

Analysis of Respondent's Behavior When Offered Alternative Modes of Response: Census 2000 Compared to the 2003 National Census Test

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BACKGROUND¹

In early 2003, the Census Bureau implemented the 2003 National Census Test (NCT). There were three objectives to this test: to study the impact of offering various self-response options, new or additional contact strategies, and alternative race and Hispanic origin questions on cooperation rates and data quality. The overall goal of the 2003 NCT was to identify, for further testing in 2004, the best strategy for increasing self-enumerated response to the census thus reducing the Non-Response Followup (NRFU) workload. Successful accomplishment of this goal will greatly improve the data quality of Census 2010 while reducing the cost of data collection.

This paper assesses the impact of offering alternative response modes by comparing the response patterns observed in the NCT to the response observed in Census 2000. The response modes tested in the NCT were Internet, Interactive Voice Response (IVR) and paper. In Census 2000 only paper and Internet were offered.

In the Response Mode and Incentive Experiment of 2000, incentives and alternative response modes were tested for their effectiveness in increasing response to the census. The study focused on the those households not returning their census forms. The study concluded that while the calling card incentive increased response to the alternative modes, the incentive group was no more likely to respond than the non-incentive group. Consequently, the incentive only redirected responses that would have otherwise been obtained by mail to the alternative modes. (Guarino, 2001)

Researchers for the American Community Survey (ACS) tested the Internet response option for its potential to help maintain high response rates,

decrease survey costs by increasing response through the Internet instead of the mail, and increase data quality. They found that offering the Internet option actually decreased overall response rates. As they expected, Internet questionnaires fared better in the automatic edit than did those submitted by mail, meaning the data quality was higher for Internet responses than for paper responses. (Griffin, et. al. 2001)

METHODOLOGY

Panel Design

The 2003 NCT included sixteen different experimental panels. The control panel represented a mailing strategy with four components including an advance letter, initial questionnaire package, reminder postcard and replacement questionnaire (sent to nonrespondents only). Seven panels were designed to examine the impact of alternative race and Hispanic origin questions.

The contact strategy portion of the test comprised three of the remaining eight panels. These three panels test the effect of no replacement questionnaire, a telephone reminder call in place of a reminder postcard, and a due date printed on the initial mailing package envelope.

The self response option portion of the test comprised the final five panels. These five panels test the impact of offering different combinations of paper, Internet and IVR reporting options, with the goal of increasing self-enumerated response to the census. The remainder of this paper focuses on these self-response options.

Two strategies were tested for implementing the self-response options and are referred to as 'push' and 'choice'. Though all households received an advance letter, households in the push panels did not receive an initial paper questionnaire. In place of an initial questionnaire, those households received a guide to using one or both electronic response options, as well as an insert requesting that they use one of the electronic response options. Motivational language about the IVR and/or Internet systems was used in the letters accompanying the guide. Households in the choice panels were offered the electronic response options in addition to the option of mailing back a paper questionnaire. Households assigned to any of the panels that included the IVR option were not told that an automated system would answer their call.

Specifically, the 2003 NCT self response option panels were:

¹This paper reports the results of research and analysis undertaken by the U.S. Census Bureau staff. It has undergone a Census Bureau review more limited in scope than that given to official Census Bureau publications. This report is released to inform interested parties of ongoing research and to encourage discussion of work in progress. The views expressed are those of the authors and not necessarily those of the U.S. Census Bureau.

Control: Households received an advance letter, initial questionnaire, and reminder postcard. Nonrespondents received a replacement questionnaire.

Push IVR (M1): Tested a push strategy for the IVR. Households in this panel initially received a guide to the IVR system in place of a paper questionnaire. Nonrespondents received a paper replacement questionnaire.

IVR Choice (M2): Tested a choice strategy for the IVR. Households in this panel could choose to respond via paper or the IVR system. Nonrespondents received a replacement questionnaire.

Internet Choice (M3): Tested a choice strategy for the Internet. Households in this panel could choose to respond via paper or the Internet. Nonrespondents received a replacement questionnaire.

Push IVR and Internet (M4): Tested a push strategy for the IVR and Internet. Households in this panel initially received a guide to both electronic response options in place of a questionnaire. Nonrespondents received a paper replacement questionnaire.

IVR and Internet Choice (M5): Tested a choice strategy for the IVR and Internet. Households in this panel could choose to respond via paper, IVR or Internet. Nonrespondents received a replacement questionnaire.

In addition to the self response option panels, the following contact strategy panel is included in the analyses:

Census 2000 Design (CS1): Tested the impact of no replacement questionnaire. This panel mimics the Census 2000 mailing strategy. That is, households received an advance letter, initial questionnaire, and reminder postcard. Nonrespondents did not receive a replacement questionnaire.

The mailing strategy for the self response option panels used a multiple contact approach. The content of each contact was dependent upon the panel assignment. Every panel included an advance letter as the first contact, which was delivered January 21st - 22nd. The advance letter informed the respondent that they would receive a request to complete a brief questionnaire for the 2003 National Census Test in the next few days. The content of this letter was the same in the control and experimental panels.

The second mailing was the initial questionnaire package, which was delivered January 30th - 31st. Households in the control panel or one of the choice panels received a paper questionnaire and a first-class postage-paid return envelope. In addition, questionnaires sent to those in the choice panels included brief instructions for the electronic response options – either the web site address, IVR telephone

number or both, depending on panel assignment. Households in the two push panels received a guide to completing their census form electronically (either by Internet or IVR) in lieu of a paper questionnaire. Regardless of panel, the mailing package included a letter from the Census Bureau's Director urging households to respond via their assigned mode(s). Both the mailing envelope and the letter contained statements explaining that the survey was required by law.

The third mailing was the reminder postcard. The reminder postcard included a statement reminding the respondent to answer the census if he/she had not already done so and thanked those who had already returned their questionnaire. Reminder postcards for the choice and push panels mentioned the same electronic response options as in the second mailing.

The fourth and final mailing was a targeted replacement questionnaire. The replacement questionnaire was sent to all nonresponding housing units as of February 12th. Both the control and choice panels received the same set of materials as in the initial mailing package. However, at this stage, households in the push panels were provided with a paper replacement questionnaire and a first-class postage-paid return envelope, but were still encouraged to respond via their originally assigned mode(s).

Housing units selected for the 2003 NCT could respond by using up to three modes, depending on their panel assignment. The three modes included paper, Internet and IVR. Each data collection mode collected the census short form data items.

The 2003 NCT mailout/mailback short form was modeled after the Census 2000 short form, with only minor changes in the introductory language (to reflect the 'test' nature of the form). The form allowed the respondent to list up to 12 household members. For up to six household members, the form provided space for reporting the 100 percent census data items (i.e. name, relationship, sex, age/DOB, Hispanic origin, and race). The form also collected traditional short form housing unit level data.

The 2003 NCT Internet application required respondents to enter their 14-digit Housing Unit ID (HUID), which was printed on the materials they received in the mail. The application collected short form housing unit level and person level data for up to 30 household members. The interactive application included a progress indicator on the left-hand side of the screen and allowed respondents to back up page-by-page and correct previously entered information. The system incorporated soft edits, which alerted respondents to incomplete or inaccurate responses but did not require corrections to these items. Once respondents entered data for all household members,

they could view and print a summary of their answers prior to making a final submission.

The 2003 NCT IVR application used speech recognition technology. That is, respondents were asked to speak their answers, and the system detected their response by comparing it to a database of “in vocabulary” responses for the question. The IVR system then repeated back to the respondent what the system “heard” for verification. If the caller indicated a problem with what the system understood, the IVR system re-prompted the respondent with a slightly altered wording of the question. The altered wording either provided more information or let the respondent know that they could use touchtone entry to key in their response. However, if the system was still unable to understand the respondent after the maximum number of re-prompts (in general, four) then that question was considered a failure. If the question was one that the Census Bureau had determined must be obtained for further census processing, such as HUID, or if there were two consecutive question failures, then the respondent failed out of the IVR system and the call was marked as a transfer.

Transferred calls were handled in two different ways depending on when the transfer occurred. If the call was transferred during business hours (i.e. 11 AM to 11 PM ET) then the IVR system played the following message: “Sorry I’m having trouble understanding you. I’ll transfer you to a Census Bureau representative. Just a moment.” The call was then transferred to a telephone agent at the Tucson Telephone Center (TTC) to complete the survey. The agent obtained the respondent’s census information and submitted the data via a version of the Internet application, modified to better facilitate agent administration.

If the call was marked as a transfer during non-business hours (i.e. 11 PM to 11 AM ET) then the IVR system played the following message: “Sorry I’m having trouble understanding you. If it were during business hours I would transfer you to a Census Bureau representative. We appreciate your participation in the 2003 Census Test. In order to speak directly to a Census agent, please call back between 11 AM and 11 PM Eastern Time, and use this new number 800-593-5569. That number again is 800-593-5569. Goodbye.” The new number provided in this message went directly to agents at TTC during business hours, thereby allowing respondents to bypass the IVR system.

Sample Design

The universe for this study includes housing units from the mailout/mailback areas from Census 2000. American Community Survey (ACS) sampled cases scheduled to receive their initial mailout from

November 2002 to December 2003 were excluded from our universe. We selected seven panels of 10,000 housing units each and nine panels of 20,000 housing units each, for a total of 250,000 housing units to form sixteen panels for the 2003 NCT. (Due to the proposed item level analysis, some panels required the larger sample size of 20,000 housing units.) The control panel contained 20,000 housing units and all response mode panels contained 10,000 housing units each.

Prior to sample selection, census tracts were stratified into two groups that reflect differences in Census 2000 mail return rates, as well as anticipated differences in the race/Hispanic origin and tenure composition of the population. In Census 2000, the Low Response Area (LRA) stratum made up 28.6% of the eligible tracts and 23.5% of the eligible housing units. Eligible tracts are those in the mailout/mailback universe. For the High Response Area (HRA) stratum the average mail return rate was 81.4%. For the LRA stratum the average mail return rate was 62.2%.

The LRA stratum is expected to contain a very high proportion of the Black and Hispanic populations and renter occupied units. For example, in Census 2000, 6.8% of householders in the HRA stratum were of Hispanic origin. Within the low response stratum, 17.1% of householders were of Hispanic origin. The addresses in the LRA stratum were sampled at a higher rate than those in the HRA stratum, to ensure sufficient representation of the low response areas. Estimates presented in this paper will be weighted to account for oversampling of the LRA stratum.

Determination of Self Response

In general, when respondents complete their census questionnaire and return it through the mail they are considered self responders. For 2003 NCT, self response is determined by whether a nonblank paper, IVR, or Internet form is received by 3/31/03. For the ‘03 NCT, no nonresponse followup was implemented.

For 2000, a case is considered to have self responded if the data was collected in anyway other than the NRFU operation.

Blank Forms

Blank forms were defined as they were in Census 2000² with a few exceptions. We did not confirm that an entry for the name variables (first and last) is comprised of all alpha characters. We did confirm that there are at least three characters (alpha or numeric) between first and last name combined. We

² For specific item definitions, refer to DSSD Census 2000 Memo Series # K-3, Date: March 8, 1999, Subject: Definition of a Blank Form by Data Capture System 2000, From: Howard Hogan.

did not confirm that an entry is an alpha character for write-in fields (relationship, Hispanic origin, race). We did confirm that there is a least one character (alpha or numeric) in the field. The blank/non-blank definition is restricted to Persons 1 - 6 only. We did not include persons 7 - 12 when calculating blank/non-blank status. These blank forms were removed from the numerator.

Duplicate forms

In the NCT, if duplicate returns were received for a given HUID, we accepted the first non-blank return for data analysis³. There is one exception to this rule: when the first non-blank return failed out of the IVR system and was flagged as a transfer to an agent, we accepted returns according to the following prioritized criteria:

1. Any telephone agent completed return (does not necessarily correspond to the first failed IVR return)
2. The first paper, Internet, or IVR (non-failure) return received
3. IVR failure

Data Used for this Analysis

Housing unit and person level data from the 2003 NCT and from Census 2000 were used to perform the analyses in this paper.

LIMITATIONS

Since we are only matching HUIDs and not actual households, there is the likelihood that some of our NCT sample are paired with different households from Census 2000. Entire households may have moved out after Census 2000 and new household members moved in prior to the '03 NCT. For this analysis, given that response propensities and household characteristics are generally similar for households within the same geographic location, we're making the assumption that those households moving in are similar to those they have replaced, in terms of their response propensities and their demographic characteristics.

We made a causal assumption in regards to respondent behavior in that, we assumed each respondent was exposed to the treatment (that is, they know what their response options were) and that the respondent's behavior was directly motivated by that treatment. However, this assumption cannot be tested.

RESULTS

Offering the alternative electronic modes does not significantly increase response rates, and the results from this test indicate that the "push" strategy may actually decrease response rates (Stapleton, Brady, and Bouffard, 2003). But, do the electronic modes elicit responses from housing units that would not have responded if offered only paper? While adding any of these electronic modes into census operations would likely increase up-front operating costs, if they were shown to successfully obtain response for a group who ordinarily would not respond to paper, the costs might be recouped in savings during NRFU.

We can get insight into this question by taking each mode panel (M1-M5) and showing whether they self responded in Census 2000 by whether they self responded in the 2003 NCT. The percent of those not self responding in Census 2000, but responding in the NCT may give us an indication of the benefit of offering alternative modes in eliciting responses from the more reluctant respondents. But, between Census 2000 and the 2003 NCT, household residents may have changed and response propensities may have changed. So, to help put the percentages for the mode panels in perspective, we look at the relationship that exists between the 2003 Control Panel and the 2000 response, and then compare the percentages within the mode panels back to the control panel. A significant difference would indicate that the alternative mode was beneficial in eliciting "extra" responses.

Unfortunately, the percent responding to the NCT and not providing a self response to Census 2000 are similar between the control panel and each of the mode panels (11.8% vs. 10.5%, 11.4%, 11.9%, 10.5%, and 11.3%). Hence, there is no evidence that the alternative modes, IVR and Internet, whether given as a choice or used in a "push" strategy, are effective in recruiting those who otherwise would not self respond when offered paper alone. On the other hand, it is encouraging that response did not drop using the alternative modes, as was seen in the ACS study, (Griffin, et.al.2001).

What effect does offering multiple modes have on respondents? Does having a variety of ways to respond confuse respondents? An indication of this confusion might be whether a HU sends in multiple forms from two or more modes. (Call center/agent cases have been recoded to be IVR, since IVR cases were automatically transferred to the call center/agent if they were experiencing difficulties in completing the questionnaire. The transfer itself wasn't the direct choice of the respondent.)

Looking at the respondents from the 2003 NCT, there isn't any strong indication that we're confusing respondents by offering multiple modes. Only 0.8% to 2.5% of respondents returned their forms using multiple modes, but the "push" respondent were

³ Note that this selection rule differs from the primary form selection rule used during Census 2000.

almost twice as likely to use multiple modes than “choice” respondents. And the actual number of modes offered had no effect.

In Table 1, we use panel CS1 to detect real change that has occurred from 2000 to 2003. CS1 has no replacement questionnaire, similar to Census 2000. Any change we see from 2000 to 2003 for CS1 is due either to the absence of the census environment or from real change that has occurred. And given that there aren't any significant differences in the responses for 2000 and 2003 we can be assured that these factors are likely not to affect the comparisons of 2000 and 2003 responses for the 2003 NCT IVR and Internet respondents. In comparing the 2003 IVR responses back to the responses given in Census 2000 for those same HUDs, we see little change for most of the demographic characteristics. It does appear that IVR respondents are more likely to report that they are multiple races or of some other race than was reported in Census 2000. Quite possibly, a problem encountered in the IVR system for the '03 NCT might help explain the higher reporting of more than one race. The question in the IVR system was designed so that the list of races was read multiple times until the respondents indicated that they were finished by saying “stop”. However, races previously selected were removed from the next iteration of the race list. Once a race was selected, the system said “Got it. Say ‘stop’ or tell me another” and the list of races was read again without the first race selected. So, many respondents went on to select Some other race the second time around, instead of saying stop, and the system captured this as multiple race.

When comparing the 2003 Internet data to the Census 2000 data for the same set of addresses, we find no significant differences in household or person characteristics except for higher reporting of some other race in the Internet data.

What is also obvious from this table is that overall Internet respondents are younger than those responding by paper or IVR and they tend to live in larger households. Both of these findings are consistent with the results from the 2000 Current Population Survey, which show that Internet use is highest for young adults, levels off for people between ages 26 and 55, and then falls among people at higher ages. Also, people who live in households headed by married couples with children less than 18 years of age are more likely than people who live in other household types to be computer and Internet users. In comparing the racial distribution for the IVR respondents to the Internet respondents, it's apparent that Asians are more likely to respond via the Internet than other races. This is also consistent with the results from the CPS, which indicate that Whites and Asian American and Pacific Islanders have had higher rates of both computer and Internet use than the other race groups.

Comparing Census 2000 unedited data for the

2003 IVR respondents to the Census 2000 data for the CSI respondents, there are no significant differences in person or household characteristics except that fewer Hispanics chose to use the IVR. This could be due to a language problem, since there was no Spanish IVR instrument in place.

While we also did not have a Spanish paper questionnaire, we assume that following along with an English instrument in an automated phone call is much more difficult than self navigating through an English paper questionnaire. Also, the IVR data showed higher reporting of Some other race, which is most likely due to a recency effect. It was the last race category given and may have been the easiest to recall. Lastly, the IVR data had lower reporting of Hispanic origin. One possibility for this was the absence of specific Hispanic subgroups given as examples which were included on the Census 2000 forms.

By looking at the 2000 data for HUs not self responding in 2000 or 2003 NCT, we can get some idea about the characteristics of the hardcore nonrespondents. Presumably, these HUs would make up a large portion of the nonresponse followup workload. And so, understanding the population could be useful in trying to minimize data collection costs. Table 2 shows they're predominately renters residing in larger than average household sizes. They are more likely to be Black or Some other race, and they're more likely to be Hispanic compared to the self responders from the CS1 panel in the previous table. Also, persons in these households are younger on average than those of self responding households.

As expected, the data in the last two columns indicate that HUs who did not self respond in Census 2000 but did respond in 2003 NCT have characteristics somewhere between those who self responded in both 2000 and 2003 and those who did not self respond in either. Just under 50% of these households were renters with an average household size similar to Census 2000 self respondents. Compared to the nonresponding households, fewer of these are renter occupied housing units, the households are smaller on average, and the household members tend to be a little older.

The data presented here on HUs not self-responding in Census 2000 are consistent with those presented in Treat and Stackhouse, 2002.

CONCLUSIONS

The results of this analysis are the following:

Offering electronic modes does not increase self response at this time.

When offered multiple modes only a small percent of respondents send in forms from multiple modes, but pushing respondents to use electronic modes doubles the number of modes received.

Significant mode effects exist for the race and Hispanic origin questions for the current IVR instrument, but likely reflect specific design decisions for this application.

We found that Internet respondents reside in larger households with younger members and Asians are disproportionately more likely to respond using the Internet than other races. Also, both Blacks and Hispanics are less likely to respond via the Internet.

Hispanics are less likely to respond using the IVR.

Characteristics of hardcore nonrespondents are consistent with prior research in that the majority are renters, they tend to live in larger households and have younger members. And minority households make up a disproportionate share of these nonrespondents.

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Table 1. Demographic Distributions for Census 2000 and 2003 NCT Self Responders by Mode of '03 NCT
(with Results from CS1 as a control)

	HUDs Assigned to Panel CS1 (Census 2000 Design) in '03 NCT		HUDs Responding by IVR in '03 NCT		HUDs Responding by Internet in '03 NCT	
	2000 Data	2003 Data	2000 Data	2003 Data	2000 Data	2003 Data
Sample Hhlds (~ n)	5300	5300	5500	5500	2900	2900
Percent Renter	21.2	20.6	20.2	20.2	20.7	20.1
Mean Hhld Size	2.5	2.45	2.4	2.43	2.78	2.75
Sample Persons (~ n)	13100	12900	13100	12000	7900	7600
Percent White	86.1	85.3	87.1	83.8	85.6	82.6
Percent Black	7	6.6	7.2	5.7	3.6	3.5
Percent AIAN	0.4	0.5	0.3	0.2	0.4	0.3
Percent Asian	3.5	4	3	1.5	6.7	7.4
Percent NHOPI	0.1	0.1	0	0.1	0.3	0.4
Percent SOR	1.3	1.6	1	2.7	1.8	3.6
Percent Multiple	1.6	1.9	1.5	6	1.6	2.2
Percent Hispanic	7.8	8.5	6	4.9	6.5	6.3
Percent Female	52.3	52.8	53	52.6	50	49.8
Mean Age	40.9	41.2	41.4	42.5	34.2	34.8

1. Only households who self responded in both 2000 and 2003 were used to populate this table.
2. The sample households and sample persons counts given include cases with missing data for some of the variables. And the person counts differ from 2000 to 2003 due to different household compositions.
3. The person level characteristics represent all household members.

Table 2. 2000 and 2003 Demographic Distributions for the Combination of the Control and Choice Panels for Those HUs Not Responding in Census 2000 by Whether They Did Respond in 2003 NCT

	No Self Response in 2000 No Self Response in 2003	No Self Response in 2000 Self Response in 2003	
	2000 Data	2000 Data	2003 Data
Sample Hhlds (~ n)	6600	5100	5100
Percent Renter	62.3	49.3	44.6
Mean Hhld Size	2.76	2.55	2.43
Sample Persons (~ n)	15400	10900	12300
Percent White	53.9	73.9	76.5
Percent Black	25.2	12.7	12.6
Percent AIAN	0.6	0.4	0.6
Percent Asian	5.3	4.9	4.9
Percent NHOPI	0.3	0.6	0.2
Percent SOR	12.5	5.6	2.3
Percent Multiple	2.2	1.8	2.9
Percent Hispanic	25.1	11.7	13.7
Percent Female	49.3	50.4	51.7
Mean Age	28.7	32	35.1

1. The sample households and sample persons counts given include cases with missing data for some of the variables. And the person counts differ from 2000 to 2003 due to different household compositions.
2. The person level characteristics represent all household members.