

Does a Final Coverage Check Identify Census Omissions and Reduce Errors? Preliminary Results of an Experiment

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Abstract

In 2010, automated matching of name and date of birth for every census enumeration will better identify duplicates than in past censuses, but the problem of omissions persists. Ironically, eliminating duplicates might result in a larger net census undercount. This research evaluates new questions to reduce omissions. At the end of the short form, respondents are given reminders of people who might be missed, and asked to review the form and answer 2 questions about possible errors. In a March 2006 national test, experimental and control forms were mailed to random samples of 7,100 households each. Returns are analyzed to determine (1) whether respondents answer the questions, (2) what sorts of situations they describe, (3) whether the questions flag errors, as determined by a follow up interview, and (4) whether a final review reduces errors.

Keywords: questionnaire design, within-household omissions, split-panel experiment

1. Introduction

Census rules that determine where people should be enumerated in the census are complex and sometimes counter-intuitive, and guidance to respondents about whom to list in their census forms is necessarily abbreviated and simplified. Some respondents do not read the guidance given, others do not understand it when they do read it, while still others ignore it even though they read and understand it because it does not agree with their own notions of who lives in their households (Gerber 1994, 2004; Gerber, Wellens, and Keeley 1996; Dillman, Parsons, and Mahon-Haft 2004).

Errors made in completing rosters of household residents have in past censuses accounted for about a third of all decennial census coverage errors (Hogan 1993). Complex living situations contribute to coverage errors, and people who are unrelated to the respondent, are transient, or have a marginal status in a household tend to be omitted, while college students and people with another residence where they live while working tend to be erroneously included (see, e.g., de la Puente 1993).

In past censuses, enumerators have asked special “coverage questions” intended to identify coverage errors, but these efforts have not proved very successful, according to anecdotal evidence and a few evaluations (see e.g., Nguyen and Zelenek 2003). In the 2001 Canadian Census, an undercount question immediately following the household roster in the mail questionnaire successfully identified some census omissions. About 1% of respondents gave positive responses, and about 20% of these mentioned people who were added to household rosters (Roy 2003).

For the U. S. census in 2010, coverage questions are being evaluated for inclusion in the mail census questionnaire and nonresponse followup instrument. An “overcount question” is intended to identify other residences where people also might have been enumerated. An “undercount question” asked immediately after Question 1 (the household count question) is intended to identify possible omissions. Possible errors would be followed up by a Coverage Followup interview to correct the error, if any. In a 2004 test, the undercount question did not identify many omissions (Krejsa et al. 2005), although revised versions performed better in a 2005 test (Linse et al. 2006).

This paper describes our effort to develop improved questions to identify possible coverage errors in census rosters.

2. Question Development

Our approach is inspired by a principle that Norman (1988) proposes for improving the usability of everyday objects: design for error. He urges designers to “Assume that any error that can be made will be made. . . Allow the user to recover from errors . . . and to reverse any unwanted outcome.” (1988: 200).

We apply Norman’s principle by giving respondents a chance to correct coverage errors they may have (inadvertently) made. Our approach differs from previous approaches to the design of coverage questions in several ways.

First, coverage questions are placed at the very end of the questionnaire rather than immediately following Question 1. Placement immediately after Question 1 implies to some respondents they have made a mistake, or are being asked to second-guess an answer they just provided. In cognitive tests, this placement caused confusion or agitation, or led respondents to go back and change their answers to Question 1, introducing errors (Gerber 2004, Cantor, Heller, and Kerwin 2003).

Cognitive testing indicates that respondents find the end of the questionnaire a logical place to review and check their answers, and actually want such items on the census form (Kerwin and Moses 2006). Final questions provide respondents with a clear stopping point and sense of completion, which is currently lacking in the census mail questionnaire (Dillman, Parsons, and Mahon-Taft 2004).

Second, identifying potential omissions does not require respondents to express uncertainty in answers they have already given. Survey respondents typically express high levels of confidence in their answers, and are usually quite confident about who should be reported (or not reported) as members of their households, even when their reports are erroneous according to census rules. As Cannell et al. (1989:47) note, in general “respondents [do] not appear to doubt their own, often mistaken, interpretations.” Human judgments are biased by overconfidence in many situations, especially those involving difficult judgments (Griffin and Tversky 2002).

Thus, instead of asking respondents if there is anyone they were “not sure” about including, the question asks if there is someone they “thought of including” but did not. In cognitive tests, this wording was more inclusive than the “not sure” wording (Kerwin and Moses 2006). Because it does not depend on respondents’ lack of certainty to identify a potential omission, it may avoid bias introduced by respondents’ overconfidence in their judgments. The disadvantage is that it may lead to more mentions of people whom the respondent thought of but decided, confidently and correctly, did not belong on the form.

2. Survey Method

To evaluate the Final Questions, Westat conducted a national mailout/mailback test for the Census Bureau in March and April 2006 in households with city-type addresses that receive mail from the U.S. Postal Service (USPS) that would be eligible for a mailout-mailback short form. Households in Austin, TX were excluded from the sample to avoid interference with a census test conducted in Austin at the same time.

A sample of 28,380 households was drawn from the USPS Delivery Sequence File (DSF). Entries listed with a P.O. Box rather than street address were excluded from the sample, because a P.O. Box is not clearly tied to a single residential housing unit. Although the DSF uncovers new housing and misses units due to resident requests for removal from the list, the imperfections of the list should not affect the results of the experiment

The sample was allocated proportionately across the 50 states and the District of Columbia (except Austin, TX). The frame was implicitly stratified, using as sort variables State, Household size, % Black or Hispanic in the zip code, % High School or less, % earning less than \$20,000 income, and zip code, and a systematic sample selected.

Sampled households received an advance letter, an initial questionnaire package, and a blanket thank you/reminder postcard. There was no replacement questionnaire and no follow up in nonresponding households.

First class mail was used to deliver all mailing pieces, and a postage-paid return envelope was enclosed for respondents to mail back completed questionnaires to the Census Bureau. Census Day was April 13, 2006.

A subsample of about 600 cases was sent for a Coverage Followup Interview, in order to assess coverage gains in households where responses to the Final Questions indicate a person might have been left off the form. All cases with a “no” response to Final Question 1 or “yes” response to Final Question 2 or a write-in response to either question were sent for follow up, along with about 300 randomly sampled cases with no indication of a coverage issue in the final questions.

3. Experimental Design

The test evaluated three experimental factors in four panels, with the sample of 28,380 addresses equally allocated among the panels.

All panels include a new section on the back page of the questionnaire entitled “Final Questions for Everyone” that includes a request for the respondent’s name and phone number and a question to determine whether respondents live in the household or are filling the questionnaire out for the people who do.

Panels 3 and 4 also included the following instruction and questions about coverage:

“Before answering these last questions, please review your answers to be sure you have provided information about each person living or staying here on April 13, 2006. It is easy to miss someone, for example—

- yourself (if you live in this household)
- new babies, or
- temporary guests with no other place to live.

1. Is the number of people for whom you have provided information the same as the number you counted in question 1 on page 1?

Yes

No—*Please briefly explain the reason.*

2. Did you leave anyone off the form that you thought about including? *For example: a person living at this address who has another home, a person living temporarily away, etc.*

Yes—*Please briefly explain the situation*

No”

This final check is intended to stimulate respondents to review their forms for errors. The questions have a dual purpose of reducing coverage errors and identifying coverage errors. The two questions target different coverage errors. Since count discrepancies may result either from erroneous inclusions or from omissions, a “no” answer to Final Question 1 may indicate either type of error. Final Question 2 is intended to identify omissions, although its inclusive wording may invite reports of non-residents whom respondents thought of including, but correctly left off the form. It is not expected to identify erroneous enumerations. Final Question 2 is adapted from a similar question (“Step C”¹) asked in the Canadian census (Roy, 2003). The control version of the “Final Questions” does not include the questions or instruction.

4. Results

13,703 completed questionnaires were returned by the cutoff date of May 19, and an additional 379 were returned after that date. Excluding 1,804 mailing packages (6.4% of the sample) returned marked vacant or Undeliverable as Addressed, response rates were between 50.3% and 53.1% for the four panels. Response rates do not vary significantly among the first three panels, while Panel 4 (mailed later with a deadline for return of the form) had a significantly higher response than panels 1-3 combined.

¹ “Did you leave anyone out of Step B because you were not sure the person should be listed? *For example: a person living at this address who has another home; a person temporarily away.*”

Four analyses are conducted to evaluate the performance of the Final Questions:

(1) Do people answer the Final Questions?

(2) Do the write-in responses describe possible omissions or other coverage errors?

(3) Based on the results of a coverage follow-up (CFU) interview, do the Final Questions identify omissions or erroneous enumerations?

(4) Do the review and reminders reduce coverage errors?

Standard errors and *t* statistics are computed using stratified jackknife methods in VPLX (Fay 1998).

4.1 Do respondents answer the Final Questions?

Table 2 shows that about 0.5% of respondents answered “no” to FQ1 and 2.4% responded “yes” to FQ2, indicating a potential omission or other coverage problem. Item nonresponse rates were 5% to 6% for each question. (Panels 3 and 4 are combined since there is no difference in response distributions.)

Table 2. Responses to Final Questions 1 and 2

	1. Is the number of people for whom you have provided information the same ...?	2. Did you leave anyone off the form ...?
Yes	94.5% (0.3)	2.4% (0.2)
No	0.5 (0.1)	91.7 (0.3)
No answer	5.0 (0.3)	5.9 (0.3)
Total	100.0%	100.0
N	6,974	6,974

Thus, most respondents found and answered the Final Questions, despite their placement at the end of the questionnaire.

4.2 What types of living situations are described by the write-in responses?

54% of those who marked “no” to FQ1 wrote an explanation in the space provided, as did 91% of those who marked “yes” to FQ2. Some respondents wrote a response when none was necessary. Over half the write-in responses to FQ1 were provided by people who had marked “yes” and hence should not have

written anything. Many were unnecessary explanations that the respondent lived alone.

Write-in responses were categorized according to the type of living situation each describes. Table 3 groups them into “Residence situations,” and “Non-residence situations.” The former (part-time or mobile residents, newborns, etc.) may describe household residents. More detailed questioning is needed to determine residence. The latter group (students living away at college, people who have died, etc.) generally should not be included on a census form (although again detailed questioning is needed to make the determination in some cases).

Table 3. Types of Living Situations Described by Write-In Responses to Final Questions

	% of FQ1 write-ins	% of FQ2 write-ins
Potential Residence Situations	18%	43%
1. Mobile or part-time resident	9	34
2. Unborn, newborn babies	--	6
3. No space on the form; lacked information	9	1
4. Caregiver, nanny	--	2
Non-Residence Situations	11	45
5. Person in college, military, jail, nursing home, etc.	9	40
6. Pets	--	2
7. Missionary abroad	--	1
8. Someone in nearby apartment	2	1
9. Person who died	--	1
Name only	--	2
Unresponsive or uncodable write-in	71	10
Total	100%	100%
Unweighted N	56	174

Although most (71%) write-in responses to FQ1 were unusable, this number drops to 25% if people who marked “yes” to FQ1 are excluded from the calculation. 9% of respondents explained that the number for whom they provided information was not the same as the number counted in Question 1 because there were not enough spaces on the form, or they lacked information for someone. 9% each described a mobile or part-time resident, or a person in a group quarters situation, and 2% described someone in an adjoining apartment.

Write-ins for FQ2 were about equally likely to describe Residence Situations (43%) and Non-

Residence Situations (45%). 2% of the write-ins provided only a name, and 10% were uncodable or irrelevant.

The largest category (33%) of FQ2 responses classified as Residence Situations describe part-time residents or mobile people that respondents thought of including but did not. This diverse group includes many complex and ambiguous living situations known to contribute to coverage errors, such as children in custody arrangements, people in the process of moving, part-time residents, frequent or regular visitors, people with transient lives or lifestyles, people with jobs involving frequent travel, extended stays or absences of uncertain frequency or duration, and so on.

6% of FQ2 write-in responses describe unborn children and recent births, including babies born before the April 13th Census Day but not yet home from the hospital (e.g., “twin boys in the Neonatal Intensive Care Unit--born April 8th”), and babies that may have arrived before April 13th. Others described babies born after Census Day or due months in the future, who are not Census Day residents.

1% of write-ins describe people who were omitted because for form lacked space or the respondent lacked or did not want to provide information.

2% describe caregivers or live-in employees (e.g., “mother of Person 1 who is a live-in nanny for Persons 4 and 5”).

Another 45% of the FQ2 write-in responses describe non-residence situations. 32% were college students whom the respondent considered including, but (correctly) left off the form. 4% were jail or prison inmates, 2% in the military, and 1% other group quarters. (Apparently, instructions to exclude college students who live away, people in jail or prison, etc., are read and followed by some respondents, even though they consider doing otherwise.) Because stays in jail may be temporary, some inmates may have been back home by Census Day. For example, “Husband is currently in jail” may be released and living in the household by Census Day.

2% of the FQ2 write-ins describe pets (“Only the dog”) and 1% each describe missionaries abroad, people in nearby housing units, and deaths that occurred before Census Day, none of which are residents under census rules.

4.3. Do the Final Questions identify omissions and other coverage errors?

In order to determine the productivity of the Final Questions, Coverage Followup interviews were attempted by telephone in all households that responded “no” to FQ1, “yes” to FQ2, or in which respondents wrote a response in either of the write-in spaces for the two final questions. (The households so identified are labelled as “Flagged by FQ”.) A random sample of households that were not flagged by their responses to the final questions was selected for comparison purposes. Of the 595 cases sent to follow-up, interviews were completed in 487 households, or 82%. The tables below compare 201 completed CFU cases in panel 3 and 4 households flagged by FQ, with 145 completed CFU cases randomly sampled from panel 3 and 4 households that were not flagged (i.e., did not provide a “no” answer to FQ1, a “yes” answer to FQ2, or a write-in response to either).

CFU interviewers requested an interview with the person who filled out the census form. They did not have responses to the final questions available to them when they conducted the interviews. The CFU was designed to follow up households in the 2006 Census Test in Austin TX, which did not include final questions. In that test, follow up interviews were attempted in households that responded positively to the undercount or overcount questions, large households, and households with a count discrepancy. (Follow-up interviewers did not have information about respondents’ answers to undercount or overcount questions available, either.)

Thus, interviewers were “blind” to the experimental treatment, and did not know whether they were interviewing flagged or not-flagged cases, or what situation led a household to be followed up.

CFU procedures called for the interviewer to review with the respondent the list of persons who had been recorded on the form for that household. Probes were given to identify people who might have been missed, including—

- Any newborns or babies
- Any foster children
- Any non-related children
- Any other non-relatives who lived or stayed here
- Any non-relatives, roommates, or boarders
- Anyone else who stayed here often
- Anyone else who had no other place to live

These probes were used to identify possible adds: people not listed on the original census roster who should be added, if further questioning determined they were residents of the household. CFU also included extensive questions to identify other residences and stays in group quarters, in order to identify people who had been enumerated in the household in error and delete them from the roster.

In order to determine whether the Final Questions identify households with missed or erroneously enumerated people, Table 4 compares the fraction of households in which people were added or deleted as a result of CFU, in flagged and non-flagged households.

Table 4. Percentage of flagged and non-flagged households in which persons were added or deleted (Panels 3 and 4)

Household	% with someone added in CFU	% with someone deleted in CFU	N
Flagged by FQ	4.5% (1.3)	7.0% (1.8)	201
Not flagged	0.7% (0.6)	2.8% (1.4)	145

Households flagged by their responses to the final questions were significantly more likely to have one or more persons missing (according to CFU) than those that were not flagged. Flagged households were 6.8 times as likely to contain an omitted person than non-flagged households.

The rate of deleted persons was also higher in households flagged by the FQ ($t=1.866$, $p<.10$); the odds of deleting a person was 2.6 times greater in a flagged households.

Table 4 implies that, of the 3.71% of households flagged for follow-up using the Final Questions, only 4.5% added someone in CFU—an improvement in only 0.2% of households. This is disappointingly low. A higher rate of adds might have been expected, particularly among the 43% of the FQ2 write-ins that describe potential “Residence Situations.”

Table 5 shows the fraction of households that produced possible adds and adds within each broad category of FQ2 write-in response.

Table 5. Possible and actual CFU Adds within households flagged by FQ2

Type of Situation described by FQ2 write-in	% with possible adds in CFU	% with adds
<u>Residence Situations:</u> mobile, part-time resident, newborn or unborn babies, caretakers, no space	22.4% (5.5)	8.6% (3.7)
<u>Non-residence Situations:</u> group quarters, pet, missionary abroad, someone in another apt.	15.6% (4.7)	1.6% (1.6)
<u>Irrelevant or uncodable response</u>	7.1% (5.0)	3.6% (3.5)
<u>Not flagged by FQ</u>	2.8% (1.4)	0.7 (0.7)

Write-ins coded as Residence Situations are associated with a significantly elevated rate of possible adds in CFU—22%, compared to 7% for irrelevant responses and 3% for households not flagged by the FQ. Most of these were weeded out by the CFU residence questions, however, so the final rate of adds was about 9%. Write-ins coded as non-residence situations were also associated with a significantly elevated rate (16%) of possible adds in CFU. A larger fraction were weeded out (about 90%) as non-residents, as one would expect, so the final rate of adds was less than 2%. This rate does not differ significantly from non-flagged households.

The categorization of the write-in as “residence situation” or “nonresidence situation” was predictive of the CFU outcome, with write-ins coded as residence situations producing more missed residents, as one would expect. Even so, many possible adds were ultimately determined to be non-residents, perhaps because the wording of FQ2 was very inclusive.

The most troubling result in Table 5 is that apparently *only 22% of the people described in the “Residence Situations” write-ins were identified as possible adds by the CFU.* An effective coverage followup should identify many, if not most, of the people described in these write-in responses even if subsequent CFU questioning determines they were not Census Day residents. A rate of 22% seems too low for a coverage follow-up interview that is intended to correct omissions as well as erroneous enumerations in the original household roster.

Most write-ins coded as “Residence Situations” are ambiguous, and may or may not describe a person who was left off the original census roster in error. To determine if they should be added to household rosters,

they first must be identified as possible adds in CFU so their residence status can be determined². Thus, it is problematic that 78% were not.

4.4. Does a final coverage check reduce omissions and other coverage errors?

Analyses (not shown) of the frequency with which respondents left themselves off the form, included new babies, or provided information for a different number of people than they had counted in the household count question do not provide much support for the use of the Final Questions as a method for preventing coverage errors. (For more detail, see Martin 2007.)

5. Conclusions

Most respondents (94%) found and answered two Final Questions intended to identify census omissions and other coverage errors. 0.5% of respondents marked “no” to FQ 1 and 2.4% marked “yes” to FQ2, indicating a potential coverage error. The situations described in their open-ended answers include many that are known to give rise to census coverage errors.

When followed up in the CFU, 4.5% of the households flagged by the FQ added a person to the roster, compared to 0.7% of those not flagged by the FQ. Thus, these questions do help discriminate between households in which a follow up interview is productive from those in which it is much less so.

The 4.5% rate of adds seems low in relation to a relatively high proportion of write-in responses that described potential residence situations. Why did so few of these cases turn out to be residents who were added to the household roster? In part, the answer is that CFU obtained more detailed information that determined many cases to be residents of other places. This probably reflects the broad wording of FQ2, which invited reports of people who were correctly left off the form.

More importantly, CFU failed to identify as possible adds many of the possible missed residents described in the write-in responses.

² If some respondents added the person described in the write-in to the form after the fact, then it would make sense that CFU did not identify the person as a possible add, because s/he was already on the form. The rosters and responses to FQ2 were reviewed to assess this possibility. In three instances (and a possible fourth) the person described in FQ2 was apparently included on the form.

Improvements are needed to the CFU to better identify any potential residents that the respondent left off the form. One possible improvement would be to add *dependent questions* that remind respondents in the CFU of information they provided in response to the Final Question (or another version of the undercount question) in order to stimulate their recall and reporting of people they may have omitted from their census forms in error.

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