EVALUATING THE IMPACT OF A NEW CATI SCREENER IN THE NATIONAL IMMUNIZATION SURVEY

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Introduction

The introduction in a random-digit-dialing (RDD) survey is the initial interaction point between the sample household and the interviewer. It often represents the initial request for participation in the survey and is therefore an important survey design component in the process of gaining cooperation and achieving a high response rate (Meegama and Blair, 1999). The relationship of the survey introduction and data quality has been studied by Couper (1997). In an RDD survey that screens for an eligible population, the survey introduction may also start the process of defining the target population to the respondent. In a screening survey the introduction can impact not only the response rate but also the household eligibility rate observed in the sample. Modest changes in a large-scale RDD screening operation can enhance a survey's ability to sample a rare eligible population, such as in the National Immunization Survey (NIS), which samples households containing children ages 19-35 months. This paper presents the experimental methods and results of a field test designed to measure whether new versions of a CATI screener introduction in the NIS improved household eligibility rates and other data quality indicators. Potential cost savings and effects on immunization estimates due to the screener treatments are also discussed.

The NIS uses quarterly RDD samples in 78 geographic areas covering the entire U.S. to sample households with children ages 19-35 months (Ezzati-Rice et al., 1995). After making contact with a household, the interviewer reads the following introduction:

Hi. I'm calling on behalf of the U.S. Department of Health and Human Services. We are conducting a nationwide immunization study to find out how many children under 4 (years of age) are receiving all the recommended vaccinations for childhood diseases. Your telephone number has been selected at random to be included in the study. The questions I have will only take a few minutes.

The interviewer next determines how many children in the sample household are between 12 months and three years of age. If there are one or more children in this age range, the interviewer obtains the date of birth of each child, and the NIS CATI system uses the date of the screener and the date of birth to determine whether the child is 19-35 months old. The immunization interview is then administered for each age-eligible child in the sample household. The NIS also includes a provider-record-check component, designed to obtain provider-reported vaccination histories for sample children (Zell et al., 2000).

The primary objective of the NIS field test experiment was to determine whether alternative survey introductions raised the observed household eligibility rate, which is currently in the 3.7 to 3.8% range. Sources of information outside the survey indicate that the actual household eligibility rate is around 4.5% or slightly higher (Ezzati-Rice et al., 1999). The purpose of the test was to determine, using statistical methods, whether a modification in the content of the CATI screener introduction furnished a net benefit to the study. The main areas of interest were the effects on the household eligibility rate, the CASRO response rate, the use of immunization records during the household interview, the household consent rate to contact vaccination providers, the percentage of identified vaccination providers with sufficient name and address information to allow mailing of provider questionnaires, and the percentage of children with adequate provider-reported vaccination histories for use in estimation (Frankel, 1983).

Sample Sizes

In each quarterly RDD sample approximately 400,000 households are screened to arrive at a sample of about 8,900 interviews for age-eligible children. The sample for each quarter is divided into replicates for sample administration purposes (Buckley et al., 1998). The NIS field test was conducted in the fourth quarter of 1999 and used 15 sample replicates. Each replicate consisted of approximately 25,000 residential numbers which were either directory-listed or non-listed households. Four replicates were randomly assigned to a Low Child Content introduction treatment group, 4 replicates were

randomly assigned to a High Child Content introduction, and the remaining 7 replicates were assigned to the control group using the Current Content NIS introduction. There were a total of 374,558 sample households in the experiment. The total sample for the Low Child Content treatment group was 102,710 households, and 104,858 households for the High Child Content group. The control group, Current Content, contained 166,990 households. Table 1 shows the breakdowns by directory-listed status. Approximately 59% of the sample households were directory-listed. The field test experiment was designed to detect differences as small as 0.3 percentage point in the household eligibility rate with 80% power at the 5% level of significance for a two-tailed test.

Alternative Introductions

The NIS field test was designed to evaluate the impact of the following changes:

- Removing references to the age-range of eligible children.
- Eliminating the phrase "on behalf" to reduce respondents' perception the call relates to a charity.
- Shortening the second sentence making it easier to read to reduce respondent break-offs.
- Including a new third sentence to more directly inform respondents of the study's purpose.
- Elimination of the sentence: "Your telephone number has been selected at random to be included in the study," making it easier to read to reduce respondent break-offs.

The purpose of the test was also to assess whether this attempt to improve eligibility rates resulted in a lower response rate or lowered other key indicators of survey quality. The Low Child Content introduction is given below.

Hi. I'm calling for the U.S. Department of Health and Human Services. We're calling about an important national study on immunization. In most cases we need just about a minute or two of your time.

In a 1994 experiment the NIS randomly assigned RDD sample telephone numbers to treatment conditions that differed by use and content of the advance respondent letters that are mailed to directory-listed households. Although the experiment observed no significant differences for several of the key indicators, it did suggest a relationship between the eligibility rate and the amount of information that the advance letter presented on the definition of the target population (Camburn et al., 1995). One hypothesis was that conspicuous reference to children might lead in some instances to a false report of no age-eligible children in the household. On the other hand, an introduction that provided the respondent with more information on the purpose of the study might yield better cooperation and higher response rates. The Q4/1999 field test design therefore included another treatment group -- an introduction with a very specific age range reference (High Child Content). This provided high contrast to the introduction with the age range reference removed (Low Child Content). The High Child Content introduction is shown below.

Hi. I'm calling for the U.S. Department of Health and Human Services. We're calling about an important national study of childhood immunization. This important study is about children under the age of 4, and it is used to measure the progress of immunization in your area. In most cases we need just a minute or two of your time.

The NIS CATI system was also modified during the field test so that, when a test case was delivered to an interviewer, a text box was presented to alert the interviewer that the case was part of the field test. This box also appeared in the introductory screen.

Results

For the analysis of the results of the experiment, a set of key survey indicators was selected to examine the impact of the field test experiment. It was posited that the Low Child Content introduction would yield a higher eligibility rate than the Current Content introduction, and the High Child Content introduction would yield a higher CASRO response rate than the Current Content introduction. The key indicators of interest were:

- Percentage of households with an age-eligible child
- Council of American Survey Research Organizations (CASRO) response rate
- Rate of shot card (vaccination record) use during the interview
- Percentage of interviews with shot card as source of information for DTP vaccine
- Rate of verbal parental consent rate to contact vaccination providers
- Percentage of identified providers with verbal consent and mailout of the Immunization History Questionnaire
- Percentage of children with adequate provider data for use in estimation.

Because the experiment varied only on one dimension, the study was limited to analysis of differences in the key indicators by the screener introduction treatment and control groups, and by directory-listed status within these groups. No test of alternative advance letters, which usually are mailed to directory-listed households in the NIS, took place (Camburn et al., 1995).

The key hypothesis was that the treatment group with the Low Child Content introduction would have the highest household eligibility rate. The rationale for this was that households in the Low Child Content introduction group would be *less* likely to 'hide,' or fail to volunteer the presence of, eligible children than those in the other treatment groups, where households were informed that participation in the interview was targeted for a specific age group of children. We found that the eligibility rate for the Low Child Content group (3.96%) was significantly different from the eligibility rate for both the High Child Content and control groups (3.64% and 3.60%, respectively), by more than 0.3 percentage point (Table 2, column 3). This represents a 10% increase in the eligibility rate compared to the Current Content introduction. One-way analysis of variance results showed that in a main-effects model, there was a significant difference in eligibility rates among the three groups of treatment and control cases (Table 3). This suggests that removing the explicit age reference information in the screener had an effect of increasing the proportion of households that were found to have at least one child in the eligible age range. The same result was also found for directory-listed households and for households with an unlisted telephone number (Table 2, column 3).

The CASRO response rate is a product of the resolution rate, the screening completion rate, and the household interview rate (Frankel, 1983). Although the CASRO response rate was highest in the High Child Content group at 79.5% (Table 2, column 6), there were no significant differences among the three groups of treatment and control cases (Table 3).

We present two measures of vaccination record (shot card) use during the interview. The first is shot card use as a percentage of completed interviews, where shot records were available for at least one of the children in the household (Table 2, column 4). The second measure is the source of the information for the DTP vaccine as a percentage of completed interviews (Table 2, column 5). The former measure of shot card use was 1.3 percentage points higher in the High Child Content treatment group than in the control group, but the Low Child Content treatment group rate was about the same as that of the control group. Statistical analysis (Table 3) showed no significant differences between the means of the three treatment groups for this measure of shot card use. For the second measure of shot card use, we also found small differences; the High Child Content group had levels that were about two percentage points higher than the Low Child Content group.

We examined the rate of verbal consent to contact vaccination providers (Table 2, column 7). We found almost no difference in the percentage of children for whom consent was given to contact vaccination providers. Also, to also get an idea of whether we were getting sufficient information from household respondents on the names and addresses of providers, we looked at the percentage of providers identified in the household interview who actually had enough information to be mailed the Immunization History Questionnaire. These providers are a percentage of all identified providers for whom we received verbal consent for children in the NIS sample (Table 2, column 9). We found that the percentage of providers who were mailed a questionnaire was slightly higher for both treatment groups compared to the control group.

From an estimation viewpoint, a key summary measure of the success of the NIS in obtaining provider-reported vaccination histories is the percentage of children with adequate provider data. It is determined by the consent rate to contact providers, the ability to obtain complete provider name and address information, and the response rate among providers in the provider record-check survey. Among children in the Low Child Content treatment group, 61.8% had adequate provider data for use in estimation (Table 2, column 8). This rose slightly to 62.6% in the High Child Content group. The control group had the lowest percentage of children with adequate provider data, 59.2%. The difference between the High Child Content group and the control group is statistically significant.

We also calculated weights for each of the treatment and control group samples so that national estimates of vaccination coverage could be compared. No significant differences were found. For the Low Child Content group the percentage of children who are up-to-date on all of their vaccinations was slightly lower than that found in the High Child Content group or the Current Content group. The Low Child Content group exhibited slightly lower vaccination coverage levels on 7 of the 9 individual vaccines and vaccination series, suggesting that the additional children captured by this CATI introduction may be less likely to be up-to-date on their vaccinations.

Impact on Screening

These findings point to a potential reduction in the number of households that must be sampled to locate a household with an eligible child for whom the interview is completed and a provider-reported vaccination history is ultimately obtained. This is a function of the household eligibility rate, the overall response rate, and the percentage of child interviews that end up with provider-reported vaccination history data. For the Low Child Content group it was necessary to sample 52.4 household telephone numbers to complete an interview that ended up yielding adequate provider-reported vaccination data for use in estimation. For the High Child Content group we needed to sample 55.2 household telephone numbers. However, for the control group it was necessary to sample 60.4 household numbers. Thus, both treatment groups reduced the number of households that must be sampled. The Low Child Content introduction resulted in a substantial reduction of 8.0 sample households. The High Child Content introduction resulted in a smaller reduction of 5.2 households. Over several quarters of data collection, the potential cost saving from use of the Low Child Content introduction, or even the High Child Content introduction, could therefore be significant.

Summary

A modification in the NIS CATI introduction points to a net benefit to the NIS. The Low Child Content introduction seems to offer the greatest potential benefit. It yielded a 10% increase in the household eligibility rate without causing any significant decline in the other key survey quality indicators. The increase in the eligibility rate was not accompanied by any statistically significant differences in the resulting vaccination levels. One limitation of the experiment is that the Current Content introduction had been used extensively by many of the interviewers, whereas the two treatment group introductions were brand new to the interviewers. It is therefore possible that the impacts we found are interviewer effects and have little to do with the actual content of the treatment introductions. To assess this, we identified a group of interviewers who began working on the NIS just prior to the field test. For these interviewers we found the same pattern of household eligibility rates, lending support to the hypothesis that the content of the introduction can have an impact on the household eligibility rate.

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Table 1. Number of Sample Households in Each Group by Directory-Listed Status.

Group:	Directory-Listed	Not-listed	Total
Low Child Content Screener	60,648	42,062	102,710
High Child Content Screener	61,970	42,888	104,858
Current Content Screener	98,774	68,216	166,990
Total	221,392	153,166	374,558

Table 2: Key Survey Indicators for Treatment and Control Groups.

Screener Introduction	Directory-Listed Status	House-hold Eligibil-ity Rate	Shot Card Use	Source for DTP Info. is Shot Card	CASRO Response Rate	% of Children with Consent to Contact Providers	% of Children with Usable Provider Data	% of Providers with Mailout
Low Child Content Introduction	Directory-listed	3.82%	48.8%	47.6%	82.1%	85.7%	62.9%	92.5%
	Not directory-listed	4.62%	54.3%	52.4%	70.2%	83.2%	57.6%	93.3%
	Total	3.96%	49.9%	48.5%	77.9%	85.2%	61.8%	92.7%
High Child Content Introduction	Directory-listed	3.50%	51.9%	50.3%	83.5%	85.4%	62.8%	93.3%
	Not directory-listed	4.36%	54.1%	51.7%	72.8%	82.7%	61.7%	92.5%
	Total	3.64%	52.3%	50.6%	79.5%	84.9%	62.6%	93.2%
Current Content Introduction	Directory-listed	3.45%	51.1%	49.6%	81.5%	84.0%	58.7%	91.0%
	Not directory-listed	4.32%	50.7%	48.3%	71.7%	87.9%	61.2%	89.1%
	Total	3.60%	51.0%	49.3%	77.7%	84.8%	59.2%	90.6%

Table 3. Tests for Differences between Group Totals on Three Selected Key Indicators.

Introduction Treatment	Household eligibility rate	CASRO response rate	Rate of shot card use
One-way ANOVA	F=5.95/ 2, 176479 D.F./ Pr > F 0.0026	F=2.11/ 2, 6540 D.F./ Pr > F 0.1211	F=1.03/ 2, 5981 D.F./ Pr > F 0.3579
Significant differences (Z-tests, $p < 0.05$)	Low vs. High; Low vs. Control	None	None