

COVERAGE, NONRESPONSE, AND COST TRADEOFFS USING A ONE-QUESTION SCREENER FOR AGE ELIGIBILITY IN HOUSEHOLD SURVEYS¹

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1. Introduction

Increasingly in household surveys, relatively small subpopulations are the target population, and relatively large screening operations are needed to locate eligible respondents. Such designs create a three-step sampling and measurement: 1) a sample of housing units is selected, located, and contacted; 2) measurement is made of the eligibility of persons in the households; and 3) households with no eligible persons are discarded, and interviews are sought with the one or more eligible persons in the remaining households.

Two research questions are of primary interest in this type of screening design. First, nonresponse characteristics of the screening step may be markedly different, with higher nonresponse among households asked to give complete rosters before interviewing begins. The issues concern the overall rate of nonresponse and the characteristics of the nonrespondents on the key eligibility criteria. Second, complete coverage of eligible persons is highly desirable, and depends on responses to the screening step. The issue concerns whether eligible persons are reported to be household members at the same rate that others in the household are reported.

The National Survey of Family Growth (NSFG), sponsored by the National Center for Health Statistics, is the basic social indicator monitoring key fertility and family formation statistics for the United States. The survey is a repeated cross-section survey design based on a multistage probability sample of housing units. NSFG Cycle 6 will be conducted in 2002. Sample housing units will be screened for the presence of household members who are female between the ages of 15-44 or male between the ages of 15-49. The response rate goals for males in Cycle 6 are constant across age and race-ethnicity groups, at 75% of those sampled eligible persons. A further challenge to the NSFG Cycle 6 is a disproportionate selection of African-American and Hispanic males, groups which have exhibited in many surveys lower cooperation rates.

At this writing, a large pretest is ongoing.

The final response rate among eligible sample persons is a function of a contact rate for sample households, a cooperation rate on a screening instrument to determine the presence of age-eligible persons, and a cooperation rate with the chosen respondent. Design features that could increase the first two rates are being tested in the pretest through experiments incorporated into the design.

Tens of thousands of housing units will be sampled in Cycle 6 in order to obtain the desired number of eligible sampled persons. Cost reduction from a shorter screening questionnaire across so many households is large. If design features could be introduced to reduce the cost of identifying ineligible housing units, the total cost of the survey could be reduced and funds used to improve other qualities of the study.

Most of the procedures which may reduce screening costs also have the potential to increase the coverage error (i.e., the chance of missing eligible persons in sampled housing units). Thus, any design feature with attractive cost and nonresponse features must be evaluated also in terms of the coverage of all eligible persons.

2. Design

A series of experiments were implemented in the NSFG pretest in February-July, 2001. A total of 1,979 households were screened in three metropolitan areas and one rural county, and 1,634 households completed a screening instrument. Households were selected in clusters; estimation takes account of this design feature.

Survey designers have used short screening devices to identify eligible persons that offer lower cost or higher cooperation rates compared to a more detailed screening device. Selection rates in NSFG Cycle 6 will vary across 18 gender, age, and race/ethnicity groups. The traditional method of screening for eligible persons in the sample household would obtain, from an informant, a roster of all household members, classifying each member into one of the 18 age, gender, and race/ethnicity groups, and selection of one person made at random with possibly different group sampling rates.

1. Presented to the 2001 AAPOR conference, Montreal, May 18, 2001. Support from CDC/NCHS contract 200-2000-07002. Views in this paper are not necessarily those of the National Center for Health Statistics.

For this study, a traditional screening method is contrasted with a short screening method. In addition, among households receiving traditional screening, two experiments were implemented to examine the effect of using additional probes to find unlisted household members and the use of initials rather than names to improve the quality of the household listing.

One-half the households were randomly chosen to receive a short screening method, and the remaining received a traditional household screener. Among those receiving the traditional household screener, two further treatments were allocated in a cross-classification of methods of recording household members. One half of the traditional screener households were randomly chosen to receive standard probes about household composition, while the remainder were administered additional probes designed to identify persons missed in the traditional screening. In addition, one-half of the traditional screener households were randomly chosen for a standard first name listing of household members, while in the remaining households initials were used.

2.1 Household-level Screener

The short screener tool asks the household informant one question that determines whether there is anyone who is age-eligible in the household. Such a simple question may encounter less reluctance from household informants than a full roster, thus increasing response rates. It could also reduce the number of call attempts on sample households, reducing cost. However, such a question might also be subject to household composition measurement errors that are not present in the full roster technique. There are two types of errors of concern:

1. False negatives: the informant reports no one is eligible when some are eligible.
2. False positives: the informant reports some are eligible when no one is eligible.

False positives lead to the interviewer collecting information needed to select a respondent when no eligible subject is present. The subsequent household roster will identify the error made by the informant eventually, but at the price of an increase in the number of interviewer hours needed to complete the screening.

False negatives mean that the interviewer records the sample unit as having no eligible persons, and thus requiring no more attention. In the aggregate, false negatives lead to errors of nonobservation of eligible persons, with no inherent measures of the size of the problem.

Screener false negatives can be decreased by

the addition of questions that widen the net of screened-in households. For example, the National Immunization Survey, sampling children 19-35 months of age, proposed screening using a question that asked whether there was any child less than 4 years of age in the household. Once screened in, the informant was then asked more specific questions to eliminate those 0-18 months, and 36 to 47 months old.

There is concern that affirmative answers to a simple screening question might be perceived by informants as implying eligibility (and thus the burden of extended interaction). That is, reluctant respondents may say "No" to a screening question in hopes of avoiding a further request. This suggests that wording should include "No" answers and eliminate "Yes" answers.

As a result, short and traditional screener designs were considered for the NSFG.

Short Screener Option: "Is everyone in this household over 55 years of age?" If the answer is "No," the interviewer will continue with a full survey description and collection of a household roster to determine eligibility. If the answer is "Yes," the interviewer will thank the informant and depart. For the pretest experiment, a subsample of cases receiving the short screener and reporting all household members over 55 years of age will be revisited to collect a full roster.

Traditional Screener Option: Contact the household, identify a suitable informant, and seek a full household listing to determine whether there are any age eligible persons.

2.2 Roster Design

Studies of the process of completing the household roster have identified two factors associated with failure to identify individual household members: 1) insufficient cuing to recall household members (especially those not part of the nuclear family) (Sweet, 1994); and 2) fear of disclosure of some members who might generate challenges to occupancy rules of a landlord or eligibility for welfare benefits (Tourangeau *et al.*, 1997). Two roster features were tested.

Probes. Probes were added in the household roster to cue the informant to reporting additional household members, particularly those who have a tendency to be missed in household listing.

Initials. Initials for identifying household members instead of full names were used to reduce the threat of identification of those not identified as the chosen respondent.

The added probes are as follows:

"To make sure that we don't miss anyone, please give me the (FIRST NAME/INITIALS) of all the people who stayed here last night. Don't forget to

include yourself, if you stayed here last night.”

“Now, I would like the (FIRST NAME/INITIALS) of any people who live here but didn’t stay here last night.”

“Finally, is there anyone else who is a member of this household who you haven’t mentioned yet?”

These probes were used on one half of the sample, and traditional listing questions on the other half. The use of initials will also be tested, with initials used on one-half of the sample and full names on the other half-sample.

Thus, the screening experiment involves three factors, the principal factor being the use of a short screener question or a traditional household roster. Two additional factors tested within the traditional roster are the use of initials in the roster and the use of probes following the completion of the roster. Appendix A provides the full text of the experimental options.

2.3 Dependent Variables

The key dependent variables for the experiment are direct measures of the cost and errors potentially associated with household screening options. These include a) the household response rate to the screener, b) the number of calls to final disposition of the household screener, c) the rate of false negatives in the short screener option, and d) the rate or proportion of additional eligible persons produced by use of initials for household members or additional probes for household members.

3. Results

3.1 Response Rate Performance of Alternative Screeners

Table 1 presents basic response rate results for the pretest sample. The difference between screening methods is not statistically significant. The response rates for the short screener are no worse than the traditional screener.

3.2 Interviewer Effort Required to Obtain Outcome

A short screener was expected to require fewer calls to complete, since more households could be screened at the doorstep than for a traditional roster. Table 2 presents additional findings on the response rate characteristics of the two screening methods. There is a statistically significant rate of successfully completed interviews on first contact for the short screener method. The results on mean number of visits to first contact with the household, among households that were successfully screened, show no difference between

Table 1. Percentage of English speaking households by screener disposition by screener type

	Short Screener	Traditional Screener
Interview.....	82.9	82.2
Refusal.....	8.0	9.4
Noncontact.....	8.6	7.6
Other	0.5	0.8
Noninterview..		
n.....	1026	953
Total.....	100.0	100.0

$$\chi^2 = 2.8053, p < .4$$

screener methods. However, the mean number of visits required after first contact for successful screening is higher for the traditional screener. That is, the short screener yields less costly screening because the screening can be accomplished at first contact more often than the traditional screener.

3.3 Number of Eligible Persons Identified by the Screener

Two experimental methods were expected to yield relatively larger numbers of age-eligible persons: (1) the use of initials to identify a household member instead of names, and (2) the use of a set of probes seeking more information about household members who might have been missed in the initial reporting of household composition.

Table 3 presents the number of age-eligible persons reported for the name-based roster technique and the initial-based roster technique. There are only minor differences in the number of age-eligible persons reported by the two experimental groups, and none of the differences in the distributions of the number of age-eligible persons between the name- and initial-based methods are statistically significant.

3.4 False-Negative Rate for Short Screener

A final analytic goal of the screener experiment was to measure the rate at which reports of no eligibles in the short screener conflict with later reports based on a traditional household roster. Among households assigned to the short screener treatment group and responding “Yes” (i.e., all of the members of the household are ages 55 years or older), a total of 210 were selected for rescreening. An interviewer visited these households and conducted a traditional screener after the short screener was completed. It is assumed that the traditional screener yields an accurate count of

Table 2. Percentage of screener interviews completed on the first contact with the sample household by screener type (standard error)

Screener Type	Percentage of Successful Interviews Completed in the First Contact	Mean Number of Visits to First Contact for Successful Screeners	Mean Number of Visits After First Contact for Successful Screeners
Short screener.....	80.5% (1.4)	2.6 (0.082)	0.47 (0.044)
Traditional screener..	73.8% (1.6)	2.3 (0.076)	0.85 (0.084)

Table 3. Distribution (%) of the number of age-eligible household members and mean number enumerated by roster condition

Number of Age-Eligible Persons in Household	Household Members Listed....		Roster Questions	
	By Names	By Initials	Added Probes	Traditional
None.....	32.8	31.7	32	32.6
1.....	22.9	26.1	24.9	24.1
2.....	33.1	31.2	31	33.3
3.....	7.2	6.8	8	6
4 or more.....	3.9	4.2	4.2	3.9
Mean eligibles.....	1.28	1.26	1.29	1.25
Total households.....	691	709	704	696

the number of eligible in the household.

Table 4 shows the number of age eligible persons listed in these 210 households. Approximately seven percent (6.7 percent) of households contained age-eligible persons. That is, the short screener yielded a 7% false negative rate for households.

4. Decision Criteria

For the main data collection on the NSFG, it is important to consider the criteria to decide whether the short screener, use of initials, and use of additional probes should be used. These decisions must be a judgment of the relative value of cost savings from the short screener, increased screener response rates, and increased rate of false negatives.

One judgement is that the response rate gain must be much greater than the false negative rate; say, by a factor of 2. Let r_{short} denote the number of respondents to the short screener, with a similar definition for $r_{traditional}$. Let n_{short} denote the number of sample households in the short screener group, with a similar definition for $n_{traditional}$. Finally, let f_{short} denote

Table 4. Percentage of sample households with short screener indicating no eligibles by number of age-eligible household members reported in reinterview

Traditional Screener Number of Age-Eligible Persons in Household	Number (%) of Short Screener Households
Total households..	210 (100.0)
None.....	196 (93.3)
1.....	12 (5.7)
2.....	2 (1.0)
3.....	0 (0.0)
4.....	0 (0.0)
5 or more.....	0 (0.0)
Non-response.....	28 (NA)

the number of false negatives in the short screener group. Then define the representation ratio as

$$\frac{\left(\left(\frac{r_{short}}{n_{short}} \right) - \left(\frac{r_{traditional}}{n_{traditional}} \right) \right)}{\left(\frac{f_{short}}{n_{short}} \right)} > 2$$

Another ratio useful to track differences among screener methods is on the cost side. Let $c_{i,short}$ denote the number calls needed to obtain the final result for the i -th household of the short screener group, with a parallel definition for $c_{i,traditional}$. A measure of the proportional change in effort (as measured by calls) in the completion of cases is given by the call ratio.

$$\frac{\sum_{i=1}^{n_{short}} c_{i,short}}{n_{short}} \quad \left| \quad \frac{\sum_{i=1}^{n_{traditional}} c_{i,traditional}}{n_{traditional}} \right|$$

The call ratio measures the proportional change in effort (as measured by calls) in the completion of cases. Call ratios of less than 1.0 reflect lower effort required for the short screener. Because cost differences exist between the short and long screener and conservative decision rules are appropriate. A criterion of $\alpha = 0.10$ for the coverage-related statistics is more appropriate, since negligible cost differences exist between the two rostering techniques. These are admittedly arbitrary and rather conservative -- giving higher likelihood of retaining the traditional screening.

5. Concluding Remarks

An experiment in the pretest study of the National Survey of Family Growth Cycle 6 showed that a short screener yielded similar response rates to the traditional approach, while requiring slightly less effort than the traditional screener. However, the short screener failed to find eligible persons in 7 percent of households.

In addition, the use of names or initials in the household roster has no effect on the distribution of the

frequency of the number of eligibles in the households. Similarly, the use of additional probes in the questions used to complete the household roster does not change the distribution of the number of eligible persons listed in the sample households.

These findings led to the decision to use a traditional screener method for Cycle 6, and not to include additional probes or use initials in the household listing process.

References

Tourangeau, R., Kearney, A., Shapiro, G., & Ernst, L. (1997). Who lives here? Survey undercoverage and household roster questions. *Journal of Official Statistics*, 13, 1-18.

Sweet, E.M. (1994). Roster research results from the Living Situation Survey. In *Proceedings from the Annual Research Conference*, pp.415-433. Washington, D.C.: Bureau of the Census.

Appendix A

Pretest NSFG Screener

Screen One:

Introduction

Hello. My name is _____. I am with the University of Michigan and am here on behalf of the U.S. Public Health Service and the Department of Health and Human Services. We are conducting an important survey, the National Survey of Family Growth. This survey is about the health of men and women and their families. The information gathered by this survey is used by many professionals who work with children, adults and families. Your household has been selected to represent \$\$ other households in the country.

Your participation is completely voluntary but very important. We will hold your responses in the strictest confidence, as required by Federal Law. You may decline to answer any question you wish.

Do you have any questions?

To make certain that the sample accurately represents everyone, I have a few basic questions about this household.

INTERVIEWER: USE HOUSEHOLD LETTER AND FAQs AS NECESSARY.

Screen Two:

Is everyone in this household over 55 years of age?

Screen Three:

To make sure that we don't miss anyone, please give me the name of all the people who stayed here last night. Don't forget to include yourself, if you stayed here last night.

Screen Four:

To make sure that we don't miss anyone, please give me a first name, a nickname or a set of initials for all of the people who stayed here last night. Don't forget to include yourself, if you stayed here last night. It is not necessary to give me anyone's full name.

Screen Five:

To make sure that we don't miss anyone, please give me the name of the people who usually live here?

Screen Six:

To make sure that we don't miss anyone, please give me the first name, a nickname or a set of initials of the people who usually live here?

Screen Seven and Eight:

Probe 2

Now, I would like the (FIRST NAME/INITIALS) of any people who live here but didn't stay here last night.

Probe 3

Finally, is there anyone else who is a member of this household who you haven't mentioned yet?

Screen Nine:

Is (PERSON#) male or female?

Screen Ten:

How old is (PERSON#)?

- If LT 1 year -> How many months is this child?

Screen Eleven:

Is (PERSON#) of Hispanic, Latino or Spanish Descent?

Which best describes their racial background?

- American Indian or Alaska Native
- Asian
- Native Hawaiian or Other Pacific Islander
- Black or African American
- White

Screen Twelve:

Usual Resident Definition

FOR EACH PERSON LISTED:

Does (fill name/initial) usually live here?

Should create two sets of HH members:

Set 1: all listed from probes.

Set 2: only those who are usual residents (remove non-residents from set 1). **RENUMBER TO REMOVE GAPS.** Go to Within Household Selection Routine.