

THE DESIGN AND ANALYSIS OF THE US 2000 CENSUS TEST

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The U.S. 2000 Census Test, was the major testing vehicle for the questions to be used in Census 2000. This survey also served as an important piece of research that will be considered by the Office of Management and Budget in their review of racial and ethnic classification standards. The U.S. 2000 Census Test was a national survey that was conducted in March 1996. In addition to testing content, this survey was design to support testing of questionnaire design components that might impact mail response and coverage. This paper will describe the design for this survey.

I. INTRODUCTION

Before each decennial census since 1970, the Census Bureau conducts a research and testing program to evaluate the subject content and specific question wording proposed for the census questionnaires. Subject matter specialists suggest alternative wording, format, or sequencing for questions currently on the questionnaires and propose wording for new questions designed to meet strong data users needs.

The 2000 Census Test also known as the 1996 National Content Survey, was the principal vehicle for testing and evaluating subject content for the 2000 Census of Population and Housing. The test is also part of a larger program of research and development to assist in selecting methodologies, operations, and questionnaire designs for both short and sample forms for the 2000 Census.

In addition, the test was also designed to compare alternative short form designs and assess the differences in coverage, completeness, and cooperation for the design elements. A content reinterview operation was conducted to assess the accuracy and reliability of the information collected in the 2000 Census test.

The authors are mathematical statisticians in the Decennial Statistical Studies Division. 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.

II. MAJOR TEST OBJECTIVES

The US 2000 Census test had multiple objectives involving both methodological and question wording and formatting issues. In order to accomplish the objective thirteen different questionnaires were tested : Seven short form questionnaires, (one control and six experimental forms) and six sample questionnaires (one control and five experimental forms).

A. Effects of Questionnaire and Mailing Package Design

The U.S. 2000 Census Test short form data allow us to evaluate two different approaches to questionnaire and mailing package design--the Official Government and the Public Information Design approaches. Both approaches incorporate features found to increase response rates to mail surveys administered using self administered questionnaires in previous Census tests. These include respondent--friendly questionnaire design, use of an advance letter, mailing a reminder postcard, mailing a replacement questionnaire and inclusion of a message that response is mandatory (required by law).

The discussion below highlights key ways the two approaches operationalized these design features.

1. Official Government Approach

Five of the seven simple mailing packages (envelopes, and questionnaires) were designed using the Official Government approach. The design of these mailing packages focused on past research which has shown that government sponsored survey obtain higher response rates than do private sector sponsored surveys. In addition, the Census Bureau built on previous research which showed that including a combined message on the outgoing mail envelope (U.S. Census Form Enclosed; Your response is required by law) significantly increased response beyond that which we could obtain with any other response inducing factors. The forms were mailed in envelopes consistent with the public's expectations of government; that is, not multi-colored or expensive. The use of this envelope may have been successful in stressing that the government was sponsoring the survey and that respondents had a legal requirement to complete and return the enclosed questionnaire.

2. Public Information Design Approach

An outside contractor was hired to design two prototype mailing packages and their envelopes. They used their extensive experience in packaging, forms design and layout, and logical organization of information to develop mailing packages that would be user friendly, accessible, easy to use, and appealing to the general public. They focused their efforts on designing the forms to be as short as possible, using marketing tools to increase a sense of urgency and priority and developing a message that would motivate its users. They attempted to design a questionnaire that would allow the Federal Government to present itself with style--a style that was patriotic, contemporary, and good looking. For the outgoing envelopes, the contractor used size, style and authority to provide contrast to junk mail. They focused their efforts on packaging the questionnaires to ensure that the envelope and questionnaire content matched in appearance. In sum, the contractor used color, informational icons (symbols to replace words), and graphics to attract the reader's attention. The predominant color chosen for these two forms was gold

B. Within Household Coverage

Comparisons among the experimental short forms were used to test differences within household enumeration methods, that is the steps that respondents are asked to complete for listing all Census day residents. In particular, this test was designed to determine the impact on within household coverage (both omissions and erroneous enumerations) of;

1. Elimination of the roster or listing of names of household members and asking instead for a count of total persons in the household;
2. Shortening or eliminating the rules about whom to include or exclude;
3. Providing room for respondents to report data on only five persons;
4. Including a "continuation roster" or forms to list the names of household members for households with more than 5 persons.

Table 1 provides an overall summary of the questionnaire design features as they relate to objectives B and C.

Table 1. Summary of Short Forms by Design Elements

Design Element	1A	1B	1C	1D	1E	1F	1G
Listing of Names on Roster	X						
Count of Persons		X	X	X	X	X	X
Rules Provided	X	X			X	X	X
Number of Persons Boxes	7	7	7	7	5	5	5
Number of Persons that can be Identified	10	10	10	10	8	5	12
Request for name and phone number (F-front; B-back)	B	B	B	B	F	F	B
Usual Home Elsewhere question (W-whole household; I-Individual)	W				I		
Number of Pages	12	12	12	12	8	4	4
Color of Questionnaire	G	G	G	G	Y	Y	G
Envelopes used for Mailing designed by; (CB-Census Bureau; CO-Contractor)	CB	CB	CB	CB	CO	CO	CB

C. Alternative Question and Wording

The final objective for this test was to determine the specific question wording and format (e.g. response categories) for the subject area questions to be included on the Year 2000 Census questionnaires.

1. Short Forms

The primary subject areas of interest were the questions for race and Hispanic origin. In particular, the addition of a "multiracial" response category to the race question and the sequencing of the race and Hispanic origin questions (race followed by Hispanic origin or vice-a-versa).

2. Sample Forms

The five experimental test forms were designed by Census Bureau staff to test alternative question designs (wording, format, etc.) for the subject areas likely to be included on the Year 2000 Census sample form. The remaining experimental sample form was designed by an outside contractor with the goal of making the form user friendly in terms of design and question wording.

III. EXPERIMENTAL DESIGN

A. Universe and Sampling Strata

The universe for the U.S. 2000 Census Test was the 1990 Census Address List for housing units in questionnaire mailback areas only. The list of addresses was not updated to account for new construction or donations. The sample design divided the universe into two strata based on race, Hispanic origin, and tenure (owner/ renter) variables at the 1990 Census Tract/Block Numbering Area level. One stratum, denoted as the low coverage area (LCA) stratum, had a high proportion of minority persons and renters; and the second stratum, denoted as the high coverage area (HCA) stratum, contained the residual. The LCA stratum contained 17,359,020 housing units (approximately 20%) and the HCA stratum contained 71,812,378 housing units after exclusions were made for units selected for previous tests following the 1990 Census. Based on 1990 Census data within the LCA stratum, about 42 percent of persons were black, 27 percent were of Hispanic origin and 57 percent were renters. The corresponding HCA percents were 5 percent, 4 percent and 27 percent respectively.

B. Mailout Sample Size and Expected Mail Returns

Stratified sampling was used to select a total sample of 94,500 housing units. The expected number of mail return rates were based on the results of previous response rate tests. (See Table 2.) For each of the seven simple form panels, a sample of 2,400 housings selected from the HCA stratum and a sample of 3,600 housing units was selected from the LCA stratum. For each of the six sample form panels, a sample of 3,500 housing units was selected from the HCA stratum and a sample of 15,250 housing units was selected from the LCA stratum. For each housing unit selected within the strata, twelve neighboring units were selected. This resulted in selection of clusters of thirteen neighboring housing units. Within each cluster, each unit was randomly allocated to one of the thirteen test panels.

Table 2: Sample Size for Short and Sample Form Panels by Stratum (HCA and LCA)

Stratum	Short Form Panels	Sample Form Panels	Stratum Totals
High Coverage Area:	Mailed	21,000	37,800
	Sample Expected Returns	12,600	25,200
Low Coverage Area:	Mailed	31,500	56,700
	Sample Expected Returns	12,600	25,200
Total Sample:	Mailed	52,500	94,500
	Sample Expected Mail Returns	25,200	50,400

C. Implementation Plan

The U.S. Postal Service delivered a questionnaire mailing package to the sample housing units (addresses). All panels received the full mail treatment strategy developed earlier in our testing cycle for Census 2000. Each housing unit received an advance notice letter (mailed February 23, 1996) and an initial mail out questionnaire (mailed February 28, 1996). A reminder postcard (mailed March 4, 1996) and a replacement questionnaire with a letter (mailed March 25, 1996) were sent to housing units for which no response was received from the initial mail out.

Stratum	Panel	Mailed Sample	Total Returns for Deliverable Addresses	Total Postmaster Returns	Mail Return Rate
High Coverage Area (HCA)	1A	2400	1650	227	75.9%
	1B	2400	1740	223	95%
	1C	2400	1724	229	79.4%
	1D	2400	1740	206	79.35
	1E	2400	1660	206	75.7%
	1F	2400	1554	210	70.9%
	1G	2400	1759	214	80.4%
	Total	16,800	11,827	1515	77.4%
Low Coverage Area (LCA)	1A	3600	1692	322	51.6%
	1B	3600	1737	349	53.4%
	1C	3600	1786	357	55.1%
	1D	3600	1707	330	52.2%
	1E	3600	1651	317	50.2%
	1F	3600	1793	352	46.4%
	1G	3600	1793	352	55.2%
	Total	25200	11886	2351	52.0%

Stratum	Panel	Mailed Sample	Total Returns for Deliverable Addresses	Total Postmaster Returns	Mail Return Rate
High Coverage Area	2A	3500	2128	335	67.2%
	2B	3500	2175	309	68.2%
	2C	3500	2234	333	70.5%
	2D	3500	2221	348	70.5%
	2E	3500	2225	318	69.9%
	2F	3500	2302	328	72.6%
Total	21000	13285	1971	69.8%	
Low Coverage Area (LCA)	2A	5250	1927	567	41.1%
	2B	5250	2069	524	43.8%
	2C	5250	2075	535	44.0%
	2D	5250	2050	548	43.6%
	2E	5250	1986	558	42.3%
	2F	5250	2205	521	46.6%
	Total	31500	12312	3253	43.65

Tables 3 and 4 provide actual numbers of questionnaires (simple and sample) returned for addresses for which an initial or replacement questionnaire could be delivered. Approximately 9.2% of short form questionnaires were undeliverable as addressed (also known as postmaster returns) while 10.1% of sample form questionnaires were undeliverable. Overall, at the stratum level, the observed number of mail returns was close to the expected number.

IV. CONTENT AND COVERAGE REINTERVIEW DESIGN

One of the key design and analysis features of this test was the use of reinterview to evaluate alternative question wording and format variations for subject areas (e.g. race, educational attainment) and to obtain a "correct" list of Census day residents (short forms only) to evaluate the experimental rostering techniques. Reinterviews were conducted from May 1, 1996 and through June 15, 1996. Reinterviews were conducted with households who completed and mailed back a questionnaire and for which a telephone number was available. The respondent who completed the mailed questionnaire was the designated respondent for the reinterview. If the respondent name was blank, the household member listed in 'person box' 1 was reinterviewed. Proxy responses were only allowed after 6 attempts to contact the designated respondent failed.

The reinterview was conducted using computer assisted telephone interviewing (CATI). Two CATI instruments were developed, a simple form instrument and a sample form instrument. The design of separate reinterview instruments was necessitated by the different analysis goals for the two types of questionnaires.

A. Reinterview Design for Simple Forms

A subsample of half the mail returns in the HCA stratum and all of the mail returns in the LCA stratum were designated for the telephone reinterview sample. This resulted in 15,213 households being designated for reinterview available, either from the questionnaire directory assistance phone numbers were unavailable for 9% of mail returns. Interviews were completed with 86.1% of households designated for reinterview.

One purpose of the reinterview was to obtain a correct list of census day residents. The reinterview began by asking a series of probes aimed at listing all possible census day residents and collecting demographic data for these persons. The names of persons listed in the telephone interview were linked electronically to the names of persons enumerated on the census questionnaire. Interviewers reviewed the links identified, asked question about questionable links and about unlinked persons from both lists, and updated the linking results. A series of

questions on places where persons resided on or around census day was asked about all persons listed during the interview and all those enumerated on the census questionnaire.

A correct census day residence status was then assigned to each person listed in the interview or on the census questionnaire based on the data collected. This was done in two steps. First an attempt was made to assign residence status electronically. This was followed by clerical review by personnel trained on the application of census day residence rules and experience with reviewing residence data and assigning residence status according to census day residence rules. Census residence status was unresolved for 1.4% all persons listed.

The second purpose of the short forms reinterview was to provide evaluation measures concerning the alternative race and Hispanic origin questions tested. The telephone reinterview used the race and Hispanic origin questions that were used in the 1990 census, modified for telephone interviewing, with one exception: one-half of the households who completed forms that provided a multiracial response option on the original mailed form were also given this multiracial option in the reinterview while the remaining half did not receive the multiracial response option. Additional questions such as preferences for race and Hispanic origin terminology, were also collected in the telephone reinterview. These included, for example, "African-American" instead "Black" and "Latino" instead of "Hispanic origin".

The race question in the computer-assisted telephone reinterview was asked in two parts using an "unfolding response category" methodology. This methodology worked as follows. In the telephone reinterview, households who did not have a multiracial option in their original mailed questionnaire were asked to select one of the following seven categories: White; Black; American Indian; Eskimo; Aleut; Asian and Pacific Islander, or other. Respondents selecting Asian and Pacific Islander were than asked to choose from 10 specific Asian or Pacific Islander subgroups. Those indicating 'other' as a race were asked to be more specific. Telephone reinterviews of respondents whose mailed questionnaire contained a multiracial category followed the same method, but a multiracial option was included along with the other seven categories for half of those reinterviewed. The same "unfolding response category" methodology was used for the "Other Hispanic" category of the Hispanic origin question in the telephone reinterview.

B. Reinterview Design for Sample Forms:

For the sample forms reinterview, all mail returns were designated to be reinterviewed in five panels. One of the experimental long form panels, 2F, was excluded from the reinterview. This resulted in 23,464 households being

designated for the reinterview sample. Telephone numbers were unavailable for 9.4% of the mail returns. A completed reinterview was obtained for about 85 percent of the households (about 18,000).

To minimize respondent burden the subject content for each sample-form reinterview was divided into two modules. A core set of population questions was asked in all modules and housing reinterview questions for each were asked in both modules. For the remaining population reinterview questions, the household respondent was asked a subset of the questions designated for the panel. The core questions included race, sex, age, Hispanic origin, place of birth, year of entry (into the U.S.) and ancestry.

VI. ANALYSIS METHODS AND RELIABILITY OF ESTIMATES BETWEEN PANELS

A. Simple Forms

The analysis of the content objectives for this test focused on between panel comparisons of the following estimates. For the alternative race and Hispanic origin questions tested on simple form panels 1A, 1B, 1C and 1D, item missing data rates and the distribution of responses (excluding persons with no response) on mail return questionnaires were compared. In addition, to assess the reliability of the information collected on the mailback forms, the rate of disagreement for each race and Hispanic origin category and the overall rate of disagreement were compared across panels. These estimates compared responses from the mailback forms with those given in the telephone reinterview and are an indication/measure of the inconsistency of reporting. The rate of disagreement for a particular response category, c , is the total number of persons reported in category c on either the mailback form or the reinterview, but not both, divided by the total number of persons with responses on both measures. The overall rate of disagreement is the total number of persons with inconsistent responses on the mailback form and reinterview divided by the total number of persons with responses on both measures.

To evaluate the coverage properties of the control and experimental forms error rates due to omissions from the roster and erroneous inclusions to the roster were calculated using the telephone reinterview and results compared. For the reinterview analysis, the test was designed to measure, at 90% confidence level, the difference in the error rates in panel-to-panel comparisons as shown in Table 5 below.

Table 5. Predicted Measurable Error Rate Difference for Short Forms

Stratum	Basic Panel Comparisons*	Pooled Panel Comparisons
Low Coverage Area	1.3%	1.0%
High Coverage Area	1.1%	0.9%
National	1.0%	0.8%

* Reinterview data for panels 1B, 1E AND 1G will be pooled and compared separately to panels 1A and 1C.

B. Sample Forms

The analysis for the sample form included between panel comparisons of item missing data rates and response distribution (excluding missing data) for the alternative questions tested (by subject area). In addition, rates of disagreement using the interview/reinterview responses were compared.