IMPROVING THE VALIDITY OF SELF-REPORTS OF CANCER SCREENING BEHAVIORS

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1. INTRODUCTION

As part of the initiative Healthy People 2010, the U.S. Department of Health and Human Services has the goal of significantly increasing the role of health promotion and disease prevention in the medical care of the population. Data collection about health practices has increased. The Behavioral Risk Factor Surveillance System (BRFSS), the Current Population Survey (CPS), and the National Health Interview Survey (NHIS) are now used to monitor how quickly the public is adopting health protective practices. Although the data collection and analytic procedures have become quite sophisticated, ultimately the quality of health survey data analyses depends on the quality of the survey data obtained from the respondents. It has long been recognized that significant response errors may exist in health surveys and many researchers have attempted to measure these errors and/or to reduce them (Biemer , Groves, Lyberg, Mathiowetz, and Sudman, 1991; Lyberg et al., 1997; Sudman and Bradburn, 1974). Depending on the direction of the errors, surveys may significantly overstate or understate the effectiveness of new health program initiatives.

Previous research indicates that there may be ways to promote accurate recall of autobiographical events. In the past twenty years, significant progress has been made in understanding the cognitive processes used by respondents to answer questions and how questions and survey procedures may be revised to reduce underreporting of many sensitive health-related events (Jobe and Mingay, 1991; Sudman, Bradburn and Schwarz, 1996; Tanur, 1992). However, another very serious problem facing many health surveys that has not yet been solved is the tendency of respondents to over-report health promotion and disease prevention activities. Over-reporting has been observed in a wide range of health activities including such behaviors as obtaining procedures for early detection for cancer, where medical provider records are used to validate self-reports (Brown and Adams, 1992; Gordon, Hiatt, and Lampert, 1993; Sudman, Warnecke, Johnson, O'Rourke, and Davis, 1994;). Such over-reporting leads to serious overestimates of health program effectiveness. Yet, compared to the problem of

under-reporting socially stigmatizing behaviors, there is very little methodological work available concerned with decreasing the problem of over-reporting socially desirable health behaviors. Nevertheless investigators continually cite over-reporting as a limitation of their research (Friedman et al., 1995; Phillips and Wilbur, 1995).

Improving the measurement of these health indicators is critical for several policy-related reasons. First, the measures used to collect them are long-standing and widely accepted. Thus, understanding the sources of measurement error will help to develop appropriate methods for collecting information regarding many of the new detection procedures that are only now becoming available. In addition, health-related indicators, such as Pap smears and mammograms, are increasingly being used as performance measures in the evaluation of HMOs, making their reliable measurement all the more imperative. Finally, because there is growing evidence of secular trends in these data (Anderson and May, 1995), it is equally important that we have confidence that the changes are not an artifact of reporting error.

The reasons for such over-reporting are generally understandable. Because an interview is a social situation, respondents may edit their answers to questions so that they do not lose face in the eyes of the interviewer (Bradburn and Sudman, 1979). Health promotion and disease prevention activities are seen by both respondents and interviewers as socially desirable activities, similar to other socially desirable activities such as voting, church attendance, and giving to charity, which are also over-reported (Cahalan, 1968; Presser and Stinson, 1998). Respondents also distort in the direction of social desirability by underreporting socially undesirable behavior such as criminal activities and drug use. There has been substantial research on methods for reducing underreporting (cf., Harrison and Hughes, 1997), but much less research on methods for reducing over-reporting. For example, to our knowledge, differences in the over-reporting of socially desirable behaviors—including cancer screening behaviors—by mode of data collection have not been examined in the literature.

In this study, we test and examine alternative methods for reducing over-reporting of health promotion and disease prevention behavior. Reducing over-reporting behavior is expected to be difficult. Our earlier efforts as well as those of other

researchers have yielded only limited positive effects (Sudman et al., 1994). We hypothesize that respondents tend to edit responses to make them coincide with what they believe or expect is the desired response and will be reduced based upon revised cues in the question format. The approaches to be examined here attempt by various means to reduce respondent concerns about the social desirability of their responses. Four methods designed to reduce over-reporting are tested: (1) use of audio computer-assisted self-administered questionnaires (ACASI), (2) asking about future intentions prior to asking about current behavior, (3) asking about barriers, and (4) asking about exceptions. A rationale for each method is discussed below.

1.1. Use of audio computer-assisted self-administered questionnaires (ACASI)

Self-administered paper questionnaires have been shown to reduce over-reporting of some socially desirable behaviors by eliminating the demand characteristics of the interview situation (including telephone interviews) associated with direct interaction with the interviewer, and increasing respondents' feelings of confidentiality. Recent studies, reviewed below, suggest increased reporting of sensitive health behaviors such as drug use and sexual activity when audio computer-assisted interviewing (ACASI) is used instead of self-administered paper questionnaires. O'Reilly and his colleagues at the Research Triangle Institute (O'Reilly, Hubbard, Lessler, Biemer, and Turner, 1994) who first developed this procedure compared answers on sensitive questions when they were asked using self-administered paper questionnaires vs. ACASI. Although the sample sizes were very small, respondents who used ACASI consistently reported higher levels of drug use than did respondents who used paper self-administered questionnaires. Similarly, Turner and his colleagues (Turner et al., 1998) in the 1995 National Survey of Adolescent Males found that ACASI respondents were four times more likely to report some male-to-male sexual activity than were respondents reporting on self-administered paper questionnaires. Similar results were found by Tourangeau and Smith (1996) who found ACASI respondents were more likely to report drug use and engaging in oral sex than were respondents using self-administered paper question-naires.

Earlier work by Bradburn and Sudman (1979) indicated that over-reporting of socially desirable behavior such as voting and owning a library card could be reduced by use of self-administered paper

questionnaires compared to personal interviews. As discussed earlier, no one has yet tested ACASI methods to reduce over-reporting of desirable behavior, but previous findings regarding differences in the underreporting of undesirable behaviors by survey mode suggests this question is worth testing.

1.2. First asking about future intentions

The second method we tested was to first ask about intentions to engage in health promotion and disease prevention activities in the future before asking about current behavior. Considerable research currently exists regarding the correlates of (Bowen, Hickman, and Powers, 1997; Friedman et al., 1995) and predictive power (Chrvala and Iverson, 1989; Phillips and Wilber, 1995) of patient intentions to engage in cancer screening activities. We hypothesized that respondents who report that they plan to engage in an activity in the future will be under less social pressure to over-report their past practice with the behavior, because they are committing to do it. Moreover, behavior intention is a strong motivation to actually do it. The evidence that asking about intentions will reduce over-reporting of health behavior, however, is less direct, but the logic is promising. The literature suggests that in consumer surveys there is a general tendency to overreport intentions to buy a product (Silk and Kalwani, 1982; Mullett and Karson, 1985; Jamieson and Bass, 1989). It is generally believed that part of this over-reporting of intentions relative to actual purchases is caused by social desirability. Respondents over-report intentions because it costs them nothing and they see a positive answer as pleasing the researcher.

Asking about intentions before asking about actual behavior should reduce over-reporting of actual behavior for two reasons: a) Respondents will attempt to be consistent. If they report intending to do something in the future, this implies that they have not already done so, at least recently; and b) Giving a socially desirable answer on intentions reduces or eliminates the pressure to give a socially desirable response to the behavior question.

1.3. First asking about barriers

The available research literature suggests a number of potential barriers to cancer screening, including convenience factors such as transportation, office hours, day care requirements; unfamiliarity with warning signs and prevention techniques; anxiety regarding the procedures themselves, such as fear of pain or radiation and anxiety regarding cancer; other psychosocial factors such as perceived efficacy and sense of control; structural factors such

as insurance and type of care delivery; having a regular source of care; cost; variations in physician practice patterns; and, particularly among minority groups, distrust of physicians and the medical system in general (Breen and Kessler, 1993; Jennings, 1997; Lobell, Rhoads, and Keske, 1998; McPhee et al., 1997; Mouton, Harris, Rovi, Solorzano, and Johnson, 1997; Price, Desmond, Slenker, Smith, and Stewart, 1992).

We hypothesize that respondents who are able to report barriers to health promotion and disease prevention behavior will feel under less social pressure to report the activity. Although there are a substantial number of studies in the health services research literature that report barriers to obtaining medical and preventive care (see above), none of this literature directly suggests that asking about barriers reduces over-reporting of receiving care, but similar barrier questions have been used in election studies by Gallup and others and have reduced over-reporting of voting (See pp. 60-61 of Sudman and Bradburn, 1983), suggesting this may also be a promising approach to investigate vis-a-vis health behaviors.

The logic of using barrier questions relates to the framing of the questionnaire. The researcher asks the respondent to concentrate on what barriers she faces in obtaining health and preventive care. In this setting, reporting non-use is less threatening, and may even be seen as socially desirable because it is providing important information to the interviewer and researcher on barriers that need to be overcome.

It is not our goal to study barriers to (or intentions regarding) cancer screening per se. Our purpose in asking questions regarding these topics is to reduce the demand for socially desirable response by giving respondents an acceptable reason why they have not had these tests. We hypothesize that affording respondents the opportunity to report a good reason for not having had a test will reduce the social desirability associated with reporting one. For example, respondents reporting a barrier to a test, to be consistent, cannot then report having had a test. Similarly, reporting an intention to get a cancer screening test may reduce the threat and the social desirability of questions asking about past behavior. Also, to be consistent, if the respondent reports an intention to get a test in the near future, it would be inconsistent to report having received such a test in the recent past.

1.4. Asking about exceptions

For regular behaviors, we expect that reminding respondents of times when they did not engage in the behavior should reduce over-reporting. Aside from issues of social desirability, respondents may over-report regular preventive care such as annual check-ups because they remember them as being completely regular, when in fact there are sometimes exceptions. In this case Menon (1994) has shown that reminding respondents about exceptions can increase the accuracy of reporting for fairly short time periods.

2. HYPOTHESES

For purposes of this research, we are focusing on Pap smears, mammograms, and physical exams that are capable of validation from medical provider records. For these behaviors the quality of reported data may be measured directly by comparisons to provider records.

We test four research hypotheses concerned with the practical utility of each experimental manipulation for improving the quality of these health behaviors.

Hypothesis 1: Respondents interviewed with ACASI will provide more accurate reports of cancer screening experiences.

Hypothesis 2: Respondents first asked about future intentions to engage in cancer screening activities will provide more accurate reports of cancer screening experiences.

Hypothesis 3: Respondents first asked about potential barriers to health promotion and disease prevention behavior will provide more accurate reports of cancer screening experiences.

Hypothesis 4: Respondents specifically asked to recall exceptions to regular behaviors will provide more accurate reports of cancer screening experiences.

3. METHODS

3.1. Sample Design

A random digit dial sample of 12,923 telephone numbers was used to screen households in Champaign-Urbana, Illinois, for eligible respondents. The CATI sample accounted for two-thirds of the telephone numbers dialed (8,699 cases). The remainder of the sample was allocated to the ACASI condition (4,224 cases). All women 50 years and older, who had lived and received health care in the Champaign-Urbana area for three years prior to the date of their interview, were eligible to participate in the study. Households with African-American women were over-sampled. A total of 1,005 interviews were completed across both conditions: 790 via CATI interview and 215 via CATI screening & ACASI interview. The AAPOR (formula 3) response rate for the CATI interviews was 56.1%.

For the CATI screening & ACASI interview condition, the telephone screening response rate was 33.1% and the ACASI screening response rate was 78.6%; the overall response rate for this condition was 26.6%. Of those women completing interviews, 82.8% consented to having their medical records abstracted (*n*=832). Seventy-five percent of those women (*n*=621) granting consent actually returned signed consent forms to our offices.

3.2. Study Procedures

As described below, all respondents were also randomly assigned to participate in either an ACASI or CATI interview. In total, this study employed a 2x2x2x2 experimental design, which enabled us to manipulate each of the interview conditions being examined by our four hypotheses.

All respondents were randomly assigned: (a) to be asked about their future intentions to receive each of these procedures either before or after being asked about their past behavior; (b) to be asked about perceived barriers to receiving each procedure either before or after being asked about their past behavior, and (c) to be asked, or not, about exceptions to their regular behaviors before being asked about their past behavior. Interviewers trained in the use of CATI software screened Champaign-Urbana households for eligible respondents. During the screening process, interviewers explained the details of the study, answered respondent questions, informed them of the $10 gratuity, and gained cooperation. If an eligible respondent was identified and agreed to participate in the CATI condition, the interview occurred immediately following the screening. Following a completed telephone interview, respondents received a cover letter thanking them for their participation, a $10 gratuity, two copies of the consent form used for medical records abstraction (one for the respondent, the other for research use), a postage-paid return envelope, and an example of the data abstraction form.

In the ACASI condition, screened households were re-contacted by trained face-to-face interviewers. The questionnaire was completed in the homes of the respondents and at their convenience. Face-to-face interviewers presented themselves equipped with a laptop computer, a set of headphones, and relevant project materials. Prior to the respondent's self-administration of the questionnaire, the interviewers led the respondent through an ACASI tutorial and answered any questions she had regarding the interview, the audio, and the use of the computer. Consent forms for medical record abstraction were signed on the day of the interview.

All interviews were conducted between October 2001 and April 2002 in English only by female interviewers. The average telephone interview was approximately 25 minutes in length while the average ACASI version was approximately 35 minutes. Record abstraction occurred at the end of the study for all respondents. The only information extracted from respondents' medical records were the dates of their physical or gynecological exams, Pap smear tests, and mammograms. Area medical facilities were provided with signed consent forms and blank abstraction forms. Records personnel from each of the individual medical facilities abstracted all data. All study procedures were reviewed and approved by the University of Illinois at Chicago Institutional Review Board (IRB), as well as IRBs at the two major health care facilities in Champaign-Urbana.

3.3. Measures

In this study, we focused on self-reports of physical exams and two cancer screening examinations: Pap smear tests and mammograms. The self-report indicator was based on reports of these procedures during a three-year period prior to the date of interview. Self-reports of procedures were compared to objective medical records. Concordance was defined as self-report of procedure validated by record confirmation. While recognizing that there may be errors in health care provider records, we use these as the gold standard in assessing the quality of self-reported receipt of Pap smears, mammograms, and physical examinations when examining our hypotheses.

3.4. Analysis

We compare levels of survey and medical record agreement across each of the four experimental manipulations included in the factorial design of our survey. According to our research hypotheses, it is anticipated that improved self-reporting of several cancer screening procedures will be associated with the following interventions: (1) ACASI, as opposed to telephone (CATI) interviews; (2) asking about respondent intentions prior to asking about respondent behaviors; (3) asking about perceived barriers prior to asking about respondent behaviors; and (4) asking respondents about exceptions to regular behaviors.

We first examined the concordance rate for each procedure—physical exams, Pap smear tests, and mammograms—and then we conducted a bivariate analysis on all primary variables. Logistic regression was also employed to explore the independent effects

of each experimental variable on report-record concordance (Hosmer and Lemeshow, 1989).

In analyzing the effects of ACASI vs. telephone administration (Hypothesis 1), we follow classical experimental procedures by analyzing respondents within the conditions to which they were initially assigned, regardless of the method by which they were actually interviewed. Consequently, any respondents assigned to the ACASI condition who expressed concern regarding the use of the computer and who were subsequently interviewed face-to-face will nonetheless be included within the ACASI group for purposes of our main analyses.

4. RESULTS

A breakdown of sample composition by each of the four experimental variables employed in this study found no significant variations in the distribution of age, education, race/ethnicity, health insurance, and family history of cancer across any of the study's four manipulations.

Table 1 presents basic concordance data for medical examinations, Pap smears, and mammographies reported during the past three years. Overall, concordance rates ranged between 79.1% (for Pap tests) and 87.9% (for mammography). The concordance rate for receipt of a medical exam during the past three years was 82.7%. When disaggregated by each experimental manipulation, the self-report/medical record agreement of medical exams and mammography screening were found to be greater among those women who were interviewed via telephone. The accuracy with which Pap tests were reported was significantly greater among women who were first asked about their future intentions to receive a Pap smear. Two of the experimental manipulations, the placement of the barriers to health care questions and asking about exceptions to medical care patterns, were not found to be associated with the accuracy of any of the self-reported health care behaviors.

A set of three logistic regression models (not shown) designed to evaluate the independent effects

Table 1. Self-report/medical record concordance by experimental variables.

	Medical Exam		Pap Smear		Mammography	
	%	(*n*)	*%*	(*n*)	*%*	(*n*)
Total	82.7	(594)	79.1	(604)	87.9	(597)
Barriers						
Asked before	81.9	(288)	78.6	(290)	88.2	(288)
Asked after	83.3	(306)	79.6	(314)	87.7	(309)
Exceptions						
Yes-asked about	82.1	(279)	81.6	(283)	87.5	(281)
No-not asked about	83.2	(315)	76.9	(321)	88.3	(316)
Intentions						
Asked before	82.8	(302)	82.7*	(306)	90.1	(304)
Asked after	82.5	(292)	75.5	(298)	85.7	(293)
Interview Mode						
Telephone	84.8	(415)	80.2	(419)	90.0	(418)
ACASI	77.7*	(179)	76.8	(185)	83.2*	(179)
Interview Mode/ Computer Ownership						
Telephone	84.8**	(415)	80.2	(419)	90.0*	(418)
ACASI–Computer at Home	82.7	(127)	79.4	(131)	85.8	(127)
ACASI–No Computer at Home	65.4	(52)	70.4	(54)	76.9	(52)

*   *p*<.05
**   *p*<.01

of each experimental variable on the concordance measures for each screening behavior were next examined. Interview mode was again found to be predictive of the accuracy of reports of receipt of a mammography exam and a medical exam during that time period. For each of these outcomes, ACASI interviews provided less concordant information than did those conducted via telephone. The odds ratio for Pap smear concordance also favored the accuracy of telephone interviews, although it did not reach significance. The placement of the intentions question in the interview schedule was found to have a significant effect on the quality of Pap smear reporting. Specifically, persons asked about future intentions before being asked about having had a Pap screening during the past three years were more likely to accurately report this behavior. The odds ratio for mammography screening also favored the advance placement of the intentions question, although this variable also did not attain statistical significance. These findings did not change in additional models in which controls were introduced for respondent age, education, and race/ethnicity.

To further explore the effects of interview mode on reporting quality, the interview mode variable was reconstructed to differentiate between those ACASI respondents who did and did not have computers at home. The analyses discussed above were re-estimated using this revised interview mode measure. A post hoc hypothesis was developed that computer familiarity may have an important effect on the ability of a sample of older respondents to effectively utilize the ACASI technology, with those having less computer experience being less able to provide correct information when distracted by the additional cognitive demands of the computer equipment and programming. The final cross-tabulation in Table 1 compares concordance measures for those inter-viewed via telephone vs. ACASI, disaggregated by home computer ownership, for each cancer screening behavior. These findings reveal that there is indeed an important difference in reporting quality between these groups, with those not owning computers giving significantly less accurate responses to questions regarding receipt of medical examinations and mammographies. Additional logistic regression models (not shown) also designed to examine these effects found that results pertaining to the intentions, barriers, and exceptions manipulations did not change. The effects of interview mode, however, did change in these reanalyses. Specifically, no differences in concordance were found between telephone and ACASI interviews when the ACASI respondents reported that they owned a personal computer. The differences in report quality remained, however, between telephone respondents and ACASI

respondents who did not report personal computer ownership. Those ACASI respondents who did not report having a computer at home gave less concordant responses to the questions regarding most recent medical examination and most recent mammography screening. Lack of computer ownership did not have a significant effect on Pap smear reporting, although the trend was in the same direction.

Finally, to better understand how the non-computer ACASI households differed from those with a computer, additional cross-tabulations were examined. These analyses revealed that, within the ACASI condition, those respondents reporting no computer in the household tended to be much older and less educated. In particular, average age of women completing ACASI questionnaires who had computers in their home was 59.7 years, compared to 68.7 years among those women answering via ACASI who did not have computers in their homes.

5. DISCUSSION

Most promising of our findings were those related to the intentions manipulation, which are supportive of the proposition that first asking about future intentions reduces the social desirability demands of reporting positive past behavior, thereby increasing data quality. We would consequently encourage future methodological research with this questionnaire structure and also recommend that health researchers consider including initial questions about future intentions when collecting data regarding socially desirable health behaviors.

An unexpected finding concerned the effects of the ACASI data collection mode in a survey of older respondents. Post hoc analyses strongly suggest that some members of our pool of respondents had difficulty navigating the computer technology associated with the ACASI mode. Rather than assuring confidentiality of answers, as originally intended, the ACASI mode appears to have distracted those women with fewer computer skills from the primary task of providing accurate information. The interpretation that these women were distracted is supported by the additional finding (not shown) that these women were as likely to over-report as they were to underreport these health behaviors. This pattern suggests that measurement error was random, rather than a deliberate attempt to provide incorrect, albeit socially desirable, information. Forced to focus on the necessary task of operating the computer, those women less familiar with the technology and equipment, we hypothesize, were forced to divert some of their cognitive effort from retrieving the information necessary to accurately answer these

questions. In contrast to those interviewed via telephone, who were not distracted by the additional responsibility of operating a computer, greater proportions of ACASI respondents failed to correctly answer the health behavior questions. This interpretation is strengthened by the fact that reporting error was greatest among those ACASI respondents who were older, less educated and without access to a home computer.

We would consequently caution researchers to carefully consider the likely composition of their samples when deciding whether to employ ACASI technology for data collection. When surveying populations with less computer experience, the introduction of this technology may do more harm than good, increasing cognitive burdens and decreasing data quality for some.

In considering limitations of this research, we acknowledge that the use of medical records as a 'gold standard' for evaluating the quality of self-reports may be challenged. In particular, we recognize the experience of many researchers who have relied on medical records and have reported that they are an incomplete and not totally reliable source (Feigl, Glaefke, Ford, Diehr, and Chu, 1988; Kosecoff, Fink, Brook, and Chassin, 1987). Use of auxiliary, albeit imperfect, information nonetheless provides invaluable insights not typically available in self-report studies.

Finally, we note that two of the experimental manipulations evaluated, barriers and exceptions, were found to have no association with self-report accuracy. We plan to conduct additional analyses to determine if experimental effects are present but being suppressed or modified by other variables. For example, we plan to determine the potential effects of various types and numbers of barriers actually endorsed by respondents on the accuracy of their responses.

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