Telephone Survey Techniques

Raymond E. Schucker, Ph.D.
Bureau of Foods, Food and Drug Administration

Introduction

Within the past decade the telephone interview has become a serious tool for survey data collection. Impetus for the improvement of telephone survey methodology initially stemmed from an increasing percentage of unlisted numbers in city telephone directories. Currently, an estimated 22% of all residential numbers are unlisted, and the rate is higher in certain metropolitan areas (1). The introduction of computer assisted random number generating procedures, known as random digit dialing, in the early 1970's made it possible for the first time to include unlisted residential numbers in surveys of telephone households.

The second significant development in the mid 1970's was the refinement of random digit dialing to eliminate the large fraction of business or non-working blocks of numbers typically encountered in unscreened randomly generated telephone samples. Two-stage number generation and clustering techniques were introduced in conjunction with test dialing, with the result that the percentage of usable residential numbers in samples has risen from 20% to over 50% (1,2).

Characteristics of Telephone Respondent Samples

Estimates place telephone subscribership at approximately 90% of private households in the continental U.S., with some continuing growth through the decade of the 1970's. Individuals from households without telephones are more likely to be male, young, black, and to have lower education and lower income (3,4). Similar to the nonsubscriber segment that is unreachable by telephone, individuals who resist participating in phone surveys are also less well educated and have lower income. However, resistors tend to be older and are more likely to be white. The literature generally indicates that nonresponse can be minimized by appropriate callback procedures (5,6).

Telephone survey costs at FDA have ranged from 20% to 100% of the cost of the personal interview survey, depending on interview length, special interviewer qualifications and complexity of data coding and analysis. However, in the author's experience, and as indicated in a large scale study conducted under a grant from the National Science Foundation, telephone survey costs generally can be expected to average 40 to 50% of the cost of comparable personal interview surveys (7). Costs will be lower for short telephone surveys of unscreened populations that can be precoded and administered without special interviewer qualifications.

Applications By FDA

Measuring Simple Behavior

Over 50% of consumer data collected by commercial research firms today is gathered by telephone and only 10% by personal interview (8). Often the consumer behavior of interest is non complex in nature. A typical problem for the survey researcher is simply to determine whether or not a product was purchased or consumed in a given period of time. Interviews about the incidence of consumption behavior can be brief and do not heavily task the respondent's ability to remember and report accurately.

An example of a survey to determine incidence of behavior is one conducted by FDA for the purpose of estimating the incidence of use of protein supplement products in an adult segment of the population (9). Need for the survey arose as a result of a number of sudden cardiac-related deaths reported among premenopausal women who had dieted for extended periods of time to lose weight. During the period of dieting, the women had used one of a number of commercial protein supplement products as the principal source of nourishment.

Consideration of the need for rapid turnaround of information, as well as the presumption that protein supplement use by dieters was quite low, led to the conclusion that a telephone probability survey was the most cost efficient technique for screening a large number of households. Under contract, a commercial research firm designed a stratified three-stage cluster sample using random digit dialing to select 25 to 44 year old female household members from a screening of 13,900 telephone households. The sample was ultimately increased to 19,260 households on the basis of interim tabulations of results as the survey progressed.

A special feature was that the interview was conducted on-line with the computer. Questionnaire responses were entered directly into the computer by the interviewer, eliminating paper and pencil recording and key punching of data. The computer also controlled the flow and sequencing of questions, projecting onto a cathode ray tube the next appropriate question for the interviewer based on the respondent's previous answer. Because survey responses were instantaneously stored in the computer, marginal tabulations of data were available on demand as the survey progressed. The quick access capability resulted in the detection of racial differences in product use during the third week of field work. This led to the decision to increase the sample size by 5,360 households to improve the statistical reliability of results by race.

Total elapsed time to screen households and complete 6,616 interviews was five weeks. After a follow-up survey of non-responders the final completion rate for the survey was 87%, which was high relative to other FDA telephone survey experience and reported telephone response rates of 63 to 70% in the literature (4,7).

Measuring Complex Behavior

Data collection complications arise when the consumer behavior of interest is complex. This occurs as the nature and extent of the required consumption information becomes more highly detailed, such as when quantitative intake must be measured in addition to simple incidence of use. An example of a telephone survey involving more complex behavior is illustrated by a study recently completed by FDA to measure quantitative intake of vitamin and mineral supplements in a pilot effort to determine the feasibility of tracking usage behavior over time. A specific objective was to measure intake at the level of the individual nutrient.

In designing the survey, the need was recognized to have respondents report vitamin usage on a brand-by-brand basis. Furthermore, since respondents would not necessarily be knowledgeable about the composition of the supplements or the units of measure for individual nutrients, the survey design called for respondents to bring their supplement bottles to the telephone and to read nutrient/mineral composition and potency information from the label. For purposes of analysis and interpretation of the consumption data, the questionnaire also covered circumstantial information of direct and indirect relevance to supplement use, such as sources of influence, whether taken under a physician's care, general dietary practices, snacking habits, vegetarianism, height and weight, a self assessment of current state of health, and respondent's perception of degree of personal control over health.

A random digit dialing technique was used to generate a national probability sample of listed and unlisted telephone households. On the basis of an enumeration of all adults residing in the household at the time of the interviewer's screening call, a stratified sample of 1,000 adults was randomly selected in each of three age groups: 16-24, 25-64, and 65 and over. Age stratification was employed in order to produce a minimum sample size in each age group for analysis purposes. Interviewers were dieticians trained in telephone interviewing techniques for the survey. They also edited and coded the consumption data.

Survey Operating Characteristics

Preliminary tabulations of the data are encouraging with respect to the quality of interview obtained with older respondents and the breadth and depth of detail achieved in all age groups. For example, reported daily intake and label nutrient composition data were obtained for over 1,150 vitamin/mineral brands reported as currently used by approximately 40% of each age group. An additional 100 brands not reported in adequate detail during the interview were well enough identified by respondents to allow the brands to be purchased at retail for label analysis purposes. Within the age stratum 65 and over, the modal age among respondents interviewed was 70; 10% of the stratum was aged 80 or over and the oldest respondent interviewed was 95.

Table 1 summarizes the overall operating characteristics of the vitamin supplements survey. Household cooperation was 87.5% (12.5% refused) during the telephone screening call to enumerate household members and select a survey participant. In the main interview, 79.8% of supplement users expressed willingness to bring their products to the telephone and read label information. Data on intake and the nutrient profile for each reported brand of supplement ultimately was obtained for 74.1% of the users. The difference between users willing to report and those actually providing complete data was 5.7%. Generally this consisted of respondents who provided complete nutrient information for most of their supplements but may have missed a supplement that had been used up and the bottle discarded, or who found that a supplement was physically located elsewhere.

The 74.1% completion rate included 1% of users who were unable to complete the interview during the initial phone call and participated in a second phone interview at a more convenient time. Also included were 6% of the users who were not willing or did not have time by phone to complete the detailed section of the interview dealing with the nutrient composition and who agreed to provide the necessary information on a mail questionnaire. Mail returns were received from 25% of this subgroup.

Finally, Table 1 shows that 83.7% of users in the survey reported nutrient composition for at least one of the supplements they were taking.

Comparison of Cooperators and Non-Cooperators

For analysis purposes cooperators were defined as supplement users who provided complete information on intake as well as nutrient composition for each brand of supplement reported. Non-cooperators were defined as of supplement users who reported their intakes, but refused to given any information on nutrient composition from the label, or gave composition data on some but not all of their supplements. In a small subgroup of users who agreed to complete the interview by mail questionnaire, Table 2 shows that cooperators did not differ significantly from non-cooperators in the average number of supplements taken. However, in the larger sample of users who were interviewed only by telephone, non-cooperators used 2.8 supplements on average compared with 1.8 reported by cooperators ($p < 0.1$).

Table 3 compares the demographics of survey cooperators and non-cooperators. The two groups did not differ in composition by race, sex, or years of schooling. However, a significantly higher percentage of non-cooperators were older, and the non-cooperator group was characterized by higher percentages of both very high and very low income households.

The implications of non-cooperation for possible bias in survey estimates remain to be assessed. This study shows non-cooperators to be heavier consumers of vitamin supplements in terms of numbers of brands consumed. This may or may not mean that non-cooperators have higher average intake per given nutrient. In part, this will depend on whether the products consumed by multi-supplement users are complementary one to another (i.e., one brand used as a source of vitamin E and another brand for calcium) or are redundant with respect to nutrient composition, such as might be the case with a person who uses two different multiple vitamin/supplements and thereby obtains a given nutrient from more than one source.

Editing of the quantitative intake and nutrient composition data continues and results should be published in the next few months. At this point we are able to conclude that the telephone interview technique is administratively feasible and cost efficient for measuring and tracking vitamin supplement behavior. Should estimates of nutrient intake be found to be biased downward to a practically significant degree due to non-response, future survey efforts will need to be directed toward improving the cooperation rate by instituting follow up procedures.

Food Intake Measurement Experimentation

In collaboration with the Behavorial Sciences Division, U.S. Army Natick Research and Development Command, FDA is sponsoring research to test various alternatives to the personal interview for collecting food intake data. A pilot research project at the University of California, Davis investigated four telephone assisted approaches with college students in an experiment to measure food consumed in the cafeteria. Two variations involved a telephone interview of food consumption recall, one covering a 6-hour period of time, the other a 24-hour period. Both interviews were replicated and the equivalent of three to seven days of food consumption was obtained per respondent. In two additional approaches, respondents kept either four 3-day or two 7-day written food records. Participants periodically telephoned their records to a central location. Half of the respondents reported to an interviewer and half to a recording device. Unobtrusive observers in the cafeteria recorded the foods actually purchased and eaten for validation purposes.

As summarized in Table 4, both telephoned food records had higher respondent dropout rates and lower data completion rates than the telephone recalls. The 3-day food record using the telephone recording device had the lowest data completion rate of the four methods. Additionally, respondent failure to contact the data center was higher for the 3-day than for the 7-day record.

Considering validity of methods, Table 5 shows 24-hour and 6-hour recalls to be about equally accurate in the food items reported versus those actually selected in the cafeteria as determined by the observers. Also, the 7-day food record was slightly more accurate than the telephoned recalls and had the lowest rate of underreporting and over-reporting of the four methods.

The low cooperation rate for the 3-day food record (Table 4) was attributed to the repeated starting and stopping of recordkeeping during the 28-day period of the study, as evidenced by respondent complaints. Resistance to calling into the telephone answering device was also found to be unacceptably high. Evaluating the trade-offs between respondent burden, participation rates, and data accuracy, the study team concluded that 24-hour telephone recall and the 7-day telephoned food record merited further investigation (10).

In a second phase of the collaborative project the two major telephone assisted methods (direct recall and the telephoned food record) are being tested in a small scale field trial at Stanford University with free-living respondents from the general population who are also participants in a community health intervention study.

In addition to further investigating the process, administrative and cost characteristics of the telephone method, the study team will attempt to validate the telephone intake measures against food intake obtained by personal interview and against health status and biochemical indicator data which will be available for the same participants.

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Table 1

Operating Characteristics Of A
Telephone Survey of Vitamin Supplements Use

Household Refusals During Screening	12.5%
Among Users Of Supplements	
Willing To Bring Supplements To The Phone	79.8%
Nutrient Composition Reported For All Supplements Taken	74.1%
Nutrient Composition Reported For At Least One Supplement	83.7%

Table 2

Comparison of Cooperators With Non-Cooperators
On Number Of Supplements Used

		Average Number of Supplements Taken
Mail Return Subgroup (n=88)		
Agreed To Return Mail Form and Did	1.5%	3.0
Agreed to Return Mail Form and Did Not	4.5%	2.7
Total	6.0%	
Remaining Users (n=1189)		
Provided Complete Nutrient Composition Data		1.8*
Did Not Provide Complete Nutrient Composition Data		2.8

* $p < .01$

Table 3

Comparison Of Cooperators
With Non-Cooperators On Demographics

	Cooperators (n=947)	Non-Cooperators (n=330)
Sex		
Male	32%	28%
Female	68	72
	100	100
Years Schooling	10.5	10.6
Race		
White	93%	89%
Black	4	8
Other	3	3
	100	100
Household Income*		
Under $9,999	23.3%	33.1%
$10,000-$19,999	33.7	23.5
$20,000-$24,999	12.1	7.8
$25,000 and over	30.9	35.5
	100.0	99.9
Age*		
16-24	33.8%	24.5%
25-64	34.9	33.0
65 and over	31.3	42.4
	100.0	99.9

* $p \leq .05$

Table 4

Participation And Cooperation Rates By Method
For A Pilot Study Of Cafeteria Food Consumption

	Drop Out Rate	Data Completion Rate	Failed to Contact Interviewer
Telephone			
6-Hour Recall	0%	55%	
24-Hour Recall	8%	58%	
3-Day Food Record	20%	27%	
Phoned To Interviewer		(41%)	40%
Phoned To Recording Device		(13%)	71%
7-Day Food Record	17%	43%	
Phoned to Interviewer		(41%)	20%
Phoned to Recording Device		(45%)	43%

Adapted from Croughan et al.[10], Table 12 and 13

Table 5

Validity Data For
Food Consumption Measurement Methods

Comparison Of Foods Reported With Foods Observed

	% Agreement	% Under-Reported	% Over Reported
6-Hour Recall	75%	25%	15%
24-Hour Recall	69	31	18
3-Day Record	75	20	15
7-Day Record	87	13	10

From Croughan et al.[10], Table 6