AN EXPERIMENT ON IMPROVING RESPONSE RATES AND REDUCING CALL BACKS IN HOUSEHOLD SURVEYS

Helen P. Koo, Research Triangle Institute
Jeanne Clare Ridley, Georgetown University
P. V. Piserchia, Research Triangle Institute
Deborah A. Dawson, Georgetown University
Christine A. Bachrach, Georgetown University
Mildrid I. Holt, Research Triangle Institute
Daniel G. Horvitz, Research Triangle Institute

INTRODUCTION

This paper reports the results of preliminary analyses of an experiment undertaken as part of a pretest for a national survey; more refined analyses are underway and will be reported in a subsequent paper. The national survey will cover white ever married women belonging to the birth cohorts of 1901-1910, i.e., women now 66 to 76 years of age. The field work for the pretest survey was carried out by Research Triangle Institute (RTI) from late June through early August 1976.

There were a number of reasons for undertaking the experiment. First, since response rates for older persons tend to be somewhat lower than among younger ones (Atchley, 1969; Benus et al., 1971; Kish, 1965), we decided to experiment with different methods of contacting respondents in hopes of finding a contact method which would improve our response rate. We also hoped that if one of the lower cost methods of contacting respondents proved to be equally or more effective than a higher cost method, we could take advantage of the less expensive method in the main survey. Also, we were concerned with the general problems encountered in surveys today, namely, increasing costs and declining response rates. Finally, a review of recent survey literature indicated that while the effects of contact procedures in mail and telephone surveys on response rates have been rather extensively studied, only a relatively few controlled studies have been carried out in which the methods of contacting respondents for personal interviews have been systematically varied (Brunner and Carroll, 1967; Cartwright and Tucher, 1967).

THE PRETEST SAMPLE

The sample for the pretest survey was designed to include households varying in geographic location, rural-urban residence, and socioeconomic status. From the 100 primary sampling units (PSU's) which make up RTI's national general purpose sample, 10 PSU's were selected in close proximity to or within the four metropolitan areas of Boston, Atlanta, Chicago, and Los Angeles. From each of the 10 PSU's, two secondary sampling units (SSU's), one urban and one rural, were purposively selected on the basis of 1970 census data to have a high proportion of white females belonging to the 1901-1910 birth cohorts and to include areas varying in socioeconomic status (SES), as indicated by median housing and rental values of the SSU. Within each SSU, all households containing a potentially eligible respondent as identified in a household screening were included in the sample for interviewing.

The screening for eligible respondents was carried out in March and April 1976. The response rate for the screening questionnaire was 89.9 percent. In the 2,342 housing units screened, 377 women were identified as potentially eligible for the pretest interview. Since many of the screening interviews were carried out with another member of a household or with a neighbor, we expected that some cases identified as eligible for an interview would not meet the eligibility requirements when actually contacted for the study. In addition, some of the more detailed eligibility requirements were not obtained in the screening interview.

THE EXPERIMENT

In the pretest survey, a 2 X 2 factorial experiment was carried out. The purposes of the experiment were to assess the main and interaction effects of two different types of procedures for contacting the potentially eligible respondents identified in the screening. The two factors tested were the use of a lead letter and the method of initial contact with the respondent. The first factor, at two levels, consisted of the central office sending (or not sending) a lead letter to the respondent prior to any attempt by the interviewer to contact her. The lead letter explained the sponsorship and purposes of the study and indicated that an interviewer would be contacting the respondent. The second factor, also at two levels, consisted of assigning (or not assigning) the interviewer to telephone the potential respondent before attempting a personal visit. In the prior telephone call, the interviewer gave information about the study and tried to make an appointment for an interview.

Within SSU's and within the four areas, the 377 potential respondents were randomly assigned into each of the four treatment combinations. The numbers of cases assigned to each treatment combination were: Lead Letter-Initial Telephone, 100; Lead Letter-Initial Visit, 91; No Letter-Initial Telephone, 96; and No Letter-Initial Visit, 90.

In the Initial Telephone treatment, interviewers were instructed to place up to four telephone calls to the respondent to set up an interview appointment. After no more than four unsuccessful attempts at telephoning, the interviewer made a personal visit to try to contact the respondent. In the Initial Visit treatment, up to two personal visit attempts were made prior to any telephone attempt to contact the respondent. Only after the second unproductive visit was the interviewer allowed to telephone to try to make an appointment.

During the course of the field work, 66 cases had to be removed from the experiment because the assigned treatment could not be followed. An additional 55 potential respondents were determined as ineligible for an interview because of age, race, marital status, or nativity eligibility requirements of the survey, or because they had died or moved. Thus a total of 256 cases, or 68 percent, were considered eligible for an interview and remained in the experiment. In the tables to be presented, only 255 of these 256 eligible, experimental cases are included because the data on one case was received too late to be included in the analysis.

RESULTS

This section describes the results of preliminary analysis of the effects of the experimental treatments on the response rate, the refusal rate, and the cost associated with obtaining completed interviews. Given the very limited time available for analysis, we felt that a reasonable technique for analyzing the results of the experiment was an unweighted analysis of variance of cell means (proportions). Because there were different numbers of individuals per cell and different cell proportions, the cell mean variances were not equal. However, because neither the cell sizes nor proportions varied greatly, it was felt that F-test procedures would be robust against the lack of strict

Table 1. Response Rates, Refusal Rates, Telephone and Visit Effort Ratios, Cost Ratios, and Number of Eligible Experimental Cases for High, Medium, and Low Socioeconomic Status (SES) Secondary Sampling Units (SSU's), by Treatment

	High SES (SSU's)			Medium SES (SSU's)			Low SES (SSU's)			All SSU's		
	Lead letter	No lead letter	Total	Lead letter	No lead letter	Total	Lead letter	No lead letter	Total	Lead letter	No lead letter	Total
A. Response Rates												
Initial Telephone	36.8	43.8	40.0	64.3	66.7	65.4	54.8	72.4	63.3	51.6	63.2	57.0
Initial Visit	35.3	33.3	34.4	50.0	47.4	48.6	52.9	63.6	58.2	47.8	52.2	50.0
Total	36.1	38.7	37.3	56.7	54.8	55.7	53.8	67.7	60.6	49.6	57.3	53.3
B. Refusal Rates												
Initial Telephone	57.9	56.3	57.1	28.6	25.0	26.9	16.1	24.1	20.0	31.3	33.3	32.2
Initial Visit	58.8	46.7	53.1	25.0	47.4	37.1	29.4	27.3	28.4	35.8	37.3	36.6
Total	58.3	51.6	55.2	26.7	38.7	32.8	23.1	25.8	24.4	33.6	35.5	34.5
C. Ratios of Numbers of Telephone (T) and Visit (V) Efforts for all Eligible Cases to Number of Interviews Completed												
Initial Telephone	5.2T 2.4V	8.2T 2.3V	6.8T 2.3V	3.3T 3.0V	2.5T 1.6V	2.9T 2.3V	4.9T 2.4V	3.5T 2.2V	4.1T 2.2V	4.5T 2.5V	4.1T 2.1V	4.4T 2.3V
Initial Visit	2.5T 7.1V	3.3T 7.8V	2.9T 7.3V	1.6T 6.2V	1.3T 5.9V	1.4T 6.2V	2.5T 4.2V	0.8T 3.8V	1.5T 4.0V	2.3T 5.2V	1.3T 5.0V	1.8T 5.0V
Total	3.9T 4.4V	6.2T 4.7V	5.1T 4.6V	2.5T 4.6V	1.8T 4.0V	2.2T 4.3V	3.7T 3.3V	2.2T 3.0V	2.8T 3.1V	3.4T 3.8V	2.8T 3.5V	3.0T 3.8V
D. Ratios of Total Cost of Efforts for all Eligible Cases to Number of Interviews Completed												
Initial Telephone	21.6	23.3	22.4	23.8	13.6	19.0	21.3	18.4	19.7	22.0	18.3	20.1
Initial Visit	51.2	57.4	54.0	44.9	42.9	43.9	31.6	26.6	28.9	38.6	35.2	36.8
Total	35.2	37.5	36.3	33.7	29.1	31.4	26.6	22.5	24.4	30.2	26.6	28.3
E. Number of Eligible Cases												
Initial Telephone	19	16	35	14	12	26	31	29	60	64	57	121
Initial Personal	17	15	32	16	19	35	34	33	67	67	67	134
Total	36	31	67	30	31	61	65	62	127	131	124	255

homogeneity of variances.

In the analyses of variance to be reported below, the SES of SSU's was included as a control variable because earlier regression analyses (results not shown) had indicated that it had important effects on whether a woman responded, refused, etc. The contrasts tested by the analyses of variance were: Initial Telephone versus Initial Visit; Lead Letter versus No Lead Letter; interactions between letter and initial contact treatments; and differences among the three levels of SES (of SSU's). Other interactions, such as those between SES and the treatments, were not included but will be examined in future analyses using other techniques. One disadvantage of analysis of variance of mean values is the inability to derive a "pure" error term directly; contrasts are tested by using, for error, interaction mean squares. In the analyses described below, the SES by initial contact methods, SES by letter treatments, and SES by initial contact methods by letter treatments sums of squares comprised the error sums of squares.

Response Rates. The response rate, defined as the proportion of the eligible experimental cases who completed interviews, was 53.3 percent for the pretest survey. The response rates for the four treatment combinations by the three levels of SES of SSU's are presented in Panel A of Table 1. In the analysis of variance, the simple averages of the response rates of these 12 cells were compared. These simple means for SES were: High SES, 37.3; Medium SES, 57.1; and Low SES, 60.9. The values tested for the treatment contrasts were:

	Lead Letter	No Lead Letter	Total
Initial Telephone	52.0	61.0	56.5
Initial Visit	46.1	48.1	47.1
Total	49.1	54.6	51.8

The results of the analysis of variance of the response rates are presented in Table 2.

Table 2. Analysis of Variance of Unweighted Response Rates by Treatment and Socioeconomic Status (SES) of Secondary Sampling Units (SSU's)

Source of variation	Degrees of freedom	Sums of squares	F	P-value
Assigned Initial Contact	1	.02634	7.90	0.031
Letter	1	.00906	2.72	0.150
Assigned Initial Contact x Letter	1	.00359	1.08	0.339
SES of SSU	2	.12874	19.31	0.003
Error	6	.02001		
Total	11	.18774		

The Initial Telephone versus Visit comparison was statistically significant, but the letter comparison was not. Nor were there significant interaction effects between letter and initial contact treatments. But the SES of SSU's had significant effects on response rates.

The Initial Telephone treatment produced a significantly larger response rate (57 percent) than the Initial Visit treatment (47 percent). The No Lead Letter treatment also resulted in a better response rate (55 percent) than the Lead Letter treatment (49 percent), but this was not statistically significant when the influence of initial contact and SES were adjusted for in the analysis of variance procedures used. Whether the Initial Telephone treatment occurred following a lead letter or not, it obtained higher response rates than the Initial Visit treatment. The SES of SSU's was important, the response rate in low and medium SES areas being markedly better (61 and 57 percent, respectively), than that of the high SES SSU's (37 percent). Although not examined in the analysis of variance, there appear to be some interesting interactions between the treatments and SES, as can be seen in Panel A of Table 1.

Refusal Rates. The refusal rate (proportion of eligible experimental cases refusing to participate) was 34.5 percent for the pretest survey. Besides refusal, there were other reasons for nonresponse, such as physical or mental incapacitation, and being away temporarily. But the present analysis examined only the rates of refusal because refusal accounted for about three-quarters of all nonrespondents.

Panel B of Table 1 presents the refusal rates by treatment and SES. Analysis of variance of the refusal rates found no significant treatment, treatment interaction, or SES effects. Thus while the Initial Telephone treatment seemed to result in better response rates, it did not reduce the incidence of refusal. This indicates that the other components of nonresponse require study.

Cost Effectiveness. Although our cost analysis is even more preliminary than those already discussed, the results are so striking that they are presented here. We do not expect that further analysis will change the conclusions drawn from these results.

For each eligible experimental case was recorded the total number of telephone calls placed and the number of attempts to make personal visits by all field personnel involved in the case to bring it to final resolution. The telephone and visit efforts were counted regardless of outcome (such as busy signal, no one at home, spoke with relative, etc.)

Panel C of Table 7 presents the ratios of the number of telephone and visit efforts expended on all eligible cases to the number of interviews completed. The Initial Telephone treatment required more telephone efforts (4.4 on the average) but fewer visit efforts (2.3) to obtain a completed interview than did the Initial Visit treatment (which took an average of 1.8 telephone efforts and 5.0 visit efforts). It appears that the prior telephone calls were successful in achieving their goal of setting up interview appointments and that generally the appointments were kept, thus reducing the number of personal visits required. Overall, whether a lead letter had been sent or not did not have much influence on the level of efforts expended, although some differences in the efforts needed by the two letter treatments appeared under the various SES conditions.

To study cost effectiveness, the telephone and visit efforts were converted to cost. The expense reports for as much of the interviewing period as was available were examined for an interviewer randomly selected from each of the four study areas. The data indicated that the average mileage cost per visit effort was $2.75. Since detailed telephone expenses were not readily available, direct telephone costs were assumed to be $.20 per call effort. The cost of labor (C) of each interviewer was assumed to be a function of the number of telephone and visit efforts she made, and the total cost then was found as a function of the direct costs and labor costs for telephone and visit efforts:

$$\text{Total cost} = (C_{\text{phone}} + \$.20)\,(\text{No. calls}) + (C_{\text{visit}} + \$2.75)\,(\text{No. visits})$$

Components of the labor costs for the four interviewers were estimated by least squares, yielding an estimate of the total cost as $.90 per telephone effort and $6.97 per visit effort. This cost function was used to convert the effort data to cost.

To assess cost effectiveness, the cost of pursuing all eligible women in a given treatment and SES condition was divided by the number of respondents in that condition who actually completed an interview. These cost ratios are presented in Panel D of Table 1.

Analysis of variance of the logarithm of the cost ratios was

performed, with the results seen in Table 3.

Table 3. Analysis of Variance of the Logarithm of Cost Ratios by Treatment and Socioeconomic Status (SES) of Secondary Sampling Units (SSU's)

Source of variation	Degrees of freedom	Sums of squares	F	P-value
Assigned Initial Contact	1	1.55484	31.50	0.001
Letter	1	0.04460	0.90	0.379
Assigned Initial Contact x Letter	1	0.02331	0.47	0.518
SES of SSU	2	0.28349	2.87	0.133
Error	6	0.29618		
Total	11	2.20243		

The logarithm of cost ratios was analyzed since it was thought that the ratio of cost ratios between two treatment conditions was more meaningful than the difference between cost ratios.

The analysis of variance did not show significant differences in cost ratios among letter treatments or SES levels; nor were there significant treatment interactions. Only the initial contact treatments differed significantly in their cost ratios. The Initial Telephone treatment resulted in much smaller cost ratios than the Initial Visit treatment. Panel D of Table 1 shows that the Initial Visit treatment was superior in cost effectiveness following either of the letter treatments and in every SES condition. In the various letter treatment by SES conditions, the cost ratios of the Initial Telephone treatment ranged from 32 to 69 percent of those of the Initial Visit treatment. Thus, not only did the Initial Telephone treatment produce better response rates than the Initial Visit treatment, it also was a more cost effective method of obtaining the interviews.

The cost function used to convert the effort data to cost was estimated on the basis of incomplete data. When calculated on the basis of complete data, the ratio of cost associated with a visit effort to the cost of a telephone effort may be found to differ from the 7:1 ratio reported above. But even if the ratio should be only 2:1, the cost ratio of obtaining an interview by the Initial Telephone treatment would still be only 76 percent of that of the Initial Visit treatment (based on the telephone and visit efforts reported for the two treatments in Panel C of Table 1). Therefore, it seems safe to judge that when the cost function is recalculated based on complete data, the conclusion will remain that the Initial Telephone treatment was more cost effective than the Initial Visit treatment.

SUMMARY AND CONCLUSION

In the preliminary analyses presented, there is no evidence that sending a lead letter to a potential respondent affected the response or refusal rate, nor is there evidence that the lead letter influenced the cost effectiveness of obtaining interviews. If anything, it may have tended to depress response rates under certain SES by initial contact conditions.

The early analyses also showed that instructing interviewers to attempt to reach their respondents first by telephone to set up an appointment was an effective method. The Initial Telephone method produced better response rates, and at less relative cost, than trying to reach the respondent initially by a personal visit. It was cost effective because although more telephone calls had to be placed, fewer visits (the more expensive effort) needed to be made to obtain interviews. The Initial Telephone treatment did not reduce the refusal rate, however.

No significant interaction effects were found between the letter and initial contact treatments, either with respect to the response rate, refusal rate, or cost effectiveness.

Finally, the SES of SSU's affected response rates, but not refusal rates or cost effectiveness. High SES areas yielded much worse response rates than medium or low SES areas.

The alarmingly high refusal rate obtained in the pretest survey clearly requires further investigation. Until a detailed study has been performed, one can only speculate on the factors responsible for such a large proportion of the elderly women refusing to be interviewed.

The analyses reported are preliminary. They have yielded some interesting findings, but they should not be considered conclusive. In the near future, we plan to reexamine the main and interaction effects of the treatments, using other methods of analysis (including weighted methods), and also to investigate various interaction effects between SES and treatments. In particular, the categorical data methods of Grizzle, Starmer, and Koch (1969) will be used to yield a complete analysis of the response and refusal rates, as well as other components of the nonresponse rate. Cost effectiveness, based on more complete data, will also be further studied. For the cost ratios, Taylor series approximations to their variances will be used to perform additional analysis with respect to the various SES by treatment interactions.

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