BAEF-2	BREF-2			
United States, total	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Regions:														
Northeast	1.3	1.2	1.3	1.4	1.3	1.3	1.3	1.1	1.5	1.4	1.4	2.1	2.4	2.1
North Central	1.6	1.5	1.5	1.7	1.6	1.6	1.4	1.2	1.5	1.4	1.4	1.5	2.4	2.1
South	4.0	4.1	4.1	3.9	4.0	4.1	3.8	3.9	3.7	3.7	3.8	3.7	3.0	3.6
West	3.2	3.3	3.1	3.1	3.2	3.1	3.9	4.2	3.7	3.8	3.7	2.8	2.2	1.9
Northeast:														
New England	0.9	0.9	0.9	1.0	1.0	1.0	1.0	0.9	1.2	1.2	1.1	1.3	2.1	1.8
Middle Atlantic	1.4	1.2	1.4	1.6	1.5	1.4	1.4	1.2	1.6	1.5	1.5	2.4	2.6	2.2
North Central:														
East North Central	1.5	1.4	1.4	1.6	1.6	1.5	1.5	1.3	1.6	1.5	1.4	1.6	2.5	2.1
West North Central	1.7	1.7	1.7	1.7	1.7	1.7	1.2	1.2	1.3	1.3	1.3	1.2	2.2	2.2
South:														
South Atlantic	4.1	4.2	4.2	4.0	4.0	4.1	4.1	4.2	4.0	4.0	4.1	4.2	3.1	3.4
East South Central	3.5	3.5	3.7	3.5	3.5	3.7	2.7	2.5	2.7	2.6	2.8	3.1	3.0	4.4
West South Central	4.2	4.5	4.3	4.0	4.1	4.2	4.1	4.3	3.8	4.0	4.1	3.4	2.8	3.5
West:														
Mountain	3.6	3.7	3.6	3.4	3.4	3.4	3.5	3.7	3.3	3.4	3.4	3.2	2.0	2.0
Pacific	3.1	3.2	3.0	3.0	3.1	3.0	4.0	4.3	3.8	3.9	3.8	2.6	2.2	1.8
New England:														
Maine	3.7	3.7	3.7	3.5	3.5	3.6	2.7	2.7	2.7	2.7	2.7	4.0	1.9	2.2
New Hampshire	1.9	1.8	1.9	2.0	2.0	2.0	2.0	2.0	2.2	2.2	2.2	2.2	1.9	1.9
Vermont	2.6	2.6	2.6	2.6	2.6	2.6	1.9	1.9	2.0	2.0	2.0	2.9	1.9	2.0
Massachusetts	0.6	0.5	0.6	0.7	0.7	0.6	0.6	0.6	0.9	0.8	0.8	0.9	2.1	1.8
Rhode Island	1.0	1.0	1.1	1.2	1.1	1.2	0.9	0.9	1.1	1.1	1.2	1.3	2.1	2.0
Connecticut	0.1	0.1	(Z)	0.2	0.2	0.1	0.7	0.6	0.9	0.9	0.8	0.5	2.3	1.8
Middle Atlantic:														
New York	1.8	1.6	1.8	1.9	1.8	1.8	1.8	1.6	2.0	1.9	1.9	2.7	2.6	2.2
New Jersey	0.7	0.6	0.8	0.8	0.7	0.6	1.0	0.9	1.3	1.1	1.1	1.7	2.6	2.0
Pennsylvania	1.2	1.1	1.2	1.5	1.4	1.3	0.9	0.7	1.2	1.1	1.0	2.2	2.4	2.2
East North Central:														
Ohio	1.6	1.4	1.4	1.7	1.6	1.6	1.4	1.2	1.6	1.5	1.4	1.6	2.5	2.1
Indiana	1.7	1.6	1.6	1.7	1.7	1.7	1.3	1.2	1.5	1.4	1.4	1.7	2.3	2.1
Illinois	1.8	1.6	1.8	2.0	1.9	1.8	1.9	1.6	2.0	1.9	1.8	1.9	2.7	2.1
Michigan	2.0	1.9	1.8	2.1	2.0	1.9	2.1	1.9	2.2	2.1	2.0	2.0	2.6	2.0
Wisconsin	-0.5	-0.5	-0.5	-0.6	-0.7	-0.7	-0.6	-0.7	-0.7	-0.7	-0.8	-0.4	2.1	1.9
West North Central:														
Minnesota	0.2	2.0	0.2	0.3	0.3	0.2	(Z)	(Z)	0.1	(Z)	(Z)	-0.3	2.0	1.8
Iowa	1.7	1.6	1.6	1.7	1.7	1.7	0.9	0.9	1.0	1.0	1.0	1.2	2.0	2.0
Missouri	2.7	2.6	2.8	2.6	2.6	2.7	2.6	2.6	2.6	2.6	2.6	2.2	2.5	2.5
North Dakota	2.5	2.5	2.5	2.4	2.4	2.4	0.8	0.8	1.0	1.0	0.9	2.0	1.9	2.3
South Dakota	3.5	3.5	3.6	3.4	3.4	3.4	2.3	2.2	2.4	2.4	2.4	3.0	1.9	2.3
Nebraska	1.5	1.4	1.5	1.5	1.5	1.5	0.8	0.7	1.0	0.9	0.9	1.0	2.1	2.2
Kansas	1.6	1.5	1.6	1.8	1.7	1.8	0.7	0.6	0.9	0.8	0.8	1.1	2.2	2.3
South Atlantic:														
Delaware	2.8	2.8	2.7	2.8	2.8	2.6	3.4	3.6	3.2	3.3	3.1	2.9	2.8	2.5
Maryland	1.5	1.3	1.6	1.4	1.3	1.2	1.9	1.6	2.0	1.8	1.7	1.6	3.0	2.3
District of Columbia	5.3	4.3	5.0	5.5	4.9	4.5	5.2	3.8	5.4	4.6	4.2	5.3	6.4	4.2
Virginia	3.3	3.1	3.2	3.3	3.3	3.2	2.9	2.6	3.0	2.9	2.9	3.3	3.0	3.0
West Virginia	6.3	6.7	6.2	5.6	5.7	5.8	4.6	4.8	4.2	4.3	4.3	6.4	2.0	2.7
North Carolina	3.4	3.2	3.6	3.4	3.4	3.5	3.1	2.9	3.2	3.1	3.3	3.4	3.2	3.9
South Carolina	5.9	6.4	6.4	5.8	6.0	6.4	5.5	6.1	5.3	5.6	6.0	6.0	3.7	4.7
Georgia	5.0	5.3	5.3	4.8	5.0	5.3	4.9	5.4	4.6	4.9	5.2	5.0	3.4	4.1
Florida	4.8	5.0	4.8	4.6	4.8	4.7	5.6	6.1	5.3	5.5	5.5	4.9	2.8	3.2
East South Central:														
Kentucky	3.6	3.6	3.5	3.4	3.5	3.6	2.7	2.7	2.7	2.7	2.8	3.0	2.3	2.9
Tennessee	4.0	4.3	4.0	3.8	4.0	4.1	3.7	3.9	3.5	3.6	3.7	3.5	2.8	3.5
Alabama	3.0	2.7	3.1	3.0	2.9	3.3	2.0	1.5	2.1	1.9	2.2	2.5	3.3	4.8
Mississippi	3.5	3.1	4.0	3.7	3.4	3.8	2.0	1.4	2.2	1.8	2.1	3.2	3.8	7.2
West South Central:														
Arkansas	6.2	6.8	6.9	5.9	6.2	6.5	4.7	4.9	4.5	4.6	4.9	5.5	2.9	4.8
Louisiana	3.1	2.9	3.3	3.2	3.1	3.3	2.8	2.6	2.9	2.8	3.0	2.4	3.6	5.1
Oklahoma	2.5	2.4	2.7	2.6	2.5	2.6	1.5	1.3	1.7	1.6	1.7	1.7	2.3	2.8
Texas	4.6	5.0	4.5	4.3	4.5	4.5	4.9	5.4	4.5	4.8	4.8	3.8	2.7	2.9
Mountain:														
Montana	1.8	1.8	1.8	1.9	1.9	1.8	0.9	0.9	1.1	1.1	1.1	1.4	1.9	2.0
Idaho	3.8	3.9	3.8	3.6	3.6	3.6	3.3	3.4	3.2	3.2	3.2	3.5	1.9	2.1
Wyoming	1.8	1.8	1.8	1.8	1.8	1.8	0.3	0.2	0.5	0.5	0.5	1.4	1.9	2.0
Colorado	2.5	2.6	2.5	2.5	2.5	2.5	2.3	2.3	2.2	2.2	2.2	2.1	2.1	2.0
New Mexico	8.3	9.2	8.2	7.4	7.8	7.8	8.3	9.3	7.5	7.9	7.8	7.9	1.9	2.2
Arizona	4.7	4.8	4.9	4.6	4.6	4.6	5.0	5.2	4.9	4.9	4.9	4.4	2.0	2.0
Utah	(Z)	(Z)	(Z)	-0.2	-0.2	-0.2	-0.1	-0.2	-0.2	-0.2	-0.3	-0.4	1.9	1.9
Nevada	4.5	4.7	4.5	4.2	4.3	4.2	6.3	6.8	5.7	5.9	5.8	4.1	2.3	1.9
Pacific:														
Washington	2.0	1.9	2.0	2.1	2.1	2.0	2.1	2.1	2.2	2.2	2.2	1.5	2.0	1.8
Oregon	1.2	1.1	1.1	1.4	1.4	1.3	1.5	1.4	1.7	1.6	1.6	0.7	2.0	1.9
California	3.3	3.4	3.2	3.2	3.3	3.2	4.5	4.8	4.2	4.3	4.3	2.8	2.3	1.9
Alaska	7.5	7.3	7.6	7.5	7.5	7.1	5.6	5.4	5.6	5.4	5.1	7.0	2.1	1.2
Hawaii	5.9	7.4	3.8	5.6	6.5	5.1	5.5	7.9	5.2	6.4	4.9	5.5	1.3	0.7

Z Less than ± 0.05.

Table F-2. Alternative Estimates of the Percents of Net Underenumeration for the Male Population, Derived by Demographic Analysis and a Composite of Demographic Analysis and Dual Systems Analysis, for Regions, Divisions, and States: 1970

(See text for explanation of alternative procedures. A minus sign denotes a net overcount)

Region, division, and State	SOR-3-1					SOR-3-2					SOR-3-1		Composite-1	Composite-2
	WCF-1			WEF-1		WCF-2			WEF-2		WCF-1			
	BACF-1	BAEF-1	BREF-1	BACF-1	BREF-1	BACF-2	BAEF-2	BREF-2	BACF-2	BREF-2	BACF-1	BREF-1		
United States, total	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Regions:														
Northeast	1.8	1.7	1.7	2.0	1.9	1.8	1.6	1.6	2.0	1.9	1.8	1.8	2.2	2.5
North Central	2.0	1.9	1.8	2.1	2.0	1.8	1.7	1.6	1.9	1.8	2.0	1.9	1.9	1.8
South	5.1	5.2	5.4	5.0	5.3	4.9	5.0	5.2	4.8	5.0	5.1	5.3	5.1	5.0
West	4.0	4.1	3.9	3.9	3.7	4.7	5.0	4.8	4.5	4.4	4.0	3.8	3.7	3.5
Northeast:														
New England	1.5	1.5	1.4	1.6	1.5	1.6	1.5	1.5	1.8	1.7	1.5	1.5	1.8	2.0
Middle Atlantic	1.9	1.8	1.7	2.1	2.0	1.9	1.7	1.6	2.1	1.9	1.9	1.9	2.4	2.7
North Central:														
East North Central	2.0	1.9	1.7	2.1	1.9	1.9	1.8	1.6	2.1	1.8	2.0	1.8	2.0	2.0
West North Central	2.1	2.0	2.1	2.1	2.1	1.5	1.5	1.5	1.6	1.6	2.1	2.1	1.7	1.4
South:														
South Atlantic	5.3	5.4	5.6	5.2	5.4	5.4	5.4	5.6	5.3	5.4	5.4	5.5	5.7	5.7
East South Central	4.5	4.5	5.0	4.5	5.0	3.6	3.5	3.9	3.7	4.0	4.5	4.9	4.2	4.3
West South Central	5.1	5.4	5.6	4.9	5.3	5.0	5.2	5.4	4.8	5.1	5.1	5.3	4.6	4.4
West:														
Mountain	4.2	4.4	4.4	4.0	4.1	4.1	4.3	4.3	3.9	4.0	4.3	4.2	3.9	3.8
Pacific	3.9	4.0	3.7	3.8	3.6	4.9	5.2	4.9	4.7	4.6	3.9	3.6	3.7	3.4
New England:														
Maine	4.2	4.2	4.3	4.0	4.1	3.1	3.1	3.2	3.1	3.2	4.2	4.3	4.4	4.6
New Hampshire	2.6	2.5	2.6	2.7	2.7	2.8	2.8	2.8	2.9	2.9	2.5	2.6	2.8	3.0
Vermont	2.7	2.7	2.6	2.7	2.6	2.1	2.1	2.1	2.2	2.2	2.8	2.7	2.9	3.1
Massachusetts	1.3	1.2	1.2	1.4	1.3	1.3	1.3	1.2	1.5	1.5	1.3	1.2	1.6	1.7
Rhode Island	1.7	1.6	1.7	1.9	1.9	1.6	1.6	1.7	1.8	1.9	1.7	1.8	1.9	2.1
Connecticut	0.6	0.5	0.4	0.7	0.5	1.1	1.0	0.9	1.4	1.2	0.5	0.4	0.9	1.0
Middle Atlantic:														
New York	2.3	2.1	2.1	2.4	2.3	2.3	2.0	2.1	2.4	2.3	2.3	2.3	2.7	3.1
New Jersey	1.4	1.2	1.2	1.4	1.2	1.7	1.5	1.5	1.9	1.8	1.4	1.4	1.8	2.2
Pennsylvania	1.7	1.6	1.5	1.9	1.8	1.3	1.1	1.1	1.6	1.4	1.7	1.7	2.2	2.5
East North Central:														
Ohio	2.2	2.1	2.0	2.4	2.2	2.1	1.9	1.8	2.2	2.0	2.2	2.0	2.2	2.2
Indiana	2.0	2.0	1.9	2.1	2.0	1.7	1.6	1.6	1.9	1.8	2.0	2.0	2.0	2.0
Illinois	2.2	2.0	1.8	2.3	2.0	2.2	2.0	1.8	2.4	2.1	2.2	2.0	2.1	2.1
Michigan	2.6	2.5	2.2	2.7	2.4	2.7	2.6	2.3	2.8	2.5	2.5	2.3	2.6	2.6
Wisconsin	-0.3	-0.3	-0.4	-0.4	-0.5	-0.4	-0.5	-0.6	-0.5	-0.6	-0.3	-0.4	-0.4	-0.3
West North Central:														
Minnesota	0.6	0.6	0.5	0.6	0.6	0.3	0.3	0.2	0.4	0.3	0.6	0.5	0.2	-0.1
Iowa	1.8	1.8	1.8	1.8	1.8	1.0	0.9	0.9	1.1	1.1	1.8	1.8	1.4	1.2
Missouri	3.1	3.1	3.2	3.1	3.2	3.0	2.9	3.1	3.0	3.1	3.1	3.2	2.7	2.4
North Dakota	2.3	2.3	2.3	2.2	2.2	0.6	0.6	0.6	0.8	0.7	2.3	2.3	1.9	1.6
South Dakota	4.0	4.0	4.0	3.9	3.9	2.8	2.7	2.7	2.9	2.8	4.2	4.1	3.7	3.4
Nebraska	1.5	1.4	1.4	1.5	1.5	0.7	0.7	0.6	0.9	0.9	1.5	1.5	1.1	0.8
Kansas	2.4	2.4	2.4	2.6	2.7	1.5	1.4	1.5	1.6	1.6	2.4	2.5	2.1	1.8
South Atlantic:														
Delaware	3.1	3.1	2.7	3.0	2.7	3.5	3.7	3.3	3.3	3.0	3.1	2.7	3.5	3.5
Maryland	2.6	2.4	2.2	2.6	2.2	3.0	2.7	2.5	3.1	2.7	2.8	2.6	3.0	3.0
District of Columbia	7.2	6.2	5.4	7.4	5.1	7.0	5.6	4.8	7.2	5.6	7.2	6.4	7.6	7.2
Virginia	4.5	4.4	4.3	4.5	4.5	4.2	3.9	3.9	4.3	4.1	4.4	4.4	4.9	4.9
West Virginia	7.0	7.3	7.5	6.3	6.6	5.2	5.4	5.5	4.7	4.9	6.9	7.0	7.4	7.4
North Carolina	4.5	4.3	4.6	4.5	4.8	4.2	4.0	4.3	4.3	4.5	4.5	4.9	4.9	4.8
South Carolina	7.4	7.9	8.6	7.3	8.2	7.1	7.6	8.3	6.9	7.8	7.6	8.3	7.8	7.7
Georgia	6.0	6.4	7.0	5.8	6.6	5.9	6.4	6.9	5.7	6.5	6.1	6.7	6.4	6.3
Florida	6.4	6.6	6.5	6.2	6.3	7.3	7.8	7.7	7.0	7.2	6.4	6.3	6.8	6.7
East South Central:														
Kentucky	4.7	4.8	5.0	4.6	4.9	3.9	3.8	4.0	3.9	4.1	4.6	4.8	4.3	4.3
Tennessee	4.9	5.2	5.5	4.7	5.1	4.5	4.7	5.0	4.4	4.7	4.8	5.1	4.5	4.6
Alabama	4.0	3.7	4.4	4.0	4.6	2.8	2.4	3.0	3.0	3.4	3.8	4.5	3.6	3.7
Mississippi	4.5	4.1	4.9	4.7	5.3	2.8	2.2	2.9	3.0	3.3	4.6	5.4	4.2	4.4
West South Central:														
Arkansas	7.2	7.8	8.5	6.9	7.8	5.5	5.7	6.2	5.4	6.0	7.6	8.2	6.7	6.6
Louisiana	3.9	3.7	4.1	4.0	4.3	3.6	3.4	3.8	3.7	4.0	3.9	4.3	3.4	3.4
Oklahoma	3.4	3.3	3.5	3.5	3.7	2.3	2.1	2.3	2.5	2.6	3.5	3.7	2.8	2.7
Texas	5.5	6.0	6.0	5.2	5.5	5.9	6.4	6.5	5.5	5.8	5.4	5.4	4.9	4.8
Mountain:														
Montana	1.9	1.8	1.8	1.9	1.9	1.0	0.9	0.9	1.2	1.1	1.9	1.9	1.5	1.4
Idaho	4.5	4.5	4.5	4.2	4.2	3.9	4.0	3.9	3.8	3.7	4.4	4.4	4.2	4.1
Wyoming	1.8	1.8	1.8	1.9	1.9	0.3	0.2	0.3	0.5	0.5	1.8	1.8	1.5	1.4
Colorado	2.9	3.0	3.0	2.9	2.9	2.6	2.6	2.6	2.5	2.6	2.9	2.9	2.6	2.5
New Mexico	9.2	10.2	10.0	8.5	8.7	9.3	10.2	10.1	8.5	8.7	9.2	9.1	9.0	8.8
Arizona	5.9	6.0	6.0	5.8	5.8	6.4	6.5	6.5	6.2	6.3	6.1	6.1	5.6	5.4
Utah	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.3	0.8	0.7	0.4	0.3
Nevada	4.8	5.0	4.8	4.4	4.3	6.3	6.8	6.5	5.7	5.7	4.9	4.7	4.4	4.3
Pacific:														
Washington	2.6	2.6	2.5	2.8	2.7	2.8	2.7	2.7	2.9	2.8	2.7	2.7	2.4	2.2
Oregon	1.8	1.8	1.7	2.1	1.9	2.2	2.2	2.1	2.4	2.3	1.9	1.8	1.6	1.4
California	4.1	4.2	4.0	4.0	3.8	5.4	5.7	5.5	5.1	5.1	4.1	3.9	3.9	3.6
Alaska	10.0	9.8	9.2	10.1	9.4	8.0	7.8	7.1	8.0	7.2	10.6	9.8	9.8	9.4
Hawaii	7.2	8.7	5.9	6.9	5.1	6.7	9.0	6.1	6.3	4.7	6.5	3.9	6.9	6.3

Z Less than ±0.05.

Table F-3. Alternative Estimates of the Percents of Net Underenumeration for the Female Population, Derived by Demographic Analysis and a Composite of Demographic Analysis and Dual Systems Analysis, for Regions, Divisions, and States: 1970

(See text for explanation of alternative procedures. A minus sign denotes a net overcount)

Region, division, and State	SOR-3-1					SOR-3-2					SOR-3-1		Composite-1	Composite-2
	WCF-1			WEF-1		WCF-2			WEF-2		WCF-1			
	BACF-1	BAEF-1	BREF-1	BACF-1	BREF-1	BACF-2	BAEF-2	BREF-2	BACF-2	BREF-2	BACF*-1	BREF*-1		
United States, Total	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Regions:														
Northeast	0.8	0.7	0.7	0.9	0.8	0.8	0.6	0.6	1.0	0.9	0.8	0.8	1.2	1.5
North Central	1.1	1.0	1.0	1.2	1.2	1.0	0.8	0.8	1.1	1.0	1.1	1.1	1.0	0.9
South	3.0	3.1	3.1	2.8	2.9	2.8	2.9	2.9	2.6	2.7	3.0	3.0	2.9	2.9
West	2.5	2.6	2.6	2.4	2.4	3.1	3.3	3.3	2.9	3.0	2.4	2.4	2.2	2.0
Northeast:														
New England	0.4	0.3	0.3	0.5	0.4	0.4	0.4	0.4	0.6	0.6	0.4	0.4	0.6	0.8
Middle Atlantic	0.9	0.8	0.8	1.1	1.0	0.9	0.7	0.7	1.1	1.0	0.9	0.9	1.4	1.7
North Central:														
East North Central	1.1	0.9	0.9	1.1	1.1	1.0	0.8	0.8	1.1	1.0	1.0	1.0	1.0	1.0
West North Central	1.3	1.3	1.3	1.4	1.4	0.9	0.9	0.9	1.0	1.0	1.4	1.4	1.0	0.7
South:														
South Atlantic	2.9	3.0	3.0	2.8	2.8	2.9	3.0	3.0	2.8	2.8	3.0	3.0	3.3	3.2
East South Central	2.6	2.5	2.5	2.5	2.5	1.8	1.6	1.6	1.8	1.7	2.5	2.5	2.2	2.3
West South Central	3.3	3.6	3.6	3.1	3.2	3.2	3.5	3.5	3.0	3.1	3.3	3.3	2.7	2.6
West:														
Mountain	2.9	3.1	3.1	2.7	2.8	2.9	3.1	3.1	2.7	2.7	2.9	2.9	2.6	2.5
Pacific	2.3	2.4	2.4	2.2	2.3	3.1	3.4	3.4	2.9	3.1	2.3	2.3	2.1	1.8
New England:														
Maine	3.2	3.2	3.2	3.1	3.1	2.4	2.4	2.4	2.3	2.3	3.2	3.2	3.5	3.6
New Hampshire	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.2	1.2	1.4	1.6
Vermont	2.5	2.5	2.5	2.5	2.5	1.7	1.6	1.6	1.7	1.7	2.6	2.6	2.7	2.9
Massachusetts	-0.1	-0.1	-0.1	(Z)	(Z)	(Z)	(Z)	(Z)	0.3	0.2	-0.1	-0.1	0.2	0.3
Rhode Island	0.3	0.3	0.3	0.5	0.5	0.2	0.2	0.2	0.5	0.4	0.4	0.4	0.6	0.7
Connecticut	-0.3	-0.3	-0.3	-0.2	-0.2	0.3	0.2	0.2	0.5	0.4	-0.3	-0.3	(Z)	0.2
Middle Atlantic:														
New York	1.3	1.1	1.1	1.5	1.4	1.4	1.1	1.1	1.5	1.4	1.3	1.3	1.7	2.1
New Jersey	0.1	(Z)	(Z)	0.1	(Z)	0.4	0.2	0.2	0.6	0.5	0.2	0.2	0.6	0.9
Pennsylvania	0.8	0.7	0.7	1.0	0.9	0.5	0.3	0.3	0.8	0.7	0.8	0.8	1.3	1.6
East North Central:														
Ohio	0.9	0.8	0.8	1.0	1.0	0.8	0.6	0.6	0.9	0.8	0.8	0.8	0.8	0.9
Indiana	1.3	1.2	1.2	1.4	1.4	1.0	0.9	0.9	1.1	1.1	1.3	1.3	1.3	1.3
Illinois	1.5	1.3	1.3	1.6	1.6	1.5	1.3	1.3	1.7	1.6	1.6	1.6	1.5	1.4
Michigan	1.4	1.2	1.2	1.5	1.4	1.5	1.3	1.3	1.5	1.5	1.3	1.3	1.3	1.3
Wisconsin	-0.7	-0.7	-0.7	-0.8	-0.8	-0.8	-0.8	-0.8	-0.9	-0.9	-0.7	-0.7	-0.7	-0.7
West North Central:														
Minnesota	-0.1	-0.1	-0.1	-0.1	-0.1	-0.3	-0.3	-0.3	-0.2	-0.3	-0.1	-0.1	-0.5	-0.8
Iowa	1.5	1.5	1.5	1.6	1.6	0.8	0.8	0.8	1.0	1.0	1.5	1.5	1.2	0.9
Missouri	2.3	2.2	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.3	2.3	1.9	1.6
North Dakota	2.7	2.7	2.7	2.5	2.6	1.1	1.0	1.0	1.2	1.2	2.7	2.7	2.3	2.0
South Dakota	3.0	3.0	3.0	2.9	2.9	1.8	1.7	1.7	1.9	1.9	3.1	3.1	2.6	2.3
Nebraska	1.5	1.5	1.5	1.6	1.6	0.8	0.8	0.8	1.0	1.0	1.5	1.5	1.1	0.9
Kansas	0.7	0.7	0.7	0.9	0.9	(Z)	-0.1	-0.1	0.1	(Z)	0.7	0.7	0.4	0.1
South Atlantic:														
Delaware	2.6	2.6	2.6	2.6	2.6	3.3	3.5	3.5	3.1	3.2	2.6	2.6	3.0	3.0
Maryland	0.4	0.2	0.2	0.3	0.2	0.8	0.5	0.5	0.9	0.7	0.6	0.6	0.8	0.8
District of Columbia	3.7	2.7	2.7	3.9	3.2	3.5	2.2	2.2	3.7	3.0	3.7	3.7	4.1	3.7
Virginia	2.0	1.9	1.9	2.1	2.0	1.6	1.3	1.3	1.7	1.6	2.0	2.0	2.4	2.4
West Virginia	5.6	6.0	6.0	4.9	5.0	4.1	4.3	4.3	3.6	3.7	5.5	5.5	6.0	6.0
North Carolina	2.3	2.1	2.1	2.4	2.3	2.0	1.8	1.8	2.1	2.0	2.4	2.4	2.7	2.6
South Carolina	4.4	4.9	4.9	4.2	4.5	4.0	4.6	4.6	3.8	4.1	4.6	4.6	4.8	4.7
Georgia	3.9	4.4	4.4	3.8	4.0	3.9	4.4	4.4	3.6	3.9	4.1	4.1	4.3	4.2
Florida	3.3	3.5	3.5	3.1	3.2	4.0	4.5	4.5	3.7	3.9	3.3	3.3	3.7	3.6
East South Central:														
Kentucky	2.4	2.5	2.5	2.3	2.4	1.6	1.5	1.5	1.6	1.6	2.3	2.3	2.0	2.0
Tennessee	3.1	3.4	3.4	2.9	3.1	2.8	3.0	3.0	2.7	2.8	3.0	3.0	2.7	2.8
Alabama	2.0	1.7	1.7	2.1	2.0	1.1	0.6	0.6	1.3	1.1	1.8	1.8	1.6	1.7
Mississippi	2.6	2.1	2.1	2.7	2.5	1.2	0.6	0.6	1.4	1.0	2.6	2.6	2.2	2.4
West South Central:														
Arkansas	5.3	5.9	5.9	4.9	5.2	3.9	4.1	4.1	3.7	3.8	5.7	5.7	4.7	4.6
Louisiana	2.3	2.0	2.0	2.3	2.2	2.1	1.9	1.9	2.1	2.1	2.2	2.2	1.7	1.7
Oklahoma	1.6	1.5	1.5	1.7	1.7	0.7	0.5	0.5	0.9	0.8	1.7	1.7	1.0	0.9
Texas	3.7	4.2	4.2	3.4	3.6	4.0	4.5	4.5	3.6	3.8	3.5	3.6	3.1	3.0
Mountain:														
Montana	1.8	1.7	1.7	1.8	1.8	0.9	0.8	0.8	1.1	1.0	1.8	1.8	1.4	1.3
Idaho	3.2	3.2	3.2	2.9	3.0	2.7	2.8	2.8	2.5	2.6	3.1	3.1	2.9	2.8
Wyoming	1.8	1.7	1.7	1.8	1.8	0.3	0.2	0.2	0.5	0.5	1.8	1.8	1.4	1.3
Colorado	2.1	2.2	2.2	2.1	2.1	2.0	2.0	2.0	1.9	1.9	2.1	2.1	1.8	1.7
New Mexico	7.3	8.2	8.2	6.4	6.8	7.3	8.3	8.3	6.5	6.9	7.2	7.2	7.0	6.8
Arizona	3.6	3.6	3.6	3.4	3.5	3.7	3.8	3.8	3.5	3.6	3.7	3.7	3.2	3.1
Utah	-0.7	-0.8	-0.8	-0.9	-0.9	-0.8	-0.8	-0.8	-0.8	-0.9	-0.7	-0.7	-1.0	-1.2
Nevada	4.2	4.4	4.4	3.9	4.0	6.3	6.7	6.7	5.7	5.9	4.4	4.3	3.9	3.7
Pacific:														
Washington	1.3	1.2	1.2	1.4	1.4	1.5	1.4	1.4	1.6	1.5	1.4	1.4	1.1	0.9
Oregon	0.5	0.5	0.5	0.7	0.7	0.8	0.7	0.7	0.9	0.9	0.5	0.5	0.3	0.1
California	2.6	2.7	2.7	2.4	2.5	3.6	3.9	3.9	3.3	3.5	2.5	2.5	2.3	2.1
Alaska	4.2	4.0	4.0	4.3	4.2	2.6	2.3	2.3	2.5	2.4	4.9	4.8	4.0	3.6
Hawaii	4.4	6.0	6.0	4.2	5.1	4.3	6.7	6.7	4.0	5.2	3.7	3.7	4.2	3.5

Z Less than ± 0.05.

Table F-4. Alternative Estimates of the Percents of Net Underenumeration for the Total White Population, Derived by Demographic Analysis, a Composite of Demographic Analysis and Dual Systems Analysis, and a Modified "Synthetic" Method, for Regions, Divisions, and States: 1970

(See text for explanation of alternative procedures. A minus sign denotes a net overcount)

Region, division, and State	SOR-3-1		SOR-3-2		SOR-3-3		Composite-1	Composite-2	Composite-3	Modified "synthetic" (median family income)
	WCF-1	WEF-1	WCF-2	WEF-2	WCF-3	WEF-3				
United States, total	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Regions:										
Northeast	0.8	1.0	0.7	0.9	0.6	0.8	1.2	1.4	1.6	1.7
North Central	1.2	1.3	0.9	1.0	0.8	0.9	1.0	1.0	1.1	1.8
South	3.1	2.9	3.0	2.9	3.1	2.9	3.0	2.9	2.8	2.2
West	2.7	2.6	3.4	3.1	3.7	3.4	2.5	2.4	2.3	1.8
Northeast:										
New England	0.8	0.9	0.9	1.1	0.7	0.9	1.1	1.2	1.1	1.7
Middle Atlantic	0.8	1.0	0.7	0.9	0.6	0.8	1.3	1.5	1.7	1.7
North Central:										
East North Central	1.1	1.2	0.9	1.0	0.8	0.9	1.0	1.1	1.3	1.7
West North Central	1.4	1.4	0.8	0.9	0.7	0.8	1.0	0.7	0.9	2.1
South:										
South Atlantic	2.9	2.8	3.1	2.9	3.2	3.0	3.4	3.4	3.1	2.0
East South Central	2.7	2.6	2.1	2.1	2.0	2.0	2.3	2.2	2.1	2.4
West South Central	3.5	3.3	3.5	3.3	3.5	3.3	2.9	2.7	2.7	2.2
West:										
Mountain	3.1	2.9	3.0	2.8	3.0	2.8	2.8	2.7	2.7	2.0
Pacific	2.6	2.6	3.5	3.3	3.9	3.6	2.4	2.2	2.1	1.7
New England:										
Maine	3.5	3.3	2.6	2.6	2.5	2.5	3.8	3.9	3.8	2.3
New Hampshire	1.8	2.0	2.0	2.1	2.0	2.1	2.1	2.2	2.2	2.0
Vermont	2.4	2.4	1.8	1.9	1.8	1.9	2.6	2.8	2.7	2.1
Massachusetts	0.4	0.6	0.5	0.7	0.3	0.5	0.7	0.8	0.8	1.7
Rhode Island	0.7	0.9	0.6	0.8	0.5	0.7	1.0	1.1	1.1	1.9
Connecticut	0.1	0.2	0.6	0.8	0.5	0.8	0.4	0.5	0.4	1.6
Middle Atlantic:										
New York	1.2	1.3	1.1	1.2	0.9	1.1	1.6	1.9	2.1	1.7
New Jersey	(Z)	(Z)	0.2	0.4	0.1	0.3	0.5	0.7	0.9	1.6
Pennsylvania	0.8	1.0	0.4	0.7	0.3	0.6	1.3	1.5	1.7	1.9
East North Central:										
Ohio	1.3	1.4	1.1	1.3	0.9	1.1	1.3	1.3	1.5	1.8
Indiana	1.3	1.4	0.9	1.0	0.8	0.9	1.2	1.3	1.4	1.9
Illinois	1.1	1.2	0.9	1.1	0.8	0.9	1.0	1.1	1.2	1.7
Michigan	1.7	1.8	1.7	1.8	1.6	1.7	1.7	1.8	1.9	1.7
Wisconsin	-0.6	-0.8	-0.8	-0.9	-0.9	-1.0	-0.7	-0.6	-0.5	1.9
West North Central:										
Minnesota	0.2	0.2	-0.1	(Z)	-0.2	-0.1	-0.2	-0.5	-0.4	1.9
Iowa	1.6	1.7	0.8	1.0	0.7	0.9	1.3	1.0	1.1	2.1
Missouri	2.0	2.0	1.9	1.9	1.8	1.8	1.6	1.4	1.5	2.1
North Dakota	2.3	2.2	0.7	0.8	0.6	0.8	2.0	1.7	1.8	2.4
South Dakota	2.7	2.7	1.4	1.5	1.3	1.5	2.4	2.1	2.2	2.5
Nebraska	1.2	1.2	0.4	0.6	0.3	0.5	0.8	0.6	0.7	2.2
Kansas	1.3	1.5	0.5	0.6	0.4	0.5	1.0	0.7	0.8	2.1
South Atlantic:										
Delaware	2.2	2.1	2.7	2.6	3.0	2.8	2.6	2.6	2.3	1.8
Maryland	-0.1	-0.1	(Z)	0.1	(Z)	(Z)	0.4	0.4	0.1	1.6
District of Columbia	3.7	3.9	3.5	3.7	3.4	3.7	4.1	4.1	3.9	1.3
Virginia	2.4	2.5	2.1	2.2	1.9	2.1	2.9	2.9	2.6	1.9
West Virginia	6.2	5.5	4.6	4.2	4.7	4.2	6.6	6.7	6.4	2.5
North Carolina	2.0	2.1	2.1	2.1	2.0	2.0	2.5	2.5	2.2	2.2
South Carolina	3.9	3.7	4.2	4.0	4.4	4.2	4.3	4.4	4.0	2.2
Georgia	3.2	3.0	3.5	3.3	3.6	3.3	3.6	3.7	3.3	2.1
Florida	4.1	3.9	4.9	4.6	5.5	5.1	4.5	4.5	4.2	2.1
East South Central:										
Kentucky	3.5	3.4	2.6	2.7	2.5	2.6	3.1	3.0	2.9	2.5
Tennessee	3.4	3.2	3.2	3.0	3.1	3.0	3.0	2.9	2.8	2.4
Alabama	1.7	1.8	1.1	1.2	0.8	1.0	1.3	1.2	1.1	2.3
Mississippi	1.0	1.2	0.3	0.6	0.2	0.4	0.6	0.6	0.4	2.5
West South Central:										
Arkansas	4.1	3.7	2.9	2.8	2.7	2.6	3.4	3.3	3.2	2.8
Louisiana	1.5	1.5	1.6	1.6	1.4	1.5	0.8	0.6	0.6	2.1
Oklahoma	1.9	2.0	0.8	1.0	0.4	0.6	1.2	1.1	1.0	2.4
Texas	4.3	4.0	4.7	4.3	4.9	4.5	3.7	3.5	3.5	2.1
Mountain:										
Montana	1.4	1.4	0.5	0.7	0.4	0.6	1.0	1.0	1.0	2.2
Idaho	3.9	3.7	3.4	3.2	4.0	3.7	3.6	3.5	3.6	2.3
Wyoming	1.6	1.7	0.1	0.4	0.1	0.3	1.3	1.2	1.2	2.1
Colorado	2.5	2.4	2.2	2.2	2.1	2.0	2.2	2.1	2.1	2.0
New Mexico	8.0	7.1	8.0	7.1	8.6	7.7	7.7	7.6	7.6	2.3
Arizona	3.6	3.5	4.0	3.8	3.8	3.6	3.3	3.2	3.2	2.0
Utah	-0.3	-0.4	-0.4	-0.5	-0.5	-0.7	-0.6	-0.7	-0.7	2.0
Nevada	3.7	3.3	4.9	4.3	5.1	4.4	3.3	3.3	3.3	1.7
Pacific:										
Washington	1.6	1.7	1.7	1.8	1.5	1.6	1.3	1.2	1.1	1.8
Oregon	1.0	1.2	1.3	1.5	1.2	1.4	0.8	0.6	0.5	2.0
California	2.9	2.8	4.0	3.7	4.6	4.2	2.7	2.5	2.4	1.7
Alaska	5.9	6.0	3.7	3.7	3.7	3.7	5.7	5.5	5.4	1.4
Hawaii	4.8	4.6	5.0	4.7	3.9	3.8	4.7	4.4	4.3	1.8

Z Less than ± 0.05.

Table F-5. Alternative Estimates of the Percents of Net Underenumeration for the White Male Population, Derived by Demographic Analysis and a Composite of Demographic Analysis and Dual Systems Analysis, for Regions, Divisions, and States: 1970

(See text for explanation of alternative procedures. A minus sign denotes a net overcount)

Region, division, and State	SOR-3-1		SOR-3-2		SOR-3-3		Composite-1	Composite-2	Composite-3
	WCF-1	WEF-1	WCF-2	WEF-2	WCF-3	WEF-3			
United States, total	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Regions:									
Northeast	1.2	1.3	1.1	1.3	0.9	1.1	1.6	1.8	2.1
North Central	1.5	1.6	1.2	1.3	1.0	1.2	1.3	1.3	1.6
South	3.9	3.7	3.9	3.7	3.9	3.8	3.8	3.8	3.4
West	3.4	3.3	4.1	3.8	4.4	4.1	3.2	3.0	2.8
Northeast:									
New England	1.4	1.5	1.4	1.6	1.2	1.4	1.6	1.8	1.6
Middle Atlantic	1.1	1.3	1.0	1.2	0.8	1.0	1.6	1.8	2.3
North Central:									
East North Central	1.4	1.5	1.2	1.3	1.1	1.2	1.4	1.5	1.7
West North Central	1.6	1.7	1.0	1.1	0.9	1.0	1.3	1.0	1.2
South:									
South Atlantic	3.9	3.8	4.1	4.0	4.3	4.1	4.3	4.4	3.7
East South Central	3.4	3.3	2.8	2.8	2.7	2.7	3.0	2.9	2.6
West South Central	4.2	4.0	4.2	3.9	4.2	4.0	3.6	3.3	3.3
West:									
Mountain	3.7	3.5	3.5	3.3	3.5	3.3	3.4	3.3	3.3
Pacific	3.3	3.2	4.2	4.0	4.7	4.4	3.1	2.9	2.7
New England:									
Maine	3.8	3.7	2.9	2.8	2.8	2.7	4.1	4.2	4.1
New Hampshire	2.5	2.7	2.7	2.9	2.7	2.8	2.8	2.9	2.8
Vermont	2.7	2.7	2.2	2.2	2.1	2.2	3.0	3.1	2.9
Massachusetts	1.1	1.2	1.1	1.3	0.9	1.1	1.4	1.5	1.3
Rhode Island	1.3	1.5	1.2	1.4	1.0	1.2	1.6	1.8	1.6
Connecticut	0.5	0.6	1.0	1.2	0.9	1.2	0.8	0.9	0.8
Middle Atlantic:									
New York	1.5	1.6	1.3	1.5	1.1	1.3	1.9	2.2	2.6
New Jersey	0.4	0.5	0.6	0.8	0.5	0.7	0.9	1.1	1.5
Pennsylvania	1.1	1.3	0.7	0.9	0.5	0.8	1.6	1.8	2.2
East North Central:									
Ohio	1.8	2.0	1.6	1.7	1.4	1.6	1.8	1.9	2.1
Indiana	1.5	1.6	1.2	1.3	1.0	1.2	1.5	1.6	1.8
Illinois	1.2	1.3	1.0	1.2	0.8	1.0	1.1	1.2	1.5
Michigan	2.2	2.3	2.1	2.2	2.0	2.1	2.1	2.2	2.5
Wisconsin	-0.5	-0.6	-0.7	-0.8	-0.7	-0.8	-0.5	-0.4	-0.2
West North Central:									
Minnesota	0.5	0.6	0.2	0.3	0.1	0.2	0.2	-0.1	0.1
Iowa	1.7	1.8	0.9	1.0	0.7	0.9	1.4	1.1	1.3
Missouri	2.3	2.2	2.0	2.0	1.9	1.9	1.9	1.6	1.9
North Dakota	2.0	1.9	0.4	0.5	0.3	0.4	1.7	1.4	1.6
South Dakota	3.2	3.1	1.8	2.0	1.7	1.9	2.8	2.6	2.8
Nebraska	1.1	1.2	0.3	0.5	0.2	0.4	0.7	0.5	0.7
Kansas	2.1	2.3	1.2	1.4	1.1	1.2	1.8	1.5	1.7
South Atlantic:									
Delaware	2.2	2.2	2.7	2.5	2.9	2.7	2.6	2.7	2.0
Maryland	0.7	0.7	0.8	0.9	0.7	0.8	1.2	1.2	0.5
District of Columbia	4.7	4.9	4.6	4.8	4.5	4.7	5.2	5.2	4.6
Virginia	3.4	3.5	3.2	3.3	3.1	3.3	3.9	3.9	3.3
West Virginia	6.9	6.2	5.1	4.7	5.2	4.7	7.3	7.3	6.7
North Carolina	2.9	3.0	3.0	3.1	2.9	3.0	3.3	3.4	2.7
South Carolina	5.0	4.9	5.5	5.3	5.8	5.6	5.5	5.5	4.9
Georgia	3.8	3.6	4.2	3.9	4.2	4.0	4.2	4.3	3.6
Florida	5.6	5.4	6.5	6.2	7.2	6.7	6.0	6.0	5.4
East South Central:									
Kentucky	4.6	4.5	3.8	3.8	3.7	3.7	4.2	4.1	3.8
Tennessee	4.1	3.9	3.8	3.7	3.8	3.6	3.7	3.6	3.3
Alabama	2.2	2.3	1.6	1.7	1.3	1.5	1.8	1.7	1.5
Mississippi	1.3	1.4	0.6	0.8	0.4	0.6	0.9	0.8	0.5
West South Central:									
Arkansas	4.6	4.2	3.3	3.2	3.0	2.9	3.9	3.7	3.7
Louisiana	1.7	1.8	1.9	1.9	1.7	1.7	1.1	0.8	0.8
Oklahoma	2.6	2.7	1.4	1.6	1.0	1.2	2.0	1.8	1.7
Texas	5.1	4.8	5.5	5.1	5.8	5.3	4.5	4.2	4.2
Mountain:									
Montana	1.3	1.3	0.4	0.6	0.3	0.5	0.9	0.9	0.9
Idaho	4.6	4.3	4.0	3.8	4.5	4.2	4.3	4.2	4.2
Wyoming	1.6	1.6	(Z)	0.3	(Z)	0.2	1.2	1.1	1.2
Colorado	2.8	2.7	2.4	2.4	2.2	2.1	2.5	2.4	2.5
New Mexico	8.8	8.0	8.9	8.0	9.5	8.5	8.6	8.5	8.5
Arizona	4.6	4.5	5.1	4.9	5.1	4.9	4.3	4.2	4.3
Utah	0.4	0.3	0.2	0.2	0.1	(Z)	0.2	(Z)	0.1
Nevada	3.8	3.4	4.7	4.1	4.7	4.0	3.4	3.4	3.4
Pacific:									
Washington	2.2	2.3	2.2	2.3	2.0	2.1	2.0	1.8	1.5
Oregon	1.7	1.9	2.0	2.2	2.0	2.1	1.5	1.3	1.0
California	3.5	3.4	4.7	4.4	5.4	5.0	3.3	3.1	2.9
Alaska	9.5	9.6	7.1	7.1	6.8	6.9	9.3	9.1	8.9
Hawaii	6.4	6.2	6.2	6.0	4.9	4.8	6.3	6.0	5.8

Z Less than ± 0.05.

Table F-6. Alternative Estimates of the Percents of Net Underenumeration for the White Female Population, Derived by Demographic Analysis and a Composite of Demographic Analysis and Dual Systems Analysis, for Regions, Divisions, and States: 1970

(See text for explanation of alternative procedures. A minus sign denotes a net overcount)

Region, division, and State	SOR-3-1		SOR-3-2		SOR-3-3		Composite-1	Composite-2	Composite-3
	WCF-1	WEF-1	WCF-2	WEF-2	WCF-3	WEF-3			
United States, total	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Regions:									
Northeast	0.5	0.6	0.4	0.6	0.3	0.5	0.9	1.1	1.1
North Central	0.9	1.0	0.6	0.7	0.5	0.7	0.7	0.7	0.7
South	2.3	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.1
West	2.1	2.0	2.7	2.4	2.9	2.1	1.8	1.1	1.1
Northeast:									
New England	0.3	0.4	0.4	0.6	0.3	0.5	0.6	0.7	0.7
Middle Atlantic	0.5	0.7	0.4	0.7	0.3	0.6	1.0	1.2	1.2
North Central:									
East North Central	0.8	0.9	0.6	0.8	0.5	0.6	0.7	0.8	0.8
West North Central	1.1	1.2	0.6	0.7	0.6	0.7	0.8	0.5	0.5
South:									
South Atlantic	2.0	1.8	2.1	1.9	2.2	2.0	2.4	2.5	2.5
East South Central	2.0	2.0	1.4	1.5	1.3	1.4	1.6	1.5	1.5
West South Central	2.9	2.6	2.8	2.6	2.9	2.6	2.2	2.0	2.0
West:									
Mountain	2.6	2.4	2.5	2.3	2.6	2.3	2.3	2.2	2.2
Pacific	1.9	1.9	2.7	2.5	3.1	2.8	1.7	1.6	1.6
New England:									
Maine	3.2	3.0	2.4	2.3	2.3	2.3	3.4	3.6	3.6
New Hampshire	1.2	1.4	1.3	1.4	1.3	1.4	1.4	1.6	1.6
Vermont	2.1	2.1	1.5	1.6	1.6	1.6	2.3	2.5	2.5
Massachusetts	-0.1	(Z)	-0.1	0.2	-0.2	(Z)	0.1	0.2	0.3
Rhode Island	0.2	0.3	(Z)	0.3	(Z)	0.2	0.4	0.5	0.5
Connecticut	-0.3	-0.2	0.2	0.5	0.1	0.4	(Z)	0.1	0.1
Middle Atlantic:									
New York	0.9	1.1	0.9	1.0	0.7	0.9	1.4	1.6	1.6
New Jersey	-0.4	-0.4	-0.2	(Z)	-0.3	-0.1	0.1	0.3	0.2
Pennsylvania	0.5	0.8	0.2	0.5	0.1	0.4	1.0	1.2	1.2
East North Central:									
Ohio	0.8	0.9	0.6	0.8	0.4	0.6	0.7	0.8	0.8
Indiana	1.0	1.1	0.7	0.8	0.5	0.7	1.0	1.1	1.1
Illinois	0.9	1.1	0.8	1.0	0.7	0.9	0.9	1.0	1.0
Michigan	1.2	1.3	1.3	1.3	1.2	1.3	1.2	1.3	1.3
Wisconsin	-0.8	-0.9	-0.9	-1.0	-1.0	-1.1	-0.8	-0.7	-0.7
West North Central:									
Minnesota	-0.2	-0.1	-0.4	-0.3	-0.4	-0.4	-0.5	-0.8	-0.8
Iowa	1.5	1.6	0.8	1.0	0.7	0.9	1.2	0.9	0.9
Missouri	1.8	1.8	1.7	1.7	1.7	1.7	1.4	1.2	1.2
North Dakota	2.6	2.5	1.0	1.2	1.0	1.1	2.2	2.0	2.0
South Dakota	2.3	2.2	0.9	1.1	0.8	1.0	2.0	1.7	1.7
Nebraska	1.2	1.3	0.5	0.7	0.4	0.6	0.9	0.6	0.6
Kansas	0.5	0.8	-0.2	-0.1	-0.3	-0.1	0.2	-0.1	-0.1
South Atlantic:									
Delaware	2.1	2.1	2.8	2.6	3.1	2.9	2.5	2.6	2.6
Maryland	-0.8	-0.9	-0.7	-0.6	-0.8	-0.7	-0.4	-0.3	-0.3
District of Columbia	2.8	3.0	2.6	2.8	2.5	2.8	3.2	3.2	3.3
Virginia	1.4	1.5	1.0	1.1	0.8	0.9	1.9	1.9	1.9
West Virginia	5.6	4.9	4.1	3.7	4.3	3.8	6.0	6.1	6.1
North Carolina	1.2	1.2	1.2	1.2	1.0	1.1	1.6	1.7	1.7
South Carolina	2.7	2.5	2.9	2.7	3.0	2.7	3.2	3.2	3.2
Georgia	2.6	2.4	2.8	2.6	2.9	2.7	3.0	3.1	3.1
Florida	2.6	2.4	3.4	3.1	3.9	3.5	3.1	3.1	3.1
East South Central:									
Kentucky	2.4	2.3	1.5	1.6	1.4	1.4	2.0	2.0	2.0
Tennessee	2.7	2.5	2.5	2.3	2.5	2.3	2.3	2.3	2.3
Alabama	1.2	1.3	0.6	0.8	0.4	0.6	0.8	0.7	0.7
Mississippi	0.8	1.0	0.1	0.3	-0.1	0.1	0.4	0.3	0.3
West South Central:									
Arkansas	3.6	3.2	2.5	2.4	2.3	2.2	3.0	2.8	2.8
Louisiana	1.2	1.3	1.3	1.4	1.2	1.2	0.6	0.4	0.4
Oklahoma	1.2	1.3	0.2	0.5	-0.1	0.1	0.5	0.4	0.3
Texas	3.5	3.2	3.9	3.5	4.1	3.6	2.9	2.7	2.7
Mountain:									
Montana	1.5	1.6	0.6	0.8	0.5	0.7	1.2	1.1	1.1
Idaho	3.3	3.0	2.8	2.6	3.5	3.2	3.0	2.9	2.9
Wyoming	1.7	1.7	0.2	0.5	0.2	0.4	1.4	1.3	1.3
Colorado	2.2	2.1	2.0	2.0	2.0	1.9	1.9	1.8	1.8
New Mexico	7.1	6.2	7.1	6.3	7.7	6.8	6.8	6.7	6.7
Arizona	2.6	2.5	2.8	2.6	2.5	2.4	2.3	2.2	2.2
Utah	-1.0	-1.1	-1.0	-1.1	-1.2	-1.3	-1.3	-1.4	-1.4
Nevada	3.6	3.2	5.1	4.4	5.6	4.9	3.2	3.1	3.1
Pacific:									
Washington	1.0	1.1	1.1	1.2	0.9	1.1	0.7	0.6	0.6
Oregon	0.4	0.6	0.6	0.8	0.5	0.7	0.1	(Z)	(Z)
California	2.3	2.1	3.3	2.9	3.8	3.4	2.0	1.9	1.9
Alaska	1.2	1.3	-0.9	-0.9	-0.5	-0.4	1.0	0.7	0.8
Hawaii	2.9	2.7	3.5	3.2	2.7	2.5	2.7	2.5	2.5

Z Less than ± 0.05.

Table F-7. Alternative Estimates of the Percents of Net Underenumeration for the Black-and-Other-Races Population, Derived by Demographic Analysis, a Composite of Demographic Analysis and Dual Systems Analysis, and a Modified "Synthetic" Method, for Regions, Divisions, and States: 1970

(See text for explanation of alternative procedures. A minus sign denotes a net overcount)

Region, division, and State	SOR-3-1					SOR-3-2					Composite-1	Composite-2	Composite-3	Modified "synthetic" (median family income)
	WCF-1			WEF-1		WCF-2			WEF-2					
	BACF-1	BAEF-1	BREF-1	BACF-1	BREF-1	BACF-2	BAEF-2	BREF-2	BACF-2	BREF-2				
United States, total	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
Regions:														
Northeast	5.4	4.1	5.5	5.6	4.6	6.2	4.5	4.5	6.4	5.4	5.8	6.9	6.9	5.7
North Central	5.6	4.5	4.9	5.7	4.6	6.2	4.8	4.3	6.3	5.2	5.5	4.9	4.8	5.4
South	7.7	8.3	8.3	7.7	8.5	6.9	7.4	7.8	6.8	7.6	7.7	7.7	7.6	8.5
West	7.6	8.8	6.5	7.5	7.1	8.7	11.2	10.3	8.5	8.8	7.3	6.3	7.3	5.7
Northeast:														
New England	3.4	2.4	2.8	3.5	2.2	4.3	2.9	2.5	4.5	3.1	3.6	4.6	4.7	5.7
Middle Atlantic	5.6	4.3	5.8	5.8	4.9	6.4	4.7	4.7	6.6	5.6	6.0	7.2	7.1	5.7
North Central:														
East North Central	5.2	4.0	4.2	5.3	4.0	5.9	4.3	3.6	6.0	4.7	5.1	4.6	4.3	5.2
West North Central	7.4	7.1	8.1	7.5	7.5	7.7	7.0	7.2	7.7	7.6	7.1	6.3	7.4	6.3
South:														
South Atlantic	8.2	8.5	8.8	8.2	8.7	7.7	8.1	8.4	7.7	8.2	8.5	8.1	8.1	7.7
East South Central	6.7	6.5	7.3	6.7	7.7	4.9	4.0	5.0	5.0	5.4	6.3	7.0	6.7	10.4
West South Central	7.6	9.1	8.0	7.5	8.8	6.8	8.3	8.8	6.7	7.9	7.1	7.6	7.2	9.1
West:														
Mountain	10.5	13.1	10.7	10.3	11.2	11.3	13.9	13.7	11.1	12.0	10.3	9.3	10.3	6.5
Pacific	7.1	8.0	5.8	7.0	6.4	8.3	10.8	9.7	8.1	8.3	6.8	5.8	6.8	5.6
New England:														
Maine	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)
New Hampshire	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)
Vermont	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)
Massachusetts	4.0	3.0	3.4	4.1	2.7	4.7	3.3	2.9	4.9	3.4	4.2	5.2	5.3	6.1
Rhode Island	7.8	6.8	10.5	7.9	8.4	9.7	8.4	10.0	9.9	10.4	7.9	8.9	9.0	6.8
Connecticut	0.6	-0.4	-1.3	0.7	-1.2	2.2	0.6	-0.3	2.4	0.4	0.8	1.8	1.9	5.5
Middle Atlantic:														
New York	5.6	4.2	5.8	5.7	5.0	6.4	4.6	4.6	6.5	5.8	6.0	7.1	7.1	5.9
New Jersey	6.1	5.1	6.5	6.1	5.1	7.6	6.1	6.0	7.8	6.6	6.4	7.7	7.5	5.6
Pennsylvania	5.4	4.0	5.3	5.6	4.4	5.6	3.8	3.6	5.8	4.3	5.7	6.9	6.8	6.0
East North Central:														
Ohio	4.0	2.5	2.5	4.1	2.8	4.3	2.4	1.8	4.5	3.1	3.9	3.4	3.0	5.6
Indiana	6.4	5.5	5.7	6.5	5.8	6.7	5.1	4.8	6.8	5.9	6.4	5.9	5.5	5.5
Illinois	6.6	5.3	6.3	6.7	5.4	7.5	5.8	5.2	7.6	6.3	6.5	6.0	5.7	5.5
Michigan	4.2	3.1	2.5	4.3	2.8	5.0	3.8	2.9	5.1	3.7	4.1	3.6	3.2	5.1
Wisconsin	3.0	2.2	2.0	2.9	1.4	3.9	2.7	1.7	3.8	2.2	3.0	2.3	2.1	5.7
West North Central:														
Minnesota	3.2	2.3	1.5	3.3	1.1	3.8	2.5	1.1	3.8	1.6	3.0	2.0	3.2	5.9
Iowa	4.2	3.7	3.1	4.3	4.0	4.2	2.6	2.5	4.4	3.6	3.9	3.1	4.2	6.1
Missouri	7.8	7.7	8.7	7.8	8.2	8.4	8.1	8.5	8.4	8.8	7.5	6.7	7.8	6.5
North Dakota	8.2	8.8	7.9	8.1	8.1	5.2	4.0	3.7	5.3	4.5	8.0	7.0	8.2	8.8
South Dakota	15.5	15.8	17.2	15.4	15.4	16.0	15.0	14.6	16.1	15.3	15.3	14.4	15.5	10.9
Nebraska	9.5	8.8	10.3	9.6	8.9	10.5	9.2	8.7	10.6	9.4	9.3	8.4	9.5	6.6
Kansas	5.7	4.6	6.5	5.9	5.6	4.3	2.9	3.5	4.5	4.0	5.4	4.6	5.7	6.9
South Atlantic:														
Delaware	6.5	6.6	5.5	6.5	5.5	7.0	8.1	6.8	6.9	6.3	6.8	6.4	6.4	6.7
Maryland	7.8	6.9	8.3	7.8	6.6	9.3	8.0	7.5	9.4	8.0	8.1	7.7	7.7	5.6
District of Columbia	6.0	4.6	5.5	6.2	4.7	5.8	4.0	3.4	6.0	4.4	6.3	5.8	5.8	5.1
Virginia	6.7	6.1	6.2	6.7	6.4	6.1	4.6	4.6	6.2	5.5	7.0	6.5	6.5	7.5
West Virginia	7.5	16.1	6.9	6.9	12.3	5.0	9.7	10.9	4.5	8.0	7.9	7.4	7.4	8.8
North Carolina	7.6	6.8	8.5	7.6	8.0	6.4	5.4	6.1	6.4	6.8	7.9	7.4	7.4	9.0
South Carolina	10.2	11.6	11.6	10.1	11.9	8.3	10.0	11.0	8.2	10.1	10.5	10.1	10.1	9.8
Georgia	9.7	11.0	11.0	9.5	11.3	8.5	10.2	11.2	8.4	10.2	10.0	9.5	9.6	9.1
Florida	8.6	9.8	8.5	8.5	9.0	9.2	11.9	11.8	9.0	10.3	8.9	8.4	8.4	8.7
East South Central:														
Kentucky	4.4	5.5	4.1	4.3	6.4	3.7	2.9	4.3	3.7	4.9	4.0	4.7	4.4	8.4
Tennessee	7.1	8.7	7.2	6.9	8.5	6.2	7.4	8.1	6.1	7.5	6.7	7.4	7.1	8.9
Alabama	6.3	5.4	6.9	6.3	7.2	4.4	2.6	3.7	4.5	4.8	5.9	6.6	6.3	10.7
Mississippi	7.5	6.4	8.7	7.6	8.0	4.7	3.3	4.1	4.9	4.6	7.2	7.9	7.5	13.5
West South Central:														
Arkansas	14.6	17.3	17.7	14.4	17.0	11.6	12.5	13.8	11.5	13.3	14.2	14.7	14.2	12.5
Louisiana	6.7	5.9	7.2	6.8	7.1	5.6	4.9	5.5	5.7	6.0	6.2	6.7	6.3	10.8
Oklahoma	7.2	6.1	9.0	7.3	7.7	6.8	5.3	6.2	7.0	6.8	6.7	7.2	6.8	8.9
Texas	6.5	9.7	5.6	6.2	8.0	6.4	10.3	10.5	6.1	8.2	5.9	6.5	6.0	8.0
Mountain:														
Montana	10.3	9.7	10.9	10.3	9.7	9.7	8.5	8.3	9.8	8.9	10.1	9.1	10.1	8.7
Idaho	-1.2	1.3	-5.7	-1.4	-1.2	-0.8	0.7	-0.2	-1.0	-0.9	-1.5	-2.5	-1.5	6.7
Wyoming	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)	(B)
Colorado	3.1	3.6	1.8	3.0	4.0	3.4	3.5	4.1	3.4	4.1	2.8	1.8	2.8	5.8
New Mexico	11.0	19.6	10.0	10.4	13.4	11.2	19.9	19.4	10.6	13.6	10.8	9.8	10.8	9.4
Arizona	14.6	15.4	16.0	14.5	14.9	14.7	15.6	15.7	14.6	15.2	14.4	13.5	14.4	9.1
Utah	9.0	8.4	10.0	8.9	7.9	9.4	8.5	7.6	9.4	8.0	8.8	7.8	8.8	6.5
Nevada	12.8	15.2	13.0	12.6	12.7	19.6	23.8	22.7	19.3	20.1	12.6	11.7	12.6	6.2
Pacific:														
Washington	9.9	8.7	10.8	10.0	8.8	11.5	10.3	9.8	11.6	10.6	9.7	8.7	9.7	5.0
Oregon	6.2	5.0	5.5	6.4	3.8	7.4	5.7	4.1	7.5	5.1	6.0	4.9	5.9	5.8
California	6.8	7.7	5.7	6.7	6.4	8.5	11.1	10.3	8.2	8.9	6.6	5.6	6.5	5.2
Alaska	12.9	12.0	13.6	12.9	11.0	12.1	11.2	9.6	12.1	10.0	12.7	11.7	12.7	6.7
Hawaii	6.5	9.0	3.1	6.3	5.3	5.9	9.7	7.2	5.5	5.1	6.3	5.3	6.2	3.6

B Enumerated population less than 10,000.
Z Less than ± 0.05.

Appendix G

Expected Sex Ratios and Census Sex Ratios for White and Black-and-Other-Races Population, for Regions, Divisions, and States, by Age in 1970

Table G-1. Expected Sex Ratios and Census Sex Ratios for the White Population, for Regions, Divisions, and States, by Age: 1970

(Expected sex ratios based on estimate series SOR-3-1, WCF-1. Sex ratios represent males per 100 females)

Region, division, and State	All ages			Under 35 years			35 to 64 years			65 years and over		
	Expected sex ratio	Census sex ratio	Difference[1]	Expected sex ratio	Census sex ratio	Difference[1]	Expected sex ratio	Census sex ratio	Difference[1]	Expected sex ratio	Census sex ratio	Difference[1]
United States, total	96.3	95.3	-1.0	102.2	101.4	-0.9	95.6	93.6	-2.0	70.7	71.5	+0.7
Regions:												
Northeast	93.6	93.0	-0.7	100.5	99.8	-0.7	93.0	91.6	-1.4	67.5	68.4	+0.9
North Central	95.9	95.4	-0.6	101.1	100.6	-0.6	95.8	94.7	-1.2	71.8	72.5	+0.6
South	97.6	95.9	-1.6	103.9	102.6	-1.2	95.7	92.7	-3.0	71.7	72.5	+0.8
West	98.9	97.6	-1.3	103.6	102.7	-0.9	99.0	96.3	-2.7	72.5	73.1	+0.6
Northeast:												
New England	94.4	93.4	-1.0	101.8	100.8	-0.9	94.0	92.0	-2.0	64.4	65.1	+0.7
Middle Atlantic	93.4	92.8	-0.6	100.0	99.4	-0.6	92.6	91.4	-1.2	68.6	69.6	+1.0
North Central:												
East North Central	96.0	95.3	-0.6	101.0	100.4	-0.6	95.8	94.6	-1.2	71.4	71.9	+0.5
West North Central	95.9	95.4	-0.5	101.6	101.0	-0.6	96.0	94.9	-1.2	72.7	73.5	+0.8
South:												
South Atlantic	97.9	96.0	-1.9	104.6	103.2	-1.3	96.0	92.2	-3.8	71.8	72.6	+0.8
East South Central	96.9	95.6	-1.4	103.5	102.1	-1.4	94.5	92.4	-2.1	71.3	72.3	+1.0
West South Central	97.5	96.2	-1.3	103.1	102.1	-1.0	96.1	93.8	-2.3	71.8	72.4	+0.6
West:												
Mountain	99.2	98.1	-1.1	102.0	101.4	-0.7	99.3	96.8	-2.5	80.4	81.2	+0.7
Pacific	98.8	97.4	-1.4	104.2	103.2	-1.0	98.9	96.2	-2.7	70.2	70.8	+0.6
New England:												
Maine	95.6	95.0	-0.6	101.5	101.8	+0.4	96.6	93.1	-3.4	70.0	70.9	+0.9
New Hampshire	96.9	95.6	-1.3	102.6	102.1	-0.5	98.4	94.3	-4.2	68.2	69.0	+0.8
Vermont	96.2	95.6	-0.6	102.7	101.7	-1.0	95.2	94.7	-0.5	68.9	68.9	(Z)
Massachusetts	92.8	91.6	-1.1	100.6	99.6	-1.0	92.8	90.5	-2.3	61.6	62.3	+0.7
Rhode Island	97.0	95.9	-1.2	108.0	107.0	-1.0	92.9	90.4	-2.5	64.7	65.5	+0.8
Connecticut	95.2	94.4	-0.7	101.7	100.4	-1.3	94.5	94.0	-0.5	66.6	67.5	+0.9
Middle Atlantic:												
New York	92.8	92.2	-0.5	99.4	98.9	-0.5	92.0	90.8	-1.3	68.5	69.6	+1.1
New Jersey	95.0	94.2	-0.8	101.2	100.6	-0.6	95.1	93.4	-1.7	67.9	68.8	+0.9
Pennsylvania	93.4	92.8	-0.6	100.2	99.5	-0.8	92.1	91.2	-0.9	69.2	69.9	+0.8
East North Central:												
Ohio	95.4	94.5	-1.0	100.1	99.6	-0.5	96.1	93.8	-2.4	69.6	70.0	+0.3
Indiana	95.8	95.3	-0.5	101.2	100.7	-0.6	95.1	94.4	-0.7	69.2	70.0	+0.8
Illinois	95.1	94.9	-0.2	101.4	100.8	-0.5	94.6	94.6	-0.1	68.9	69.5	+0.6
Michigan	97.3	96.4	-0.9	101.2	100.4	-0.8	97.0	95.3	-1.7	75.7	76.1	+0.4
Wisconsin	96.7	96.4	-0.3	101.3	100.8	-0.6	96.3	95.8	-0.4	76.5	77.3	+0.8
West North Central:												
Minnesota	96.6	96.0	-0.6	100.5	99.7	-0.8	97.4	96.4	-1.0	76.0	76.8	+0.8
Iowa	94.8	94.6	-0.2	100.7	100.4	-0.2	95.2	94.5	-0.7	71.1	71.9	+0.8
Missouri	94.1	93.7	-0.5	101.0	100.9	-0.2	93.6	92.1	-1.5	69.4	70.2	+0.9
North Dakota	101.2	101.8	+0.6	103.9	104.5	+0.6	101.7	102.0	+0.3	86.7	87.8	+1.2
South Dakota	99.4	98.5	-0.9	103.5	102.2	-1.3	100.0	98.8	-1.2	81.2	82.7	+1.5
Nebraska	95.4	95.5	+0.1	100.2	100.7	+0.5	96.6	96.0	-0.7	73.7	74.0	+0.4
Kansas	97.7	96.1	-1.6	105.3	103.2	-2.1	96.8	94.8	-2.0	70.1	71.1	+1.0
South Atlantic:												
Delaware	95.7	95.6	-0.1	100.3	100.4	+0.1	96.7	95.9	-0.8	66.3	66.6	+0.3
Maryland	97.6	96.1	-1.5	102.4	101.4	-1.0	98.4	95.7	-2.7	66.4	65.6	-0.7
District of Columbia	83.7	82.0	-1.7	99.0	98.1	-0.9	84.9	82.2	-2.7	57.1	52.8	-4.3
Virginia	100.4	98.3	-2.0	106.9	105.2	-1.8	98.3	95.3	-3.0	67.3	66.7	-0.6
West Virginia	95.4	94.1	-1.3	101.5	99.7	-1.9	91.9	90.9	-1.0	77.4	78.5	+1.1
North Carolina	98.7	97.0	-1.7	106.4	104.7	-1.7	94.8	92.5	-2.4	67.6	68.4	+0.8
South Carolina	101.2	98.8	-2.4	109.6	107.2	-2.4	96.8	93.4	-3.3	63.3	64.7	+1.4
Georgia	97.9	96.7	-1.2	104.1	103.4	-0.6	96.8	94.3	-2.4	63.8	64.2	+0.4
Florida	96.4	93.5	-2.9	102.8	101.8	-1.0	95.0	87.1	-7.9	80.8	82.8	+2.0
East South Central:												
Kentucky	98.7	96.5	-2.2	105.3	102.8	-2.4	95.9	93.1	-2.9	74.3	75.3	+1.0
Tennessee	96.0	94.7	-1.3	102.8	101.5	-1.3	93.4	91.4	-2.0	70.0	71.0	+1.1
Alabama	96.2	95.2	-1.0	102.7	101.5	-1.2	94.0	92.7	-1.3	69.2	70.1	+0.9
Mississippi	96.8	96.4	-0.5	103.2	103.3	0.2	95.4	93.1	-2.3	71.2	72.4	+1.2
West South Central:												
Arkansas	96.0	95.0	-1.0	101.5	100.8	-0.7	94.2	92.1	-2.1	78.3	79.5	+1.2
Louisiana	97.2	96.8	-0.5	103.4	102.9	-0.5	94.9	94.1	-0.7	68.4	68.8	+0.5
Oklahoma	96.8	95.4	-1.4	104.5	103.0	-1.5	94.8	92.7	-2.2	71.8	72.5	+0.7
Texas	97.9	96.4	-1.6	103.0	101.8	-1.1	97.1	94.3	-2.8	71.3	71.7	+0.4
Mountain:												
Montana	99.6	99.8	+0.2	100.6	101.8	+1.1	102.7	101.2	-1.6	85.5	85.6	+0.1
Idaho	100.9	99.6	-1.3	103.0	102.2	-0.8	101.8	98.9	-2.9	85.7	86.2	+0.5
Wyoming	100.4	100.6	+0.1	103.0	102.5	-0.4	100.3	101.3	+0.9	86.3	86.8	+0.5
Colorado	97.9	97.2	-0.6	101.6	101.9	+0.3	98.8	95.9	-2.9	72.3	73.1	+0.8
New Mexico	99.4	97.5	-1.9	101.9	100.4	-1.5	98.4	95.4	-2.9	83.3	83.0	-0.2
Arizona	98.7	96.7	-2.0	103.1	101.2	-1.9	95.9	92.3	-3.6	82.3	84.5	+2.2
Utah	98.8	97.4	-1.4	101.5	100.0	-1.5	98.8	97.1	-1.6	77.9	77.4	-0.5
Nevada	103.4	103.1	-0.2	101.8	102.0	0.2	107.5	106.4	-1.1	97.3	97.1	-0.2
Pacific:												
Washington	99.7	98.5	-1.2	103.9	103.3	-0.6	100.7	97.7	-3.0	74.7	75.2	+0.5
Oregon	97.2	95.9	-1.3	101.4	99.7	-1.7	97.1	95.8	-1.4	77.8	78.7	+0.9
California	98.0	96.8	-1.3	103.8	103.0	-0.8	98.0	95.4	-2.6	68.2	68.8	+0.7
Alaska	134.2	122.9	-11.3	128.3	121.3	-7.0	150.0	127.2	-22.8	(B)	(B)	(B)
Hawaii	121.1	116.7	-4.4	122.4	120.5	-1.9	124.6	113.7	-10.9	(B)	(B)	(B)

B Base less than 10,000 females.
Z Less than ± 0.05.
[1]A minus sign (-) denotes a deficit, and a plus sign (+) denotes an excess, in the census sex ratio.

Table G-2. Expected Sex Ratios and Census Sex Ratios for the Black-and-Other-Races Population, for Regions, Divisions, and States, for All Ages and Under 35 Years of Age: 1970

(Expected sex ratios based on estimate series SOR-3-1, WCF-1, BACF-1. Sex ratios represent males per 100 females)

Region, division, and State	All ages			Under 35 years		
	Expected sex ratio	Census sex ratio	Difference[1]	Expected sex ratio	Census sex ratio	Difference[1]
United States, total	95.7	91.6	-4.0	98.8	95.6	-3.2
Regions:						
Northeast	91.9	88.2	-3.7	94.2	92.2	-2.0
North Central	95.2	91.5	-3.8	96.4	93.9	-2.5
South	95.4	91.1	-4.3	100.5	96.2	-4.2
West	102.8	99.1	-3.7	102.1	100.2	-1.9
Northwest:						
New England	95.5	91.8	-3.7	96.4	94.8	-1.5
Middle Atlantic	91.5	87.8	-3.7	94.0	91.9	-2.0
North Central:						
East North Central	95.0	91.3	-3.7	95.8	93.4	-2.5
West North Central	96.2	92.5	-3.8	99.4	96.7	-2.7
South:						
South Atlantic	96.0	91.7	-4.3	100.6	96.5	-4.1
East South Central	93.6	89.3	-4.3	100.3	95.5	-4.8
West South Central	95.8	91.4	-4.4	100.5	96.4	-4.1
West:						
Mountain	104.4	99.3	-5.1	104.7	100.8	-3.9
Pacific	102.5	99.0	-3.5	101.6	100.1	-1.5
New England:						
Maine	(B)	(B)	(B)	(B)	(B)	(B)
New Hampshire	(B)	(B)	(B)	(B)	(B)	(B)
Vermont	(B)	(B)	(B)	(B)	(B)	(B)
Massachusetts	94.4	90.0	-4.5	95.1	92.8	-2.3
Rhode Island	111.5	105.6	-6.0	117.6	114.5	-3.2
Connecticut	92.2	90.4	-1.9	92.2	92.6	+0.4
Middle Atlantic:						
New York	90.5	87.0	-3.5	93.0	91.5	-1.5
New Jersey	93.9	89.5	-4.4	96.0	92.8	-3.3
Pennsylvania	92.1	88.3	-3.8	94.4	92.1	-2.3
East North Central:						
Ohio	94.7	90.4	-4.3	96.0	92.7	-3.3
Indiana	96.2	92.5	-3.7	98.4	95.4	-3.0
Illinois	93.3	89.7	-3.6	94.1	92.0	-2.1
Michigan	97.3	93.6	-3.7	97.4	95.0	-2.3
Wisconsin	96.4	94.1	-2.4	95.5	94.9	-0.6
West North Central:						
Minnesota	102.8	99.0	-3.8	100.8	98.8	-2.1
Iowa	99.7	94.6	-5.1	101.2	97.4	-3.8
Missouri	93.0	89.3	-3.7	96.9	94.2	-2.7
North Dakota	(B)	(B)	(B)	(B)	(B)	(B)
South Dakota	102.6	98.4	-4.3	102.6	99.6	-3.0
Nebraska	97.2	94.2	-3.0	98.0	97.0	-1.0
Kansas	101.6	97.7	-4.0	106.8	103.9	-2.9
South Atlantic:						
Delaware	95.2	92.8	-2.4	95.1	94.4	-0.7
Maryland	98.1	93.2	-5.1	99.3	94.8	-4.5
District of Columbia	92.6	88.7	-3.9	94.8	92.0	-2.8
Virginia	99.6	95.0	-4.5	103.6	99.0	-4.5
West Virginia	92.5	88.6	-4.0	98.9	94.7	-4.2
North Carolina	96.3	92.5	-3.7	102.1	98.6	-3.5
South Carolina	96.5	91.5	-5.0	103.7	98.2	-5.5
Georgia	93.4	88.8	-4.6	100.5	95.8	-4.7
Florida	95.9	91.9	-4.0	98.8	95.3	-3.4
East South Central:						
Kentucky	97.5	93.6	-4.0	105.9	101.6	-4.3
Tennessee	92.6	88.6	-4.0	98.0	94.0	-4.0
Alabama	92.6	88.1	-4.5	100.1	94.9	-5.2
Mississippi	94.5	90.1	-4.4	100.7	95.6	-5.1
West South Central:						
Arkansas	96.5	90.0	-6.5	103.6	95.9	-7.7
Louisiana	94.6	90.2	-4.3	99.8	95.4	-4.3
Oklahoma	95.8	90.9	-4.9	100.8	97.4	-3.4
Texas	96.6	92.8	-3.8	100.1	97.2	-3.0
Mountain:						
Montana	107.4	101.0	-6.4	106.9	101.5	-5.4
Idaho	(B)	(B)	(B)	(B)	(B)	(B)
Wyoming	(B)	(B)	(B)	(B)	(B)	(B)
Colorado	107.8	102.2	-5.6	111.9	107.5	-4.4
New Mexico	98.4	94.2	-4.2	97.6	94.5	-3.1
Arizona	104.2	98.0	-6.2	104.5	98.9	-5.6
Utah	(B)	(B)	(B)	(B)	(B)	(B)
Nevada	103.9	99.6	-4.3	101.9	98.9	-3.0
Pacific:						
Washington	108.9	104.6	-4.4	108.4	105.7	-2.7
Oregon	100.0	97.8	-2.2	97.1	97.6	+0.5
California	101.3	97.5	-3.8	101.0	99.1	-1.9
Alaska	109.0	111.2	2.2	105.4	109.9	+4.4
Hawaii	105.5	102.9	-2.6	101.9	101.6	-0.3

B Base less than 10,000 females.

[1]A minus sign(-) denotes a deficit, and a plus sign (+) denotes an excess, in the census sex ratio.

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