

Quantifying the Influence of Incentives on Mail Survey Response Rates
and Their Effects on Nonresponse Error

Virginia M. Lesser, Oregon State University
Don A. Dillman, Washington State University
John Carlson, University of Idaho
Frederick Lorenz, Iowa State University
Robert Mason, Oregon State University
Fern Willits, Pennsylvania State University

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Abstract

Over the past fifty years, an accumulation of research has shown that financial incentives improve response rates. Our objective is to determine whether or not this still holds true and to determine the impact of incentives on nonresponse bias. A series of eight studies on both student and general populations was conducted to address these topics. The experiments were also designed to investigate how the delivery of the incentive may impact response rates. Financial incentives combined with multiple mailings continue to improve response rates. Demographic characteristics of the incentive groups were more similar to the selected sample as compared to the control group in most studies. This suggests that estimates produced from studies using financial incentives may have lower mean square error than those studies offering no financial incentives.

Introduction

The goal of any sample survey is to obtain accurate inferences about a population. One threat to the accuracy of these inferences is nonresponse. Over the past 50 years an accumulation of research has shown that financial incentives improve survey response rates (Armstrong 1975; Church 1993; Fox, Crask, and Kim 1988; Heberlein and Baumgartner 1978; Yammarino, Skinner, and Childers 1991; Yu and Cooper 1983). Some, but not all of these studies, combined the total design method discussed by (Dillman 1978), such as multiple mailings, with financial incentives. A number of studies conducted in the early 1990s combined the total design method with financial incentives to show that response rates improve with both the use of financial incentives and the total design method (James and Bolstein 1990; James and Bolstein 1992; Martinez-Ebers 1997; Singer, Van Hoewyk, and Maher 1998; Tambor et al. 1993; Warriner et al. 1996). An objective of this paper is to determine if the effectiveness of

incentives has been undermined by changing cultural and social values and by other improvements in survey methods. Results from eight new experiments conducted on different populations providing incentives ranging from \$2 to \$5 are presented. All of these experiments used multiple contacts, thought to be the most powerful inducer of mail survey response.

In four of the studies discussed in this paper, response rates were also compared by type of delivery, whether cash or check, or whether a \$2 bill or two \$1 bills. With regard to the presentation of the monetary incentive, a \$2 incentive could be delivered as two \$1 bills, one \$2 bill, or a \$2 check.

Another objective of this paper is to determine if financial incentives reduce non-response bias. In an ideal survey where nonresponse is considered a random event, respondents will have the same characteristics as non-respondents. This assumption is often difficult to evaluate since information is seldom available to compare the nonrespondents with the respondents. A major reason for attempting to improve response rates is to obtain participation from more individuals selected in the sample, thus bringing the sample mean closer to the population mean, and hence reducing nonresponse bias. Since it is widely recognized that financial incentives increase response rates, a more important question is whether the introduction of the financial incentive decreases nonresponse error by bringing the characteristics of the sampled closer in line with population values.

Nonresponse error is one component of total survey error (the other three are frame, measurement, and sampling error) and is the focus of this research. We will study nonresponse bias, since errors associated with the inability to obtain measurements on all the members of the selected sample, can be viewed as constant over all possible samples, i.e., a fixed error. Nonresponse bias, is defined as the multiplicative effect of the nonresponse rate (λ) of a sample survey and the difference in the measured population

characteristic between the nonrespondents and respondents ($\bar{Y}_{NR} - \bar{Y}_R$).

$$\text{Nonresponse bias} = \lambda(\bar{Y}_{NR} - \bar{Y}_R)$$

For one component of this error, nonresponse rate, the literature has shown there is a reduction in the nonresponse rate when mail surveys use both multiple mailings and financial incentives. In order to investigate whether there are differences between the nonrespondents and respondents, data are needed on the nonrespondents. Few experiments have actually had this information available. Data summarized by McDaniel and Rao (1980) and Shettle and Mooney (1999) did not show any increased differences between respondents and nonrespondents for the variables examined, but Tambor et al. (1993) did see significant differences between respondents and nonrespondents. One approach to further evaluate differences between respondents and nonrespondents is to compare their demographic characteristics. The present research includes six studies that include demographic data on both respondents and nonrespondents. This information will be used to evaluate the impact of financial incentives on nonresponse bias. A comparison of results between student and general populations will be discussed.

Experiments

The following studies were conducted across a number of states that include Idaho, Iowa, Pennsylvania, Oregon, and Washington. The subjects were randomly assigned to either the incentive group or a non-incentive group. A variety of populations was included in these studies, e.g., both general and student populations. Brief summaries are provided for the studies that investigated the topics outlined above. In addition to testing the impact of financial incentives on response rates, a number of other experiments were conducted in these studies. The details of these additional studies are listed below.

1. A 1997 survey was conducted on students who recently left the College of Agricultural Sciences at Oregon State University without receiving their degree. The questionnaire had 22 questions and three mailings were sent in this study. Approximately one third of the sample received no incentive, another third received a \$2 check with the initial mailing, and the final third
2. A 1998 study was conducted on students who recently graduated from the College of Agricultural Sciences at Oregon State University. The questionnaire had 24 questions and five mailings were sent in this study. Approximately one third of the sample received no incentive, another third received a \$2 bill with the initial mailing, and the final third received a \$5 bill with the initial mailing.
3. A 1997 study on distance education issues was conducted on students who recently attended Oregon State University but left before receiving their degree. There were 15 questions on this questionnaire and four mailings were sent. There were five study groups, consisting of a non-incentive group, those who received either a \$2 bill, a \$2 check, a \$5 bill, or a \$5 check. The experimental groups received the incentive on the second mailing of the questionnaire. Each check was written out to the person selected in the study.
4. A 1998 satisfaction study was conducted on students who graduated from Oregon State University in June, 1997. There were 20 questions on this questionnaire and either three or four mailings were sent depending on the study group. There were 5 study groups which included: (i) 4 mailings including a preletter, a \$2 incentive was sent with the first mailing; (ii) 4 mailings including a preletter; (iii) 4 mailings and the \$2 incentive was sent with the preletter; (iv) 4 mailings with no preletter but two follow-ups; and (v) three mailings – no preletter was sent in this group.
5. A 1994 customer satisfaction survey was conducted on new residents who visited the Washington State Department of Motor Vehicles in order to obtain a new state license. The questionnaire had 52 questions. Approximately half of the sample received no incentive while the other half of the sample received a \$2 bill in the initial questionnaire mailing. Up to four contacts were sent to each individual in the selected sample.
6. A study of new residents in Iowa who obtained a new State of Iowa drivers license were surveyed in 1997. The questionnaire was eight pages in

length. Approximately one third of the sample received no incentive, another third received two \$1 bills, and the final third received a \$2 bill. There were four mailings in this study and the incentive was sent with the first mailing.

7. A 1996 study was conducted on people aged 50-70 who had just recently moved to Idaho. There were 50 questions on this questionnaire. Approximately one third of the sample received no incentive, another third received a \$2 bill with the first mailing, and the final third group was informed in their first cover letter that they could be entered in a drawing to win \$300. The final group was only entered in the lottery if they completed and returned their questionnaire.
8. A mail survey assessing citizen's views about current social issues was carried out in Centre County, Pennsylvania in 1998. The questionnaire was six pages long, and contained 60 questions. There were three mailings, all included a copy of the survey form. The response experiment involved both a cash incentive (two \$1 bills) and personalization. Sample members were randomly assigned to six treatment groups: (i) no incentive, no personalization; (ii) no incentive, first mailing not personalized but second mailing personalized; (iii) no incentive, first and second mailing both personalized; (iv) incentive, no personalization; (v) incentive and personalization both on the second mailing only; (vi) incentive on first mailing, personalization on first and second mailings.

Results

All financial incentive studies conducted showed increased response rates as compared to the non-incentive group (Table 1). This increase was found whether three, four, or five mailings were sent in the study. The amount of the increase varied according to how the financial incentive was packaged (i.e., check, cash, novelty bill). These differences are shown in the additional studies conducted in these surveys.

Check versus Cash. There were no significant differences in the comparisons testing the response rates obtained from the cash versus the check incentive (Table 1, Studies 1 and 3). Study 1 study comparing a \$2 bill versus \$2 check showed a no significant difference in response rates (p-value=0.212), while Study 3 has a p-value=0.479 for this comparison. The results of the two studies on the \$2

Table 1. Studies conducted to investigate impact of financial incentives in mail surveys.

Study	Sample Size	Groups	Response Rate
1	382	\$0	28%
		\$2 check	44%
		\$2 bill	53%
2	398	\$0	57%
		\$2 bill	68%
		\$5 bill	82%
3	973	\$0	32%
		\$2 check	54%
		\$2 bill	49%
		\$5 check	53%
		\$5 bill	54%
4 ^a	1968	4 mailings, \$0, preletter	52%
		4 mailings, \$2 first mail	65%
		4 mailings, \$2 preletter	67%
		4 mailings, \$0, postletter	44%
		3 mailings, \$0	43%
5	725	\$0	44%
		\$2 bill	63%
6	943	\$0	42%
		2 \$1 bills	70%
		\$2 bill	73%
7	2053	\$0	53%
		\$2 bill	72%
		\$300 lottery	58%
8 ^b	2000	\$0, no personz	37%
		\$0, 1 personz	40%
		\$0, 2 personz	46%
		\$2, no personz	61%
		\$2, 1 personz	62%
\$2, 2 personz	64%		

^aFirst mail denotes the incentive was sent in the first mailing.

^bPersonz denotes amount of personalization, either none, 1 personz for personalization on second mailing, or 2 personz for personalization on first and second mailings.

check versus cash actually showed a reversal in the results on which type of currency provided the higher response rate. There was no significant difference in the response rates comparing a \$5 check or \$5 cash (p-value=0.899; Study 3).

\$2 versus \$5. Study 2 in Table 1 showed a significant increase in response rates between the \$2 and \$5 treatment groups (p-value=0.008). However, there were no significant differences found between the \$2 and \$5 treatment groups in Study 3, regardless of whether check or cash was used (cash p-value =0.96; check p-value=0.44). It should be noted that the incentive in Study 3 was sent in the second mailing of the questionnaire while the incentive in Study 2 was sent in the first mailing.

Two \$1 bills versus One \$2 bill. Study 6 (Table 1) did not show any significant differences in response rates related to the delivery of two \$1 bills or one \$2 bill (p-value=0.48). There was a three-percentage point increase in response rate between the groups receiving the novelty of a \$2 bill over the two \$1 bill group.

Prepayment versus Lottery. There was a 5% increase in the response rate for the group that received notice of the lottery compared to the non-incentive group (Table 1, Study 7). However, this increase in the response rate was not significant between these two treatments (p-value=0.38), while the test between the \$2 prepayment and the control group in this study was significant (p-value=0.002).

Personalization with Incentive. At each level of personalization, there was an increase in response rates of approximately 20%. However, this increase in response rate due to the financial incentive appears to decrease with increasing levels of personalization (Table 1, Study 8), but this interaction between personalization and incentive was not significant.

Impact of Incentives on Reducing Nonresponse Bias. It should be noted that there are two components to reducing nonresponse error. The first is to decrease the nonresponse rate, which has been shown in all studies presented in this research. The second is to decrease the difference in responses between the nonrespondents and the respondents. Typically, no information is available on the nonrespondents. However, in six studies mentioned above (1, 2, 3, 4, 5, and 6), some limited demographic information was available for nonrespondents.

Since many surveys, such as the Current Population

Survey, include nonresponse adjustments for gender, this variable was investigated to determine whether a financial incentive made any changes to the distribution of gender in the different treatment groups. In studies of students, the financial incentive groups did as well or better than the non-incentive groups in obtaining a sample of completed surveys that matched the gender distribution of the selected

Table 2. Comparison of gender characteristics between the sampled population and the respondents completing questionnaires in each treatment group.

Study	Group	Gender (%)	
		Male	Female
<i>Student Population Studies</i>			
1	Selected sample	55	45
	Control	39	61
	\$2 Check	43	57
	\$2 Bill*	46	54
2	Selected sample	62	38
	Control	50	50
	\$2*	65	35
	\$5	66	34
3	Selected sample	56	44
	Control	47	53
	\$2 Check*	57	43
	\$2 Bill	48	52
	\$5 Check	26	74
	\$5 Bill	45	55
4	Selected sample	47	53
	\$0, 3 Mailings	45	55
	\$0, 4 Mailings (post)	51	49
	\$0, 4 Mailings (pre)*	47	53
	\$2, Preletter*	47	53
	\$2, Post	54	47
<i>General Population Studies</i>			
5	Selected sample	55	45
	Control	48	52
	\$2 Bill*	50	50
6	Selected sample	48	52
	Control	44	56
	Two \$1 Bills	40	60
	\$2 Bill*	49	51

* The treatment group that most closely resembles the sampled population.

sample for most treatment group comparisons (Table 2).

For example in Study 1, the percentage of females in the selected sample was 45%. The percentage of completed responses from females was 61% for the non-incentive group, while the percentage of completed responses from females was 57% and 54% for the \$2 check and \$2 bill groups, respectively. In Study 2, the percentage of females in the selected sample was 38%. The percentage of completed responses from females was 50% for the non-incentive group, while the percentage completed responses from females was 35% and 34% for the \$2 incentive and \$5 incentive, respectively. As compared to the non-incentive group, Studies 3 and 4 also showed a slight improvement for the incentive groups for some, but not all incentive groups, in bringing the sample of completed responses closer to the demographic ratio of the selected sample. In most cases, this, combined with the lower nonresponse rate for the incentive groups, implies that nonresponse bias is reduced when financial incentives are used in student population studies. In the two studies of the general population, the \$2 bill treatment group brought the gender characteristics of the completed sample more in line with the gender characteristic of the selected sample as compared to the control group (Table 2). However, the two \$1 bills in Study 6 appeared to increase the number of females in the completed sample more than the number that appeared in the selected sample.

Further comparisons of demographics were done for the general population studies. Age was compared across the treatment groups in each study. In one of the two studies (Study 6), the \$2 bill treatment group brought the age characteristic of the completed sample more in line with the age demographics of the selected sample (Table 3). The effect of financial incentives on reducing nonresponse bias due to variability in response rates across age categories was unclear due to the conflicting results in the two studies on age. No comparisons were done in the student populations since there was a small range of ages found with these data.

Conclusions

A main advantage of conducting repeated experiments, as shown in this paper, is to provide stronger evidence that response rates clearly increase with the use of financial incentives, as compared to reviewing results of one study. The data consistently

Table 3. Comparison of age characteristics for two general population studies between the sampled population and the respondents completing questionnaires in each treatment group.

Study	Group	Age (%)			
		50+	40-49	30-39	18-29
5	Sample	11	21	31	37
	Control*	15	21	21	34
	\$2 Bill	13	27	32	28

Study	Group	Age (%)					
		65+	55-64	45-54	35-44	25-34	<25
6	Sample	6	7	15	25	32	16
	Control	8	9	17	23	29	14
	2-\$1Bills	7	7	16	29	31	9
	\$2 Bill*	7	9	14	22	34	14

* The treatment group that most closely resembles the sampled population.

show the improvement in response rates with financial incentives. The repeated experiments across populations and time reflect the variability that may arise in these financial incentive studies.

Financial incentives continue to improve response rates across a variety of populations and geographical areas. Moreover, the analysis presented here suggests that incentives may also decrease nonresponse bias in regard to gender by increasing the likelihood that males (who are less likely to respond to mail surveys than are females) will participate. Six studies showed that the financial incentive brought the completed sample more in line with the distribution of the selected sample with respect to gender. Given that responses may differ across gender, this would suggest that the differences between the respondents and nonrespondents would be smaller for the financial incentive groups. Since the multiplication of these two components is a measure of nonresponse bias, it is expected that nonresponse bias attributed to variability in gender response rates is smaller for the financial incentive groups compared to the non-financial incentive groups. This was true for both the student and general populations studied in this paper.

To the extent that financial incentives encourage traditionally underrepresented groups to complete

and return their surveys, a similar decrease in nonresponse bias would be expected for them as well. Clearly, further study of this matter is warranted to ascertain the relative impact of financial incentives on nonresponse bias for other populations with respect to other demographic variables, such as age and ethnicity.

References

- Armstrong, J. Scott. 1975. Monetary Incentives in Mail Surveys. *Public Opinion Quarterly* 39:111-116.
- Church, Allan H. 1993. Incentives in Mail Surveys: A Meta-Analysis. *Public Opinion Quarterly* 57:62-79.
- Dillman, D. 1978. *Mail and Telephone Surveys*. New York: Wiley.
- Fox, Richard J., Melvin R. Crask, and Jonghoooon Kim. 1988. Mail Survey Response Rate: A Meta-Analysis of Selected Techniques for inducing response. *Public Opinion Quarterly* 52:467-491.
- Heberlein, Thomas A., and Robert Baumgartner. 1978. Factors Affecting Response Rates to Mailed Questionnaires: A Quantitative Analysis of the Published Literature. *American Sociological Review* 43 (4):447-462.
- James, Jeannine M., and Richard Bolstein. 1990. The Effect of Material Incentives and Follow-up Mailings on the Response Rate and Response Quality in Mail Surveys. *Public Opinion Quarterly* 54:346-361.
- James, Jeannine M., and Richard Bolstein. 1992. Large Monetary Incentives and their Effect on Mail Reesponse Surveys Rates. *Public Opinion Quarterly* 56:442-453.
- Martinez-Ebers, Valerie. 1997. Using Monetary Incentives with Hard-to-Reach Population in Panel Surveys. *International Journal of Public Opinion* 9:77-86.
- McDanial, Stephen V., and C. P. Rao. 1980. The Effect of Monetary Inducement on Mailed Questionnaire Response Quality. *Journal of Marketing Research* 17:265-268.
- Shettle, Carolyn, and Geraldine Mooney. 1999. Evaluation of Using Monetary Incentives in a Government Survey. Arlington, VA: National Science Foundation.
- Singer, Eleanor, John Van Hoewyk, and Mary P. Maher. 1998. Does the Payment of Incentives Create Expectation Effects? *Public Opinion Quarterly* 62:152-164.
- Tambor, Ellen S., Gary A. Chase, Ruth R. Faden, ail Geller, Karen J. Hofman, and Neil A. Holtzman. 1993. Improving Response Rates Through Incentives and Follow-Up: The Effect of a Survey of Physicians' Knowledge of Genetics. *American Journal of Public Health* 83:1599-1603.
- Warriner, Keith, J. Goyder, H. Gjertsen, P. Hohner, and K. McSpurren. 1996. Charities, No; Lotteries, No; Cash, Yes: Main Effects and Interactions in a Canadian Incentives Experiment. *Public Opinion Quarterly* 60:542-562.
- Yammarino, Francis J., Steven J. Skinner, and Terry L. Childers. 1991. Understanding Mail Survey Response Behavior: A Meta-Analysis. *Public Opinion Quarterly* 55:613-639.
- Yu, J., and H. Cooper. 1983. A Quantitative Review of Research Design Effects on Response Rates to Questionnaires. *Journal of Marketing Research* 20:36-44.