RESEARCH PROGRAM FOR THE 1990 DECENNIAL CENSUS

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CYCLE OF PLANNING, TESTING AND PREPARATION FOR THE 1990 CENSUS

During the ten year cycle between decennial censuses of population and housing the Census Bureau identifies the combination of techniques and methodologies that will achieve, most effectively, the goals of the census.

The Census Bureau evaluated 1980 decennial census procedures and operations. This led to suggestions for new or modified techniques for 1990. During the ten year cycle, these procedures are assessed, and the those with the greatest potential are chosen for research projects. Experimental designs for these projects are developed and integrated into test censuses which are carried out between actual censuses. The results of the test censuses are then evaluated. This process produces objective measurements of operational improvements in terms of increase in census coverage of the population and improvement in data quality and cost efficiencies. Then these research results are assessed to determine which experimental techniques are effective and should be integrated into the 1990 census design.

TESTING OPPORTUNITIES

The census-taking process is a function of both the opportunities and limitations imposed by such elements as topography of the nation, varying population density, differences in language and socio-economic characteristics of persons within the country. For these reasons census-taking procedures differ between geographic areas. As a result, testing of techniques is often conducted in many separate, different settings. Test censuses are undertaken in urban, suburban and rural settings including Indian reservations.

COMPONENTS

The following major tests were undertaken in (or are being planned for) the ten year cycle leading to the 1990 census:

- o 1984 -- Address List Compilation Test
- o 1985 -- 2 urban test censuses
- o 1986 -- 2 test censuses: 1 urban, 1 rural
  -- National Content Test
- o 1987 -- 1 test census: very rural area
  -- Special Purpose Tests -- including a second Content Test
- o 1988 -- Dress Rehearsal: 3 areas covering urban, rural and very rural areas.

This paper will describe the various components of the testing cycle noting the test objectives and, when available, the test results.

1984 ADDRESS LIST COMPILATION TEST

The Address List Compilation Test (ALCT) was conducted in 2 urban sites (Hartford and Bridgeport, Connecticut) and in two sets of rural counties in Georgia and Texas. In these sites the Census Bureau tested different methods of developing the census address list used to address census questionnaires for mail out.

In mailout/mailback areas, the United States Postal Service (USPS) delivers questionnaires for respondents to complete and mail back to the Census Bureau. Enumerators have to visit those housing units that do not return a questionnaire. Complete and accurate address lists are essential to conducting a good census using the mailout/mailback method. A good address list, then is necessary for reducing the costs of enumerator visits as well as controlling enumeration. Enumeration control is the process by which receipt of census forms is recorded. Once an address is included on the Census Bureau's address lists, either that address and its occupants are enumerated or the address is determined to be nonresidential or nonexistent.

The major objective of the ALCT was to determine which source to use to obtain the most accurate and cost effective address list in both urban and rural areas. The potential sources in urban areas were commercial vendors, the USPS, or an update and reuse of the Census Bureau's 1980 census address list. In rural areas the sources that were considered were the USPS or the Census Bureau's own enumerators.

The Census Bureau wanted to test the ability of the suppliers to create initial address lists, and it also wanted to assess various methods of updating the lists. Updating methods are used to improve address list coverage, assure that the USPS can deliver mail to the address and, if need be, to guarantee a census enumerator can find the address during follow-up activities.

For the 1980 census the initial list for mail-out/mail-back areas was created by purchasing addresses from commercial vendors for the more urban parts of the country and by enumerators creating lists of addresses "from scratch" for the more rural areas. This listing operation was called prelist. Updates in urban areas to at least subsets of the address lists were performed by the USPS in an operation called the Advance Post Office Check (APOC) and by the Census Bureau in a canvassing operation called precanvass.

In rural areas in the ALCT in the Census Bureau wanted to test USPS updating techniques and updating by the Census Bureau.

The following decisions for 1990 address list compilation were made based on ALCT results:

Results

- In urban areas the Census Bureau will use the vendor list as the initial address list and will update the vendor lists with multiple checks by the USPS and a precanvass by Census Bureau
- In rural areas the Census Bureau will produce the initial list by prelisting, and the USPS will update the list in an APOC operation. A subsequent test census indicated that a Census Bureau field check called APOC reconciliation is then needed to reconcile any differences between the versions of the address list.

1985 TEST CENSUSES

The 1985 test census included censuses at two sites, Jersey City, New Jersey and Tampa, Florida. Jersey City was an older site with a sizable inner city in the northeastern part of the United States while Tampa was a less densely populated sunbelt city. Both sites had diversified populations with significant minority group representation.

Two Stage Census

In the Jersey City site the Census Bureau tested a different method of census-taking against the method used in 1980. It experimented with a two stage census. In the first stage the Census Bureau collected the basic data, the 100 percent data obtained for all people in the census, then in the second stage it returned to a sample of the population to collect additional "sample" data (the additional information collected on the long form questionnaire in 1980). The Census Bureau thought that this approach could expedite the overall census process over the 1980 methodology. In the 1980 methodology all the 100 percent and sample data were collected at one time.

In the two-stage experiment one half of the site was enumerated using the 1980 methodology and the other half with the two-stage design.

The Census Bureau's objective was to find out if such an approach would improve census-taking in hard-to-enumerate areas. Specifically, the research hypothesis was that during nonresponse follow-up the presence of long forms has a negative effect on 100 percent data collection costs, data quality and components of coverage.

Results

- The two-stage procedure did NOT produce a significant (at the .10 level) improvement over the 1980 method. Mail response for the two stage panel receiving only the form requesting 100 percent data was higher than for the 1980 methodology panel receiving 100 percent and sample forms. However, the mail response for the mailout of the sample form in the two-stage panel was VERY LOW relative to the other panel (German, 1986). The initial gain in mail response in the first stage was offset by difficulty in obtaining sample data. The two-stage approach will not be used in 1990.

Coverage of Address Lists

Obtaining a list of all housing units in the United States is a facet of census-taking the Census Bureau wanted to improve for the 1990 census. Specifically, the precanvass operation, where enumerators are given a list of addresses and instructed to make all needed additions, deletions and corrections to the addresses in that area, was slated for testing.

An objective in 1985 was to test if the 1980 precanvass procedure, where in most cases enumerators only verified the counts of housing units in multiunits, could be improved by a UNIT-BY-UNIT PRECANVASS. In a unit-by-unit precanvass, enumerators were told to verify the addresses of all units and make apartment designation corrections, if needed.

Results

- The unit-by-unit precanvass improved the precensus accuracy of apartment designations. Only 25 percent of Jersey City apartment number corrections made using the new unit-by-unit precanvass procedures would have been made under the 1980 census address correction rules. In Tampa the comparable number was 77 percent (McKelvey, 1985).
- The unit-by-unit precanvass also produced a coverage gain comparable to that produced by the precanvass operation used in 1980. Precanvass coverage results were
  - Jersey City: 5 percent added housing units
  - Tampa: 7.1 percent added housing units (Thompson, 1985).

1985 Post-Enumeration Survey

Coverage of the population in a census can be measured by matching results of an independent survey, for

instance a post enumeration survey, to the census and estimating undercoverage from the results.

The 1985 Post-Enumeration Survey (PES) was designed to be a block sample of persons to be matched to the 1985 Test Census of Tampa, Florida. The goal for 1985 was to collect data to develop a computer and clerical matching system to use in later test censuses.

Results

- o The computer matcher was found to be fast and accurate, linking 62 percent, 4587 out of 7358, of the cases (Childers, 1985).
- o The block sample in 1985 improved the efficiency of interviewing and matching because the housing units were clustered by block.

1986 TEST CENSUSES

In 1986, test censuses were carried out in two sites: an urban "hard-to-enumerate" site in Central Los Angeles County and a rural site, composed of several counties in east central Mississippi.

Rural Methodology

Development of a better census-taking methodology in a rural setting was a major objective of the Mississippi test. In areas where some addresses have no house number or street name the Census Bureau tested new ways to create and maintain rural address lists and ensure accurate questionnaire delivery.

Recall that in rural areas the census enumerators create an address list by prelisting. The Census Bureau wanted to refine its basic prelist procedures but also to test the additional use of a method of updating these addresses using the USPS. USPS updating techniques had been successful in 1980.

Towards these ends the Census Bureau prelisted the entire test site to prepare the initial address list. Then it had the USPS check the accuracy of the listing. This was the USPS check that had not been done in rural areas in 1980.

Given that the USPS check would sometimes result in two different versions or geographic codes for an address, the Census Bureau then reconciled USPS/prelist differences. After this point in the process an experimental design was introduced to test two different census collection procedures. The test site was split into two areas:

- In one half of the site the Census Bureau updated the list an additional time with a precanvass operation and the USPS delivered the questionnaires.
- In the other half of the site Census Bureau employees simultaneously delivered questionnaires and updated the address list. This process was called update/leave.

Results For the entire rural site:

- o The results were that the initial prelisting was completed on time and within budget. Additionally, 89 percent of the addresses were classified as deliverable by the USPS (Hernandez, 1986). This confirmed that prelisting is a good method of compiling a list of addresses in rural areas that deliverable by the USPS.
- o The USPS check was found to improve coverage BUT a reconciliation procedure by the Census Bureau was needed to resolve differences in USPS/Census Bureau descriptions of addresses.

For the test of different delivery procedures:

- o The analysis of the new update/leave procedure is currently taking place. Some operational problems were noted during the test. We have decided to use the concept in selected locations.

Nonhousehold Sources Search

The Nonhousehold Sources Program (NHHS) is a coverage improvement operation, designed to improve within household coverage of minority populations in urban areas. In the operation addresses obtained from the Department of Motor Vehicles and from other administrative lists, called nonhousehold sources lists are matched to the census address list. In 1980 for a person whose NHHS address matched a census address, the census questionnaire for the address was searched. If the (NHHS) person was not found on the questionnaire, (s)he was followed up by telephone or in a field operation and, if found to have been falsely omitted, added to the census.

The test in Central Los Angeles included an automated system for searching and matching the persons from the NHHS lists to the census. In 1980 the search operations were clerical for the most part.

Results

- o The operational change from clerical to automated searching and matching from 1980 for NHHS were found to be successful. Searches were carried out with increased timeliness due to

their automation; the efficiency of operation was heightened.

- The effects that the whole program had on coverage of the population are still being studied.
- Analysis is not complete, but the coverage yield from the follow-up operation was about the same as the yield from similar areas in 1980 and less than the yield from pretests leading to the 1980 census (Thompson, 1986).

The 1986 results in terms of person adds per case processed were not encouraging. While coverage improvement is a major objective of the 1990 census, the Census Bureau has concluded that the NHHS program is not an effective means toward achieving this objective.

Coverage Measurement

In Central Los Angeles the Census Bureau measured coverage by two different methodologies. It conducted a Pre-Enumeration Survey (PrES) and a Post-Enumeration Survey (PES).

In a PrES a sample of people from the site is interviewed before the census. Then the results are matched to the census. The count of nonmatched people is used to measure undercoverage. The goal of this survey was to compare PrES results with those of the usual census coverage measurement instrument, the PES.

In the PES a sample of the population is interviewed soon after census enumeration is complete. As in the PrES, the results are matched to the census and used to measure undercoverage.

The results of the Los Angeles PES were also used as a test of adjustment related operations. That is the PES was used to:

- produce measurements of coverage and then apply them to the census, adjusting the census for the degree to which the population was undercounted.
- test the feasibility of integrating the census and PES operational schedules: to test if the Census Bureau could take a complete census and be ready to adjust it before December 31. (In 1990 apportionment counts are due to the President on or before December 31, 1990.)

A PES was also undertaken in the rural Mississippi site. This was important since rural addresses are often not house number/street name type addresses. Given this lack of specificity in addresses, it is hard to match the rural type addresses in the PES to addresses in the census. The Mississippi site offered a test of rural matching techniques, both clerical matching and computer matching, which was invaluable to the Census Bureau's undercount measurement research program.

Finally, in the 1986 tests each of the coverage surveys were matched to the census using an improved computer matching program. In the clerical matching operations used in 1980 to match the PES to the census, a great deal of time had been used in the initial stages of matching. The Census Bureau hoped the computer matching algorithm would be an effective replacement for this clerical procedure.

Results

- 1986 Pre-Enumeration Survey Match

  Out of 4522 cases, the computer matched 66 percent. There were 984 cases not (yet) matched and 567 cases that were possible matches. During the clerical matching phase 881 cases were converted to matches. After the clerical matching there were 641 cases not (yet) matched and 13 cases that were possible matches. Analysis is not yet completed.
- 1986 Rural Post-Enumeration Survey Match

  The total number of cases 7953, the number the computer matched was 5407 which is 68 percent.

  The number of cases matched by the clerical staff was 1099 and by the special matching group was 351. Analysis is not yet completed.
- 1986 Urban Post-Enumeration Survey Results

  The computer matching of the Los Angeles test census and PES results consisted of two passes. The first pass used only the PES data and census data in PES blocks. The second pass matched by the use of the mainframe computer PES data and the census data for the whole test site. The total number of cases was about 20,000. The results of the first pass matched about 73.5 percent of the total file and gave a possible match code to 12.5 percent of the total file. The results of the second pass matched about 0.7 percent of the total file and gave a possible match code to 2.9

percent of the total file (Diffendal, 1986). The very small number of matches from the second pass of matching was due to the very low geocoding error rate in Los Angeles and the small number of movers within the test site.

Nonmatched cases were then followed up in the field. There were 1551 cases sent to field follow-up. About 97 percent of the follow-up cases had a completed interview. After follow-up interviews were returned to the office, clerks reviewed the information and assigned the final match status, preparing the file for the estimation activities.

Dual system estimation produced estimates of the undercount for the post strata by age and sex. This enabled the production of a file of the dual system estimates, census counts, adjustment factors and variance estimates. The smoothing of the adjustment factors was done by fitting a Bayesian regression model to the adjustment factors using separate components for model error and sampling error. The results of the estimation process indicated about a 9 percent undercount for the Los Angeles test site.

1987 TEST CENSUS

This year's test of the census operations was conducted in a rural area in North Dakota with low population density that included 2 American Indian reservations.

The main objective of the test was to test use of two census-taking procedures in one office:

- a mailout/mailback procedure in larger, more densely populated towns.
- door-to-door enumeration in the remainder of the site.

Using two procedures in the same office can cause some problems. Duplication of addresses might occur near the boundaries between the two types of areas. One of the major objectives of the test was to evaluate the extent to which such duplication might occur.

Additional objectives included:

- the development of a decentralized processing system within the local office that improves on the 1986 system used in the rural site.
- the continued testing enumeration techniques for American Indian reservations.
- the use of an "enumerator friendly" census questionnaire --one upon which the questions are worded in a manner that makes it easier for the enumerator to illicit accurate responses.

Results

- o Results have only been produced for the initial census operations, i.e., prelisting of the mailout/mailback area and the Advanced Post Office Check (APOC) of those addresses.
- o With respect to the potential duplication problem, it was found that the USPS could successfully use census maps in APOC to delineate the boundaries of the prelisted areas and seldom incorrectly added addresses to be covered in the door-to-door enumeration.

1988 DRESS REHEARSAL

The Census Bureau has selected three sites where it will implement and refine the full array of methods and procedures that it expects to use in 1990.

- St. Louis, Missouri - This is an urban area where a high percentage of the basic street addresses are multiunits. It also contains an inner city with a large Black population.
- East Central, Missouri - This rural area includes one typical small city, Columbia, Missouri.
- A group of eight counties in Washington State - These include a sparsely populated rural area and two American Indian reservations.

Although the Dress Rehearsal will not be the testing ground for any further large-scale census experiments, some final small scale tests that are relatively transparent to the enumerators and to census processing will be undertaken. Among these are the final test of two types of census questionnaires, those that will be mailed and those used by the enumerators; final evaluation of the motivational insert to be used in the 1990 census; and testing of refinements in the way the Census Bureau enumerates people that move on or around Census Day.

The Dress Rehearsal has begun. Precensus activities are underway. Census day is March 20, 1988.

SUMMARY

At the close of this testing cycle the Census Bureau will have tested census-taking procedures and processes in a variety of areas:

- o Hard-to-enumerate urban areas
- o Less densely populated suburban areas
- o Rural areas

- Very sparsely settled rural areas
- American Indian reservations

In addition, the Census Bureau will have tested techniques with a variety of populations including:

- Blacks
- Hispanics
- Asian, Pacific Islanders
- American Indians

These tests will allow the Census Bureau to refine the 1980 procedures in order to design an improved 1990 census.

Citations/Acknowledgements

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Footnote

[1]This paper reports the general results of research undertaken by Census Bureau staff. The views expressed are attributable to the authors and do not necessarily reflect those of the Census Bureau.