

TECHNICAL PAPERS ON HEALTH AND BEHAVIOR MEASUREMENT

TECHNICAL PAPER 24

Survey Measurement of Sexual Behaviors: Problems and Progress

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Reference Citation

Turner, C.F., H.G. Miller, and S.M. Rogers. (1997) Survey measurement of sexual behaviors: Problems and progress. In J. Bancroft (ed.), *Researching Sexual Behavior*. Bloomington, Ind.: Indiana University Press.

Survey Measurement of Sexual Behavior

Problems and Progress

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Overview

In this chapter, we review evidence of the biases that attend common measurements of sexual behavior, as well as new developments that hold promise of reducing these biases. Given the underinvestment in research on sexual behavior during the past four decades, this area today is informed by only a thin substrate of methodological studies. For this reason, much of the evidence we adduce to support inferences about biases in such measurements must be drawn from parallel experience in measuring other sensitive behaviors—for example, drug use. We subsequently describe promising technologies for improving survey measurements of sexual behavior and present data from a pilot study that examined the impact of one approach in reducing bias in such measurements.

Central Role of Surveys

Surveys of the sexual and drug-using behavior of large, representative samples of the U.S. population have long been recognized as a prerequisite for understanding and retarding the spread of the human immunodeficiency virus (HIV). Indeed, at present, all means of controlling the spread of HIV, the most deadly of sexually transmitted pathogens, rely on our ability to influence human behavior. Even if a fully effective vaccine or therapy becomes available, the history of other sexually transmitted diseases, or STDs (Brandt, 1987), suggests that the need for protective behavioral change will persist. So, too, will the need for a reliable technology to monitor the effectiveness of our efforts to encourage such changes in behavior.

Groups that have reflected on the research required to combat the epidemic of acquired immunodeficiency syndrome (AIDS) have echoed those arguments for survey research that investigates sexual and drug-using behavior. Such bodies include numerous committees of the National Academy of Sciences and the Institute of Medicine (IOM, 1986, 1988; Turner, Miller, & Moses, 1989; Miller, Turner, & Moses, 1990; Auerbach, Wypijewska, & Brodie, 1994), Ronald Reagan's Presidential Commission on the

HIV Epidemic (1988), the National Commission on AIDS (1993), and the General Accounting Office (1988). Among the major reasons those groups cite for conducting surveys are the following:

- Understanding the spread of the HIV epidemic (and its *potential* for spread) requires knowing some simple “facts” about sex, such as the size of key population groups, including men who have sex with men and heterosexuals with multiple partners; the rates of new partner acquisition; and so forth. Population-based surveys of sexual behavior can supply estimates of the prevalence and patterns of behavior that affect the velocity and breadth of spread of HIV and other STDs.
- Inducing behavioral change requires an understanding of what motivates and constrains behavior that risks transmission of HIV and how behavioral change can be made more attractive. Surveys can provide information about the factors that shape risk-taking behavior and thus help researchers to develop hypotheses about the sorts of behavioral interventions that may motivate individuals to change that behavior.
- Measuring the effectiveness of prevention efforts requires data collected at one point in time as a baseline and data collected at regular intervals thereafter to assess whether protective change is occurring in the population’s patterns of sexual behavior. Continued monitoring of behavior through population surveys allows scientists to gauge the persistence of change and risk-taking as new people enter the at-risk population, as the current at-risk population ages, and as secular events modify people’s responses to this epidemic.

The National Institutes of Health (NIH) has responded to the need for such data by funding several major research projects to survey AIDS-related sexual and drug-using behaviors in the U.S. population. Because of the substantial cost of sending field interviewers to tens of thousands of households across the country, the largest surveys of the U.S. adult population have used telephone survey techniques. In the National AIDS Behavioral Survey (NABS) research program (Catania et al., 1992b), telephone interviews were conducted with 10,630 respondents in 1990; currently, telephone interviews are proceeding among a new probability sample of 6,400 U.S. adults. These NIH-funded telephone surveys are substantially larger than the surveys of adults that have collected data on AIDS-related behavior during personal visits.¹ Because of the great efficiency of tele-

1. So, for example, Tanfer’s (1993) National Survey of Men conducted in-person interviews with 3,321 men, and the University of Chicago team of Laumann and colleagues (1994) interviewed 3,432 adults in the National Health and Social Life Survey. The lone exception to the generalization that in-person surveys of adult sexual behavior have been conducted with much smaller samples than comparable telephone surveys is the British National Survey of Sexual Attitudes and Lifestyles (Johnson et al., 1994), which undertook in-person interviews with 18,876 respondents.

Table 1. *Selected Major Telephone Surveys of AIDS-Related Behaviors*

Survey	N	Population	Reference
1990 National AIDS Behavioral Survey (NABS)	10,630	U.S. adults, ages 18–75	Catania et al., 1992b
Analyse des Comportements Sexuels en France (ACSF)	20,055	French adults, ages 18–69	ACSF Investigators, 1992
New Zealand Partner Relations Survey	2,361	New Zealand adults, ages 18–54	Davis et al., 1993
Los Angeles Men's Survey	1,610	Los Angeles males, age 18 and older	Montgomery, Lewis, and Kirchgraber, 1991
Australian Survey of Sexuality and Menopause	2,001	Australian women, ages 45–55	Dennerstein et al., 1994
California AIDS Survey	2,012	California adults, age 18 and older	Communication Technologies, 1987

phone survey methods, the NABS research program surveyed samples that were large enough to permit analyses of key subpopulations (for example, people with multiple new sexual partners in the past year); surveys of samples of comparable size would be almost prohibitively expensive to conduct using personal interviews. Telephone surveys have also played a crucial role in shaping our understanding of AIDS-related behavior in other nations (see Table 1).

Because of the importance of telephone surveys in monitoring AIDS risk behaviors, emerging evidence suggesting the possibility of nontrivial reporting biases has caused substantial concern. Interview modes that require respondents to disclose sensitive, stigmatized, or illicit behavior to a human interviewer appear to affect the quality of the data. In particular, requiring respondents to disclose to a human interviewer that they have engaged in such behavior seems to greatly diminish the willingness of respondents to report those activities.

Quality of Survey Data: Issues and Concerns

Concerns persist regarding the quality of survey measurements of sexual behavior. We know that adults typically underreport many sexual activities² and that important gender-related differences are present in the error structure of the data. In national probability surveys in the United States and Europe, for example, studies found that men consistently reported more heterosexual partners than did women—an algebraic impossibility.³ Similarly, among individuals who reported risk factors for HIV and other STDs, men were more likely than women to report using condoms during heterosexual sex (Catania et al., 1992b). In both of these cases, the extent to which the difference in results by gender reflects overreporting by men or underreporting by women is not known.

Although a complex array of factors can distort survey measurements of sexual behavior, there are only a few ways to independently corroborate the accuracy and reproducibility of those measurements. To date, evidence of validity and reliability has been gleaned largely from reports by regular sexual partners, test-retest reliability studies, and independent replication of surveys within the same population.⁴ A review by the National Academy of Sciences of studies conducted before 1990 concluded that surveys of sex-

2. For reviews, see Chapter 6 in Miller, Turner, & Moses, 1990; Turner, Danella, & Rogers, 1995; Catania et al., 1990; and Bradburn & Sudman, 1979. See also Johnson et al., 1994; and McQueen et al., 1989.

3. See Smith, 1992; Dolcini et al., 1993; and Morris, 1993. However, for a proposed resolution of the paradox, see Wadsworth et al., 1996.

4. See Clark & Wallin, 1964; Levinger, 1966; Jacobson & Moore, 1981; Blumstein & Schwartz, 1983; Coates et al., 1988; Kahn, Kalsbeek, & Hofferth, 1988; and Seage et al., 1989. For reviews, see Chapters 2 and 6 in Turner, Miller, & Moses, 1989; and Turner, Danella, & Rogers, 1995.

recent use. SAQs yielded estimates of the prevalence of recent cocaine use that were 2.4 times higher than estimates obtained with interviewer-administered questionnaires (IAQs). The effect was less pronounced for reports of marijuana use, and it was almost nonexistent for reports of alcohol use by adults.⁵ Recent analyses of a parallel experiment embedded in the National Longitudinal Survey of Labor Market Experience, Youth Cohort (NLS-Y), also found that SAQs yielded more frequent reports of illicit drug use than did IAQs (Shober et al., 1992).

Dramatic mode effects have also been seen when women are offered an SAQ to report on abortion. Jones and Forrest (1992) have used data from abortion providers to estimate the extent of bias in reports of abortions in three major national survey programs: the National Survey of Family Growth (NSFG), the NLS-Y, and Kantner and Zelnik's national surveys of young women. They found substantial biases in reports of abortion in all of those surveys. Estimates derived from women's self-reports in the 1988 NSFG, for example, included only 37% of the abortions reported annually by abortion providers during the 1984–1987 period. In that same wave of the survey, women were also given an SAQ to offer a second, private opportunity to report past abortions (London & Williams, 1990). Jones and Forrest note that use of SAQs increased reporting of abortions from 39% to 71% of the level reported by abortion providers.

Evidence of Bias in Measurements from Telephone Surveys

Although the need for economy argues for use of telephone survey methodology to collect AIDS behavioral data from the population, such surveys may be vulnerable to serious biases. Two major studies compared estimates of the prevalence of illicit drug use obtained from interviewer-administered telephone surveys with estimates obtained from self-administered questionnaires during in-person surveys. (Table 2 summarizes the relevant results.) Gfroerer and Hughes (1992) compared results from the 1988 National Household Survey on Drug Abuse, a survey conducted in person that uses self-administered questionnaires, with results from a 1988 national telephone survey conducted for the Food and Drug Administration (FDA). The FDA survey used questions modeled on those in the NHSDA, and Gfroerer and Hughes went to considerable lengths to match the composition of the two samples.⁶ With fairly large samples ($n_s = 5,018$

5. However, even for alcohol use, SAQs appeared to encourage more reports by 12- to 17-year-olds—a group for whom the use of alcohol is illicit. For this group, estimates of the prevalence of recent alcohol use were 1.4 times higher when SAQs were used.

6. For example, households without telephones were excluded from the NHSDA database, and re-editing and poststratification weighting were used to make the data processing and sample composition for the surveys comparable.

Table 2. Prevalence Estimates for Sensitive Alcohol and Drug Use Behaviors Derived from Telephone Surveys and Relative Increases in Prevalence Observed When Estimates Are Derived from Self-Administered Questionnaires in Personal Visit Surveys

Measurement	Gfroerer and Hughes (1992) (a)		Aquilino (1994) Total Sample (b)		Aquilino (1994) Black Sample (c)	
	Prevalence Estimate from Telephone Survey (Per 100)	Relative Increase with Self-Administration (d)	Prevalence Estimate from Telephone Survey (Per 100)	Relative Increase with Self-Administration (d)	Prevalence Estimate from Telephone Survey (Per 100)	Relative Increase with Self-Administration (d)
Drunk 1+ times per month in past year	n.a.	n.a.	11	36%	4	275%
Ever used marijuana	25.8	33%	56	4%	46	26%
Used marijuana in past 12 months	5.2	54%	8	63%	5	200%
Ever used cocaine	7.9	43%	19	32%	12	92%
Ever used crack	n.a.	n.a.	2	100%	1	700%
Used cocaine in past 12 months	1.4	121%	3	0%	2	150%

Note. All estimates exclude households that do not have working telephones; n.a. = not available.

(a) Gfroerer and Hughes (1992) compared results for 5,018 respondents age 18 and older (living in households with a telephone) in the National Institute on Drug Abuse's (NIDA's) 1988 National Household Survey on Drug Abuse (NHSDA) with results obtained in a Food and Drug Administration (FDA)-sponsored telephone survey of a national probability sample of 1,965 adults conducted in 1988. The latter survey used NHSDA questions reformatted for computer-assisted telephone interviewing. Reported response rates for the adult sample varied somewhat (71% in the NHSDA versus 66% in the FDA telephone survey). Prevalence estimates were derived after re-editing datasets and re-weighting samples to ensure that they were comparable.

(b) The Aquilino (1994) sample included 2,417 adults ages 18 to 45 drawn as a multistage area probability sample of the 37 largest metropolitan statistical areas in the United States. Sampled respondents were randomly assigned (within sample clusters) to one of three experimental treatments: telephone survey; in-person, interviewer-administered questionnaire survey; or in-person survey with an SAQ. Samples in the two treatment conditions (telephone vs. SAQ) presented in this table represent approximately two thirds of the total n of 2,417.

(c) The survey oversampled African Americans and Hispanics. Aquilino (see his Table 1) indicates that 22% of 2,417 respondents were African American (i.e., n = 532). As with the total sample, the two (randomly assigned) treatment conditions presented in this table would represent roughly two thirds of the total sample of African Americans.

(d) Relative percentage increase in reporting defined as $(100 * (\text{SAQ [self-administered questionnaire] Estimate} - \text{Telephone Estimate}))$ divided by Telephone Estimate.

and 1,965), Gfroerer and Hughes found that SAQs yielded significantly and substantially higher estimates of illicit drug use. The relative increase in estimated prevalences ranged from 33% for reporting any lifetime use of marijuana to 121% for reporting use of cocaine in the past 12 months.

Aquilino (1994) has recently reported similar results from an experiment in which respondents were randomly assigned to different modes of survey administration. The experiment was embedded in a probability survey of households in the 37 largest metropolitan areas in the United States. To remove the impact of differences in recruitment by survey mode, the experiment began with an initial in-person household contact to screen and recruit respondents, who were then randomly assigned to a survey mode.⁷ Aquilino's results were generally consistent with those of Gfroerer and Hughes, although Aquilino's estimated prevalences of drug use were higher and there was some variation in the observed mode differences. Overall, Aquilino found that self-administered surveys produced higher estimates of prevalence for most measurements of drug use. So, for example, self-administered surveys produced a 63% relative increase in reports of marijuana use in the past 12 months and a 32% relative increase in reports of any lifetime cocaine use. Aquilino also reported similar results for his oversampling of 532 African American respondents. Although the small samples in that subanalysis make the estimates rather unstable, the analyses offer highly suggestive evidence that African American respondents may be more sensitive than the rest of the population to the mode of survey administration and more likely to report drug use in a self-administered survey than in a telephone survey.

Limitations of In-Person Surveys Using SAQs

Given this litany of potential measurement biases, one might wonder whether we should retreat to conducting only in-person surveys that use self-administered questionnaires. For several reasons we should seek alternative solutions. First, using only in-person surveys with SAQs would mean substantially higher costs for those surveys that are now conducted by telephone. Second, although SAQs constitute a reasonable technology for surveying sexual, contraceptive, and other sensitive behavior, they have important drawbacks. Extensive use of contingent questioning—that is, branching or skip patterns—may not be possible in SAQs because some respondents have trouble following the complex instructions necessary to navigate their way through a self-administered form (Lessler & Holt, 1987). This limitation makes it difficult to match the questions that are asked of a respondent with the particular behavior they report—for example, by asking detailed follow-up questions.

7. Households without a telephone were excluded from analyses.

Even more important, according to the National Center for Education Statistics (1993), the reading skills of a sizable segment of the U.S. population are limited. Literacy problems are particularly severe among some of the populations of special interest in studies of sexual behavior, including people whose history of STDs or drug use places them at greater risk of HIV infection. (In studies of intravenous drug users in Baltimore, for instance, AIDS researchers⁸ estimated that between 30% and 50% of study participants could not reliably complete a self-administered survey form.) The extent of reading problems in such populations means that a sizable proportion of the respondents in national surveys and other kinds of research must be questioned by an interviewer. This requirement introduces potential bias into the resultant measurements of stigmatized sexual, drug use, and related behavior. Furthermore, the bias that is introduced when an SAQ must be administered by the interviewer will be correlated not only with the respondent's level of literacy but with other important variables associated with literacy, such as education and related socioeconomic and demographic characteristics.

For respondents who are able to complete SAQs, the available evidence suggests that this survey mode invites other data-quality problems. For example:

- Attempts to derive national estimates of the prevalence of male-male sexual contact from the 1970 Kinsey Institute survey required more than a year of statistical effort to impute values for the 20% of cases in which key data elements were missing on the SAQ (Fay, Turner, Klassen, & Gagnon, 1989; Turner, Miller, & Moses, 1989, pp. 122–128).
- Analysis of more recent SAQ data on sexual behavior (Rogers & Turner, 1991) indicated that the nonresponse problem had not improved markedly over the past 20 years. For instance, we found that questions on male-male contact were not answered by 19% of men completing the sexual behavior SAQs used in the 1989 and 1990 General Social Surveys conducted by the National Opinion Research Center. Similarly, Cox and colleagues (1992) found that 14% of the respondents to the 1988 NHSDA did not answer one or more SAQ questions about cocaine use.
- Analyzing the patterns of response in major surveys that use SAQs indicates that substantial proportions of respondents give logically inconsistent answers. Cox and coworkers found, for example, that of 946 respondents who reported cocaine use on one or more questions in the

8. David Celentano, School of Public Health, Johns Hopkins University, in discussions with the steering committee for the Multisite Trial of Behavior Interventions to Halt the Spread of HIV, sponsored by the National Institute of Mental Health, February 1991.

1988 NHSDA, more than 14% gave logically inconsistent answers—that is, their responses to one or more questions indicated that they had never used cocaine. Similarly, Smith (1989) reported evidence suggesting that approximately one half of the men who reported male-male contact in the 1988 General Social Survey gave responses to other questions in the face-to-face segment of the survey that raised doubts about the validity of their reports of homosexual contact on the SAQ.

Until recently, these problems were unavoidable. Now, however, advances in survey technology offer hope that they can be overcome in the future. Specifically, audio computer-assisted self-interviewing (audio-CASI) and telephone audio-CASI (T-ACASI) appear to promise a reduction of the measurement biases that have plagued surveys of sensitive behavior in the past.

In-Person Audio-CASI

Over the past five years, researchers at Research Triangle Institute (RTI)⁹ have developed the audio-CASI technology to administer complex questionnaires in personal interview surveys (Turner, Lessler, & Gfroerer, 1992; O'Reilly & Turner, 1992; O'Reilly et al., 1994; Cooley et al., 1996). Using portable laptop computers, respondents listen to questions through headphones and enter their answers by pressing labeled keys. The recorded audio component has high-quality sound; it does not rely on synthesized voices and presents no significant delays in playing back the audio-delivered questions.¹⁰ This private interview mode can be used with any respondent who can hear and speak; it does not require literacy in any language.¹¹

9. A parallel effort was under way at the University of Michigan (Johnston, 1992) during the period. That effort implemented audio-CASI on the Apple Macintosh platform.

10. Although the new technology bears a superficial resemblance to attempts to use Sony Walkmen to read survey questions (Camburn, Cynamon, & Harel, 1991), it is, in fact, fundamentally different. In particular, audio-CASI is computer-controlled and thus capable of executing skip patterns, checking for out-of-range responses and inconsistencies across similar questions, and generating data files.

11. Because of audio-CASI, interviewers who spoke only English were able to interview subjects who spoke only Korean or Spanish (Turner et al., 1996b; Hendershot et al., 1996). English-speaking field interviewers carried cellular telephones when recruiting and interviewing Korean- or Spanish-speaking subjects. If the interviewers encountered problems rostering the household, recruiting subjects, or conducting the interview, they could call the study office, where Korean- and Spanish-speaking interviewers were available for help. The audio-CASI computer was programmed to read questions and answers in both Spanish and Korean. We believe that extensions of this method will provide an efficient, cost-effective way to include linguistic minorities who would otherwise be excluded from national samples.

Our in-person audio-CASI technology is robust, and the average field interviewer can use it in a broad range of environments. The audio software is integrated with a standard software system for computer-assisted interviewing. A number of support capabilities are provided through the personal computer (PC) function keys: the screen display can be blanked out or left on; the audio can be turned on or off; questions can be repeated; and the respondent can back up through the questionnaire or can elect to refuse to answer a particular question. Our early audio-CASI pilot tests indicated the following:

- The technology was stable and could be used without disrupting typical survey and research routines.
- Virtually without exception, respondents had no trouble using the new technology. That was true for both educated people and people with substantial reading problems, for the young and the old, and for English-speaking respondents and respondents who spoke only Spanish or Korean.
- Even literate respondents reported that they preferred the new technology to paper-and-pencil SAQs.
- Although the samples for the pilot test were small, statistically significant increases were found in reports of some sensitive behavior (such as abortion) when audio-CASI was used.

During 1995, RTI's in-person audio-CASI technology was adopted for use in two major national surveys: the National Survey of Family Growth, sponsored by the National Center for Health Statistics of NIH (Cycle V; $n = 10,000$ females, ages 15 to 44), and the NIH-funded National Survey of Adolescent Males, or NSAM (new cohort; $n = 1,741$ males, ages 15 to 19). Preliminary data from these surveys indicate that the audio-CASI technology was well accepted by field interviewers and survey respondents in personal visit surveys and that it substantially increased reports of sensitive behavior. In the NSFG, for example, one fifth of women increased the number of abortions or sexual partners they reported during reinterviews that used audio-CASI to administer the survey questions (Kinsey, Thornberry, Carson, & Duffer, 1995). Similarly, preliminary data from a randomized experiment embedded in the NSAM also indicated a substantial increase in the number of adolescent males who reported having male-male sexual contacts (Turner, Ku, Sonenstein, & Pleck, 1996a).

Table 3 presents the results obtained from the first 928 respondents in the 1995 NSAM.¹² The table shows the percentage of respondents who re-

12. The two paragraphs that follow, which describe the 1995 NSAM, are excerpted from Turner and colleagues (1996a).

ported engaging in each of six types of male-male sexual contact: masturbating another male, being masturbated by another male, insertive oral sex, receptive oral sex, insertive anal sex, and receptive anal sex. The final line of the table shows the results for a composite measure comparable to that reported for the 1988 NSAM. The measure indicates whether the respondent reported at least one type of male-male contact.

As Table 3 shows, there were substantial and statistically reliable differences between the reports given in the audio-CASI interview and those provided in the paper-and-pencil SAQ. Respondents were more than four times more likely to report some male-male contact in the audio-CASI interview. Although the odds ratios for the individual behaviors varied somewhat (from 2.1 to 5.4) and several were statistically unreliable with our incomplete sample size of 928, it appears that audio-CASI will reduce the underreporting of male-male sex in the 1995 NSAM.

Telephone Audio-CASI Technology

In the winter of 1994–1995, researchers at RTI enhanced their in-person audio-CASI system to allow it to conduct complex call-in or call-out telephone audio-CASI surveys.¹³ (In a call-in survey, the respondent initiates the interview by calling a number that is answered by the T-ACASI interviewing system. In a call-out survey, a human telephone interviewer calls the respondent and subsequently transfers the call to the T-ACASI system.)

Our T-ACASI system is an outgrowth—both in motivation and architecture—of the technology RTI developed for in-person audio-CASI surveys of sexual and contraceptive behavior. Those efforts resulted in development of a software platform that fully integrates audio-CASI and

13. Early experimentation with T-ACASI began at the Bureau of Labor Statistics (BLS) during the late 1980s under the rubric of touch-tone data entry (TTDE) surveys (Werking, Tupek, & Clayton, 1988; Werking et al., 1988; Clayton & Harrell, 1989; Werking & Clayton, 1990; Clayton, 1991). In the early 1990s, RTI adopted an analogous touch-tone data entry procedure for call-in randomization of subjects for clinical trials. Such early systems are currently being used by the BLS in its monthly collection of data from the vast majority of the 350,000 establishments that respond to the Current Employment Survey. Methodological research indicates that error rates using TTDE technology are low (Phipps & Tupek, 1990) and that TTDE has a considerable advantage over other methods in terms of cost and timeliness of data reporting (Werking & Clayton, 1990). Initial T-ACASI applications were limited to simple data-collection tasks, typically involving only 5 to 10 questions that were asked without skip patterns or other tailoring of the survey instrument (Weeks, 1992). The Current Employment Survey, for example, requires only 1 minute and 45 seconds for the average respondent to complete. In addition, both the subject populations and the subject matter for those early T-ACASI efforts were limited to routine, nonsensitive reporting of commercial or technical data by trained, highly literate respondents.

Table 3. *Estimates of Prevalence of Different Types of Male-Male Sexual Contact in a National Sample of Males Ages 15 to 19, by Mode of Data Collection (Self-administered Questionnaire or Audio-CASI): Preliminary Results from the 1995 National Survey of Adolescent Males*

Measurement	Estimated Prevalence (Per 100)					
	Paper SAQ		Audio-CASI		Odds Ratio	<i>p</i>
	Est.	(N)	Est.	(N)		
Ever masturbated another male	1.1	(176)	2.3	(731)	2.07	0.29
Ever been masturbated by another male	0.6	(176)	3.0	(730)	5.44	0.03
Ever had insertive oral sex with another male (your penis in his mouth)	0.6	(176)	2.5	(730)	4.42	0.07
Ever had receptive oral sex with another male (his penis in your mouth)	0.6	(176)	2.1	(730)	3.67	0.13
Ever had receptive anal sex with another male (his penis in your rectum or butt)	0.0	(176)	1.2	(730)	(b)	0.05
Ever had insertive anal sex with another male (your penis in his rectum or butt)	0.6	(176)	1.6	(729)	2.93	0.23
Any male-male sex (a)	1.1	(176)	4.7	(728)	4.26	0.01

Note. Preliminary data from the first 928 cases of the 1995 National Survey of Adolescent Males. *p*-values are those for likelihood ratio chi-square for fit of independence model to the two-way table of mode by reporting of behavior. SAQ = self-administered questionnaire; CASI = computer-assisted self-interviewing.

(a) This composite measure of any male-male sex is derived from the six individual measurements. Cases with missing data for any of the six behaviors were excluded from the analysis of the composite measure.

(b) An odds ratio cannot be calculated because of the zero denominator.

Source. Turner, C. F., Ku, L., Sonenstein, F. L., & Pleck, J. H. (1996a). Impact of audio-CASI on bias in reporting of male-male sexual contacts: Preliminary results from the 1995 National Survey of Adolescent Males. In R. B. Warnecke (Ed.), *Health survey research methods*. Hyattsville, MD: National Center for Health Statistics.

T-ACASI capabilities and that can be implemented on a wide array of hardware. By merely cloning the relevant software and digitized voice files, the administration of a survey can be painlessly transferred among (1) laptop PCs used in the field, (2) desktop systems used in clinics, and (3) telephone audio-CASI systems used for call-in or call-out surveys.

Pilot Test of T-ACASI

Encouraging preliminary results are available from a pilot study that implemented the questionnaire from the National AIDS Behavioral Survey (Catania et al., 1992b) under T-ACASI.¹⁴ (The NABS survey includes a wide variety of questions on sensitive issues, including heterosexual and same-gender sexual experiences, HIV serostatus, and drug use.) The pilot study used a cross-over experimental design in which a live telephone interviewer first asked each respondent¹⁵ a standard set of introductory questions (section A) to elicit nonsensitive personal characteristics and attitudes. The sensitive questions in the survey were divided into two sections (B and C), and subjects were randomly assigned to one of two experimental conditions: (1) all questions in section B were administered by a human interviewer, and all questions in section C were administered using T-ACASI; or (2) all questions in section B were administered using T-ACASI, and all questions in section C were administered by a human interviewer. At the conclusion of the interview, a human telephone interviewer asked respondents a final series of questions (section D) to evaluate their experience with each mode of interviewing.

In addition to assessing the feasibility of implementing the new technology, the pilot study was intended to test two hypotheses:

H₁ Respondents will feel more comfortable reporting sensitive sexual behavior to a computer in a T-ACASI interview than to a human interviewer in a standard telephone interview.

14. In this section, we draw on material reported in Turner and coworkers (1996c).

15. The sample for this experiment was restricted to people ages 18 to 49. People under the age of 18 were excluded because of the difficulties in obtaining written parental consent in a telephone survey. People over the age of 45 were excluded because they have a low incidence of STDs and of risky sexual practices (Catania et al., 1992b:1103; Laumann et al., 1994:Tables 5.4a and 11.2). The pilot study used a composite sample with two strata. The first and largest stratum (target $n = 200$) was recruited from a probability sample of households with listed telephones in Cook County, Illinois (which comprises the city of Chicago and surrounding areas). The second stratum (target $n = 50$) was made up of patients recruited from the Wake County STD Clinic in Raleigh, NC. We included that group in the experiment to gain information on the impact of T-ACASI in a population that has a history of HIV risk behavior. We report here the results of a preliminary analysis of data from the first 142 interviews conducted in the pilot study.

H₂ Respondents will be more likely to report engaging in stigmatized or sensitive behavior (e.g., anal intercourse) and less likely to report engaging in normative behavior (e.g., always using condoms) in the more private T-ACASI interview mode than in a standard telephone interview with a human interviewer.

Results from preliminary analyses of the first 142 interviews in the pilot study encourage us to believe that T-ACASI surveys of sexual behavior are both feasible and likely to improve the quality of the resultant data. First, we found that touch-tone telephones were widely available in the “younger households” in the study—that is, households with an adult aged 18 to 49. Second, we found that the T-ACASI system was stable and that interviewers had relatively little difficulty in using it.¹⁶ Third, our substantive hypotheses were generally confirmed by the study (see Table 4):

- By an odds ratio of 4.5, those who judged one method superior thought T-ACASI protected respondents’ privacy more effectively than standard telephone interviewing.
- By an odds ratio of 4.4 among respondents who had an opinion, T-ACASI was considered more likely to elicit honest reporting of sexual and drug use behavior.
- By an odds ratio of 2.9, respondents who preferred one method reported that T-ACASI was better than standard telephone interviewing for collecting information about sensitive behaviors.
- By an odds ratio of 1.8 among respondents who reported a preference, T-ACASI was thought to provide a more comfortable environment for answering sensitive questions.

Given the small number of interviews used for these analyses (the maximum number for each condition was 62 and 80), we initially feared that their statistical power would be inadequate to detect differences across interview modes. On the contrary: our preliminary analyses indicated that there were significant (or bordering on significant) differences in the

16. During the study and the poststudy reviews, we discovered, for example, that respondents with two-line phones or call-waiting would occasionally discontinue the interview to take another call. The T-ACASI system initially treated such lengthy “silences” on the line as terminated interviews. We have altered our system so that after waiting several minutes for the respondent to come back on the line, the T-ACASI program will notify the telephone interviewer of the interruption so that the interviewer can recontact the respondent to complete the interview. We also encountered instances of “dropped connections” during the first days of interviewing, but they were not so frequent as to disrupt our operations. To deal with these occasional glitches, our hardware interface has been “trained” to adapt better to the telephone switching system environment in which it is working (that is, the electronic characteristics of telephone lines when they “hang up,” generate flash tones, busy signals, and so forth).

Table 4. *Respondent Preferences for T-ACASI Versus a Standard Telephone Interview Using a Human Interviewer*

Dimension	Preference for			Odds Ratio (a)
	T-ACASI	Human	Indifferent	
Best at protecting your privacy	49%	11%	40%	4.53
Best for getting honest answers	73%	17%	10%	4.39
Best for asking about sensitive topics like sexual behavior	66%	23%	11%	2.88
More comfortable giving your answers	44%	24%	31%	1.82
Easier to use	30%	59%	11%	0.51
Most interesting to use	27%	50%	23%	0.54
Easiest to change answer (b)	1%	61%	37%	0.02

(a) Odds ratio for preference of T-ACASI to human interviewer; indifferent responses were excluded.

(b) This question asked respondents to rate which was the "hardest" mode in which to change answers. We report responses for the "easiest" mode to make them consistent with the coding of other dimensions in the table.

Source. Turner, C. F., Miller, H. M., Smith, T. K., Cooley, P. C., & Rogers, S. M. (1996c). Telephone audio computer-assisted self-interviewing (T-ACASI) and survey measurements of sensitive behaviors: Preliminary results. In R. Banks, J. Fairgrieve, L. Gerrard, et al. (Eds.), *Survey and statistical computing*, 1996. Chesham, Bucks, U.K.: Association for Survey Computing.

responses to many of the most sensitive questions in the survey. Anal intercourse among heterosexuals is probably the most sensitive behavior reported by a sizable proportion of the U.S. population¹⁷ and thus the behavior that should be most likely to show the effects, if any, of the increased privacy afforded by T-ACASI. As Table 5 shows, the pilot study found a difference of almost 17 percentage points in the proportion of respondents who reported engaging in anal sex during their lifetime in the interviewer-administered questioning (25.4%) compared with the T-ACASI mode (42.0%).¹⁸ T-ACASI also substantially increased the likelihood that respondents would admit that:

17. Laumann and colleagues (1994) note that 25.6% of men and 20.4% of women (ages 18 to 59) report having had anal intercourse.

18. Our ongoing analyses of data for the full experiment suggest that this result is attenuated in the sample from the full study.

- They never used a condom (18.4% for the T-ACASI mode versus 8.1% for the interviewer-administered mode).
- They had infrequent (less than once a month or never) discussions of their sex lives with their most recent partner (64.0% versus 30.7%).
- Their most recent sexual relationship lasted less than 6 months (21.3% versus 5.8%).
- They had very limited sexual experience (that is, no sexual partners in adulthood [7.6% in the T-ACASI mode compared with 1.6% with a human interviewer]; no sexual intercourse in the past 6 months [8.0% versus 1.5%]; or intercourse 10 or fewer times in the past 6 months [41.3% versus 22.7%]).

T-ACASI also appears to lessen the likelihood that respondents will overreport normative behavior. For example, although 14.8% of respondents told a human interviewer that they had "used a condom every time they had sex in the past 6 months," only 6.8% of respondents made that claim when they were interviewed using T-ACASI.

Although the results from this small number of interviews must be viewed cautiously, they appear to support our hypotheses that subjects prefer a T-ACASI interviewing mode when answering sensitive questions and that T-ACASI increases the likelihood that subjects will report sensitive behaviors and decreases overreporting of normative behaviors. Such results indicate the potential value of T-ACASI for improving data quality in telephone surveys of sexual behavior.

Future Research

The studies are part of our current program of research aimed at improving the quality of survey measurements of sexual and other sensitive behavior. Among the activities presently under way are:

- A large-scale national survey of sexual behavior conducted as a randomized field experiment in which one-half of respondents will be interviewed using standard telephone survey procedures and one-half will be interviewed using T-ACASI.
- Experimental comparison of audio-CASI with both interviewer-administered and paper-and-pencil self-administered measurements in a large-scale, in-person survey of sexual behavior.
- An experimental test of the impact of telephone audio-CASI on the reporting of HIV status and of sexual, drug use, and other sensitive behavior, which is being conducted as a methodological add-on to the Urban Men's Health Survey (with J. Catania and colleagues).
- Tests of the impact of audio-CASI on reports of sexual behavior and

Table 5. *Estimates of Prevalence of Sensitive Behaviors Obtained from Telephone Interviews Using Human Interviewers and Telephone Audio-CASI (T-ACASI)*

Measurement	Estimated Prevalence (Per 100)				Odds Ratio	p
	Human Interviewer		T-ACASI			
	Estimate	(Base N)	Estimate	(Base N)		
<i>Anal Intercourse</i>						
Ever had anal intercourse	25.4	(67)	42.0	(50)	2.13	0.03 (a)
Had anal intercourse in past 6 months	3.0	(67)	12.0	(50)	4.43	0.03 (a)
<i>Oral Sex</i>						
Given oral sex (since age 18)	79.7	(59)	79.5	(73)	0.99	ns (b)
Received oral sex (since age 18)	89.8	(59)	89.0	(73)	0.92	ns (c)
<i>Limited Sexual Experience</i>						
Had no sex partners since age 18	1.6	(61)	7.6	(79)	4.93	0.09 (d)
Had no sex in last 5 years	4.8	(62)	11.4	(79)	2.53	0.15 (e)
Did not have sex in past 6 months	1.5	(67)	8.0	(50)	5.74	0.01 (f)
Had sex fewer than 10 times in past 6 months	22.7	(67)	41.3	(50)	2.51	0.01 (f)
<i>Condom Use</i>						
Never used a condom in lifetime	8.1	(62)	18.4	(76)	2.57	0.07 (g)
6 months: Used condom every time had sex	14.8	(54)	6.8	(44)	0.42	0.14 (h)
6 months: Almost every time or every time had sex	27.8	(54)	15.9	(44)	0.49	0.14 (h)
<i>Stability and Quality of Relationships</i>						
Most recent sexual relationship lasted less than 6 months	5.8	(52)	21.3	(61)	4.42	0.01 (i)
Never discussed sex life with most recent partner	1.9	(52)	14.8	(61)	8.83	0.03 (j)

Measurement	Estimated Prevalence (Per 100)				Odds Ratio	p
	Human Interviewer		T-ACASI			
	Estimate	(Base N)	Estimate	(Base N)		
Discussed sex life less than once a month	28.8	(52)	49.2	(61)	2.39	0.03 (j)
Ever had a one-night stand since age 18	59.0	(61)	64.4	(73)	1.26	ns (k)

Notes. *p*-values are those for statistical tests of association in 2-way tabulations of Interview Mode by Question Response. In cases in which the response distributions have more than two categories, these *p*-values do not apply to each individual odds ratio. ns = not significant.

(a) MH = 4.97, d.f. = 1. Mantel-Haenszel test for trend in 2 × 3 table (Interview Mode by Reporting of Anal Sex). Categories of anal sex were (1) never experienced, (2) experienced but not in past 6 months; and (3) experienced in past 6 months. Note that the anal sex questions were not asked of people who reported no heterosexual sex in the previous 12 months or who reported only female-female sex in the past 5 years.

(b) $L^2 = 0.00$, d.f. = 1. Likelihood ratio chi-square test of independence model for 2 × 2 tables (Interview Mode by Given Oral Sex: Yes/No). The question was not asked of people who reported having no sex partners since age 18.

(c) $L^2 = 0.02$, d.f. = 1. Likelihood ratio chi-square test of independence model for 2 × 2 tables (Interview Mode by Received Oral Sex: Yes/No). The question was not asked of people who reported having no sex partners since age 18.

(d) $L^2 = 2.91$, d.f. = 1. Likelihood ratio chi-square test of independence model for 2 × 2 tables (Interview Mode by Had Any Sex Partners since Age 18: Yes/No).

(e) $L^2 = 2.02$, d.f. = 1. Likelihood ratio chi-square test of independence model for 2 × 2 tables (Interview Mode by Had Sex in Past 5 Years: Yes/No).

(f) MH = 7.27, d.f. = 1. Mantel-Haenszel test for trend in 2 × 3 table (Interview Mode by Frequency of Sex in Past 6 Months). Categories for frequency of sex were 0; 1–10; and 11+ times. Note that this question was not asked of people who reported no heterosexual sex in the previous 12 months.

(g) $L^2 = 3.23$, d.f. = 1. Likelihood ratio chi-square test of independence model for 2 × 2 tables (Interview Mode by Ever Used a Condom: Yes/No).

(h) MH = 2.13, d.f. = 1. Mantel-Haenszel test for trend in 2 × 4 table (Interview Mode by Condom Use in Past 6 Months). Categories for condom use were never; sometimes; almost always; and every time. Note that these questions were asked only if the person reported having one or more sex partners in the past 6 months.

(i) $L^2 = 6.03$, d.f. = 1. Likelihood ratio chi-square test of independence model for 2 × 2 table (Interview Mode by Most Recent Relationship Lasted More than 6 Months: Yes/No). The question was not asked of people who reported that they did not have a person that they had had sex with most often in the past year.

(j) $L^2 = 9.00$, d.f. = 1. Likelihood ratio chi-square test of independence model for 2 × 4 table (Frequency of Discussion by Interview Mode). Categories for frequency of discussion were never; less than 1 a month; 1–2 times a month; and 1+ times a week. Note that this question was not asked of people who reported that they did not have a person that they had had sex with most often in the past year.

(k) $L^2 = 0.41$, d.f. = 1. Likelihood ratio chi-square test of independence model for 2 × 2 table (Interview Mode by Ever Had a One-Night Stand: Yes/No). This question was not asked of people who reported that they had not had sex since age 18.

Source. Turner, C. F., Miller, H. M., Smith, T. K., Cooley, P. C., & Rogers, S. M. (1996c). Telephone audio computer-assisted self-interviewing (T-ACASI) and survey measurements of sensitive behaviors: Preliminary results. In R. Banks, J. Fairgrieve, L. Gerrard, et al. (Eds.), *Survey and statistical computing*, 1996. Chesham, Bucks, U.K.: Association for Survey Computing.

condom use during clinical interviews in STD clinics (with R. Jadack and colleagues).

- Assessment of the impact of audio-CASI on reports of HIV risk behaviors in the HIV Vaccine Preparedness Study (with D. Metzger, B. Koblyn, and coworkers).

Over the next two years, we hope that this research will provide a firmer foundation for drawing inferences about the extent, if any, to which audio-CASI and T-ACASI technology may increase the validity and reliability of survey measurements of sexual, contraceptive, and other related behaviors. We also hope such studies can help to identify the types of measurements and research contexts for which those technologies are best suited and the costs and barriers to their adoption.

Author Note

Research Triangle Institute was established in 1958 by Duke University, North Carolina State University, and the University of North Carolina to foster basic and applied research in science and engineering.

Acknowledgment

Preparation of this chapter was supported by grants to Charles Turner from the National Institutes of Health—specifically, grants RO1-HD/AG31067-01 from the National Institute of Child Health and Human Development and the National Institute on Aging, and RO1-MH56318-01 from the National Institute of Mental Health.

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