THE EVALUATION AND RESEARCH PROGRAM OF THE 1960 CENSUSES
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I. INTRODUCTION

Our task is to describe the Evaluation and Research Program of the 1960 Censuses of Population and Housing. This program is directed at two broad classes of objectives:

First, the identification of sources of error in census results, the development of improved methods of measurement and control, and the evaluation of the accuracy and cost of alternative census methods and of alternative methods of evaluation. These are objectives for producers of census and survey statistics.

Second, the measurement of both the variance and the bias of statistics of the 1960 Censuses. These are objectives for users of Census data. Such measurement should guide users in the appropriate application of the statistics and should help guide the Bureau of the Census in planning future census programs to meet the needs of users more adequately.

To make clear how we propose to try to achieve these objectives, we will first have to describe briefly how the 1960 Censuses will be taken. There are two main census-taking programs, the "single-stage" census designed for the sparsely populated areas, especially in the West, and for certain sections of the South, and the "two-stage" census designed for the. enumeration of the rest of the country, which includes more than 80 percent of the population. (In the "single-stage" census areas, the sample data will be collected at the same time that the complete canvass is made.) We shall limit our description to the "two-stage" census. The following are some of its main features:

1. The complete two-stage census will include a listing of the population and of housing units, and the collection of certain basic data for them. Much of the data collected in the 1960 Censuses will be obtained from a 25 percent sample of households - designated for the sample as the complete listing is prepared. The first stage of the census will be the complete canvass and sample designation. The second stage will have as its goal the collection of the sample data.

2. During the week preceding April 1, the Post Office will distribute "Advance Census Reports" to all households receiving mail. This "ACR," which asks for all the first-stage census information, is to be filled out by the household and held for the census enumerator. The "ACR" asks for a complete listing of the persons in the household - visitors present overnight on March 31 as well as residents whether present or absent - and for data on the characteristics of these persons

and of their housing arrangements. The characteristics are limited in number - relationship to head of household, sex, race, month and year of birth, and marital status, and a small number of housing characteristics. These identify the so-called "100 percent" or "nonsample" data.

3. During the first part of April, after being given nine hours of training, three hours a day on three separate days, a corps of about 150,000 enumerators will personally canvass the households in the districts assigned to them. They will search for all places where people live and will seek to obtain a complete listing of people and of housing units. They will visit each household to record the nonsample data on "Stage I FOSDIC schedules." They will transcribe the data from the ACR's that the respondents fill out, but if an ACR is not available or is inadequately filled out, they will conduct the interviews to obtain the data. (Entries are made on the Stage I FOSDIC schedules by position marking - by filling little circles with ordinary black lead pencils. The data on these Stage I FOSDIC schedules will require no coding. The schedules will be microfilmed, and a Film Optical Sensing Device for Input to Computers - hence FOSDIC - will convert the microfilm images to magnetized spots on computer tapes.)

4. During this Stage I enumeration, there will be a formal quality control program with uniform procedures and acceptance standards. The Stage I FOSDIC schedules and the canvassing activity of the enumerators will be checked for completeness and consistency. Mistakes brought to light by this program will be the basis for remedial action.

5. Also during the Stage I enumeration, the enumerators will leave "Household Questionnaires" at every fourth household. The household will be asked to fill out this questionnaire and mail it within three days to the local census office. The household questionnaire asks for considerably more data on personal characteristics such as education and income and on housing arrangements and facilities.

6. The work of the Stage I enumerator will end with the transcription of the nonsample data from the Stage I FOSDIC schedules to the Stage II FOSDIC schedules, which will finally contain all the data collected - nonsample as well as

sample - for the 25 percent sample of households.

7. About one third of the Stage I enumerators will be employed on Stage II. After taking eight additional hours of training, four hours per day on two separate days, the Stage II enumerators will be given the Household Questionnaires - the ones mailed in to the local census offices by the sample households. They will transcribe the sample data from the questionnaires to the Stage II FOSDIC schedules - to the pages on which the nonsample data were transcribed by the Stage I enumerators.

8. The Stage II enumerators will follow-up households from which questionnaires either were not obtained or were incomplete or identifiably defective in some manner. They will complete the Stage II FOSDIC schedules by telephone-interview for partially missing or defective information or by visiting the households from whom no questionnaires were returned.

9. Again, for Stage II, there will be a formal quality control program with uniform procedures and acceptance standards throughout the country.

10. Some of the population data on the Stage II FOSDIC schedules will have to be coded - for example, birthplace and occupation - before the schedules go through the microfilm-FOSDIC-computer process.

This description has left out many important elements of the methods to be employed next April. It will suffice, however, for the presentation of the main features of the Evaluation and Research Program.

II. PROJECT DESIGNED TO MEASURE NONSAMPLING VARIABILITY

Conceptually, we view a census or a sample survey as a repeatable process of measurement. Thus, we will regard the enumeration in April and May 1960 as one trial of a possible set of trials. The mathematical model underlying this view of a census is contained in a paper by Hansen, Hurwitz, and Bershad (1).

We regard the observed value of a particular census or survey statistic - say the number of white males 25 years old and over who have completed high school and who reside in Montgomery County, Maryland - as a value from a potential population of such values, conceived as arising from a set of possible independent repetitions of the census or survey in the given area. Such a census number is thus regarded as a chance variable with an expected value (of which the result actually to be obtained in the 1960 enumeration is an estimate) and a variance. The objective of this evaluation project is to obtain estimates of

such variances and their major components for a probability sample of areas of the United States.

The following is an oversimplified account of the mathematical model and of the specific experiments that are being designed.

1. The model identifies separately the variability that arises from independent repetitions of a census inquiry on the same unit of enumeration. This variability, we label the "simple" or "uncorrelated" response variance. Independent replication of the observations would be required to make unbiased or consistent estimates of this variance. This is not achievable in survey work, where the first response must be regarded as, in general, "conditioning" all subsequent responses - although in some cases perhaps to only a minor degree. Consequently, we attempt to achieve approximations.

We hope to obtain satisfactory approximations to the simple response variance by two experiments. In the first experiment, we will mail household questionnaires to a probability sample of 1,000 sample households. These are households from which, except for some nonrespondents, we have already obtained sample data either from a household questionnaire or from an interview by the Stage II enumerator with the FOSDIC schedules. We will ask these selected households to report to us again. We will then follow the same procedures that are to be employed in Stage II. We will turn over the list of households (and the questionnaires that have been mailed back) to a small group of Stage II enumerators. They will be given the same instructions for transcription to FOSDIC schedules and for follow-up that were employed in Stage II of the Census.

In the second experiment, a probability sample of 5,000 sample households will be drawn. A small group of Stage II enumerators will be told to reinterview these households with the Stage II FOSDIC schedules. In both experiments, the enumerators will be supplied with the Stage I data for the households, but not the Stage II data.

A few remarks about these experiments: First we shall also investigate the simple nonsampling variance that arises from independent replication of coding of the same data. In this case, our experiment will conform quite closely to the demands of our model by providing for independent coding operations. Second, for attribute data - 0-1 variates - the upper limit of the simple response variance of a proportion (P) is

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PQ/n, where n is the total number of persons on which the statistic is based. Thus the simple response variance can be appreciable only for statistics of small tabulation cells.

2. The mathematical model also identifies the <u>variability</u> that arises from the correlated errors introduced into the census process by (or associated with) enumerators and their supervisors, by coders, and by personnel engaged in other operations. These correlated errors can make a far more important contribution to response variability than the simple or uncorrelated response errors. We shall indicate briefly what we mean by "correlated response errors" and how we propose to measure them.

The model postulates a sampling process (in general not under our control). In a given trial, i.e., census or sample survey, the particular interviewer assigned to a district, his particular supervisor, the particular coder assigned to work with the schedules obtained from the district, are regarded as having been random selections from a population of interviewers, crew leaders, coders, etc., eligible to work on the particular district. We postulate an expected value of a response for each unit of enumeration taken over all trials (and, therefore, among other things over-all possible selections and assignments of interviewers, coders, etc.) On any given trial, the difference between the response obtained and its expected value is a <u>response deviation</u>. Any tendency on the part of a particular interviewer, coder, etc., consistently to introduce or be associated with the introduction of a systematic error into the response deviations of each unit of enumeration (i.e., person or housing unit) in his assignment will show up as a correlation between the response deviations.

There is an analogy here with cluster sampling. The correlation has a multiplicative effect on the simple response variance, and what is a trivial effect for the average person or household may become an appreciable effect for the average enumeration district, crew leader district, tract, small town, or other relatively small tabulation area.

A large-scale experiment was conducted as part of the 1950 Census in four areas in Ohio and Michigan - 24 counties and more than 700 enumerators in all. This "Enumerator Variability Study" (or EVS) provided estimates of the correlated response variances associated with the enumerator. The impact of supervisory personnel and of coders was not studied. These estimates were used in constructing estimates of total non-

sampling variability - neglecting supervisors, coders, and other sources of correlated errors - of census statistics for small areas. In particular, estimates were produced for a set of areas containing an average of 6,500 population enumerated by 7 enumerators.

The EVS estimates turned out to be substantial and consequently were an important factor influencing the design of the 1960 Censuses. The use of the so-called "self-enumerative" forms - The Advance Census Report and the Household Questionnaire - is meant to reduce the "enumerator effect" on the statistics, as well as the response bias. This will be discussed later.

The 1950 EVS involved the random assignment of two enumeration districts to an enumerator included in a stratum averaging 7 enumerators and 14 districts. This permitted estimates of the between-enumerator variances and evaluations of the statistical significance of the estimates. Some of these results are presented in papers by Eckler and Hurwitz (2) and by Hanson and Marks (3). The estimates of the between-enumerator variances in the 1950 EVS were estimates of the correlated response variances. These estimates were themselves subject to considerable variability because the unit of randomization was an enumeration district - a very large and variable unit.

Now we are ready to discuss the experiment we are designing to estimate the effect of correlated response errors in 1960. We have recognize the importance of this experiment by allocating about $350,000 to it. It is designed to provide estimates of response variance in statistics compiled from the second stage of the Census for areas of various sizes. We should also like to learn whether or not the quality of the statistics will have been improved by the change in the 1960 methods of enumeration, particularly the use of self-enumeration. This will not be measured directly. The principal reason is that considerations of cost and feasibility prohibit any direct comparisons of the self-enumerative approach with a completely non-self-enumerative approach on the same population at the same time.

We have been developing a much more sophisticated experiment for 1960 than the EVS of 1950. Unlike the EVS, the 1960 experiment will have the following properties:

1. It will be based on a probability sample of the entire area of the United States included in the two-stage census.

2. It will provide estimates of the correlated response variances associated with crew leaders and coders as well as enumerators.

3. It will provide more efficient estimates because the unit of randomization will be the household rather than the Enumeration District.

Unlike the two replication experiments described above, this "interpenetration" experiment will constitute the second stage of the census - in the areas in which the experiment is carried out. In these areas, pairs of enumerators will be purposively assigned to geographic clusters of enumeration districts in much the same manner that they would be in nonexperimental areas. Within each cluster, the households included in the 25 percent census sample will be divided into two random groups, one group assigned at random to one enumerator and the other group assigned to the other enumerator. In half the clusters, one of the enumerators will be selected at random to be supervised by a crew leader of a neighboring crew leader district and the other enumerator will be supervised by the regularly assigned crew leader. Altogether the experiment will include 100 crew leaders, 1,600 enumerators, and 320,000 households.

The results of the replication experiments and the interpenetration experiment will be combined to provide estimates of total nonsampling variability of census statistics for average tabulation areas of various sizes (in terms of number of people) and types (urban-rural, tract, city, county, etc.), from about 1,000 to 16,000 population.

III. PROJECTS DESIGNED TO STUDY POPULATION AND HOUSING COVERAGE

We differentiate between coverage and content errors: Coverage errors are the errors in counting people and housing units. These gross errors of under - and overenumeration affect the unclassified population and housing unit totals for the United States and its subdivisions. The net effects of these errors - the net coverage errors - have generally been net deficiencies in the counts.

Content errors are the errors in the tabulated results that arise from errors in classifying people or housing units with respect to the characteristics for which data are collected. Included are errors arising in reporting, recording, transcribing, coding, and tabulating the data. With respect to any class of any characteristic (say, the age class, 10-14, or the tenure class, owner-occupied), a content error results from an improper transfer out of or omission from one class and a corresponding improper transfer to or inclusion in another class. Thus the net content error for a particular class may be a deficiency or a surplus. Over all classes, however, the gross content errors are equal - what is an omission from one class is an erroneous inclusion in another. The algebraic sum of the net content errors class by class is zero.

The gross content error of a given class (the sum of the erroneous omissions and exclusions) corresponds closely under certain conditions to what we have called the simple response variance. The net content error, however, reflects the bias of the census-taking method.

A general discussion of the meeting of bias

and the methods of measuring it is beyond the scope of this paper.

But let us now return to the measurement of coverage error. The best available evidence regarding the 1950 Census of Population and Housing indicates that the total population count was deficient by about 2-3 percent, or perhaps more. The problem of coverage is more serious than indicated by this average error rate because we have evidence that some significant differentials existed in the 1950 Census. Young children, nonwhites, young adult males, persons in rural nonfarm dwelling units, all these and some others had substantially higher risks of being undercounted than the general population.

Some of the innovations introduced in the 1960 Censuses represent efforts to reduce the over-all coverage error rates as well as the differentials. The division of the enumeration into two stages is designed to place emphasis in training and in supervision on obtaining complete coverage in the first stage. The Advance Census Report is designed to pin down the enumeration to a particular date and thus help avoid the loss in coverage that is associated with an enumeration extended over time. The enumeration of visitors is designed to cut down on the coverage losses among people with tenuous attachments to households. The enumeration of the transient hotel population on the night of March 31-April 1 will avoid having these people claim they have already been enumerated elsewhere.

Let us return now to the general problem of evaluating coverage. This problem was one of the main concerns of the evaluation program of the 1950 Census -- the Post-enumeration Survey ("PES"). The 1950 PES was the first major attempt to measure the errors of a decennial census. Emphasis was placed on enumerative methods themselves for measuring the errors of the census enumeration. As far as studying coverage error is concerned, the PES was a more intensive enumeration than the Census. The best available evidence is that the PES found about half of the underenumeration of the population in the 1950 Census. The coverage of the PES was especially deficient among those groups for which the risk of underenumeration in the 1950 Census was highest.

This state of affairs has impelled us to seek new methods of studying coverage error and also to examine ways by which the enumerative methods of the PES might be improved. This has led to the development of three evaluation projects for studying coverage error, in addition to a fourth project designed to study directly a method for improving coverage - the Post Office check:

1. "Reverse Record Check" of a General Sample of the Population of the United States

The objective is to construct an independent sample of the population of the United States as of April 1, 1960, and to determine how many persons appearing in that sample were not enumerated in the Census.

The independent sample will be drawn from four main components:

a. Persons enumerated in the 1950 Census.
b. Aliens who entered the United States after April 1950 and who are registered in January 1960.
c. Children born during the intercensal period and whose births are registered.
d. Persons omitted from the 1950 Census but detected by the 1950 Post-enumeration Survey.

This combined list or "frame" will be incomplete in a number of respects. It will not include, for example, non-registered births during the intercensal period, citizens (particularly Puerto Ricans) who entered the country after April 1950, and persons missed in the 1950 Census who were not detected by the 1950 PES. The original list will cover about 98 percent of the population.

An attempt will be made to determine the current address of each person selected in the sample and then to determine whether or not the person was enumerated in the 1960 Census.

A pretest to determine the feasibility of the method has just been completed and indicates that we can expect to locate the correct addresses of more than 80 percent of the sample selected from the 1950 Census. We hope to be able to increase this by about 5 or 10 percent.

This method has been developed in an attempt to deal with the situation found in 1950, namely that the PES tended to miss some of the same kinds of people who were missed in the Census itself. The independent sample has the virtue of identifying explicitly some persons who in 1960 will be members of population groups which we believe will have the greatest risk of underenumeration. For example, the sample will identify from the 1950 Census a group of persons who were 8-14 years in 1950 - a group where the risk of underenumeration was relatively low - but who are now 18-24 - a group for which the risk of underenumeration is relatively high.

2. Reverse Record Check of Special Samples of the Population of the United States

This project is directed primarily at evaluating the enumeration status and age reports of three special population groups- aged social security beneficiaries, selective service registrants, and students enrolled in colleges and universities in February 1960. The method is essentially the same as that contemplated for the first project. A current address of each person' selected in the sample will be obtained. There will be a match against the census

records for the area containing the current address to determine whether or not the person was enumerated, and if enumerated, to evaluate the reported age and perhaps other characteristics. The study of selective service registrants will provide us with data for evaluating the coverage of one of the hardest-to-enumerate population groups - young adult males. A sample of college and university students will also provide data on this point, and in addition, will enable us to evaluate the special census rules for enumerating college and university students wherever they are staying while going to school.

3. Re-enumerative Studies of Coverage Error

The major objective of this project is to obtain estimates - by enumerative methods - of the net and gross errors in counting the population and the housing units in the United States. The studies of coverage error that are contemplated will require the use of specially trained enumerators to return to either area samples or samples of enumerated housing units in a search for errors of both omission and inclusion, i.e., missed persons and housing units and erroneously included persons and housing units.

In comparison to the 1950 PES, what may be regarded as significant improvements are being introduced into this project. First, it is planned to investigate the completeness of coverage of the population during the early part of May 1960, a little more than a month following the beginning of the Census. (In 1950, this investigation was delayed until August and September.) Second, unlike the 1950 PES, the investigation of coverage error is being separated from the investigation of content error. This will provide the opportunity for more intensive training of the enumerators used in this study on a more limited number of subjects.

The study of the omission of persons in enumerated living quarters will be carried out in two ways. First, there will be a de facto enumeration of persons present in a sample of enumerated living quarters during the early part of May. We will seek to obtain all the possible addresses at which these persons might have been enumerated and to determine whether or not they were enumerated at any of these addresses. Second, there will be the attempt to reconstruct a list of residents of these living quarters as of April 1, 1960, and a subsequent match against the Census to determine if they were enumerated. (Only the second approach was used in the 1950 PES.)

The re-enumerative study of omitted housing units , and consequently, of

omitted persons residing in the omitted housing units will also be accomplished in two ways:

First, the Survey of Change and Residential Financing (SCARF) will provide a basis for evaluating the coverage of housing units and households. As a part of this program, a fairly intensive canvass has been virtually completed of a large sample of small areas (segments) in the United States. Lists of living quarters located in these segments have been prepared. These lists will not be used in the Census, nor will the location of the segments be known by the Census enumerators. The area of the segments will, however, be canvassed in the normal course of the Census. A subsample of about 4,000 segments included in SCARF will be re-enumerated during the summer of 1960 in a search for housing units omitted from the Census or included in error. The enumerators participating in the search will have available to them not only the 1960 Census data but also lists of dwellings enumerated in the SCARF program. Their job will be to reconcile the SCARF and Census enumerations and to find the housing units omitted from either canvass.

The second approach is what has been termed the "successor-predecessor" approach and will be carried out in conjunction with the study of omitted persons in enumerated living quarters described above. This canvass will take place early in May 1960. In addition to visiting a sample of housing units enumerated in the Census as described above, enumerators will locate the housing units that immediately precede and follow the enumerated unit. Rules for providing a unique ordering of housing units will be given to enumerators. If, after matching against the Census records, it turns out that either a successor or a predecessor unit has been missed, another enumerator will be sent out to continue a chain of canvass in the indicated direction until an enumerated housing unit is located.

Some special attempts, in addition to the above, will be made to gauge the adequacy of enumeration of the transient population who are to be enumerated in hotels, motels, and other transient quarters.

It should be noted that no one method will be relied on exclusively for providing estimates of coverage error. An important objective of the program is to evaluate alternative methods. Every effort will be made in the analysis to incorporate data from all the methods employed to achieve estimates of coverage error of maximum reliability and validity.

Also we are developing further, but are not

yet ready to state firmly our methods for studying overenumeration - duplicate or factitious enumeration. Provision is being made for such study through re-enumeration of samples of enumerated persons and housing units. Several methods will be used.

4. Post Office Coverage Improvement Study

This project stems from a major innovation proposed for the 1960 Censuses that was not adopted because of the lack of funds. This was the use of Post Office personnel to identify households erroneously omitted from the enumeration. The program was budgeted at about 4 million dollars. Our pre-census experimentation indicated that the deficiency in coverage might have been reduced by about one percentage point by this program. We regard this as a worthwhile goal, especially because our evidence suggested that the reduction by this procedure in the over-all coverage error would be greatest in groups more seriously undercovered in 1950.

Thus, although we are unable to employ this procedure at full effectiveness, one of our evaluation and research projects is directed toward additional study of the feasibility and effectiveness of the use of Post Office personnel to improve coverage. The project has the following main features:

a. Within each of the 15 Postal Regions into which the United States is divided, we shall select - by probability sampling methods - an area containing 10,000-15,000 households. The urban part of the sample will consist of areas that are either parts of postal zones or entire postal zones. The rural part of the sample will consist of areas served by several post offices.

b. We shall identify the census enumeration districts - about 50 on the average - which make up each of the selected areas. We shall instruct the enumerators to make up cards showing the name and address of every enumerated household.

c. After withholding a small sample of the cards to provide a basis for controlling the quality of the work performed by the postal carriers, we shall turn the cards over to the local post offices, where the cards will be sorted by carrier route. The postal carriers will then be asked to sort the cards in delivery order and to make up new cards for any households that appear to be missing.

d. The cards for the apparently missed house-
holds will be checked against the Stage I
FOSDIC schedules. This will provide evi-
dence of the effectiveness of the Post
Office in improving census coverage.

IV. PROJECTS DESIGNED TO STUDY CONTENT BIASES

Response variance is an important factor
only for small frequencies or small-area statis-
tics. Response bias is the prime cause of error
in the important summary measures. The new
methods for collecting and compiling data in the
1960 Censuses impose a special responsibility
for studying this type of bias. In the content
area, there is a strong presumption and theoreti-
cal basis for expecting that the innovations in
method will reduce the variance of small-area and
small-cell statistics. We believe that self-
enumeration with enumerator follow-up will reduce
the biases as compared with the usual straight
enumerator method - primarily because of the
time and opportunity self-enumeration allows for
members of a household to consult one another, to
consult records, and to give more considered re-
sponses. Our task, however, is to substitute
objective appraisal for opinion and belief.

In the PES of the 1950 Censuses, two ap-
proaches to the measurement of content bias were
employed - the re-enumerative check and the record
check. In the re-enumerative check, a sample of
census households was reinterviewed by a small
group of carefully selected and specially trained
enumerators. The enumerators were supplied with
special questionnaires designed to facilitate
more careful questioning, and obtained the infor-
mation from the best respondents instead of any
responsible member of the household. These enu-
merators were more closely supervised. They were
paid on an hourly basis rather than on a piece-
rate basis as was the case in the original 1950
Census enumeration. The PES enumerators were pro-
vided with transcriptions of the original data so
that they might, after the initial interview,
reconcile discrepancies between the reinterview
responses and the original responses. In short,
we instituted an improved method of enumeration,
which we were willing to regard, before the fact,
as being capable of providing us with estimates of
bias in the census enumeration. The results of
the re-enumerative check indicated, however, that
in general the expected values of our improved
method were not much different from the expected
values of the 1950 Census, in spite of evidence
from other sources that, for at least some items,
substantial biases existed. The estimates of net
error tended to be quite small, although there
were some noteworthy exceptions.

The record checks conducted as part of the
1950 PES involved comparisons of 1950 Census data
with data on birth certificates, records of the
1920 Census, income tax returns, social security
records, alien and naturalization records of the
Immigration and Naturalization Service and in the
files of the Veterans Administration. These checks
were somewhat disappointing because, in general,
we were able to find check data for only about
50-80 percent of the persons in the samples we
investigated. Our judgment is, however, that, if
we had been able to produce unbiased estimates of
net error from the record checks, they would
have been greater than the estimates obtained
from the re-enumerative check.

Our experience with the record checks led
us to the view that much more developmental work
is required before they can be used as evalu-
ative instruments. We have also been inclined
to the view that current records, such as those
maintained by employers for persons now working
or by schools for persons now attending school,
are more promising than historical records, such
as birth certificates. We are now considering
comparisons with employer records to evaluate
census data on occupation, industry, weeks worked
in 1959, and similar items.

We are still placing reliance on enumerative
methods for measures of bias arising from errors
in obtaining data from respondents. Two of our
studies are concerned with this. We also plan to
do much more than we did in 1950 in the investi-
gation of processing errors. Let us now turn to
the specific projects:

1. Measurement of Content Biases in Data
   Collection

   Two studies are contemplated. The first
   has some features in common with the 1950
   PES. Intensive reinterviews will be
   conducted at 5,000 households included
   in the 25 percent Census sample.
   Specially trained enumerators will be
   employed to probe intensively for the
   best possible answers regarding the
   population and housing characteristics
   of the sample persons and housing units.
   Some of the enumerators will not be
   furnished with the original Census
   schedules. For these enumerators, the
   data collected in the intensive inter-
   views will be matched with the data col-
   lected in the original Census enumera-
   tion. Discrepant cases will be sent
   back to the field for reconciliation.
   Other enumerators may be given the
   original data so that reconciliations
   may be attempted on the spot. The data
   obtained in the intensive interviews
   will be coded by specially trained cod-
   ers so that the results obtained reflect
   the best that we are capable of accom-
   plishing by enumerative means.

   The second study of content error is a
   match between the data of the Current
   Population Survey and the 1960 Census
   of Population. The Current Population
   Survey (CPS) is conducted monthly on a
   sample of 35,000 households by the
   Bureau of the Census and is the primary
   source of current data on the labor force
   as well as periodic reports on other
   demographic characteristics.

   The matching will provide additional
   estimates of bias in selected Census

statistics as well as some data on the extent of gross error and on the causes of error.

The Current Population Survey-Census match conducted in 1950 provided useful information for the planning of the 1960 Censuses. It is proposed to improve the method over that employed in 1950 by carrying out field follow-ups on discrepant cases to obtain some information on the causes of discrepancies. The CPS-Census match will be limited to those households included in the CPS sample that are also included in the 25 percent Census sample (about 8,000 households).

2. Studies of Processing Error

Three aspects of the processing of the data collected in the 1960 Censuses will be studied:

a. The transcription that takes place in the field. In the first stage of the two-stage Census, there are two types of transcription - copying data from the Advance Census Report to the Stage I FOSDIC schedule and copying data from the Stage I to the Stage II FOSDIC schedules. In the second stage of the Census, a key element in the enumeration is that of copying the sample data from the household questionnaires to the Stage II FOSDIC schedules. An item-by-item review will be made of a sample of Advance Census Reports, household questionnaires, and Stage I and Stage II FOSDIC schedules to determine the extent to which transcription errors contribute to the net and gross errors and to the "correlated response deviations."

b. Coding of sample data. Two large-scale coding operations are being established to deal with the data on the Stage II FOSDIC schedules. The first - general coding - requires clerks to enter the codes for detailed family relationship, place of birth, migration status, place of work, and income on the FOSDIC schedules. The second operation is the specialized occupation and industry coding. It is proposed to provide estimates of the contribution to net and gross errors in Census statistics arising from coding error, as well as the contribution to response variability arising from correlated response deviations in coding. This will be accomplished by recoding the data obtained in the Census enumeration for a sample of households and comparing the recodes with the original codes. Some of the recoding will be carried out by regular coders and some by coders selected for special expertness.

c. The microfilm-FOSDIC-computer operation. A comprehensive program of quality control of the microfilm-FOSDIC-computer operation is now being developed. This program plus the inherently high reliability of the electronic equipment should assure tabulations that are subject to far fewer errors than those produced by conventional punched card equipment. The computers will undertake the job formerly performed by editing clerks and conventional equipment. Thus the editing of the data will be done uniformly, in accordance with the rules given to the computer. There is a need, therefore, to evaluate the editing rules - particularly the rules for imputing missing data. A study has been established for this evaluation as well as for an overall evaluation of the entire processing system.

V. SOME ADDITIONAL REMARKS

The following features of this research and evaluation program are worthy of discussion in a meeting of statisticians:

1. We recognize that we are checking our own work. This is a grave responsibility to which we have not found any practicable alternative. We shall strive, however, as conscientiously as possible to make available full descriptions of our methods and their limitations as we have been able to determine them, as well as of our results. The data of our evaluation program can, of course, serve as material for independent appraisal of the 1960 Censuses by other analysts. Indeed, this was the case in 1950 where a very interesting analysis of the completeness of coverage of the census was made by Ansley Coale (4), to whom we made available the relevant data on the 1950 Post-enumeration Survey.

2. We shall use various types of samples in the conduct of most of our evaluation studies. It perhaps no longer requires stating that a sample can be used to check on the accuracy of a complete count. This, of course, has been recognized in the quality-control field.

3. We recognize that we have much to learn about methods of evaluation. It turns out, however, that the best time for developing methods of evaluation is during an evaluation program itself - because of the availability of funds, personnel, and census data.

4. In our judgment, evaluations of the methods and results of the 1960 Censuses are not likely to come directly from the results of any single study or project. It is for this reason that we have designated as one of our evaluation and research projects a series of analytical studies.

This project has been identified in order to reserve funds for analyses of the results of both the 1960 Censuses and the evaluation studies. In these studies, we shall examine the strong points and limitations of the measurements of error made in the evaluation studies and we shall undertake some intensive demographic analyses as well as statistical comparisons with results obtained from other sources. The final appraisals of the quality of the 1960 Censuses and of our evaluation efforts will come from these analytical studies.

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