Random Selection in a National Telephone Survey: A Comparison of the Kish, Next-Birthday, and Last-Birthday Methods

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The process of randomly selecting a respondent in household surveys is one juncture in the interview session that often results in a large proportion of refusals. Do the standard methods (Kish, ''last-birthday,'' and ''next-birthday'') differentially contribute to the dropout rate? At what stage in the screening process are informants/respondents more likely to drop out? The literature that addresses these questions is mixed. Utilizing a national Random Digit Dialing (RDD) sample design, we compared the differential dropout rate in the standard respondent selection methods; in particular, the magnitude of the dropout rate in each phase of the screening process. Contrary to what would be expected, we found a significant difference between the three methods in the dropout rate during the initial stages of the screening process. The highest proportion of dropout rates occurred in the screening interview before the informant was asked questions unique to one of the three selection methods. The higher rates were in the Kish and ''last-birthday'' conditions, with the highest number in the Kish condition. We suggest that interviewers rather than respondents are a primary source of the higher rate of refusals when using the Kish method.

Key words: Kish; respondent selection; birthday methods.

1. Introduction

Obtaining adequate response rates in probability surveys has continued to be an increasingly time-consuming and costly endeavor. While finding ways to encourage respondent cooperation is difficult for survey research in general, it is particularly problematic for public health and AIDS- and STD-related research that involves asking sensitive and/or threatening questions. Especially perplexing is the fact that potential respondents often refuse to participate in an interview early in the screening process and typically before he/she knows the topic of the survey (Groves et al. 1988; Groves 1989; Catania et al. 1992). Questions related to the random selection of respondents is one juncture in the screening session that may affect whether or not informants are kept on the telephone long enough for the respondent to be selected. Do the standard methods (Kish, ''last-birthday,'' and ''next-birthday'') of randomly selecting a household respondent differentially contribute

to the drop-out rate? At what stage in the screening process are informants/respondents more likely to drop out?

The literature that addresses these questions is mixed. In addition, past studies comparing the Kish and birthday methods are confined to a state or county sample in the midwestern region of the U.S. We have replicated these analyses utilizing a national Random Digit Dialing (RDD) sample. A central focus of the analysis is on the screening process. We know from studies to date that informants/respondents tend to drop out more frequently in the Kish compared to the ''birthday'' methods and that in the U.S., the ''last-birthday'' method yields a sample that is more representative of African American populations (Oldendick et al. 1988). However, there is no research that systematically compares dropout rates in the three methods at each stage in the screening process to determine when respondents refuse to finish the screening questionnaire.

2.   Respondent Selection Methods

The Kish method requires that all eligible household members be listed by sex, and within sex groupings by age from oldest to youngest (Kish 1949). After all eligible household members are listed, the interviewer uses a selection table to randomly choose a person to interview in those households with more than one eligible household member. Prior work has suggested that the Kish method makes people uncomfortable, resulting in informants or respondents dropping out when being asked to specify household rosters (Groves et al. 1988; Catania et al. 1992). In particular, the listing of household members may be threatening for some people who may not want to reveal that they actually live alone (e.g., women), or who wish to conceal the identity of someone living in their household (e.g., an undocumented immigrant). The ''last-birthday'' method involves identifying the person in the household who had the last birthday among all eligible household members; the ''next-birthday'' method involves identifying the person in the household who will have the next birthday among all eligible household members. To select a respondent, both birthday methods require less information about each household than the Kish method. As a result, the birthday methods are considered less intrusive.

Studies in the U.S. indicate that the birthday methods produce representative samples (Salmon and Nichols 1983; O'Rourke and Blair 1983) and comparisons between Kish and ''last-birthday'' methods (Oldendick et al. 1988) show few differences in the refusal rates or in representativeness of the resultant samples. One exception is race. Oldendick et al. (1988) found in one of their samples that the ''last-birthday'' method, compared to the Kish method, resulted in a higher percentage of African Americans. The percentage of African Americans interviewed in that sample using the ''last-birthday'' method was closer to what would be expected when compared to census data. They concluded that the ''last-birthday'' method produced a more racially representative sample than the Kish method. Other differences between the Kish and ''last-birthday'' methods indicated a slight age bias in favor of younger respondents for the ''last-birthday'' method (O'Rourke and Blair 1983). This confirms anecdotal reports that respondents are sometimes confused and identify the youngest eligible household member as the person who had the last birthday. Lavrakas and Bauman (1993) in their study of the ''last-birthday'' selection method found that respondents of Hispanic origin were more likely than other

race/ethnic groups to indicate incorrectly the household member with the last birthday. Lavrakas and Bauman (1993) speculated that this could be a result of cultural differences in understanding the concept of a ''last birthday.''

3. Method

This study was an RDD (random digit dialing) survey. Eligible respondents were 18 to 49 years old residing in the 48 contiguous states in the U.S.A. Sampling was done by the Survey Research Center at the University of Maryland and data collection was conducted by Communication Technologies Corporation (CTC) in San Francisco. Interviewers were recruited from CTC's available pool of experienced interviewers ($n = 40$; 62% female; 28% nonwhite). Interviewers had prior interviewing experience in which they used the Kish and ''birthday'' methods for selecting respondents. Screening and interviewing were conducted in English only. Data were collected from July to December, 1992.

Experiments. The purpose of the study was to conduct three experiments: (1) respondent selection experiment containing three conditions (''last-birthday,'' ''next-birthday,'' and Kish methods); (2) interviewer selection experiment containing three conditions (respondents were given a choice of a male or female interviewer, respondents were assigned interviewers of the same sex, or respondents were assigned interviewers of the opposite sex); and (3) questionnaire experiment containing two conditions (standard questions or enhanced questions; see Catania et al. (1996), for a discussion of the latter two experiments). Using a randomized block design, working residential telephone numbers (WRNs) were assigned to one of 18 conditions (three respondent selection methods by three interviewer selection conditions by two questionnaire versions). One aim of the design was to eliminate, or at least minimize, interviewer bias that could occur when interviewers are involved in any aspect of the decision-making process of assigning conditions to respondents. For this reason, an assignment of experimental conditions was made (from a list containing random combinations of the three conditions) when a WRN was reached. The appropriate screener (reflecting the first two experiments) and questionnaire (reflecting the third experiment) were immediately attached to the sample call record sheet. Once the assignment was made, it remained with that particular sampled telephone number (WRN) regardless of whether the household was eligible to participate. All interviewers were blind to the study hypotheses. In addition, supervisors randomly assigned samples to each interviewer in batches of five. As such, each interviewer administered each of the 18 conditions during the course of the study. Interviewers were not assigned an additional sample until they had resolved each of the five sample pieces as best they could during any given shift period. This article focuses only on the first experiment, the *respondent selection experiment*.

Screening questions. Three screeners were designed, each containing one of the three interviewer selection conditions. All three screeners contained identical introductions followed by two health-related questions. At this point, the Kish and ''birthday'' screeners diverged. The Kish screener contained questions that asked informants for a listing of people who lived in the household and then the sex and age of each household member. The two ''birthday'' screeners first contained an age-eligibility screening question, and then questions appropriate for one of the two ''birthday'' methods.

4. Results

There were 5,019 WRNs contacted. We eliminated from the analysis 1,594 numbers that included never answered telephone numbers, households in which there was no one who spoke English, households in which no household member was between the ages of 18 and 49, and respondents who were noninterviewable. This left 3,425 households. Once ineligibility was determined, the remaining screening questions were not administered since it was not necessary to select anyone to interview from that household. The remaining 3,425 telephone numbers included households that were eligible, and households in which eligibility was unknown. The focus of this analysis is on these 3,425 households.

Overall, we see in Table 1 that there is a significant difference between the three methods, with the largest proportions dropping out in the Kish method. The percentages in the table are the proportion of households that answered that question but did not continue in the screening or interview process. The ''next-birthday'' method was more effective than the Kish method as more people overall dropped out of the latter condition. Moreover, an ordinary logistic regression analysis showed there to be a significant difference between the ''next-birthday'' and Kish methods. Informants in the Kish method were more likely than informants in the ''next-birthday'' method to drop out of (rather than complete) the screening process ($OR = 1.24$, 95% $CI = 1.05$, 1.48). There was no difference between the Kish and ''last-birthday'' methods, nor was there a difference between the ''last-'' and ''next-birthday'' methods.

As is shown in Table 2, there are two general sequences of stages in which the ''last-birthday'' and Kish methods tend to result in more dropouts than the ''next-birthday'' method. These are in Stages 1 and 2, and in Stages 3, 4, and 5. Stages 1 and 2 contain the introduction and general health question. At this point in the screening process, the informant/respondent is not aware of the questions that follow. Stages 3 through 5 contain the heart of the respondent selection criteria, the birthday questions in the ''last-'' and ''next-birthday'' methods, and the listing of household members by sex and age in the case of the Kish method. What is interesting in these two sequences of stages is that the ''next-birthday'' method consistently results in fewer dropouts (12.5% in Stages 1 and 2 and 4.2% in Stages 3 through 5 for the ''next-birthday'' method versus 16.2% and 5.3%, respectively, for the ''last-birthday'' method; and versus 16.9% and 7.6%, respectively, for the Kish method). Again, the Kish method resulted in the largest proportion of dropouts. These differences, however, are not significant.

Of particular interest was the finding related to proportion of dropouts during the first sequence of screening stages. Most informants hung up during, or soon after, the introduction.

Table 1.   Dropouts in three respondent selection conditions: ''Last-birthday,'' ''Next-birthday,'' Kish method

Screener dropouts (% households)	Last birthday	Next birthday	Kish method
Yes	34.1	32.0	37.0
No	65.9	68.0	63.0
(*n*)	(1,116)	(1,143)	(1,166)

Chi-square $= 6.30$, $df = 2$, $p < .05$

Table 2. Outcome of screening questions in three respondent selection conditions: ''Last-birthday,'' ''Next-birthday,'' Kish method (percent)

Stage	Description	Last birthday	Next birthday	Kish method
1	Hung up before, during, or after introduction	16.1	12.2	16.6
2	Last question answered was first general health question	0.1	0.3	0.3
3	Last question answered was second general health question	1.4	1.0	3.5
4a	Answered age of hh[a] members (LB[b] and NB[c] only)	1.4	1.9	n.a.
4b	Name and sex of hh[a] members (Kish)	n.a.	n.a.	0.3
5a	''Birthday'' questions	2.5	1.3	n.a.
5b	Age of hh[a] members/other hh[a] members	n.a.	n.a.	3.8
6	Last questions answered were callback information questions	6.4	7.8	6.6
7	Last questions answered were consent questions	6.2	7.3	6.0
8	Finished screener/Never started questionnaire	3.0	3.6	2.8
9	Finished screener	62.8	64.4	60.2
	Total	100.0	100.0	100.0
	(*n*)	(1,116)	(1,143)	(1,166)

[a]hh = household [b]LB = last birthday [c]NB = next birthday

This is not a new finding; it is common knowledge among survey research practitioners. What is of particular note is that the dropout rate was not uniform across conditions (''last-birthday,'' ''next-birthday,'' and Kish). The largest proportion of those dropping out of the screening process were in the Kish and ''last-birthday'' conditions, with the largest number in the Kish condition. The informant dropped out before he/she could possibly know what kind of questions were about to be asked during the screening process. However, this was not the situation with interviewers. Interviewers, unlike informants, were familiar with the screening questions that were to be asked next. Therefore, interviewers may be, more likely than informants, the cause of ''hang-ups.''

An ordinary logistic regression analysis showed there to be differences between the respondent selection methods in the first stages of the screening process ($n = 521$). Informants/respondents in the ''last-birthday'' method and in the Kish method were more likely than informants/respondents in the ''next-birthday'' method to dropout of the screening process at this early stage (($OR = 1.34$; 95% $CI = 1.06, 1.70$); ($OR = 1.40$; 95% $CI = 1.11, 1.77$)). Perhaps the attitude of the interviewers toward the Kish and ''last-birthday'' procedures contributed to the dropout rate at the beginning of the interviewing session. The relative ease or difficulty involved in administering the different methods may have some connection to how the interviewer approaches the screening process. For example, in the Kish method, respondents are more likely to ask the interviewer why he or she wants information on all people in the household. This may create an uneasy feeling among interviewers because it is typically when respondents begin to ask about the purpose of particular questions that they tend to hang up. Perhaps interviewers were projecting that respondents would find these questions troubling and would hang up and hence

were not as persistent or as committed in administering the screening questions. They may have assumed that it would eventually involve more effort on their part and/or on the part of the household informant to complete the screening process and that the more likely outcome would be a ''hang up.'' A similar scenario could be happening with the ''last-birthday'' method. Again the ''last-birthday'' method may create feelings of unease with the interviewer because this method also tends to generate questions from the respondent regarding the meaning of ''last birthday.'' That is, informants sometimes think that the ''last birthday'' means the youngest household member, not the person who had the last birthday.

At every other stage in the screening process, the dropout rates for the three methods were not significantly different. While the Kish method may be more cumbersome for the respondent to complete, these data indicated that respondents dropped out of the Kish method more frequently than the other two methods before the ''intrusive'' questions associated with the Kish method were asked. The significant difference in dropout rates occurred at the first stage of the screening process, and as such appears to be attributable to interviewers rather than to respondents. By focusing on the respondent, we may be missing a major source of the problem – the interviewer.

In order to determine whether this is a general interviewer problem or specific to a few interviewers, we examined the differences in dropout rates between the three selection methods by interviewer. A chi-square test found that only one screening interviewer (out of 17) was more likely to have a higher dropout rate. However, the difference was significant between only two of the methods, the Kish method versus the ''next-birthday'' method ($p < .03$). Hence, it appears that this may be a general interviewer problem given that the cumulative effect resulted in the ''next-birthday'' method being the most successful.

Comparison of demographic characteristics. There were no significant differences in demographic characteristics in the resultant samples of the three respondent selection methods. One complicating factor in this analysis, however, is the possible confounding effects of the other two experimental manipulations (see Section 3). Whether or not a respondent completes the interview may have more to do with the nature of the questionnaire than with the respondent selection method that was administered. In this study, those potential interaction effects are even more problematic given that there were two experimental manipulations (interviewer selection and questionnaire experiments) that followed the respondent selection method experiment. Analysis of the possible interaction effects is beyond the scope of this article.

5.   Summary and Conclusion

In general, it appears that the ''next-birthday'' method is the most successful in limiting the rate of dropouts and that the Kish method appears to be the least successful method. The difference between the ''next-birthday'' and ''last-birthday'' methods in terms of dropout rate is not consistent. The proportion of household informants who drop out during or soon after the introduction varies and is dependent on the method used. It appears that interviewers are a key factor that needs to be considered in evaluating the success or failure of each of the selection methods. The interviewers in this study were all experienced and familiar with all three methods of respondent selection, some had more experience with the Kish method, others with the ''birthday'' methods. We identified one

interviewer who was particularly influential in contributing to the dropout rate in the Kish method versus the ''next-birthday'' method. However, the cumulative effect of a large proportion of interviewers resulted in a significant difference in the overall dropout rate in the early stages of the screening session, with the ''last-birthday'' method being the most successful. In situations in which household rosters are a necessary component of the study, controlling interviewers' contribution to the dropout rate is critical. Certainly, more focused training on the importance of the screening questions may reduce interviewer anxiety. In addition, sending advance letters, even in RDD studies, would reduce interviewer anxiety in making cold contacts and may contribute to limiting the dropout rate in the early stages of screening interviews (Groves et al. 1988).

Given where the differential dropout rates occur, the response rates by respondent selection method should be attributed to interviewers rather than respondents. This calls into question the literature that suggests that response rates for the ''last-birthday'' method are higher than for the Kish method. It also may help to explain why some studies show an effect and some do not.

6.   References

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