

COVERAGE EVALUATION OF EXPERIMENTAL FORMS IN THE 2000 CENSUS TEST

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1. Introduction

The 2000 Census Test conducted in 1996 was a major test of the census mail-out/mail-back questionnaire. The Census Bureau began the use of a mail-out/mail-back in 1970 to cut cost and improve data quality. Whenever a respondent completes a census form and returns it by mail, the Bureau saves the additional cost of sending an enumerator to the household. Also, studies show that data are more accurate on self administered questions than on questionnaires administered by an enumerator.

The mail-out/mail-back approach to census enumeration has worked successfully but over the past three censuses mail response rates have been steadily dropping. The response rates have dropped from 78% in the 1970 census to a low of 65 percent in the 1990 census (Waldrop, 1995). Many people had significant concerns about the 1990 census, relating to both cost and data quality. These concerns often stem from the low response experienced.

Recognizing that the declining response rates threaten the Bureau's efforts to conduct a quality census at a reasonable cost in the year 2000, the Bureau has been conducting a research and development program for the Census 2000 since 1991. Research on new census questionnaire designs has been one important part of this effort. A key element in the redesign of the census questionnaire has been to make the questionnaire simpler and more user-friendly. Redesign of a census questionnaire cannot solve all the problems of the decennial census, but response to the census can be addressed with an improved census form that is shorter and more user-friendly. Such a form would appeal both to people who might feel they are too busy to respond and to people who have difficulty filling a form. It is hoped that a shorter form that is easier to complete will be more appealing and increase mail response to the census.

Making the census forms shorter and more user friendly through changes to the design of the enumeration method used on census questionnaires was feature examined in the 2000 Census Test. The term enumeration method refers to the instructions given to respondents and the steps respondents follow for compiling a list of

household members. Since the first mail-out/mail-back census in 1970, the traditional enumeration method requested that the respondent list the names of all household members on a roster before providing detailed data about each member. The request for a household roster was a lengthy and complex questionnaire item. Also, the traditional enumeration method requires the respondent to list the name of each household member twice, once on the roster and again the section of the questionnaire where detailed data was collected for each individual.

It has been hypothesized that having respondents complete a household roster helps to ensure more accurate census count. Having a list to reference may help to avoid inadvertent errors of omission. Focusing the respondent's attention on compiling a complete list of household members before they begin answering detailed questions about individuals may help them accurately assess which persons were household members on census day.

As an aid to respondents detailed instructions about whom to include and whom to exclude as household members accompanied the request for a roster of household members. Census residence rules are quite extensive. Because it is not practical to include all the rules on a questionnaire, the Bureau has carefully chosen which rules to include in the lists and the wording of these lists.

The 2000 Census Test evaluated two alternatives that shorten and simplify the design of the enumeration method. The first was to eliminate the household roster and replace it with request for a count of household members. Providing count of household members is a much shorter and more simple task than listing the names on a roster. When the roster is eliminated, the respondents are required to list the names of each household member only once when providing detailed data for each individual.

The second basic change was to eliminate the detailed instructions about whom to include and whom to exclude as household members. Past research has shown the need to include such lists on the questionnaires to help respondents understand who should be include on the questionnaires (Hainer, 1988). However, eliminating the list of rules from the questionnaire can make the

questionnaire appear more user-friendly, shorten the length of the questionnaire, and allow more flexibility in the design of the questionnaire.

These two changes created a shorter and more simple enumeration method. This paper evaluates the effects of these changes on the completeness of population coverage.

2. Methodology

2.1 Sample Design

Experimental forms were mailed to a national sample of households selected from the 1990 Census mail-out universe. Two strata of households were formed based on race, Hispanic origin and tenure. A coverage area stratum (1990 LCA) had high proportions of minority persons and renters in the 1990 census. The balance of the universe formed the high coverage area (1990 HCA) stratum. A sample of 2,400 clusters of contiguous housing units was selected from the HCA stratum and a sample of 3,600 housing unit clusters was selected from the LCA stratum. Within each cluster housing units were randomly allocated to various experimental form panels.

2.2 Questionnaire Design

Differences in the enumeration method were evaluated by mailing out three different questionnaires; a control form designed with the traditional enumeration method and two experimental forms with shorter less complex enumeration methods. Apart from differences in the enumeration method, these three questionnaires had very similar designs and content.

The first step on the control form (Form 1A) was the household roster. In this step the respondent was given the following instruction: "List on the numbered lines below the name of each person living here Saturday, March 2, 1996, including persons staying here who no other home" This instruction was followed by a list of eight instructions about whom to include and a list of five instructions about whom to exclude. Ten blank lines on which to list the names of household members followed these lists.

On one experimental form, Form 1B, the request for a household roster was replaced with a request for a count of household members. On this form the respondent was asked the following question in the first step: "How many people were living here on Saturday, March 2, 1996?". This question was followed by a list of four instructions about whom to include and a list of four instructions

about whom to exclude.

On the other experimental form, Form 1C, both the request for a household roster and the accompanying list of residence rules was eliminated and replaced with a request for a count of household members. The wording of the question about the count of household members was the same as on Form 1B.

2.3 Data Collection

The overall response rate to the census questionnaires was about 77% in the HCA stratum and about 52% in the LCA stratum. Computer assisted telephone interviews were conducted with housing units that returned a census questionnaire. Interviews were attempted for all of the LCA sample mail returns and for half to the HCA sample mail returns. Interviews were completed with about 76% of the LCA mail returns and with about 84% of the HCA mail returns sampled for the interview.

The telephone interview collected an independent roster of household members. The names of all people who could possibly have been household members on census day were collected. This was done by asking questions that probed for persons with specific types of living situation and relationships to the household. This independent list of persons was compared with the name of persons enumerated on the census questionnaire. Questions were asked about each person on the two lists to determine if each person was a resident of the household on census day according to census residence rules. The residence status of the persons listed determined which were residents omitted from the mail return questionnaire and which people were erroneously included on the questionnaire. The correct census day status was resolved for all but 1.4% of the people listed.

2.4 Coverage Error Measurement

The effects that the enumeration methods have on the completeness of population coverage were evaluated by comparing measures of coverage error across forms. Coverage error was measured by the estimated rates of omissions and erroneous enumerations. These rates are the ratio of the estimated total number of errors (omissions or erroneous enumeration) to the estimated total number of correct census residents across all forms. No adjustment was made for nonresponse to the mail-out questionnaire or telephone interview. The estimated totals exclude persons whose residence status was unresolved.

3. Results

3.1 Roster vs. No Roster

The effect of replacing the household roster with a count of household members on the completeness of population coverage was evaluated by comparing omission rates and erroneous enumeration rates across forms. The estimated rates of omissions and erroneous enumerations are shown in Tables 1 and 2, respectively. Comparisons of the rates of omissions and rates of erroneous inclusions for Form 1A with Forms 1B and 1C

are shown in Tables 3 and 4.

The data from this study show no evidence that eliminating the request for the respondent to complete a household roster and replacing it with a request for a count of household members affects the quality of population coverage within households. It does not appear that respondents left more persons off the form or included more persons incorrectly when the household roster was eliminated and replaced by a count of household members.

Table 1. Omission Rates

Form	Omissions (%) and Standard Errors (%)					
	National		1990 HCA		1990 LCA	
	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
1A	1.69	0.43	1.39	0.49	3.57	0.51
1B	1.25	0.24	1.00	0.27	2.73	0.38
1C	1.96	0.32	1.75	0.36	3.18	0.41

Table 2. Erroneous Enumeration Rates

Form	Erroneous Enumerations (%) and Standard Errors (%)					
	National		1990 HCA		1990 LCA	
	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
1A	1.75	0.30	1.60	0.34	2.65	0.41
1B	1.45	0.24	1.22	0.27	2.82	0.44
1C	2.32	0.31	2.14	0.35	3.41	0.43

Table 3. Omissions Rates
Comparison of Form 1A with Forms 1B and 1C

Comparison	Differences (%) and 90% Confidence Intervals					
	National		1990 HCA		1990 LCA	
	Difference	90% Confidence Interval	Difference	90% Confidence Interval	Difference	90% Confidence Interval
1A -1B	0.44	-0.52, 1.40	0.39	-0.70, 1.48	0.84	-0.41, 2.09
1A -1C	-0.27	-1.30, 0.7	-0.36	-1.55, 0.83	0.39	-0.88, 1.66

Table 4.

**Erroneous Enumeration Rates
Comparison of Form 1A with Forms 1B and 1C**

Comparison	Differences (%) and 90% Confidence Intervals					
	National		1990 HCA		1990 LCA	
	Difference	90% Confidence Interval	Difference	90% Confidence Interval	Difference	90% Confidence Interval
1A -1B	0.30	-0.44 , 1.04	0.38	-0.46 , 1.22	-0.17	-1.36 , 1.02
1A -1C	-0.57	-1.41 , 0.27	-0.54	-1.50 , 0.42	-0.76	-1.89 , .37

3.2 Residence Rules vs. No Residence Rules

The effect of eliminating the list of census residence rules from the questionnaire has been evaluated by comparing the quality of population coverage for Form 1C to Forms 1A and 1B. Tables 5 and 6 show the differences in omission rates and erroneous inclusion rates between Form 1C and Forms 1A and 1B. Table 6 shows that the estimated erroneous inclusions rate for Form 1C was significantly higher than the estimated

rate for Form 1B at the national level and within the High Coverage Area (HCA) stratum. These data show that, at least for the households in the HCA stratum, eliminating the list of residence rules from the questionnaire increases the tendency for respondents to will include persons on the form in error. These data show no evidence that eliminating an explanation of residence rules from the form increases or decreases omissions to households.

Table 5.

**Omissions Rates
Comparison of Form 1C with Forms 1A and 1B**

Comparison	Differences (%) and 90% Confidence Intervals					
	National		1990 HCA		1990 LCA	
	Difference	90% Confidence Interval	Difference	90% Confidence Interval	Difference	90% Confidence Interval
1C-1A	0.27	-0.76 , 1.30	0.36	-0.83 , 1.55	-0.39	-1.66 , 0.88
1C-1B	0.71	-0.07 , 1.49	0.75	-0.15 , 1.65	0.45	-0.64 , 1.54

Table 6.

**Erroneous Enumeration Rates
Comparison of Form 1C with Forms 1A and 1B**

Comparison	Differences (%) and 90% Confidence Intervals					
	National		1990 HCA		1990 LCA	
	Difference	90% Confidence Interval	Difference	90% Confidence Interval	Difference	90% Confidence Interval
1C-1A	0.57	-0.27 , 1.41	0.54	-0.42 , 1.50	0.76	-0.37 , 1.89
1C-1B	0.87*	0.13 , 1.61	0.92*	0.08 , 1.76	0.59	-0.62 , 1.80

* Indicates that the test of the null hypothesis of no difference against a two-sided alternative of some difference is significant at a 10% level of significance.

Data from the telephone interviews provided information about causes for the erroneous inclusions. It shows which of those causes may be responsible for the increases in the numbers of erroneous inclusions when no rules are given to the respondent. Data on the types of places where erroneously included persons lived on census day were categorized into eight pre-

specified place types and a miscellaneous place category. After the miscellaneous place category, persons living away at college were the second largest category of erroneous inclusions. Across all forms the proportion of erroneous inclusions due to college students was more than 24.3%. The proportion of erroneous inclusions due to college students on the

form with no census residence rules (Form 1C) is compared with the two similar forms that included residence rules (Forms 1A and 1B) in Table 7. The rate of erroneous inclusions due to college students was significantly higher on Form 1C than on either of the forms that included census residence rules. These results are consistent with past research that shows that respondents often think of students living away at college as household members (Sweet, 1994). These data support the need for instructions on where to count college students.

Table 7.
Percent of Erroneous Enumerations
Attributable to College Students
Living Away From Home

Percent of All Erron. Enum. (EE) and Standard Errors			
	Form		
	1A	1B	1C
Estimate (Standard Error)	32.3 (8.3)	28.4 (7.8)	54.1 (6.9)

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4. Conclusions

The quality of population coverage is not compromised when the traditional roster on the census questionnaire is replaced by a simple request for a count of household members. Data from the 2000 Census test show no increase or decrease in within household coverage when the question on the count of household members was used. Plans for the Census 2000 are to use this count question in design of the questionnaire.

Some explanation of census residence rules (i.e., lists of whom to include and whom to exclude) appears necessary on the census questionnaire. The absence of rules results, at the very least, seems to increase erroneous inclusions to some households. The data show that respondents will often incorrectly count college students living away from home when rules are not provided. These data do not show any effect on omissions when the rules are not include on the questionnaire. The 2000 Census questionnaire will include some explanation of census residence rules.

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