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Exploring the Impact of Mode on Key Health Estimates in the National Health Interview Survey

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Abstract

In an effort to increase response rates and decrease costs, many survey operations have begun to use several modes to collect relevant data. While the National Health Interview Survey (NHIS), a multipurpose household health survey conducted annually by the National Center for Health Statistics, Centers for Disease Control and Prevention, is primarily a face-to-face survey, interviewers also rely on the telephone to complete some interviews. This has raised questions about the quality of resulting data. To address these questions, data from the 2005 NHIS are used to analyze the impact of mode on eight key health indicators.

KEY WORDS: Mode; health; bias.

1. Introduction

A growing body of research indicates that differences in health estimates may result from differences in the mode of survey administration, especially when sensitive questions are asked (de Leeuw, 2005). The National Health Interview Survey (NHIS) is not a mixed mode survey by design; interviews are at least initiated face-to-face. In fact, the majority of interviews are conducted entirely by personal visit; in 2005, for example, 75% of interviews were conducted entirely by personal visit. Once a personal visit has occurred, however, the NHIS does allow for telephone follow-up if a personal visit follow-up is not possible. Any one of the NHIS's four main sections (described in more detail below), may be conducted by a telephone follow-up. In 1997, 18% of all completed interviews included at least one main section that was conducted primarily by telephone. By 2005, the proportion of interviews in which at least one section was conducted primarily by telephone had risen to almost 25% (Riddick, 2005). This increase is substantial enough to raise questions about the potential for bias, especially for more sensitive health indicators.

The main research question of this study is: What impact, if any, does telephone follow-up in a face-to-face survey have on national estimates of health? To respond to that question, we addressed two more specific questions. First, do the health estimates derived from interview sections conducted primarily by telephone differ from health estimates from sections conducted primarily in-person?² Estimates for eight health indicators derived from items in sections conducted primarily by telephone are compared with the same estimates from sections conducted primarily face-to-face. From this point forward in this paper, these two groups will be referred to as "personal visit

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² Mode of administration, our primary variable of interest, is not collected on an item by item basis. Rather, at the close of the interview, the interviewer is asked to report whether or not each main section of the interview was collected primarily face-to-face or primarily by telephone. In this study, an item is considered to be collected by telephone if the interviewer reported that the section from which the item is derived was conducted primarily by telephone.

respondents” and “telephone respondents.” Note that an individual may be a personal visit respondent with respect to one estimate and a telephone respondent with respect to another estimate, since that designation depends on which NHIS section contained the item(s) on which the estimate was primarily based.

This brings us to our second research question. If there are statistically significant differences between estimates for personal visit respondents and estimates for telephone respondents, could the differences be accounted for by factors other than telephone mode? For example, if telephone respondents are likely to be younger, age rather than mode could be the reason there might be different estimates for personal visit respondents and telephone respondents. The second step of our analysis controlled for variables that might explain such differences between estimates.

2. Methods

2.1 Data Collection in the NHIS

The NHIS is a general health survey that has been fielded since 1957. It produces national estimates on health insurance coverage, health care access and utilization, health status, and health behaviors, and is conducted by the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention. The annual sample consists of approximately 100,000 persons of all ages who reside in approximately 40,000 households that represent the civilian non-institutionalized resident population of the United States. Trained interviewers from the U.S. Bureau of the Census conduct in-person interviews for the NHIS using computer-assisted personal interviewing (CAPI). The NHIS uses a multi-stage clustered sample design and over-samples blacks and Hispanics (in 2006 it began over-sampling Asians as well). In 2005, the year from which data were used for this study, the sample included data for 98,649 persons, including 31,578 randomly sampled adults.

The NHIS questionnaire comprises four main sections: household, family, sample adult, and sample child. The household composition section is completed by one household respondent who provides basic sociodemographic information on all members of the household. In addition, this information is used to determine whether the household should be screened out on the basis of the over-sampling criteria and to determine how many families are in the household. For each family, the family section of the interview is completed by one family respondent who provides health information on all members of the family. This means that the information that the family respondent reports for her- or himself is self-reported, and the information that she or he reports for other members of the family is, for them, proxy-reported. We use both self-reported and proxy-reported data in the analyses of items from the family section (in this study, the health insurance items).

For each family a “sample adult” and (in households with one or more children aged 17 years or younger) a “sample child” are randomly selected. A knowledgeable adult provides information on the sample child. The sample adult answers questions about her or his own health. Many of the questions in this section are considered sensitive or personal, so that a proxy respondent could probably not provide reliable data. For example, questions about frequency of smoking, drinking, and daily exercise are questions considered both sensitive and difficult for a proxy respondent to address accurately.

By design, the NHIS is a personal visit survey. Interviews must at least be initiated face-to-face. Telephone follow-up is permitted under special circumstances, although there has been minimal guidance for interviewers concerning the appropriate use of the telephone. These are examples of the instructions given to interviewers in their field manual: “All NHIS interviews should be conducted by personal visit. However, there may be times when the only way you can complete the interview is by telephone.” And, “The NHIS is a personal visit survey, not a telephone survey. Therefore, you must personally visit the households to conduct the interviews. Telephone contacts may be used—once the initial personal contact has been made—to complete partial interviews or to collect other missing parts of the interview...” (U.S. Bureau of the Census, 2005).

2.2 Measuring Telephone Use

The primary variable of interest in this study is mode of administration. Because we are primarily concerned with the impact of mode on health estimates, it would be preferable if mode of administration were collected at the item level. At present, however, it is not. Rather, the interviewer reports on whether each main section of the interview was conducted primarily by telephone or by personal visit. We then assign a mode, accordingly, to all items contained in that section. While recognizing that this is an imperfect measure, we suspect that once a section is begun in one mode, that mode is probably the mode used throughout the remainder of the section (although it is possible that a breakoff occurred in the middle of a section begun in one mode and the interview was picked up again in another mode). For the purposes of this study, the mode of administration of a section determines the mode of administration for the items in that section.

At the completion of each interview, interviewers are asked a series of questions about the administration of the interview. For example, they are asked to report on the cooperativeness of respondents, the language(s) in which the interview was conducted, how many visits the interviewer made to the household, etc. Interviewers also record “yes” or “no” answers to each of the following question(s): “Were any of the following sections conducted primarily by telephone? Household Composition? Family? Sample Adult? Sample Child?” No precise meaning of the word “primarily” is given to the interviewers; that determination is left up to the interviewers. In 2005, interviewers indicated that 21.0% of the household composition sections, 21.3% of the family sections, 27.2% of the sample adult sections, and 24.0% of the sample child sections were conducted primarily by telephone. The proportions are large enough to warrant investigation into the impact this may have on health estimates.

2.3 Measuring the Impact of Mode on Health Estimates

The impact of mode was analyzed for eight indicators of health: health insurance coverage (covered by insurance, covered by public insurance, or covered by private insurance), obesity (Body Mass Index (BMI) ≥ 30), engagement in regular leisure-time physical activity (light, moderate, or vigorous activity performed for at least 30 minutes five or more times per week), current smoking (smokes every day or some days), alcohol consumption (had 5 or more drinks in one day at least one time in past year), and ever been tested for HIV.

The three health insurance questions analyzed here are contained in the family section of the interview, where person-level information may be either self-reported or reported by proxy and where 21.3% of the interviews were conducted primarily by telephone. The five health behavior questions are contained in the sample adult section, where information obtained was almost entirely self-reported and where 27.5% of the interviews were conducted primarily by telephone.

2.4 Statistical Analyses

These analyses used weighted data. The weights are adjusted for non-response and post-stratified by sex, age, race and Hispanic origin. All statistical analyses were conducted using SUDAAN V. 9 software (using the Taylor linearization method to produce standard errors) to account for the complex sample design of the NHIS (Research Triangle Institute, 2004). Because of the large sample size, all significance testing was conducted at the .01 level.

We compared health estimates derived from sections conducted primarily by telephone to estimates from sections conducted primarily in-person. To determine whether those differences could be accounted for by factors other than telephone mode, we performed logistic regression analyses in two steps. In the first step, eight models were fitted to assess the effect of mode alone on each of the eight dichotomous health indicators; each model had one independent variable, mode (telephone vs. personal visit; personal visit is the reference category). In this study, we refer to these as the unadjusted models.

In the next step of the analysis, eight additional models were fitted to assess the effect of mode, while controlling for other factors that can be associated with telephone use or with health outcomes. Each of these models had mode as the independent variable of interest and 10 control variables. The controls used were: sex, age, education level, race and ethnicity, employment status, family size, urbanization, region of the country, whether any person in the

family has a functional limitation, and the Census Regional office under which the interview was conducted. In this

Table 2. Unadjusted and Adjusted Odds Ratios for Mode of Administration in Logistic Regressions Predicting Eight Health Indicators

Health Indicator and Mode	Unadjusted Odds Ratio	Adjusted** Odds Ratio
Uninsured		
Telephone	0.70*	0.87*
Personal visit	1.00	1.00
Public Insurance		
Telephone	0.70*	0.80*
Personal visit	1.00	1.00
Private Insurance		
Telephone	1.59*	1.23*
Personal visit	1.00	1.00
Obesity		
Telephone	0.87*	0.90
Personal visit	1.00	1.00
Regular Leisure-time Physical Activity		
Telephone	1.30*	1.12*
Personal visit	1.00	1.00
Current Smoking		
Telephone	0.81*	0.81*
Personal visit	1.00	1.00
Alcohol Consumption		
Telephone	1.14	1.00
Personal visit	1.00	1.00
Ever Been Tested for HIV		
Telephone	1.05	0.98
Personal visit	1.00	1.00

*p<.01

** Adjusted Odds Ratios were controlled for sex, age, education level, race and ethnicity, employment status, family size, urbanization, region of the country, whether any person in the family has a functional limitation, and the Census Regional office under which the interview was conducted

The reference group for mode of administration in all models is Personal visit respondents. The “Adjusted Odds Ratio” column shows the odds ratios for mode for each health outcome, adjusted for the set of control variables. The results in Table 2 indicate that the effect of mode on current smoking and HIV testing is not significant with or without the introduction of the controls. For the other outcomes, the introduction of the controls eliminates or attenuates the significant effect of mode. For example, the introduction of the controls eliminates the significance of the effect of mode on obesity, and the odds ratio shifts closer to 1.00, from 0.87 to 0.90. The introduction of the controls reduces the effects of mode on being uninsured (odds ratio shifts from 0.87 to 0.70), on being privately insured (odds ratio shifts closer to 1.00, from 1.59 to 1.23), and on participating in regular leisure-time activity (odds ratio shifts from 1.30 to 1.12).

In summary, there are effects of mode on six of the eight health indicators that the controls did not eliminate. Further research is needed to determine when responding over the telephone yields different answers than would have been given in face-to-face interviews, and to what extent the differences between the personal visit respondents and telephone respondents can be attributed to variables other than mode.

4. Limitations

The best way to determine a mode effect is to use an experimental design where cases are randomly assigned cases to different modes, and then compare the results. The resulting differences could then be more confidently ascribed

to mode. The main limitation of this study is that such random assignment was not possible. We attempt to approximate this by controlling for factors that could be related to health outcomes but that might also be related to whether or not a phone followup was used. Our ability to do this has been a function of the control variables available on the data file. Each variable has been found in the literature and in our own initial bivariate analyses to have an association either with health outcomes or with mode of administration. Our controls have reduced the effect of mode; however, because we can never completely control for every variable, we can never be certain that any residual effect is strictly due to mode.

5. Conclusions and Future Directions

Preliminary analyses seem to indicate that the effects of mode in models predicting health indicators can be attenuated by the introduction of controls thought to be associated with health characteristics. However, although the mode effects did not appear to be large, they were not completely eliminated by the controls introduced here. One next step is to refine the models. In this preliminary study we used the same controls for each health outcome. We realize that each health outcome may have a unique set of predictors and require variables more specific to that health outcome.

As a matter of design and policy, the NHIS is a personal visit survey. It is conceivable, though not likely, that we could insist on personal visit data only. What would happen to the estimates if we were to disallow telephone follow-up? If this change were to occur, some of the sections that would have been conducted primarily by telephone would instead be conducted by personal visit, or, more likely, they would not be completed at all, thus driving up the non-response rate for that section. Therefore, analyzing the effects of disallowing telephone follow-up could be analyzed by treating the telephone respondents as nonrespondents for each estimate: dropping them out of the sample, reweighting the data for each section, and calculating new estimates.

For the foreseeable future, however, telephone follow-up is likely to continue. Given this, what steps should we employ to ensure that interviewers collect equally valid data whether they administer the survey in person or over the telephone? Currently, new questions for the NHIS are usually developed as if they were only going to be administered face-to-face; for example, sometimes lengthy flashcards are used to provide visual cues to respondents, a practice that is difficult to transfer to the telephone. Since almost 25% of responses to any given question may be provided over the telephone, due consideration should be given to designing mode-neutral questions.

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