

ASSESSING THE IMPACT OF DIFFERENTIAL INCENTIVES AND ALTERNATIVE DATA COLLECTION MODES ON CENSUS RESPONSE¹

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collecting data that simultaneously encourages cooperation.

Abstract

Two methods often tested as means of increasing survey participation are alternative response modes and incentives. While past research suggests that both methods can potentially increase response, this research has taken place in a traditional voluntary survey setting. Census 2000 marks the first time that incentives have been tested in a decennial census, where response is mandated. Therefore, it is difficult to assess the extent to which past results may generalize to the census, due to differences in the legality of response and visibility of the census. The questions remain: Do incentives encourage response to the census? Do alternative data collection mode options promote response? How effective are these techniques in increasing response among those who did not initially respond to the census? Results from this experiment suggest that an incentive is effective in encouraging those who did not initially participate to use a new response mode, yet does not encourage response from those with no intention of responding.

Two methods with which researchers have experimented as means of increasing survey participation are response modes and incentives. With respect to response mode, past research suggests that data collection mode can influence survey participation (Groves *et al.*, 1979).

In addition to alternative response modes, incentives are another method tested as a means of increasing response. Numerous empirical studies lend support for the conclusion that incentives increase response rates (Singer *et al.*, 1999; Abreu *et al.*, 1999; Shettle *et al.*, 1999; Kulka, 1994; Church, 1993). Recently, incentives research has shifted focus to the use of incentives for nonresponse conversion. With respect to the efficacy of incentives for refusal conversion, Kulka (1994) and Abreu *et al.* (1999) found that delaying the use of incentives to later stages of contact can be quite effective as a nonresponse conversion technique, especially among groups which are disproportionately non-white and of lower socioeconomic status (SES).

1. Introduction

Since 1960, most U.S. decennial census data have been collected via the return of a paper questionnaire for households responding to the mailback request (Cohen *et al.*, 1999), and via face to face interviews for households that did not mail back census forms. All households that did not return a census form by April 18, 2000 were visited or called by a census enumerator who collected information. Six attempts were made by phone and/or visits before proxy data were sought.

In addition to their effect on response, some researchers have studied the effect of incentives on sample composition and consequently, the potential for nonresponse bias. Shettle *et al.* (1999) report mixed findings, with some studies showing differential motivating effects of incentives while others reveal no differential effects. In these studies, there is some evidence to suggest that incentives are effective in recruiting younger people (Dillman, 1996) and those who are typically underrepresented in surveys such as low income and non-white groups (James *et al.*, 1990).

Nonresponse Follow up (NRFU) procedures, such as the one just described, are extremely costly. In fact, Dillman *et al.* (1994) estimate that each 1 percent decrease in the mailback response rate could cost as much as \$17 million to collect NRFU information through face to face interviews. In order to control costs, the Census Bureau has an interest in finding a cost-efficient technique for

In past research, incentives are tested in voluntary survey environments. Census 2000 marks the first time that incentives have been tested in a U.S. decennial census. Therefore, it is difficult to assess the extent to which past results may generalize to the census, due to the differences in the legality of response and the visibility of a decennial census. In this experiment, a combination of alternative response modes and an incentive is tested as a means of

¹ This paper reports the results of research and analysis undertaken by 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.

gaining cooperation from households that did not initially return their census forms. It is not the intention of this experiment to test incentives as a nonresponse conversion technique. The purpose of this experiment is to test the effect of these factors on response among a group that is potentially difficult to enumerate.

2. Method

2.1 Experimental Design

This experiment includes 19,639 households that were randomly pre-assigned to three nonresponse alternative response mode treatment groups prior to mailout. On March 13, 2000, standard Census 2000 questionnaires were mailed to these households. Any household that did not return a census form by April 26, 2000 formed the target population for this study. The response rate as of the date at which the nonresponse universe was identified (4/26/00) was 71.5% (see Figure 1). The alternative response mode options are:

1. **Reverse Computer-Assisted Telephone Interview (CATI):** Households are encouraged to call a toll free number on a brochure and in a letter included in the second mailing to report their short form census data.

2. **Automated Spoken Questionnaire (ASQ):** Households are encouraged to call a toll free number in a brochure and letter sent with the second mailing which is, unbeknownst to the respondent, connected to a computerized speech recognition system that collects short form data by processing spoken replies into text.

Callers who experience problems with the ASQ system are automatically transferred to a CATI interviewer at any point in the interview for reasons including problems with speech recognition, foreign noises (cough, sneeze), or failure to provide data at a specified time.

3. **Internet:** Households are presented with an Internet URL in a brochure and letter sent in the second mailing, where the respondent can enter short form data at a Census Bureau Internet site.

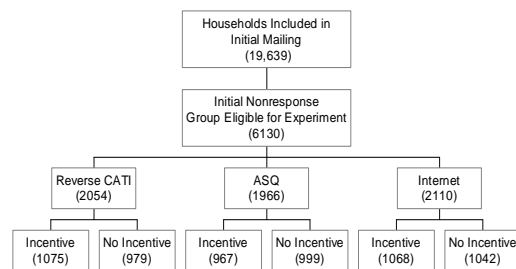
Every household, regardless of treatment group, was presented with an Operator Assistance toll free number to which they could direct questions. As a courtesy, the operators collected census data for the cases that preferred to provide their information in this manner.

Within each mode, households were randomly split into two groups prior to the second mailing, where one group received the incentive, and one group did not. The incentive is a calling card worth 30 minutes of long distance service in the US. The card is activated only for

those respondents using the assigned mode for the treatment group. The experiment has a 3x2 factorial design in which an incentive is fully crossed with three alternative response modes.

All experimental packages were mailed to the nonresponding households on May 2, 2000. These households had the option of answering Census 2000 via the paper questionnaire originally sent to the household with the initial mailing; however, replacement questionnaires were not included with the second mailing and calling cards were not activated for households that returned paper questionnaires.

Figure 1. Treatment Groups and Mailout Sample Sizes



2.2 Hypotheses

The following hypotheses were developed based on past research:

1. The CATI and ASQ modes will gain significantly higher response than the Internet. Although there is no evidence to suggest that initial nonrespondents prefer the telephone over the Internet, Internet accessibility limitations in this population may suppress the use of the Internet since the typical census nonrespondent universe is one that resembles the universe of households without Internet/computer access (Newburger, 1997; Word, 1997).

2. The incentive will increase response compared to no incentive, with a stronger effect in areas expected to contain a high concentration of non-white renters (low census coverage areas) compared to other areas.

3. The group of respondents receiving the incentive will be younger and more racially/ethnically diverse compared to non-incentive respondents

2.3 Sample Design

The original 19,639 households, selected from mailout/mailback areas of the country, are proportionately allocated to two strata that reflect anticipated differences in the race and tenure composition of the population and,

based on previous census experience, differences in the Census 2000 mail return rates. Strata are formed from 1990 census tract level race and tenure data and are denoted as low and high coverage areas (LCA and HCA respectively). The LCA stratum is expected to contain a much higher proportion of the Black and Hispanic populations and renter-occupied housing units than the HCA stratum. The HCA stratum comprises approximately 81% of the total mailout/mailback universe at the time the sample was selected. All figures in this report are weighted to make the inference to the full frame.

The mailout sample size for each treatment group was around 1000 addresses (see Figure 1). The United States Postal Service returned about seventeen percent of experimental forms that were mailed in each treatment group as undeliverable. These cases are excluded from the denominator of the response rates since they never had the opportunity to respond.

Certain cases in the nonresponse universe returned their census forms after the April 26 cutoff. Since experimental packages were mailed on May 2, any case returning a form by mail prior to May 4 are excluded from the analysis since these cases are not true nonrespondents. A total of 173 out of the 6130 households are eliminated under this criterion.

2.4 Measurements

There are two response rates² used in this study:

1. *Mode specific response rate*: The mode specific response rate is defined as the number of non-blank questionnaires returned by the alternative mode assigned to the treatment group divided by the number of experimental forms mailed out less undeliverable forms. The numerator contains only those households that responded via the mode requested for their panel.

2. *Overall response rate*: The overall response rate is defined as the number of non-blank questionnaires returned by any mode (mail, CATI, ASQ, Internet) for the treatment group divided by the number of experimental forms

mailed out less undeliverable forms.

This report focuses on results pertaining to the mode specific response rates since these rates reveal the effect of the incentive in redirecting response to a new mode, as well as the efficiency of the data collection modes. The mode specific response rate allows pure comparisons of the efficiency of the data collection systems, since mode switches (ASQ rollovers to CATI or Operator Assistance calls that resulted in CATI interviews) are not counted as respondents.

2.5 Analysis

The analysis of the experimental treatments is conducted by measuring the pairwise differences in the response rates among the treatment groups and by modeling the mode specific response rate using logistic regression. For pairwise comparisons involving more than two levels of a treatment, the Bonferroni multiple comparison procedure is used so that statements about the family of pairwise comparisons are made while maintaining a 90 percent simultaneous confidence level.

In order to take into account the stratified sample design, standard errors were computed using jackknife replication with random groups in WesVarPC version 3. Since there is no clustering in the sample and only two strata to which the sample is allocated, 100 element replicates were formed within each stratum by consecutively numbering households from 1 to 100, after the households were sorted in the same order in which the sample was selected. Due to smaller sample sizes, 25 replicates were used for analyses involving only respondents.

3. Results

3.1 What is the effect of the mode options on response?

Past research has shown that response mode can influence participation (Groves *et al.*, 1979). The hypothesis regarding the effect of mode predicted higher response to the telephone (ASQ and CATI) modes compared to the Internet, due to the expectation of low Internet accessibility among this population. Mode specific response rates are computed across the incentive groups and mode differences are examined in Table 1.

In accordance with the hypothesis, CATI elicits higher response than the Internet. The disagreement with the hypothesis relates to the performance of the ASQ. CATI gains higher response than the ASQ, and ASQ does not gain higher response than the Internet. Yet, response rates do not differ between CATI and ASQ when calls and rollovers to CATI are permitted from households assigned to ASQ (not shown), suggesting that ASQ usability issues are responsible for the ASQ and CATI difference.

² Response rate calculations follow the guidelines of the American Association for Public Opinion Research (AAPOR, 2000). The numerators include both fully and partially completed interviews, as long as the information provided was sufficiently complete to be considered a response. The denominators exclude households ineligible because they never received the experimental mailing. The rates follow the format of "RR6" according to the AAPOR guidelines.

Table 1. Mode Specific Response Rates and Differences Among Modes (Computed Across Incentive Groups)

Mode	Mode Specific	Difference**
CATI	7.8%	2.9%*
ASQ	4.8%	
CATI	7.8%	4.1%*
Internet	3.7%	
ASQ	4.8%	1.2%
Internet	3.7%	

* statistically significant when familywise error rate controlled at $\alpha=.1$ for all comparisons.

** subject to rounding error.

3.2 What is the effect of the incentive on response?

Past research repeatedly shows that incentives increase response compared to no incentives, especially among populations that are poor and heavily non-white (Singer,forthcoming). My hypothesis predicts that the incentive will increase response, with a larger effect in low coverage areas compared to high coverage areas. In order to assess the effect of the incentive, mode specific response rates in Table 2a are compared across incentive groups within and across response modes.

Table 2a. Mode Specific Response Rates and Pairwise Differences between Incentive and No Incentive Groups within and across Response Modes

Mode	Mode Specific		Difference
	Incentive	No Incentive	
CATI	8.8%	6.7%	2.1%
ASQ	6.4%	3.4%	3.0%*
Internet	3.9%	3.4%	.5%
Total	6.4%	4.5%	1.9%*

* statistically significant when $\alpha=.1$.

Results in Table 2a agree with the hypothesis that the incentive increases mode specific response compared to no incentive when rates are computed across response modes. The incentive effect is not significant within CATI and Internet, but is significant in the ASQ.

Table 3 presents logistic regression results when mode specific response is regressed on the experimental treatments and some control variables. The Simple Model investigates the effect of the incentive on response while controlling for strata as a proxy for socioeconomic status under the assumption that the effect is constant within each response mode. The interaction model reveals whether the incentive effect differs based on the stratum to which it is administered.

Table 3. Logistic Regression Coefficients Predicting Log Odds of Responding through the Assigned Mode

Variable	Simple Model	Interxn Model
Internet =1	-.302*	.012
CATI = 1	.496*	.717*
ASQ = 1	--	--
Incentive =1	.374*	.888*
High Coverage Area = 1	.567*	.725*
CATI * Incentive		-.365
Internet * Incentive		-.534*
Incentive * High Coverage Area		-.253
Intercept	-3.616	-3.934

* statistically significant when $\alpha=.1$.

Tests of parameter estimates in the Simple Model confirm that CATI obtains higher response than the Internet and ASQ while controlling for the incentive treatment, and that the incentive effect holds while controlling for response mode and stratum.

The Interaction Model in Table 3 helps determine if the incentive is more effective in increasing response in low coverage than high coverage areas. The test of this interaction (Incentive*High Coverage Area = -.253) reveals that the effect of the incentive on response does not significantly differ between high and low coverage areas. This finding disagrees with my hypothesis and past research showing a more pronounced incentive effect among low SES groups compared to others (Kulka,1994; Singer,forthcoming). There are at least two possible reasons for this disagreement. First, strata, while a good indicator of census response, may not be a suitable proxy for SES. Second, legality and sponsorship differences between the census and surveys may have implications. Certain groups, such as illegal immigrants and fugitives, may deliberately avoid the census. If low coverage areas

contain a higher concentration of these groups than high coverage areas, these results may indicate that the incentive does not increase response from groups that tend to avoid the census.

3.3 Incentive Effect on Response Distribution

Logistic regression results in Table 4 help determine if the incentive has an effect on the demographics of respondents. From past research, I expected incentive respondents to be younger and more racially and ethnically diverse than non-incentive respondents.

Table 4. Logistic Regression Coefficients Predicting the Log Odds of a Respondent Receiving the Incentive

Variable	Model
Age of Person 1	-.015*
Person 1 Black = 1	.239
Person 1 Hispanic = 1	-.030
Renter-occupied Household = 1	.188
High Coverage Area = 1	-.067
Female = 1	.031
Household Size	-.091
Intercept	-.043

* statistically significant when $\alpha=.1$.

The model suggests that Person 1 in households receiving the incentive due to alternative response mode participation tends to be younger than Person 1 in households not receiving the incentive. This finding may suggest that the incentive is more attractive to younger persons. Conversely, since the incentive was only activated for those who tried a new response mode, younger people may be more likely to use new technology. It is impossible to control for the effects of mode in this study given that an alternative mode response was required in order for a household to receive the incentive. However, an age comparison reveals that mail respondents are on average older (50.4) than electronic mode respondents (42.1), suggesting that the proposed incentive effect on younger people may be due to increased willingness to try a new mode. Otherwise, while controlling for age, sex, and households size, there is no evidence to suggest that incentives disproportionately recruit minorities or renters

3.4 Overall Response Rate Findings

In Table 2a, the increase in mode specific response due to

the incentive is significant when the three response modes are combined, yet the effect of the incentive is insignificant when overall response to the second mailing is considered (see Table 2b). This finding suggests that the incentive redirects response to alternative modes, but does not encourage response from those with no intention of responding.

Table 2b. Overall Response Rates and Pairwise Differences between Incentive and No Incentive Groups within and across Response Modes

Mode	Overall Response Rate		Difference
	Incentive	No Incentive	
CATI	14.4%	14.5%	-.1%
ASQ	15.2%	11.9%	3.3%*
Internet	11.9%	13.2%	-1.3%
Total	13.8%	13.2%	.6%

* statistically significant when $\alpha=.1$.

4. Conclusions

Examination of the response modes reveals that CATI obtains the highest level of response compared to ASQ and the Internet. However, there is some evidence that ASQ usability difficulties are responsible for the difference between CATI and ASQ. Moreover, Internet accessibility limitations among this population confound the response rate comparisons involving the Internet.

The incentive increases response to the alternative modes; however, the effect disappears when total response to the second mailing is examined. Therefore, the incentive is successful in transferring response that would have otherwise been obtained by mail to a different mode, but not in recruiting households that otherwise would not participate.

Logistic findings reveal that the incentive seems to attract younger respondents; however, this finding is confounded with the influence of the alternative response mode options. Younger persons may be influenced by the chance to use a new mode, rather than the incentive itself.

It is quite notable that around 13% participation (see Table 2b) was obtained from cases that did not initially return their census forms, especially since replacement questionnaires were not included in the second mailing. Since about 4 to 6 percent of household responded using an alternative mode, around 6 to 9 percent returned the questionnaire that was included in the initial mailing.

Taken together, the results provide some guidance for future decennial censuses. It may be worthwhile to investigate the effect of sending a second census request to households failing to answer the first request since 13% participation was gained from the second mailing. Although there is no evidence that this technique could potentially replace the personal/telephone interviews, it may successfully lower the number of cases that need to be followed-up using the expensive approaches.

5. Limitations

The sampling frame in this experiment includes only mailout/mailback areas with city-style addresses. Addresses added between the sample selection in July 1999 and the initial mailout in March 2000 are not included in the sampling frame, which may result in a slight undercoverage of the target population.

Furthermore, non-English speaking households are not represented in this experiment since the experimental questionnaires and forms are only available in English.

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