

THE EFFECT OF AGE AND TYPE OF ADVERTISING MEDIA EXPOSURE ON THE LIKELIHOOD OF RETURNING A CENSUS FORM IN THE 1998 CENSUS DRESS REHEARSAL

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Introduction

Nonresponse in self-administered censuses and surveys can occur for several reasons, including lack of awareness or knowledge of the survey. Since personal interaction between the survey organization and respondent does not occur during the data collection phase, the request for information may not be salient to some respondents. Another reason for nonresponse is that some respondents are unaware of having received a questionnaire in the mail.

Paid advertising is one method used by organizations to increase awareness and convince their target audience to perform a desired action. In many cases, organizations target their paid advertising by medium at certain age groups to maximize return on advertising money (Kotler, 1991; D'Amico, 1999). In the 1990 U.S. population census, younger adults had the lowest mail return rate among householders (Fay, Bates, and Moore, 1991).

The 1998 Census Dress Rehearsal tested paid advertising as a method to raise awareness and knowledge, and ultimately to increase mail response rates in the Sacramento and South Carolina test sites. A question that arises from this campaign is the effectiveness of the individual media in convincing various age groups to return their census forms.

Background

A review of relevant literature on survey advertising revealed that only national statistical agencies have used large-scale paid advertising campaigns to increase response rates in surveys and censuses. The U.S. Census Bureau used the 1998 Census Dress Rehearsal to test the effectiveness of a large-scale advertising campaign to increase awareness and persuade respondents to mail back their forms. The Census Bureau used only pro bono advertising on a smaller scale in the 1980 and 1990 Decennial Censuses (U.S. Census Monitoring Board, 1999).

Census Bureau evaluation studies found significantly increased awareness and knowledge about the Census

among respondents exposed to advertising after the 1980 and 1990 Decennial Censuses, and the 1998 Census Dress Rehearsal (Moore, 1982; Fay, Bates, and Moore, 1991; Bates and Buckley, 1999). The 1990 Decennial Census study also found a significant association between advertising exposure and mail return behavior (Fay, Bates, and Moore, 1991). However, the 1998 Census Dress Rehearsal evaluation study did not find a significant relationship between reported advertising exposure and mail return behavior (Bates and Buckley, 1999).

There were several differences between the two studies, most notably the use of different statistical techniques. Fay, Bates, and Moore (1991) used tests of differences in the mail return rates between respondents reporting advertising exposure and those not reporting census advertising exposure. These tests did not control for confounding variables, such as age group, race and ethnic origin, income, and householder educational attainment. Conversely, Bates and Buckley (1999) used a logistic regression model to control for these variables, and also used mail return behavior as the dependent variable.

Another difference between studies was their geographic scope. The 1990 Census Outreach Evaluation Survey was a nationally representative personal interview sample ($n = 2,000$), while the Bates and Buckley study was a telephone sample of about 1,500 completed interviews in each of the dress rehearsal sites (Sacramento and the Columbia, South Carolina metropolitan area) exposed to advertising. The potential covariation between age, advertising exposure, and mail return behavior was treated differently in these studies. Fay, Bates, and Moore (1991) and Moore (1982) showed that younger respondents were less likely to return their census forms, but neither study used an age/advertising exposure interaction effect in a multivariate analysis. Bates and Buckley (1999) did not include in the logistic regression

NOTE: This paper reports the results of research and analysis undertaken by Census Bureau staff. It has undergone a more limited review by the Census Bureau than its official publications. This report is released to inform interested parties and to encourage discussion.

models used in their study. Fay, Bates, and Moore (1991) specifically mention the need for future studying the interaction of age and other factors impacting the likelihood of response.

Of course, other factors have been shown to affect survey participation. Fay, Bates, and Moore (1991) found that households with some unrelated members, younger householders, black householders or of Hispanic origin, less educated householders, and households with less income were less likely to mail back their census form in 1990 than householders not possessing these characteristics. Additionally, Bates and Buckley (1999) found that civic participation was associated with returning a census form in the 1998 Census Dress Rehearsal.

In summary, no previous work has shown that advertising exposure is associated with mail return behavior, controlling for any effects caused by respondent age and other factors that have been shown to be associated with mail return behavior. This study will attempt to determine if mail return behavior and recalled exposure to newspaper, television, and radio advertisements about the census differs by age group.

Methodology

This study will use data collected in a Random Digit Dialed (RDD) telephone survey conducted by Westat, Inc. at two of the 1998 Dress Rehearsal sites in Sacramento, California and Columbia and surrounding counties in South Carolina. This survey was originally designed and conducted in part for Bates and Buckley's (1999) study evaluating the impact of paid advertising on the likelihood of returning a census form. According to Dimitri (1999), the initial wave of census questionnaires was mailed approximately two and one half weeks prior to Census Day (April 18, 1998). The second wave of census questionnaires was mailed just prior to Census Day. The telephone survey began approximately one week after the commencement of the second wave mailing (April 24, 1998 in Sacramento, May 1, 1998 in South Carolina), and lasted between one month (South Carolina) and six weeks (Sacramento). Bates and Buckley (1999) claim that this survey's time limitations partially caused a poor response rate in both sites. The Sacramento site achieved a 54% response rate, and South Carolina site achieved a 64% response rate (response rate definition used 1998 AAPOR guidelines), but these response rates include respondents living outside of the Census Dress Rehearsal sites excluded from this analysis (Roper Starch Inc., 1998).

The designated respondent in the telephone survey was the person usually handling the mail in the household, as self-reported by the phone answerer. It was assumed that the member handling the mail was the person most likely to have completed their household's census form prior to the start of the census nonresponse followup period. This interview consisted of several sections; including media use, civic participation, awareness of government agencies (including the Census Bureau) and programs, recall of exposure to census information, recall of specific advertising, census form receipt, and demographic information.

The dependent variable, return of census form, was defined to be the likelihood of whether the housing unit returned a census form prior to the start of the census nonresponse followup period. The age group variable is the categorical self-reported age of the phone answerer. The recalled advertising exposure variables were defined to be whether or not the respondent recalled a program (or programs) encouraging people to participate in the census by media type. If the respondent recalled the program(s), then the respondent was (were) asked to recall exposure from a series of fourteen media types (e.g., television, newspaper, radio, billboard, community group meeting, etc.).

According to Bates and Buckley (1999), the Dress Rehearsal advertising campaign began in the first week of March 1998 and continued until the last week in June for some media. Given the early June closeout date for the South Carolina telephone survey, the longest respondent recall period would be about three months since the start of the campaign.

Analytical Plan

Two logit models were created (one model for each site) to test for association between the dependent variable, mail return behavior, and the primary independent variables, respondent age and exposure to advertising exposure by media form. Next, respondent age/advertising exposure interaction effect variables were added to the logit models.

These covariates were included in a logistic regression model to predict the likelihood of response contingent on two independent variables, age group and recalled exposure from medium about the census. Three individual media forms were included in the models, radio, television, and newspaper exposure. Other covariates eligible for inclusion in this model were race

of the respondent, civic participation, household income, and educational attainment.

One of the two criteria used to determine the covariates' inclusion is significant overall predictive improvement to the reduced model using a maximum likelihood ratio test. The second criterion used for inclusion was any change in predicted association (i.e., change in outcome for hypothesis tests, $p < .05$) for advertising exposure and age group variables already included in the models. Both criteria were required for covariates' (other than age group and advertising exposure) inclusion in the final models.

As previously mentioned in the background section, these variables were found to be associated with mail return behavior in the 1990 census and 1998 Census Dress Rehearsal (Fay, Bates, and Moore, 1991), Bates and Buckley, 1999).

A four category civic participation variable was created to capture the potential effect of civic participation on mail return rates. Bates and Buckley (1999) demonstrated that mail return behavior is associated with the respondent's degree of civic participation. This variable was included in the model to account for any differences in mail return behavior resulting from level of civic participation.

Race, household income, civic participation, and educational attainment were eligible for inclusion in the final models because these variables were associated with mail return behavior. As previously mentioned, all of these variables have been shown in previous studies to be associated with mail return behavior (Fay, Bates, and Moore, 1991; Bates and Buckley, 1999) in the 1990 census and 1998 Census Dress Rehearsal. The racial explanatory variable was initially placed in the models to account for differences in advertising exposure due to targeted advertising. Educational attainment was placed in the model to account for any advertising exposure differences correlated with educational attainment. Both educational attainment and household income were dropped from the final models because excluding these variables did not affect any significant relationships between relevant variables in the model, and did not provide significant additional predictive power to the models.

Additionally, civic participation was dropped from the Sacramento site's models for the same reason. This variable was included in the South Carolina site's models because adding it changed the model's predicted

significance level. A black non-Hispanic origin variable was included in the model to account for differences in mail return behavior associated with race.

The independent variables included in these models (and possible values) are:

- Newspaper exposure to census advertising (yes/no)
- Radio exposure to census advertising (yes/no)
- Television exposure to census advertising (yes/no)
- Respondent age group (three categories; age 18 to 34, 35 to 54, and 55 years or older)
- Racial group/Hispanic origin (Black non-Hispanic, and all other)
- Civic Participation (four categories; zero activities reported, one, two, or three or more) (South Carolina site only).

The age group variable was collapsed into three categories, ages 18 to 34, 35 to 54, and 55 years or older, to provide a more reliable analytical model for age group categories with limited sample size. Data collapsing was conducted to provide greater sample size for analyzing potential differences in mail return behavior between younger and older adults when exposed to census advertising.

Results

Main Effects Only Model

The main effects model in Table 1 indicates that Sacramento respondents' newspaper exposure was significantly related to returning a census form (parameter coefficient of 0.456), controlling for age group and racial/ethnic origin. Sacramento respondents exposed to census newspaper advertising were predicted to be 58% (odds ratio) more likely to return a form than respondents not exposed to newspaper advertising. As noted in the previous section, adding civic participation, income, Hispanic origin, or Asian racial group variables failed to change the association predicted by this model.

In contrast, no association between mail return behavior and newspaper exposure was found for the South Carolina site. As noted in the previous section, this lack of association was contingent on including a civic participation explanatory variable in the main effects model. Including this variable dropped newspaper exposure's achieved significance level from a probability value of .017 to .167.

No reason was found to explain the difference in newspaper advertising's effectiveness between sites, since the model controlled for differences associated with age and race. It is noted that the addition of several other possible covariates (i.e., Spanish spoken as the primary language of the household, income, educational attainment) did not significantly alter these findings.

Exposure to census radio advertising was not shown to significantly improve mail return behavior in either site, despite radio's higher proportion of South Carolina's advertising (22% of budget) relative to Sacramento (7%). Exposure to television advertising also did not significantly improve the mail return rate at either site. Again, no significant increase in mail return was achieved from the increased proportion of the Sacramento's total advertising spent on television advertising (52%), relative to the television's share (16%) of the South Carolina advertising budget.

Consistent with 1980 and 1990 census studies (Moore, 1982; Fay, Bates, and Moore, 1991), persons 55 years of age and older were significantly more likely to return a census form than persons 18 to 34 years of age. Black racial origin was associated with mail return behavior (Sacramento parameter coefficient of -0.480, and South Carolina parameter coefficient of -0.602), and civic participation is associated with mail return behavior in the South Carolina site (parameter coefficient of 0.371)

Advertising Exposure/Age Group Interaction Effects Model

According to the models described in Tables 1 and 2, the overall inclusion of advertising exposure/age group interaction variables did not significantly improve the power of the main effects model in either site.

Although the addition of all interaction terms did not improve the overall predictive power of the main effects model, Table 1 shows that one Sacramento age group/advertising exposure contrast was predicted to be significant by this model. Respondents aged 55 years and older were predicted to be 2.8 times as likely (odds ratio) as 18 to 34 year old respondents to return their census forms when exposed to newspaper advertising. Tables 1 and 2 also show that no age group was predicted to have significantly different mail return behavior than another group when exposed to radio advertising. Higher relative proportion of radio advertising in the South Carolina site did not translate into a significant interaction effect for a particular age group. Although no age group contrasts were significant,

Table 1
Logistic Regression Coefficient Predictors in Returning a Census Form
Sacramento Site (n=844)

<i>Model</i>	<i>Main Effects Only</i>	<i>Ad Exposure/Age Interaction Effects Included</i>
Independent Variable	Parameter Estimate (Std. Error)	Parameter Estimate (Std. Error)
<i>Intercept</i>	-0.125 (0.158)	-0.239 (0.199)
<i>Newspaper Ads</i>	0.456* (0.171)	0.217 (0.299)
<i>Radio Ads</i>	0.000 (0.178)	0.399 (0.302)
<i>TV Ads</i>	0.104 (0.170)	0.197 (0.283)
<i>Interaction Effects</i>		
<i>Newspaper/ Age 35 to 54</i>	NA	0.067 (0.382)
<i>Age 55 and older</i>	NA	1.355* (0.557)
<i>Radio/ Age 35 to 54</i>	NA	-0.577 (0.390)
<i>Age 55 and older</i>	NA	-0.718 (0.587)
<i>Television/ Age 35 to 54</i>	NA	0.506 (0.410)
<i>Age 55 and older</i>	NA	-0.350 (0.487)
<i>Racial Group Black</i>	-0.480* (0.206)	-0.467* (0.207)
<i>Respondent Age</i>		
<i>35 to 54 yrs.</i>	0.506* (0.168)	0.815* (0.279)
<i>55 years and older</i>	1.537* (0.225)	1.459* (0.343)

* indicates significance at p<.05 level.

NOTE: NA signifies exclusion from main effects only model. Reference group for racial group is all other races, 18 to 34 year for respondent age. Main Effect Only Model Achieved Log Likelihood Chi Squared Score=79.294 (6 Degrees of Freedom (DF)) (p=0.0001), Interaction Effect Model Achieved Log Likelihood Chi Squared Score 90.174 (12 DF) (p=0.0001). No significant improvement in predictive power when interaction terms are included (90.174/79.294) = 1.1372 (p>.05, 6 DF).

Table 2
 Logistic Regression Coefficient Predictors in Returning
 a Census Form
 South Carolina Site (n=1028)

<i>Model</i>	<i>Main Effects Only</i>	<i>Ad Exposure/Age Interaction Effects Included</i>
Independent Variable	Parameter Estimate (Std. Error)	Parameter Estimate (Std. Error)
<i>Intercept</i>	0.138 (0.192)	0.305 (0.256)
<i>Newspaper Ads</i>	0.219 (0.159)	-0.014 (0.296)
<i>Radio Ads</i>	0.037 (0.158)	0.097 (0.296)
<i>TV Ads</i>	0.059 (0.170)	-0.078 (0.332)
<i>Interaction Effects</i>		
Newspaper/ Age 35 to 54	NA	0.509 (0.371)
Age 55 and older	NA	0.019 (0.449)
Radio/ Age 35 to 54	NA	-0.356 (0.374)
Age 55 and older	NA	0.459 (0.453)
Television/ Age 35 to 54	NA	-0.180 (0.377)
Age 55 and older	NA	-0.337 (0.518)
<i>Racial Group</i>		
Black	-0.602* (0.140)	-0.617* (0.143)
<i>Respondent</i>		
Age 35 to 54 yrs.	0.019 (0.171)	-0.380 (0.309)
55 years and older	0.527* (0.200)	0.643 (0.350)
<i>Civic Participation</i>	0.371* (0.085)	0.364* (0.085)

* indicates significance at p<.05 level.

NOTE: NA signifies exclusion from main effects only model. Main Effect Only Model Achieved Log Likelihood Chi Squared Score=64.604 (7 DF) (p=0.0001), Interaction Effect Model Achieved Log Likelihood Chi Squared Score=75.736 (13 DF) (p=0.0001). No significant improvement in predictive power when interaction terms are included (75.736/64.604) = 1.1723 (p>.05, 6 DF).

it appears that the oldest group of South Carolina respondents (55 years or older) returned their census forms in greater numbers when exposed to radio advertising, relative to younger respondents (parameter coefficient of 0.643). In contrast, Sacramento's youngest group of residents was more than twice as likely to return their forms (odds ratio) when exposed to radio advertising as the eldest group (parameter coefficient of -0.718).

Television advertising was not predicted to interact with age group, according to this model. Although no single age group contrast was statistically significant, each site's model predicts that the youngest group of respondents (18 to 34 years old) was approximately 40% more likely (odds ratio) to return a census form than the oldest group of respondents (55 years and older). The higher proportion of television advertising in Sacramento did not translate into a significant interaction for a particular age group.

Conclusion

It appears that no consistent interaction effect exists between age group and exposure to television, radio, and newspaper advertising about the census. The addition of age/media interaction effects did not provide significantly greater predictive power to a logistic regression model. Exposure to newspaper advertising was significantly related to returning a Census form at the Sacramento site, but no similar association was found at the South Carolina site.

At a minimum, age was found to be associated with returning a census form, controlling for advertising exposure from newspaper, radio, and television sources. This finding is consistent with Fay, Bates, and Moore (1991), and age should be considered for use in future studies targeting mail return behavior and advertising exposure.

Another limitation to these findings include the measurement error associated with self-reported advertising exposure. One suggested method to minimize this error includes data collection of media consumption patterns by a diary and/or metered box wired to a television, as used by television and radio ratings services. This data collection method might provide more reliable data about the media consumption patterns of all sampled household members, and eliminate recall error associated with self-reported advertising exposure.

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