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**Procedural Difficulties in Taking Past Censuses
in Predominantly Negro, Puerto Rican, and Mexican Areas**

Leon Pritzker
N.D. Rothwell

U.S. Census Bureau
Washington, D.C. 20233

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PROCEDURAL DIFFICULTIES IN TAKING PAST CENSUSES IN
PREDOMINANTLY NEGRO, PUERTO RICAN, AND MEXICAN AREAS

Leon Pritzker and N. D. Rothwell
U. S. Bureau of the Census

Introduction

We have tampered with our assigned topic by expanding in one area and contracting in another. Our expanded topic includes census-taking problems that affect the entire population, although we shall emphasize the impact of these problems on statistics for Negroes particularly, and for Puerto Ricans and Mexicans mostly by indirection since we have limited knowledge about particular procedural problems for them. In contracting, we shall limit ourselves to problems in data collection that affect counting, although we know these problems are related to and occasionally indistinguishable from problems in collecting accurate age, sex, relationship, income, and other data. We are also aware that we are slighting significant procedural difficulties in other stages of a census such as data processing, which, for example, affects the counts of persons with Spanish surnames or Mexican persons.

Historical Perspective

Having thus redefined the assignment, let us start with a brief

historical review. George Washington observed the conduct of the first United States Census in 1790 and commented:

Returns of the Census have already been made from several of the States and a tolerably just estimate has been formed now in others, by which it appears that we shall hardly reach four millions; but one thing is certain our real numbers will exceed, greatly, the official returns of them; because the religious scruples of some, would not allow them to give in their lists; the fears of others that it was intended as the foundation of a tax induced them to conceal or diminished theirs, and thro' the indolence of the people, and the negligence of many of the Officers numbers are omitted.¹

In contrast to George Washington's view, perhaps the most complacent attitude toward a census was expressed by the Superintendent of the Census in 1860, Joseph C. G. Kennedy:

It is evident that the population in all varieties of young and old, male and female, was a present and visible fact to the enumerator, with scarce a chance of omission. . . .

Fortunately for the interests of statistics, the unhappy insurrection which developed itself so soon after the eighth decennial enumeration was completed, was not the occasion of the detention or loss of any of the returns, and we are enabled to present a true statement of the condition of the population immediately preceding the lamentable civil war. . . .²

The succeeding Superintendent of the Census in 1870, General Francis A. Walker, expressed very different and what, for his time, were unorthodox official opinions:

¹ John C. Fitzpatrick, ed., The Writings of George Washington (Washington, D. C.: U. S. Government Printing Office, 1939), Vol. 31, p. 329.

² Census Office, 8th Census, 1860, Population of the United States in 1860, pp. iii and xlii.

More of the error inevitably enters, through the inadequacy of the provisions of the existing census law, than is pleasant to contemplate. The protracted system of enumeration is essentially vicious, and it is not possible to cure the evil by any course of administrative treatment. . . .

Now where the enumeration of a people is extended over such a period of time, a de facto enumeration is of course impossible. . . . The most familiar illustration is that of a ward of a city. The enumeration commencing on the 1st of June, and being protracted until the 10th of September, a family moving on the 1st of July or the 1st of August from a portion of a ward not yet visited by the assistant marshal, into a portion of another ward where the assistant marshal has already made his rounds, will of course escape enumeration, unless the head of the family so thoroughly appreciates the importance of the census as to be at pains to hunt up the proper person and offer information, some portions of which are never given without considerable reluctance. It is assuming more than is fair, to suppose that one out of a hundred persons so situated will be at this trouble to perform a duty necessarily more or less unpleasant. When it is considered how many thousands of persons in every large city, how many tens of thousands in a city like New York, not only live in boarding-houses, but change their boarding-houses at every freak of fancy or disgust, not to speak of those who leave under the stress of impecuniosity and therefore are not likely to leave their future address or advertise their residence, it will be seen how utterly unfitted is such a system of enumeration to the social conditions of the country at the present time. . . .³

In General Walker's complaints about the "essential viciousness of a protracted enumeration" he touched on a number of problems related to the fact that a primary use of census statistics is for political apportionment. Hence, people are supposed to be enumerated as if they remained in what was their usual residence at the time of the start of the census. That place becomes less easily determined

³Census Office, 9th Census, 1870, Vol. I., The Statistics of the Population of the United States, pp. xxi-xxii.

for mobile people as the enumeration continues beyond the official date, and, furthermore, the possibility of omissions and double enumerations of persons increases.

Although General Washington's and General Walker's views were rare exceptions, they provide historical background for a number of current ideas. First, enumeration of what General Walker referred to as impecunious people in cities has always been difficult, regardless of their particular ethnic or racial identification. Second, sources of difficulties are multiple and interrelated: some difficulties are contributed by the nature of the population to be enumerated--the living arrangements, mobility, and attitudes; some can be attributed to failures of the staff responsible for taking the census; some are related to the nature of the inquiries, the types of questions, and their formulation; others arise from the nature of the task to be completed--a count made as of a fixed date and based on the usual residence of each inhabitant.

These current ideas are in sharp contrast to the one prevailing in the nineteenth century that census statistics are correct by definition. That view is illustrated in the following quotation about the Census of 1900:

The population of the area of enumeration, June 1, 1900, according to the Twelfth Census was 76,303,387. A careful census is like a decision by a court of last resort--there is no higher or equal authority to which to appeal. Hence there is no trustworthy means of determining the degree of error to which a census count of population is exposed, or the accuracy with which any particular census is taken. . . .⁴

⁴Census Office, 12th Census, 1900, Special Reports: Supplementary Analysis and Derivative Tables, p. 16.

Post-Enumeration Surveys

For a long time the assumption of correctness precluded critical inquiry by the Census Bureau itself about the accuracy of its own procedures. There was, however, some independent investigation by demographers, including some at the Bureau during the 1930's and 1940's. Yet, it was not until 1950, after the development of sampling theory, techniques, and procedures during the preceding decades, that the Bureau officially took a major step toward discarding the assumption of correctness in census statistics. Sampling theory contributed theories of errors and recognition of errors by users of statistics. More importantly, sampling provided a tool for measuring the accuracy of census data.

Planners of the 1950 sample Post-Enumeration Survey (PES), like their predecessors, assumed that census methodology was basically sound but recognized that there might be some flaws in execution. They believed that the traditional system of having enumerators conduct a canvass and interview in every household required improvement but they did not believe that it required radical change. Their initial hypotheses were that shortcomings of census field procedures, and consequent inaccuracies in the enumeration, were due to some poorly qualified enumerators who were inadequately trained, paid piecework wages, rushed through their assignments with insufficient supervision, who had to interview with less than ideal questionnaires, and who often accepted secondhand information from a housewife about other household members.

Accordingly, the PES was undertaken "to evaluate the coverage

and accuracy of responses obtained in the census."⁵ A sample of areas was recanvassed in a search for living quarters missed in the census enumeration. A second sample consisted of living quarters enumerated in the census which were then re-enumerated. Consistent with hypotheses about sources of error, the following features were incorporated in the reinterviews:

1. The PES population information was obtained whenever possible from the "best" respondent, even if this involved repeated call-backs. Information on personal characteristics for an adult was to be obtained from the person himself, whereas in the census information for all members of a household was obtained from any responsible member of the household who happened to be at home when the enumerator called.
2. For several items, the PES made use of detailed "probing" questions, in contrast to the more summary form of questions used in the census.
3. Superior interviewers were selected, and given more intensive training and closer supervision than was possible for the 140,000 enumerators used in the census.
4. The PES interviewers were paid hourly rates, instead of the piece rates used in the census.
5. The PES information was compared with the census information on a case-by-case basis by the PES interviewer in the field, immediately following the PES interview. An explanation of any discrepancies was sought from the respondent, and appropriate changes made in the reinterview results where needed.⁶

The intensive procedures employed for the PES made it cost roughly

⁵Morris H. Hansen and Leon Pritzker, "The Post-Enumeration Survey of the 1950 Census of Population: Some Results, Evaluation and Implications." Paper presented at the Annual Meeting of the Population Association of America, Ann Arbor, Michigan, May 1956 (unpublished; reproduced as PES Results Memorandum No. 54).

⁶U. S. Bureau of the Census, "The Post-Enumeration Survey: 1950," Bureau of the Census, Technical Paper No. 4 (Washington, D. C., 1960).

20 times as much per person as the original Census enumeration. Yet, results measured against bench marks of demographic analysis, like those presented by J. S. Siegel (in his paper in this volume), appear to have shown that the PES had uncovered only about 40 percent of the net underenumeration--that is, less than half of the difference between the "true" count and the Census count. The words "appear to have shown" are used here because it is possible that the estimation procedure introduced a bias, which resulted in an underestimate of the number of persons found in the PES who should legitimately have been included in the census.⁷

Estimates from the PES were that approximately 3.4 million persons, or 2.5 percent of the population, had been erroneously omitted and 1.3 million persons, amounting to about 1.0 percent of the population, had been erroneously included in the 1950 Census. Thus, the net

⁷The PES provided estimates of the difference between the true count of the population and the enumerated count by age, sex, color, etc. The estimates are algebraic sums of two component estimates--persons missed in the census and persons erroneously enumerated. It has not been feasible to obtain unbiased estimates of these components for the United States as a whole because of the enormous difficulties of searching and matching against an entire census. Our procedure has been to match only against the records of the enumeration district in which an error was alleged to have occurred. Thus we have counted a person as missed if he was not enumerated in the district in which he should have been, even though he was enumerated somewhere else. We have counted a person as overenumerated if he was counted in the district in which he should not have been counted, even though he was not enumerated anywhere else. The algebraic sum of the component estimates made on this basis would give an unbiased estimate of the net difference between the census count and the true count, provided that a completely consistent view was taken of the people who were enumerated once but in the "wrong" enumeration district. We believe that the procedure we adopted did not result in a completely consistent approach, and that the resulting bias was in the direction of understating the net census undercount. This matter is being investigated further.

undercount measured by the survey was about 2 million persons, or 1.5 percent, while the estimates based on demographic analysis showed an undercount of about 3.5 percent for 1950. Although the PES indicated that the Census was more likely to have missed nonwhite than white persons--it showed a 3.3 percent undercount for nonwhites as compared with 1.2 percent for whites--the age-sex-color distributions obtained by the survey closely resembled those of the census. The same relatively high deficiencies of young nonwhite males that existed in the census age-sex-color distributions also existed in the PES statistics.

Our explanation for what might be viewed as a failure of improved execution of traditional data collection techniques to reveal the extent of the census undercount indicates much about the nature and source of the failure:

There are two ways in which people can be missed in a census. One occurs when a building, apartment, or other living quarter is missed. The people who occupy that space are missed as a consequence. The second occurs when all the living space is enumerated but not all of the occupants--either because the enumerators or respondents are confused by the application of residence rules or the definition of a household, or because respondents deliberately withhold information, or because, as we shall see later, they are poorly informed.

Analysis showed that the PES was very successful in finding space that the original census enumerator

had missed but was much less effective in uncovering missed persons--those residing in previously enumerated space who were unreported and those without any clearly recognizable place of residence.

The evidence for this generalization was not as firm for 1950 as it subsequently has become, because there was some question about the effect of timing of the 1950 PES on its results. The survey was conducted three or four months after the census enumeration, and its failure to identify persons who should have been but were not enumerated can be attributed to the time lag. In 1960, however, a post-enumeration survey was conducted much closer to the census date and similar results were observed.

In 1960, as in 1950, the post-enumeration survey estimates of census undercounts, particularly for nonwhite people, fell short of those indicated by demographic analysis.⁸ The 1960 survey estimates were that the net deficiency in the count of white persons was 1.6 percent and of nonwhites 3.8 percent, as contrasted with demographic analysis estimates of undercoverage of 2.2 percent for whites and 10.5 percent for nonwhites.⁹ Again, re-enumeration was more success-

⁸In 1960, however, the estimate of underenumeration of white females from the post-enumeration survey of 1.7 percent was almost identical with the estimate of 1.6 percent based on demographic analysis.

⁹Eli 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, American Statistical Association (1966), pp. 62-70. 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, American Statistical Association (1966), pp. 71-85 (this paper is reproduced in the appendix to the present volume.

ful in identifying missed living quarters than missed persons within already enumerated quarters. A little more than half of those identified as missed in the 1960 Census were in missed living quarters. Other noteworthy similarities between the 1960 and 1950 results that are pertinent to the identification of procedural difficulties might be mentioned. Re-enumeration results showed that census enumerators tended to miss a higher proportion of living quarters in rural areas and in cities with a population of more than a million than they did in suburbs, smaller cities, and towns.¹⁰ They also indicated that persons loosely attached to households, members of the extended family and nonrelatives, were more likely than the head of household, wife, or children to be missed in the census. "Lodgers" showed a particularly high rate of net deficiency.¹¹

Some new analysis has shown that a previously suspected source of underenumeration within households was, in fact, responsible for a disproportionate amount of it. This was from what are called "close-out cases," households to which enumerators were not able to gain access even after an initial call and two call-backs. In 1960 such households amounted to about 3 percent of all households in the United States as a whole but 5 percent in cities of 50,000 or more. Enumerators went back to these households to learn what they could from neighbors, janitors, or other people about the number of occupants

¹⁰U. S. Bureau of the Census, "Housing Unit Coverage Errors by Type of Geographic Areas - 1960 Census" (Unpublished Memoranda, 1967).

¹¹Unpublished tabulations in Statistical Methods Division files, Bureau of the Census; Bureau of the Census, Technical Paper No. 4, op. cit., p. 9.

and their ages, sex, and color.¹² A recent tabulation of 1960 results indicates that more than a third of the people identified in the post-enumeration survey as having been missed in enumerated households were in those completed by the closeout procedure.¹³

The Nature of the Differential Underenumeration of White and Nonwhite Persons in Censuses

Now, we should like to present some conjectures about the nature and sources of errors in census statistics. The first of these requires an assumption that demographic analyses by Siegel and Zelnik, which provide what we currently consider to be the best estimates of coverage error in total and by color, constitute an acceptable benchmark. An additional assumption, which has been evaluated and found acceptable, is that the post-enumeration surveys have provided reasonably accurate estimates, by color, of persons missed in the censuses because their living quarters were missed. The difference between the total underenumeration as measured by demographic analysis and the underenumeration contributed by missed living quarters represents an approximation to the number of persons who were not reported as household members in enumerated private homes; not reported on rosters of places classified as special dwellings, such as rooming houses; not reported in transient quarters such as missions; not reported in in-

¹²U. S. Bureau of the Census, U. S. Censuses of Population and Housing, 1960: Enumeration Time and Cost Study (Washington, D. C., 1963), Table 18, p. 33.

¹³U. S. Bureau of the Census, "Within Household Population Coverage Errors" (Memorandum from Joseph Waksberg to members of the Task Force on Coverage Evaluation, February 9, 1967).

stitutions such as hospitals or jails; and, possibly, who were not staying in any category of places covered by a census enumeration.

The results of this computation, which are shown in Table 1, are dramatic. Seven out of ten white persons but fewer than three out of ten nonwhites who were missed in the 1960 Census were subsequently found in missed quarters by post-enumeration survey interviewers.¹⁴ Thus, a minority of white people but a large majority of nonwhites who were missed in 1960 were either present but unreported in enumerated living quarters or were not staying in any kind of place covered by the census. In addition to conventional housing units, the kinds of places enumerated in the census and covered by the post-enumeration survey in 1960 included housing units in trailers, tents, and houseboats, as well as group quarters and transient accommodations. Examples of the latter two categories are boarding and rooming houses, hotels, motels, barracks, convents, missions, flop houses, jails, reformatories, dormitories, orphanages, and other similar places which have living facilities.¹⁵ There was, however, no attempt to enumerate in places where there were no living facilities; that is, on trains, buses, or planes; in stations, depots, or airports; in hallways, all-night movies, automobiles, abandoned or boarded-up houses; or in other sites not considered habitable. When, therefore, we speak about the

¹⁴Missing housing units was not, however, a trivial cause of underenumeration for nonwhites. Note that Table 1 shows that an estimated 2.5 percent of the nonwhite population as compared with 1.6 percent of white persons were in housing units which the 1960 Census enumerators missed.

¹⁵Special procedures were used in 1950 and 1960 in an attempt to improve enumeration in transient quarters.

people in the third column of Table 1 as a residual group not found in living quarters missed by census enumerators, we cannot distinguish missed persons in quarters which were enumerated from missed persons who were not present in any living facility covered by the census.

Although the analysis of closeout cases described earlier was not made separately by color of occupant, the potential effect of the closeout procedure, which applied only to identified or enumerated households, appears to be greater for nonwhites than for whites.

The post-enumeration surveys have been too small to provide the kinds of analytical tabulations that would pinpoint communities, neighborhoods, or racial or ethnic groups within communities among which coverage errors are particularly prevalent. Some historical evidence presented in Table 2 is consistent, however, with the hypothesis that underenumeration of Negro males is disproportionately concentrated in urban areas.

In a review of the figures shown in Table 2, an extension of the conjecture presented in Table 1 is relevant: when entire households are missed in a census, the proportions of males and females as expressed in sex ratios are not likely to be affected; but when household rosters are incomplete or when other kinds of living arrangements have not been completely enumerated, it is plausible that the sex ratios would be affected. Thus, the lower sex ratio for Negroes than for native whites is consistent with the PES finding that underenumeration of nonwhites is, to a greater extent than for whites, a missed-persons rather than a missed-households phenomenon. Although the lower sex ratio for Negroes is also consistent with observed differ-

ences in sex ratios at birth¹⁶ and presumed differential mortality by sex and color, our conjecture about the effect of underenumeration is reinforced by a study of sex ratios for the age group 20-44. In 1960 the sex ratio based on census statistics for whites aged 20-44 was 97.1, and for Negroes in the same age group it was 87.1, a difference we believe to be greater than might be expected on the basis of demographic factors.

Table 2 also shows that a low sex ratio has been historically an urban phenomenon both for native whites and for Negroes. Although the observed consistently low urban sex ratios for whites as well as for Negroes may result from differential migration of women to cities, our conjecture is that relatively high underenumeration of males in urban areas also contributes to it. At any rate, it is clear that the observed decline in combined urban and rural Negro sex ratios, as measured, can be entirely accounted for by the rapid urbanization of the Negro population. Standardization based on the 1900 Census proportions of rural and urban population produces nearly identical sex ratios in every decade from 1900 to 1960. As much as was available of the kind of data shown in Table 2 was examined region by region to be sure that what have been described here as urban-rural differences were not North-South differences.¹⁷

¹⁶At birth the sex ratio of whites in the period 1940-1962 was 105.7 and of nonwhites was 102.3 according to Vital Statistics of the United States, Volume 1, 1962, Tables 1-15.

¹⁷Although in the early decades of the twentieth century the Negro urban sex ratios were particularly low in the South, this regional difference disappeared in the 1950's and 1960's, but the urban-rural differences have persisted.

Sex ratios have also been computed for the age group 20-44

Other Sources of Information about Procedural Problems

Two or three other bits of information about problems in the conduct of past censuses provide some support for the hypothesis suggested by the historical sex ratios that difficulties in enumerating the Negro population are more city-centered than rural. The sources of the information are the Enumeration Time and Cost Study from the 1960 Census, the procedural histories of the 1950 and 1960 Censuses, and reports of on-the-scene observers.

In the Enumeration Time and Cost Study in 1960, comparisons were made among cities of 50,000 or more, smaller cities, and rural areas. Tables in the published report of that study show that people in large cities are harder to find at home and, as a group, appear to be somewhat less cooperative than people in smaller communities. Six percent of the households in large cities and 3 percent in smaller cities and rural areas required three or more visits to complete enumeration. Five percent of the households in large cities and 2 percent in small cities and rural areas were completed by closeout procedure—that is, information had to be obtained from neighbors or others. Questionnaires containing sample information for the census were mailed back by seven out of ten large-city households and eight out of ten smaller-city and rural households, which resulted in slower

covering the period 1910-1960. They follow the pattern of urban-rural differences described here but, unlike the ratios for all ages combined, the urban ratios for whites and Negroes aged 20-44 declined until 1950 and remained nearly constant in 1960. The combined urban-rural sex ratio for this age group of whites and Negroes has also declined since the beginning of the century. The significance of these observations is heightened by the anticipated increase in the proportion of the 20-44 age group in the 1970 and 1980 populations.

completion of the data collection in large cities than elsewhere.¹⁸

The procedural histories of the 1950 and 1960 Censuses show that, although there was no deliberate planning for differential costs of enumeration, unit costs were higher for the largest Standard Metropolitan Statistical Areas than for other places. The procedural histories also document progress toward reaching General Walker's goal of a fast enumeration. The field canvass for the Census of 1800 took well over a year to complete, while records for 1950 showed that 90 percent of the enumeration was completed within the month of April, and those for 1960 that 98 percent had been enumerated by April 30. In 1960 the remaining 2 percent was not completed until mid-July. Lags were concentrated in New York, Chicago, Los Angeles, and several other large cities.¹⁹ New York and Chicago contained a tenth of all the Negroes and three fourths of all the Puerto Ricans in the United States, while Los Angeles contained 8 percent of the persons with Spanish surnames. Thus, the lags, which were also accompanied by large staff turnover and attendant difficulties, could have had a greater impact on the statistics for Negroes, Puerto Ricans, and Mexicans than for whites.²⁰

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¹⁸U. S. Bureau of the Census, U. S. Censuses of Population and Housing, 1960: Enumeration Time and Cost Study (Washington, D. C., 1963), Tables 16, 18, p. 33; Table 19, p. 34; Table 26, p. 37; Table 34, p. 41.

¹⁹U. S. Bureau of the Census, U. S. Censuses of Population and Housing, 1960: Procedural History (Washington, D. C.: U. S. Government Printing Office, 1966), p. 64; Table 9, p. 359.

²⁰U. S. Bureau of the Census, U. S. Census of Population: 1960, Subject Reports: Persons of Spanish Surname, PC(2)-1B; Nonwhite Persons by Race, PC(2)-1C; Puerto Ricans in the U. S., PC(2)-1D. (For the sake of comparison, the percentage of the total U. S. population in New York City in 1960 was 4 percent; in Chicago, 2 percent; and in Los Angeles, 1 percent.)

In the cities where lags were greatest and enumerator turnover highest, the Bureau sent staff members to observe and assist after the bulk of the enumeration for the 1960 Census had been completed. At that time, these observers reported that many of the people remaining to be enumerated were either inaccessible (that is, they were rarely at home or were unwilling to answer their door) or they were uncooperative.

Constraints on Interpretation

We have presented measurements of errors which indicate that nonwhites--who, of course, are principally Negroes--are less completely enumerated than white people. We also have data from the 1950 PES which indicate that census coverage among poor uneducated people is not as good as among the more affluent or educated; and Negroes, Puerto Ricans, and Mexicans certainly have been overrepresented among the poor and uneducated.

We have also cited evidence that troubles in taking a census--troubles which historically have been linked with errors--are more prevalent in the largest cities of the United States and the cities where there are high concentrations of Negroes and Puerto Ricans. Although we believe that there is a connection between the errors measured and the problems described, our evidence is not definitive. Thus, we have conjectures and not conclusions.

Experience with a different coverage problem may explain such caution: In 1940 a match of the Census results with birth records indicated considerable underenumeration of infants. The presumption

was that people did not think of their infants as household members or, if they did, it was in some special most-easily-forgotten category. In 1950 a similar match was performed, but follow-up inquiries revealed that 80 percent of the times that babies were missed their parents were also. Hence, the problem was not, as originally thought, the underreporting of infants per se but the missing of entire families in which infants were present. Improved questions about babies would have been no solution for the redefined problem. It called for more thorough canvassing techniques.

By analogy, we might now incorrectly assume that the kinds of problems described in observers' reports were the predominant causes of census errors when, in fact, we had overlooked some places like bus depots, subways, hallways, and all-night movies which had not even been canvassed; or had depended on incomplete counts from nonprivate housing-unit sources such as institutions or hotels or missions; or had not seen weaknesses in the rural enumeration; or had failed to note a substantial contribution to error from seemingly cooperative people who, out of misunderstanding or fear, reported incomplete household rosters.

Although fear of enumeration in a census may be unwarranted, it nevertheless is real for people who feel that in divulging the truth they could jeopardize their homes or livelihood. Currently, enumerators tell of respondents who fear to report complete household rosters because public housing authorities or their landlords would evict them for overcrowding. They say that violations of increasingly strict housing codes result in underreporting of lodgers or tenants. They

speak of welfare regulations which mitigate against the reporting of wage earners or, in some places, of unemployed men in the home. Public housing, urban codes regulating use of private housing, and the welfare system are all relatively recent developments. Since we believe that undercoverage of the urban population in censuses has been persistent and predates these developments, we must hypothesize the existence of some equivalent historical constraints on full enumeration. Alternatively, we might give more weight to enumerators' reports that fear of local police and other authorities, and what General Walker called "the stresses of impecuniosity" in the guise of credit collectors, affect the census counts. While refusals to be interviewed are straightforward and hostile respondents are obvious, erosion of the census count may be occurring in far less dramatic situations and may often be imperceptible to the most sophisticated enumerators or observers.

Tests of Methods of Improving Coverage

Although shy about drawing cause-and-effect conclusions, the Census Bureau has conducted many tests of hypotheses about sources of problems and errors. Some have been carefully designed experiments, others merely tests of feasibility, and others have been what might be classified as ad hoc projects arising from the need to cope with an immediate difficulty. Voluminous files describe results of these tests, but only a few tests will be cited as examples.

In connection with a special census in the city of New York in 1957, some experiments were conducted to see whether the procedures

employed were responsible for an important part of the undercounts, particularly in slum areas. In the first experiment, three such areas were selected to test the use of neighborhood leaders as enumerators. The distinction sought was between leaders and other residents, not between neighborhood and outside enumerators, since decennial- and special-census staffs are typically recruited from within the communities to be enumerated. The people selected as leaders re-enumerated a sample of apartments in blocks they chose. Comparisons between their results and the original enumeration indicated that the recheck enumerators missed more persons than the original enumerators had.

In connection with the same special census, students in the city schools were required to take a census form home, have it completed by their family, and return it. The results of a matching study between the school forms and census schedules indicated that the school forms could improve coverage; but many clerical errors and double counting, arising from different designations for the same persons, reduced the usefulness of the match. A third test, which involved matching census results with welfare rolls, revealed almost no missed persons.²¹

More procedural tests were made in 1958 in connection with a census in Indianapolis. Five experimental procedures were employed, all of which were postcensus checks on the completeness of the coverage

²¹William W. Winnie, Jr., "New York City Special Census, Special Study No. 4, Special Re-enumeration to Evaluate Coverage Within Dwelling Units" (unpublished, October 7, 1957); William W. Winnie, Jr., "New York City Special Census, Special Study No. 3, Sample Survey of the Results of the School Form Program" (unpublished, September 1, 1957); U. S. Bureau of the Census, Statistical Research Division, "The Matching Problem," New York City Special Census - Special Study No. 7 (Matching Households on Relief Designated by New York City against Special Census Schedules, unpublished, September 11, 1957).

obtained by enumerator canvass. In combination, all five procedures were effective in increasing coverage by little more than 2 percent for white persons and by nearly 6 percent for nonwhites. The most effective single procedure was a check made in the post office by letter carriers to identify residential addresses missed in the census. Furthermore, this procedure required the least amount of clerical work and was the most free of error. It was tested again in other communities, employed experimentally in the 1960 Census, and provided the kind of experience that led to current proposals for 1970 Census procedures.²²

During the 1960's other procedural tests have been conducted, and their results are reflected in the plans for the 1970 Census, which is the subject of another paper. The only results we shall mention, therefore, are those which shed some light on past procedural difficulties.

In a 1964 test of the effectiveness of employing an address register to make initial contacts with households by mail instead of by personal interview, a closeout rate was computed and compared with the rate for the same neighborhoods in 1960. These were city slum neighborhoods in Louisville, Kentucky. The test indicated that the new procedure had reduced by half the proportion of cases where none of the required census information could be obtained at firsthand from

²²U. S. Bureau of the Census, "Tests of Use of Post Office Resources to Improve Coverage of Censuses," Working Paper No. 19 (1965); U. S. Bureau of the Census, Statistical Methods Branch, "Summary of Special Lists, Procedures, and Other Related Results, Indianapolis Experimental Coverage Procedures Test, Results Memorandum No. 5" (unpublished, February 27, 1958).

anyone in the household.²³

In the 1964 test in Louisville and again in a 1965 test in Cleveland, Ohio, an address register was compiled on the basis of information cumulated from a commercial list supplier, the post office, and respondents' reports. The mail was then used as the initial data collection agent, followed when necessary by personal contact by an enumerator. In both tests experimental evidence was obtained that coverage of the total white and Negro population, but not of Negro men, had been improved.²⁴

Concluding Remarks

Recent history reinforces optimism that there are reasonable solutions to the past census omissions arising from enumerators' failures to find every building and every living quarter. In a number of tests the Bureau has collected evidence of its ability to improve housing-unit coverage, white and nonwhite. There is also a reasonable expectation of being able, if only by mail, to establish some direct contact with all identifiable households and thus to re-

²³U. S. Bureau of the Census, "Closeout rates in X-2 area ED's, 1960 rates vs. 1964 rates" (memorandum from Ernest Tracey and Barnett Denton to Leon Pritzker, October 30, 1964).

²⁴"Population and Housing Coverage in the Cleveland Special Census," Cleveland Special Census Results Memorandum No. 13 (prepared by Statistical Methods Division, October 15, 1965); "More Information on Coverage of Nonwhite Population," Cleveland Special Census Results Memorandum No. 36 (memorandum from Joseph Waksberg to Conrad Taeuber and Morris Hansen, July 19, 1966); "Louisville Evaluation. Population and Occupied Housing Unit Coverage in Missed and Overenumerated Housing Units," Results Memorandum No. 15 (prepared by Statistical Methods Division, August 31, 1964).

duce closeout cases. We are, however, less sanguine about the success of our efforts to find solutions to the problem of enumerating people who for one reason or another are not reported by householders or who are not associated with any particular household or other type of living quarter in which the census is taken.

In the light of achieved completeness of coverage of 97 or 98 percent, a continuing drive for coverage improvement in decennial censuses may appear to be straining for a trivial goal. Yet, levels of achievement which appear impressive on a national level become problematical when viewed in the perspective of demands for small-area data and for data about minority racial and ethnic groups. Striving for improved coverage does not derive from a desire to reach 99.44 percent completion at the national level so much as from the need to work toward uniform coverage of all groups in the population--of Negroes, whose count is known to be deficient, as well as of Puerto Ricans and Mexicans, whose counts we presume are also deficient. Consistent with our view that undercoverage arises from multiple inter-related sources, we are not seeking any panacea but are making many kinds of efforts which now seem plausible and potentially effective for achieving the goal of a more complete census.

Table 1. COMPUTATIONS INDICATING NATURE OF DIFFERENTIAL UNDER-
 ENUMERATION OF WHITE AND NONWHITE PERSONS
 IN THE 1960 CENSUS

Color	Siegel-Zelnik Estimate of Net Underenumeration in 1960 Census ¹	Re-enumeration Survey Estimate of Missed Persons in Missed Living Quarters in 1960 Census	Other Missed Per- sons---Estimated as Difference be- tween (1) and (2)
	(1)	(2)	(3)
<u>Thousands of Persons</u>			
Total	5,702	3,143	2,559
White	3,560	2,568	992
Nonwhite	2,142	575	1,567
<u>Percentage of Underenumerated Total</u>			
Total	100.0	55.1	44.9
White	100.0	72.1	27.9
Nonwhite	100.0	26.8	73.2
<u>Percentage of Estimated "True" Total Population²</u>			
Total	3.1	1.7	1.4
White	2.2	1.6	0.6
Nonwhite	9.5	2.5	7.0

¹Derived from percentages shown in the paper by Jacob S. Siegel and Melvin Zelnik, "Evaluation of Coverage in the 1960 Census of Population by Techniques of Demographic Analysis and by Composite Methods," Proceedings of the Social Statistics Section, American Statistical Association (1966).

²Denominators are published census totals plus the estimates of persons shown in column 1.

Table 2. SEX RATIOS OF THE NEGRO AND NATIVE-BORN WHITE POPULATION,
BY URBAN-RURAL RESIDENCE: 1820-1960

Census Year	Negro Population				Native-born White Population			
	%	Sex Ratio			%	Sex Ratio		
		Urban	Total	Urban		Rural	Urban	Total
1960	73	93.4	90.4	101.9	68	97.5	94.5	104.4
1950	62	94.3	90.0	101.7	63	98.6	93.6	104.7
1940	49	95.0	88.1	102.1	55	100.1	94.5	107.5
1930	44	97.0	91.3	101.7	54	101.1	96.0	107.6
1920	34	99.2	95.4	101.2	50	101.7	96.9	106.7
1910	27	98.9	90.8	102.1	44	102.7	97.3	107.1
1900	23	98.6	87.8	102.1	39	102.8	96.9	106.6
1890	19	99.5	*	*	34	102.9	*	*
1880	*	97.8	*	*	*	102.1	*	*
1870	*	96.2	*	*	*	100.6	*	*
1860	*	99.6	*	*	*	103.7	*	*
1850	*	99.1	*	*	*	103.1	*	*
1840	*	99.5	*	*	*	104.6	*	*
1830	*	100.3	*	*	*	103.7	*	*
1820	*	103.4	*	*	*	103.3	*	*

*Not ascertained.

Note: The principal data for this table were compiled by Nampeo R. McKenney of the Ethnic Origins Statistics Branch, Population Division, from these sources: United States Censuses of Population for 1910, 1920, 1930, 1940, 1950, 1960; Negroes in the United States, 1790-1915; Negroes in the United States, 1920-1932.