A RESPONSE RATE EXPERIMENT FOR RDD SURVEYS

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One of the challenges of random-digit-dial (RDD) surveys is to obtain the cooperation of households at the beginning of a household contact. Unlike list-sample surveys, in which sampled persons are asked for by name and are often connected to a sponsoring or cooperating institution, little is known about the telephone numbers selected for an RDD study, and respondents may perceive the call as a telemarketing attempt or an unwanted intrusion. A household screening response rate in the 1995 National Household Education Survey (NHES:95) that was significantly lower than previous NHES administrations led to an interest in identifying the source of the loss in response and exploring survey designs that maximize response rates at the screening level.

The National Household Education Survey

The NHES, a data collection system of the National Center for Education Statistics (NCES), is a telephone survey of the noninstitutionalized civilian population of the U.S. Households are selected using RDD methods, and data are collected using computer-assisted telephone interviewing (CATI). From 45,000 to 64,000 households are screened for each administration, and individuals within households who meet predetermined criteria for populations of interest in the given survey are sampled for extended interviews. The NHES survey for a given year typically consists of a set of screening questions (Screener) and two extended interviews on different education topics. The data are weighted to permit estimates of the entire population. The NHES was conducted in 1991, 1993, 1995, and 1996.

Rationale for an Experiment in Screening

As noted above, the idea of conducting an experiment in the NHES on factors associated with Screener response rates was precipitated in part by a lower than expected screening response rate in the NHES:95. While the NHES:93 response rate at the screening stage was 82 percent (Brick et al. 1994), the NHES:95 screening response rate was 73 percent (Collins et al. 1996). The topics addressed in the surveys were different, but both survey administrations were related to educational issues and the topics covered were not expected to be associated with the screening response rates.

A key design difference between the 1993 and 1995 surveys was the screening method. In the 1993 survey, only 30 percent of households (those with at least one person age 18 or younger or in 12th grade or below) were enumerated in the Screener. A screen-out question was asked in the Screener and households without any potentially eligible members were eliminated without enumerating all the household members. In the 1995 survey, every household was potentially eligible for an extended interview and all the members of every household were enumerated in the Screener. It was suspected that this full enumeration of all households was a major factor in the difference in response rates.

When it was clear that the Screener response rate in the NHES:95 was going to be much lower than planned, letters were mailed to nonresponding households, except those designated as "language problems." The addresses were obtained from a commercial service that provides addresses for telephone numbers listed in directories. Fewer than half of the telephone numbers could be matched to valid addresses of households. The results of this NHES:95 nonresponse mailing showed that those who were mailed letters responded at a much higher rate than those who were not sent letters. This raised the question as to the potential effectiveness of an advance mailing to an RDD sample.

Much of the literature on response rates and screening methods in RDD surveys focuses primarily on procedures used to sample adult household members and the relative benefits and drawbacks of various procedures. This literature examines alternatives to a full enumeration approach like the Kish (1949) method of respondent selection, which involves the enumeration of household members. Because of concerns about the intrusiveness and the amount of time required to conduct the enumeration, there has been concern that the Kish method has a depressive effect on response rates (Lavrakas et al. 1993; Oldendick et al. 1988). A number of alternative procedures for selecting adult respondents within households have been developed and compared to the Kish method; these include the Troldahl-Carter method (Troldahl and Carter 1964) and the "last birthday" method (Lavrakas et al. 1993).

In general, this literature focuses almost exclusively on methods of sampling one random adult within households. The sampling of children as a unit of analysis is seldom, if ever, addressed. When children are sampled or there is the potential to sample more than one person in a household for a survey, as in the NHES, enumeration becomes an essential design element. In addition, when characteristics of household members are needed for sampling, the enumeration of household members may be needed so that information required for sampling can be collected in an unambiguous way.

When the population of interest is found in a relatively small fraction of households, a preliminary screen-out question may be used prior to enumeration to eliminate those households without any eligible members. Such eligibility criteria can be based on age or on other characteristics that can be reliably reported by an adult household member responding to a Screener.

Design of the Experiment

A screening experiment was developed and implemented as a part of a field test for the NHES:96. This research provided the opportunity to test the effects of the experimental conditions while holding constant the survey content, timing, interviewer training, and calling protocol. The experiment tested the effects of 1) screening out ineligible households before enumerating all household members, and 2) sending respondents an advance letter about the survey. The field test sample of 9,301 telephone numbers was partitioned into four equal samples to examine the effects of four conditions:

- No advance letter, no screen-out question;
- No advance letter, screen-out question;
- Advance letter, no screen-out question; and
- Advance letter, screen-out question.

Screen-out Condition. The screen-out question used in this experiment asked the Screener respondent whether any of the people who normally lived in the household were age 20 or younger. If no one in the household was age 20 or younger, the Screener ended at this point. In households with members in the target age range, household enumeration was conducted. If there were eligible household members or the household was part of the no screen-out sample, the interview continued in exactly the same way for both samples. Information on the demographic characteristics, school enrollment, and grades of the household members were obtained. The last part of the Screener contained questions pertaining to public library use.

Westat has centralized telephone interviewing centers where most RDD surveys are conducted. The half-sample that received the screen-out question was assigned to one telephone interviewing center and the half-sample that did not receive the screen-out question was assigned to another center. This approach was used to eliminate the contamination that might have occurred if interviewers at the same facility talked to one another about the study. The interviewers at the facilities were not informed that a different version of the interview was being tested at the other site. Before this design was considered, the NHES:95 initial cooperation rates in the two facilities were compared and found to be nearly identical (60% and 61%).

Advance Letter. For the advance letter component of the experiment, all sampled telephone numbers were sent to a commercial firm that matches telephone numbers to addresses using information from telephone directories. A random sample of half of the numbers assigned to each facility was selected and the advance letter was mailed only to the addresses obtained for those in the selected half-samples. Addresses were available for about half of the residential telephone numbers in the half-samples selected for the advance mailing. About 11 percent of the letters were returned as undeliverable by the Post Office.

The advance letter identified the U.S. Department of Education as the sponsor of the survey, provided an overview of the purpose and content of the survey, stated the average amount of time required to complete interviews, and stressed the importance of participation while emphasizing that participation was voluntary. A page of commonly asked questions about the survey was also included.

Data Collection Procedures. Interviewers with experience working on the NHES:95 were selected for the experiment. Westat's telephone center management examined the cooperation and refusal conversion rates of each interviewer to ensure that the interviewers in both facilities were comparable and that the selected interviewers did not have unusually high rates.

The data collection protocol required that at least seven attempts be made to contact a sampled telephone number and complete a Screener, with additional calls allocated to any extended interviews in the household. The calls were staggered at different times of the day and week. Initial refusal cases were held for a period of 13 days, at which time specially trained refusal conversion interviewers attempted to convert these cases. Unlike full-scale NHES surveys, no interviewing was done in

Spanish for this experiment. The data collection procedures were identical in the two facilities, and the data collection period for the experiment lasted 5 weeks

Findings: Response Rates

The initial cooperation rates are the most important in any RDD survey, and the differences in these rates between the experimental conditions are obvious (Table 1). The difference in rates between the screen-out and no screen-out conditions is 11.5 percent (e-f). The screen-out condition is the dominant factor for determining the level of the initial cooperation rate for the Screener in this experiment. The difference in the initial Screener cooperation rate due to the advance letter is 3.2 percent (g-h), but this difference is significant only for those interviews conducted with no screen-out question (c-d). The screen-out question leads to a substantially higher initial cooperation rate. If no screen-out question is included, then the advance letter increases the initial cooperation rate (c-d), but not to the same level attained by using the screen-out question (a-c).

The screen-out question not only results in a higher Screener initial cooperation rate, but it also has the desirable feature of resulting in a higher refusal conversion rate. The increase of 8.1 percent is large enough to be of substantive importance. It is worth noting that most of the difference in refusal conversion rates in the screen-out question occurs when no advance letter is mailed (b-d).

No statistically significant differences were observed for the extended interview initial cooperation rates. All of these rates were uniformly high.

Table 1.--Differences in cooperation rates, by screen-out question and advance letter

Experimental condition	Number of telephone[1] numbers	Screener cooperation[2]		Screener refusal conversion		Extended interview	
		Rate	s.e.	Rate	s.e.	Rate	s.e.
(a) Screen-out/letter	2,326	74.7%	1.3	31.8%	3.2	95.3%	1.1
(b) Screen-out/no letter	2,325	74.1	1.4	38.1	3.3	92.7	1.5
(c) No screen-out/letter	2,325	65.8	1.5	28.4	2.9	93.6	1.3
(d) No screen-out/no letter	2,325	59.6	1.6	25.5	2.7	94.7	1.3
Difference (a)-(b)		0.6	1.9	-6.3	4.6	2.6	1.8
Difference (a)-(c)		**8.8**	2.0	3.4	4.3	1.7	1.7
Difference (a)-(d)		**15.0**	2.1	6.3	4.2	0.7	1.7
Difference (b)-(d)		**14.4**	2.1	**12.6**	4.2	-1.9	2.0
Difference (c)-(d)		**6.2**	2.2	2.9	3.9	-1.0	1.9
(e) Screen-out	4,651	74.4	0.9	35.0	2.3	94.1	0.9
(f) No screen-out	4,650	62.8	1.1	26.9	2.0	94.1	1.0
Difference (e)-(f)		**11.5**	1.4	8.1	3.0	0.0	1.3
(g) Letter	4,651	70.4	1.0	29.9	2.1	94.5	0.9
(h) No letter	4,650	67.2	1.1	31.2	2.1	93.6	1.0
Difference (g)-(h)		3.2	1.4	-1.3	3.0	0.9	1.3

[1] In a list-assisted RDD design, about one-half of all sampled telephone numbers are residential. The numbers shown reflect the total sample for each experimental condition.

[2] At this stage, refusal conversion attempts are not included.

NOTE: Differences in bold type are significant at the 95 percent confidence level. Calculations of differences are based on unrounded data.

A goal of the experiment was to examine the probable Screener response rate under these different experimental conditions. The predicted Screener response rate shows this better than any other single measure, although the rates are about 1 percent higher than the actual response rates. This rate represents the expected Screener response rate under the full NHES data collection protocol, in which additional efforts are used to complete nonresponse cases.

The *predicted Screener response rate* is the initial cooperation rate for the Screener plus one minus the proportion of initial refusals that were converted. Let i be the initial cooperation rate for the Screener and let r be the refusal conversion rate for the Screener, then the predicted response rate is $100\{i+(1-i)*r\}$ percent. Applying this formula to cooperation and conversion rates from previous cycles of the NHES indicates that this formula results in a predicted rate that is about 1 percent higher than actual rates.

This rate is particularly useful because the initial cooperation and refusal conversion rates do not depend on the calling protocol (number of call attempts, maximum number of attempts, number of times refusal conversions are attempted, etc.), and the calling protocol for the experiment differs from the standard NHES protocol. The predicted Screener response rate is robust to these differences in protocols.

The predicted Screener response rates using the screen-out question are about 82 to 84 percent, while enumerating all households gives predicted Screener response rates in the range of 70 to 75 percent (Table 2).

The lower Screener response rates associated with the no screen-out approach raise the important question of the source of the loss in response. As noted previously, the literature generally regards enumeration as more invasive than other respondent selection approaches. However, data collection experience on the NHES indicates that most refusals occur prior to the enumeration matrix (Brick et al., forthcoming). Some researchers (Bercini and Massey 1979) have suggested that the lower response rates may be related to the interviewers' perception of the task. Specifically, Bercini and Massey reported that collecting household members' names had a "direct negative effect on interviewer performance." The findings of this experiment are consistent with that hypothesis and are further supported by the fact that most refusals occur prior to enumeration, and cannot be attributed to respondent reaction to the enumeration (Brick et al. 1997).

Table 2.--Predicted Screener response rate, by screen-out question and advance letter

Experimental condition	Number of telephone numbers	Initial cooperation rate	Refusal conversion rate	Predicted response rate
Screen-out/letter	2,326	74.7%	31.8%	82.7%
Screen-out/no letter	2,325	74.1	38.1	84.0
No screen-out/letter	2,325	65.8	28.4	75.5
No screen-out/no letter	2,325	59.6	25.5	69.9
Screen-out	4,651	74.4	35.0	83.3
No screen-out	4,650	62.8	26.9	72.8
Letter	4,651	70.4	29.9	79.2
No letter	4,650	67.2	31.2	77.4

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Household Education Survey (NHES), field test of the 1996 survey.

Following this screening experiment, efforts were made in the NHES:96 interviewer training to emphasize that only a brief interview (screening questions, personal characteristics, and library use questions) was to be conducted in most households. However, the NHES:96 Screener response rate was at the lower end of the range expected for a no screen-out approach with an advance mailing (the NHES:96 Screener response rate was 70 percent). Thus it appears that direct experience with conducting a given survey shapes the interviewers' perception of the ease or difficulty of the task. Training is not likely to have a lasting effect when it does not correspond to experience during the interview. It appears that experience has an effect on response rates.

Resources

The other part of this evaluation is the consideration of two measures of resources expended to conduct the surveys: 1) the length of the interview, and 2) the air time required. These measures are examined at the facility level so that differences between the screen-out question and the full enumeration can be evaluated. The difference due to the advance letter cannot be examined because both facilities had cases with and without advance letters. However, this is only a minor restriction since the advance letter was not expected to reduce the length of the interview.

The average length or administration time of the completed Screener interviews differed by whether or not the screen-out question was used. The Screener contained questions on the educational and demographic characteristics of household members and items on public library use[1]. These questions were asked in all households in the no screen-out condition, but were only asked in the screen-out condition if there were household members age 20 or younger. While the longer administration time has cost implications, it must be remembered that much of the additional administration time is associated with collecting data on the characteristics of households and their members that would not be available for analysis otherwise. In other words, more data on households were collected in the no screen-out condition and these data were considered to be of analytical value for the NHES. The difference in cooperation rates discussed earlier suggests that some of the additional time was also required for refusal conversion activities, i.e., persuading persons who initially refused to complete the interview.

Instrument administration time alone is not an appropriate comparison of resources associated with the screening experiment, since more data were collected under the no screen-out condition and because administration time reflects only the level of effort expended on completed cases and not effort associated with cases that ultimately were finalized as nonresponses. Air time reflects interviewing effort for both responses and nonresponses. The total air time was 520 hours in the Telephone Research Center with the screen-out question and 645 hours in the Center without the screen-out question. This difference is primarily due to two factors: the additional interviewing time for households in the no screen-out condition (which was reflected in the survey administration time discussed above) and additional time for refusal conversion efforts, both successful and unsuccessful. The air time for the no screen-out condition is nearly 25 percent greater than the air time devoted to the telephone numbers that had the screen-out question. Since air time is probably more highly correlated to the total data collection cost of the survey than any other single measure, it is reasonable to speculate that the cost of doing the no screen-out method and collecting the household-level data (demographic, educational, and library items) for all households is about 25 percent greater than the cost of conducting data collection with a screen-out question under these or similar eligibility conditions.

Conclusions

The results of this experiment were definitive. The use of a screen-out question to eliminate ineligible households prior to enumeration results in considerably higher response rates. The cost of interviewing is also about 25 percent lower for this approach if the items included in the screening interview are similar to those used in the NHES:96 and about one-third of all households had members eligible for extended interviews. Some of the additional resources required for the no screen-out condition are associated with the collection of these additional data.

[1] The questions on public library use were asked in the Screener if no household members were sampled for an extended interview; if one or more household members were sampled for extended interviews, the public library use questions were asked during the first extended interview in the household. A more extensive treatment of this research can be found in the forthcoming NCES report, *An Experiment in Random-Digit-Dial Screening* by Brick, Collins, and Chandler.

However, the cost differential is also associated with the need for a larger refusal conversion effort.

The screen-out question approach could be used to obtain high response rates in those surveys in which only a subset of households is eligible for the extended component interviews. Since the advance letter does not increase response rates when the screen-out approach is used, its use under a screen-out design should not significantly increase response rates. However, a letter might still be useful for refusal or other nonresponse conversion purposes under these conditions.

Despite the advantage of a higher response rate, the screen-out approach is not acceptable if estimates of the characteristics for all households are necessary to meet the goals of the study. The experiment showed that mailing an advance letter was effective in increasing the Screener response rate when the full enumeration of all households was conducted. Thus, the advance mailing should be used in such designs.

Other procedural methods used in the NHES have been shown to improve response under both screen-out and full enumeration designs. These include second refusal conversion attempts and refielding nonresponse cases such as those with maximum numbers of contact attempts and those with only noncontact (e.g., answering machine) results. Extending the data collection period to allow refusals to be held for a longer period prior to attempting conversions and to provide a longer period over which to contact other nonresponse cases may be helpful, but this approach needs to be considered in terms of the costs and the time constraints under which the survey must operate.

During the development phase of a survey, it is incumbent upon the researchers to consider the balance between the substantive goals of the study and the response and resource implications of the designs that could be used to meet those substantive goals. This experiment indicates that the approach to enumeration used in an RDD survey has implications both for the screening response rate and for the resources required to carry out the survey.

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