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Comparison of Computer-Assisted Telephone Survey Methodologies:

CATI vs. T-ACASI

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Abstract

Background and Objectives - Computer-Assisted Survey Methodologies vary by cost, ease of implementation, and effectiveness. New modes of data collection that minimize cost and maximize ease and effectiveness should continually be explored. This paper will compare the differential impact of two Computer-Assisted Survey Methodologies, CATI (Computer-Assisted Telephone Interviewing) and T-ACASI (Telephone Audio- Computer-Assisted Self-Interviewing) on response rates and interviewing effort.

Design - The study was conducted by The Center for Survey Research at the University of Massachusetts, Boston in conjunction with the Research Triangle Institute. Data came from a National RDD sample resulting in 2183 screened, eligible households. All screening was done by the CATI procedure. Following the screening, one eligible adult was randomly selected to complete an interview concerning behaviors and attitudes relevant to AIDS and sexual health. A total of 1452 adults completed the interview. The sample was randomly pre-assigned to either the CATI or T-ACASI mode of interview, with 799 interviews being completed by CATI and 653 interviews being completed by T-ACASI. T-ACASI respondents who had broken off during the interview were recontacted and asked questions about the break-off. An attempt to boost response rates for the T-ACASI sample involved offering a payment to T-ACASI refusals in exchange for their completion of the interview.

Results - Household survey response rates were found to be substantially higher for the CATI sample (71.5%) than for the TACASI sample (61.3%). The T-ACASI mode was additionally found to utilize more interviewing effort than the CATI mode (13.38 vs. 9.42 calls per completed interview). Continued research should be done to explore the potential of T-ACASI, as there remain many highly desirable aspects to this mode of data collection.

INTRODUCTION

There is substantial evidence to support the assertion that the mode by which a survey is administered can have a significant impact on the study's findings. Interviewer and respondent characteristics and the setting and context in which the survey is administered have all been shown to affect outcomes. Studies that deal with sensitive or stigmatized topics are especially subject to mode-related biases and it is thus crucial that the respondent be allowed the most comfort and privacy possible when supplying answers to questions that are very personal in nature (Shober et al., 1992; Turner et al., 1992; Rogers et al., 1996; Turner, Ku et al., 1996; Turner et al., 1997; Turner et al., 1998; Miller et al., 1999).

Telephone surveys allow respondents more privacy than in-person interviews, yet the standard telephone interview does still involve person-to-person contact over the phone. Though the information may be supplied anonymously, the respondent still may feel uncomfortable divulging highly personal information to a live interviewer and may even provide answers he or she considers more socially acceptable than those that actually apply to his or her situation. With the aim of maximizing the quality of information obtained from such sensitive-topic surveys comes the development of an automated approach to survey interviewing known as audio computer-assisted self-interviewing (ACASI). This system allows a respondent to participate in a survey, self-administering questions using a specialized computer. The respondent hears pre-recorded questions through headphones and records responses directly into the computer. This approach eliminates the need for a live interviewer, can thus increase a respondent's sense of privacy when sharing personal information, and as a result, can increase the accuracy of the reporting of such sensitive topics (Cooley and Turner, 1998). A related technology is the telephone version of the audio computer-assisted self-interviewing (T-ACASI), which allows a respondent the same privacy when answering survey questions by phone. Use of T-ACASI involves connecting a respondent with a specialized computer, which administers a survey over the telephone. The respondent answers questions asked by a computer by using the keys on his or her touch-tone telephone. T-ACASI thereby increases the amount of privacy a respondent has in answering the survey questions by telephone (Cooley et al. 2001).

Studies that have compared ACASI and T-ACASI with traditional live interviewer-based approaches have demonstrated significantly more accurate reporting of sensitive or stigmatized behaviors as measured by these new self-administered computer technologies (Turner et al., 1998; Miller et al., 1999; Gribble et al., 2000). The majority of these studies have sought to gain accurate knowledge of the extent and nature of sensitive-topic behaviors. Fewer studies have sought to assess the effectiveness and desirability of using these new self-interviewing modes from a field perspective, looking specifically at response rates, interviewing effort, and the correlative cost. This paper examines specifically the effectiveness of the T-ACASI mode of data collection in comparison with the standard computer-assisted telephone interviewing (CATI) mode of data collection from a methodological, rather than substantive, standpoint. Papers that deal with the content-oriented, substantive findings of this study are forthcoming.

METHODS

In July, 1999, the Center for Survey Research at the University of Massachusetts, Boston (CSR) entered into a contract with the Research Triangle Institute (RTI) to conduct fieldwork for the National STD and Behavior Measurement experiment. A pretest was initiated and completed in August, 1999, followed by the official data collection period from September, 1999 to April, 2000. The project consisted of a national RDD telephone survey designed to measure behaviors related to risks associated with contracting HIV and AIDS. The study incorporated two distinct, randomly-assigned modes of telephone survey data collection: half the sample was scheduled to be interviewed by Computer-Assisted Telephone Interviewing (CATI) and the other half by Telephone Audio-Computer-Assisted Self-Interviewing (T-ACASI), in order to measure the impact of survey mode on the reporting of these highly

sensitive behaviors. The survey contained questions related to drug and alcohol use, sexual history and behaviors, symptoms of sexually transmitted disease, and related attitudinal and behavioral items. An identically designed and simultaneously-fielded study utilized a Baltimore city sample, in order to compare results with a previous study in Baltimore on the same topic.

Sample Design and Eligibility

A national, random digit dial (RDD) sample was created using the GENESYS sampling system. This sample was then split randomly in order to pre-assign half to the CATI and half to the T-ACASI modes of interview. Eligible households were those that contained at least one adult between the ages of 18 and 45, this age range targeted as the group most susceptible to risk behavior related to AIDS. One additional T-ACASI sample requirement was for the household to have a touch-tone telephone, in order to complete the interview using this technology. It was estimated that very few numbers assigned as T-ACASI cases that were determined to be eligible households would not meet this requirement. Any eligible T-ACASI household without a touch-tone phone would then be attempted to be interviewed by CATI.

*Data Collection Procedure*s

All cases, regardless of mode pre-designation, were screened using the same CATI instrument. Once a sample number was determined to be a household, the interviewer proceeded to screen the household for eligibility. In all cases, this involved establishing the number of adults living in the household and their ages. If more than one eligible adult was found in the household, a respondent was randomly selected for extended interview. Cases pre-designated as T-ACASI were also asked whether or not they had a touch-tone telephone to use for the interview. Those few cases that did not meet this criteria were then attempted to be interviewed in CATI.

Respondents in cases pre-designated as CATI were then attempted to be interviewed by a trained interviewer, while respondents in cases pre-designated as T-ACASI followed a modified set of procedures. Following the screening and identification of the respondent, respondents in T-ACASI cases were explained the procedures and put on hold while the interviewer set up the connection with the computer at RTI. Once the connection was made, the interviewer then brought the respondent back into the call, keeping the computer connected, for a 3-way call. The interviewer stayed on the line with the respondent as he or she answered a few demographic questions, so the respondent would be comfortable using the technology without assistance. Following this initial demographic section, the interviewer then removed him/herself from the call and left the respondent to answer the questions in private. The T-ACASI interview concluded with a few "debriefing" questions, designed to measure the respondent's comfort with and ease of the T-ACASI procedures. For comparability, cases conducted in CATI were also asked these debriefing questions, using the T-ACASI technology. In order to accomplish this, completed CATI interviews were also connected to the computer at RTI for this brief closeout interview.

Procedures for Dealing with Breakoffs

Once the interviewer had disconnected from T-ACASI interview cases, he or she was unaware of whether the respondent continued on to the end of the interview. It was established that RTI would, on a daily basis, email the status of each case attempted on the previous day. The email contained information about the status of the case, such as whether or not the interview was completed. Any case that had been attempted in the previous day but was not completed was then recontacted by an interviewer, in an attempt to discover why the respondent did not finish the interview and to reconnect the respondent to the computer for the remainder of the survey.

Paying Respondents

During the course of the data collection, it became clear that the interviews were not being completed at the same rate in the T-ACASI sample as they were in the CATI sample. In an attempt to boost response rates for the T-ACASI sample, respondents who had broken off early on in the survey were identified and recontacted to ask if they would complete the interview in exchange for a monetary incentive ($25).

RESULTS

Screening Results

Displayed in Table 1 are the results of attempting to screen our sample telephone numbers, overall and by mode. A total of 2183 screeners were completed, all using CATI procedures, for the project overall. In roughly half of these cases (1117) the screener was completed for a pre-designated CATI household and in the other half (1066), the pre-designated T-ACASI households. This can be interpreted as one indication that our random half-samples were handled equivalently during the interviewing process.

The vast majority of sample numbers (92%) were positively identified as either residential or nonresidential, and these results were extremely comparable between the CATI and T-ACASI half samples. There were additionally very similar rates of businesses, fax/modems, phones out of service, non-residences, foreign language households, refusals, and screening limits across the two half-samples; further evidence that the samples were treated equivalently during data collection.

Table 2 shows the rates at which numbers were resolved as residential, rates at which resolved telephone numbers were residential, residential rates assuming 4% of "unknown status" numbers were residential, and rates at which residential households contained an eligible (18-45 year old) adult. These rates are compared across survey mode, as well as between our sample and the expected rate at which each should occur. Again, our CATI and T-ACASI half samples appeared remarkably well-matched, differing from each other on each rate by no more than 1.4 percentage points. This again reassured us that the random half-samples were being worked by our interviewing staff in a completely equivalent manner. No interviewer biases were being introduced. Our sample as a whole did differ slightly from expected rates in terms of the rate at which resolved telephone numbers were residential and the rate at which residential households contained an eligible adult. The residential rate may be explained by assuming that 4% of all telephone numbers of unknown residential status were really residential. The 4% figure is based upon a thorough follow-up of a sample of "unknown status" numbers to ascertain their residential status. This 4% figure has been consistent in CSR-performed RDD sample surveys for nearly five years. The second difference, the higher figure for estimating the rate at which residential households should have an eligible adult, may be partially attributed to the fact that the expected number is based upon 1990 Census figures. Another explanation may be in nonresponse bias, where those households that have members in the eligible group may be less likely to complete the screener than other households. When 2000 Census figures are available, a new comparison should be done. Also, it is important to note that if nonresponse bias did exist, it affected both the CATI and T-ACASI samples equally.

Interviewing Results

Table 3 displays interviewing results for the 2183 successfully screened households containing eligible respondents. While sample numbers designated for CATI and T-ACASI had been very equally matched through results of the screening process, Table 3 reveals some contrasting interview outcomes

for the two samples. This finding is not surprising given the procedures used to obtain interviews are quite different between the two samples, whereas they had been identical through the screening process. A detailed explanation of the difference between the two interviewing procedures is provided in the Methods section. As shown in Table 3, a greater proportion of the screened CATI-designated households than screened T-ACASI-designated households completed interviews, while more T-ACASI cases ended up as partial interviews, refusals, other types of noninterviews, or calling limits (where a respondent was identified
and did not refuse, but still did not complete the interview).

Response Rates

These discrepancies in interviewing outcomes are detailed in Table 4. As shown in this table, and as referenced earlier, the screening response rates were very similar across the two half-samples and both were higher than the expected rate of 80%. However, the rates at which successfully screened households completed interviews differed substantially between sample groups. Table 4 breaks down response rates by screening rate, interview rate and overall survey response rate, as well as by specific survey section. After the completion of the screener, at the point where CATI and T-ACASI cases are handled differently for the extended interview, response rates were lower for the T-ACASI cases. This was true for the completed interviews as well as the partial cases. Overall, survey response rate grew to as much as nine percentage points higher for CATI cases than for T-ACASI cases. This is quite a large discrepancy and can only be attributed to the T-ACASI mode.

Interviewing Effort

In addition to the impact of survey mode on response rates, this study was concerned with the amount of interviewing effort needed to complete the data collection goals, which in turn has strong cost implications. Table 5 compares a number of components of interviewing effort across CATI and T-ACASI samples. It is worth noting that interviews in the T-ACASI sample required a significantly greater average number of call attempts (13.38) to complete than did interviews in the CATI sample (9.42); a 42% increase in the average number of call attempts. Related to this, the table also displays that, as percentile of call attempts increases, the T-ACASI cases required increasingly more calls than did the CATI cases, to complete. Further indication that the T-ACASI cases required increased effort is shown in the percentage of screened households that later refused to be interviewed, with T-ACASI cases refusing the interview in 32.2% of screened cases, compared with only 26.0% of CATI cases.

Dealing with T-ACASI breakoffs and Attempts to Boost Response Rates

Table 6 displays the frequency of reasons for breakoff among the T-ACASI cases. These reasons were obtained through an additional phone call to the respondent who did not complete the interview. As shown, sources of breakoff that involved technical/computer problems occurred in comparable numbers to those that involved respondent-based issues. The most frequent technical problem mentioned, cited in about half of these cases, was that the computer simply disconnected. This is really due to respondents having a difficult time explaining what happened, other than the computer "went away". Next most common were breakoffs due to call waiting, or the computer "timing out" when the respondent thought the interview was finished. In the case of respondent-initiated sources of breakoff, the most frequent reasons respondents had for hanging up were deliberate choices: thinking the interview was too long or not liking the questions asked. It should be mentioned that very few respondents (roughly 3%) said they initiated the breakoff for the reason that they did not like answering questions that were asked by a computer.

Table 7 shows the results of offering a payment to those respondents in T-ACASI cases who

began, but did not complete, the interview. As it became apparent that response rates were lower than desired for this half of the sample, the payment incentive was implemented in order to increase response rates. Of the 130 respondents selected to be contacted, CSR was able to reach nearly three-quarters of them. Just over half of those contacted proceeded to complete the survey, while roughly a third refused. The remaining proportion did not specifically refuse, but still did not complete the survey. It must be emphasized that these 130 cases were not a random selection, but were in-process refusals who were still active at the time a decision was made to offer payment.

DISCUSSION

Overall, both modes of survey administration (CATI and T-ACASI) were able to collect data at desirable levels. The fact that the T-ACASI system worked well enough to achieve desired response rates is very encouraging for future studies that endeavor to use this type of anonymous data collection technique and avoid the personal-interviewer bias that may characterize some sensitive-topic studies.

While response rates were considered acceptable at the conclusion of the data collection, there is certainly room for improvement. Response rates for interviews for the CATI half-sample were substantially higher than those for the T-ACASI half-sample, which may be partially attributable to technological difficulties using the new T-ACASI technology, as well as the ease with which respondents can terminate a T-ACASI interview. As the difference in response rates occurred for the interview portion of the survey, and not the screening portion (which was conducted in CATI in all cases), it is clear that the difficulties lie with some aspects of the new T-ACASI system. These differences occurred between the two half-samples, despite their being randomly assigned and highly comparable across all characteristics.

Some of the difficulties with the T-ACASI system may be addressed by seeking to minimize the amount of time between a call breakoff and the attempt to reconnect the respondent to the computer. Before the study began, there was a reluctance to recontact T-ACASI breakoffs immediately. This was due to concern that we could be placing interviewers into a bad position of calling back an angry respondent immediately. This would ruin all chances of refusal conversion. Instead, we opted for a next day recontact of T-ACASI breakoffs. Given the finding that half of all T-ACASI respondents cited a computer problem as the reason for breakoff, and given that only a small percentage of breakoffs were due to respondents not liking the survey questions, it seems that a large proportion of these cases could have been reconnected immediately with possible positive response rate implications. The longer the wait between the time the respondent breaks off and an attempt at reconnection is made, the less likely the respondent may be to be available for interview completion. Another difference between CATI and T-ACASI lies in the ability of the CATI interviewer to notice a tired or hesitant respondent and to immediately address any content or time related concerns. Clearly, a computer cannot anticipate nor sense, and consequently address, such issues. It seems important for an interviewer to intervene as quickly as possible for T-ACASI breakoffs, and quickly address any problems or concerns.

The decision to offer payment to T-ACASI respondents who had begun, then promptly broken off the interview, was made during the course of data collection. Over a third of those selected for this incentive proceeded to complete the interview, indicating that this initiative did have some positive results. One drawback to this incentive initiative however is that the respondent must provide still more personal information, in the form of their name and address, in order to receive payment. This may compromise results in the form of respondents answering sensitive questions differently than they would if they were still anonymous. Again, the ultimate solution to this problem is to minimize the extent of T-ACASI breakoffs in the first place.

This study also sought to examine interviewing effort expended, and related cost implications. Clearly, the increased number of calls it took to complete a T-ACASI interview vs. a CATI interview are related to issues of technology as well as the ease with which T-ACASI breakoffs can occur. The fact that more (32.2% vs. 26.0%) screened T-ACASI households initially refused to be interviewed than screened CATI households is further indication of the ease of T-ACASI breakoffs and the need for quick interviewer intervention.

On the whole, the use of T-ACASI as a mode of data collection proved effective and very advantageous, given its ability to preserve respondents' comfort and anonymity when answering sensitive questions. Future T-ACASI projects should seek to minimize interview breakoffs and improve the efficiency with which a respondent is reconnected after a breakoff has occurred.

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Table 1. Screening Results

	CATI	T-ACASI	Total
Completed Screener - Eligible Household	1117	1066	2183
Completed Screener - No Eligible R	1563	1580	3143
Business Number	892	919	1811
Fax or Modem	540	516	1056
Phone Out of Service	1929	1921	3850
Non-Residential	31	39	70
Foreign Language	104	105	209
Screening Refusal	314	315	629
Screening Limit[1]	86	91	177
Unknown Residential Status[2]	549	573	1122
Total	7125	7125	14250

[1] Numbers known to be residential for which eligibility could not be determined.

[2] Numbers for which residential status could not be determined.

Table 2. Comparative Results of Screening

	Entire Sample	CATI Half Sample	T-ACASI Half Sample	Expected Result
Rate of Resolving if a Telephone Number is or is not Residential	92.1%	92.3%	92.0%	90.0%
Rate at which Resolved Telephone Numbers are Residential	48.3	48.4	48.2	44.5[1]
Residential Rate if 4% of Unknown Status Telephone Numbers are assumed Residential	44.8	45.0	44.6	44.5
Rate at which Residential Households have someone 18-45 years old	41.0	41.7	40.3	48.0[2]

[1] This number produced by the GENESYS sampling system.

[2] This number based upon 1990 Census figures.

Table 3.Interviewing Results

	CATI	T-ACASI	Total
Completed Interviews[1]	799	653	1452
Partial Interviews[2]	35	56	91
Refusals[3]	178	220	398
Other Noninterviews[4]	7	6	13
Limits[5]	98	131	229
Total	1117	1066	2183

[1] T-ACASI total includes 22 interviews which were assigned to be done by T-ACASI but were done by CATI because R did not have a touch tone telephone. The T-ACASI total also includes 10 interviews which were completed, but whose data were lost early in the study by a computer failure.

[2] Interviews that have completed some sections of the survey but not all. Two of the T-ACASI partial interviews were done by CATI, due to R not having a touch tone telephone.

[3] Three T-ACASI refusals were cases attempted by CATI due to R not having a touch tone telephone.

[4] Generally due to an ill R.

[5] Identified R who did not refuse, but did not complete the interview.

Table 4. Comparative Response Rates

	Entire Sample	CATI Sample	T-ACASI Sample	Expected Rate
Screening Response Rate[1]	86.22%	86.40%	86.05%	80.00%
Rate at which successfully screened HHs completed Interviews:				
Through Entire Interview	66.51	71.53	61.26	75.00
Through Sexually Transmitted Disease Section	67.16	72.07	62.01	75.00
Through Sexual Experience Section	68.99	73.50	64.26	75.00
Through Drug Use Section	70.68	74.66	66.51	75.00
Overall Survey Response Rate[2]				
Through Entire Interview	57.34	61.80	52.71	60.00
Through Sexually Transmitted Disease Section	57.91	62.27	53.36	60.00
Through Sexual Experience Section	59.48	63.50	55.30	60.00
Through Drug Use Section	60.94	64.51	57.23	60.00

[1] This rate is computed as follows: Completed Screeners /((Completed Screeners + Screening Refusals + Screening Limits + (.04 x Unknown Status))

[2] This rate is the product of the screening response rate and the rate at which screening households were interviewed.

Table 5. Comparative Interviewing Effort

	CATI	T-ACASI
Average call attempts per completed interview	9.42 calls	13.38 calls
10th percentile of call attempts per completed interview	1 call	2 calls
25th percentile of call attempts per completed interview	3 calls	4 calls
50th percentile of call attempts per completed interview	7 calls	9 calls
75th percentile of call attempts per completed interview	12 calls	18 calls
90th percentile of call attempts per completed interview	23 calls	33 calls
Percentage of screened households that later refused (This includes cases that were eventually converted.)	26.0%	32.2%
Average Interview Length*	24.59 minutes	9.78 minutes
Average call attempts per screening refusal	24.47 calls	23.51 calls
Average call attempts per screening limit	32.89 calls	33.48 calls
Average call attempts per unresolved residential status	15.90 calls	16.33 calls
Average call attempts per respondent refusal	14.83 calls	15.13 calls

* For T-ACASI cases, this includes only the amount of time an interviewer was talking to R. It does not include the time R spent with the T-ACASI computer on his/her own.

Table 6. Nature of T-ACASI Breakoff.

	# Occurrences
Computer Problem Source of Breakoff	140
Computer simply disconnected (no explanation)	72 (51%)
Call Waiting	28 (20%)
Respondent thought they finished questions (timed out)	14 (10%)
Keypad buttons stopped working with computer	10 (7%)
Bad telephone line connection	5 (4%)
Pound Key left respondent in dead air (problem with help utility)	4 (3%)
Computer asked inappropriate questions (timed out)	3 (2%)
Phone battery went dead (timed out)	3 (2%)
Computer would not go to last question asked	1 (1%)
Respondent Source of Breakoff	138
Interview was too long	45 (33%)
Didn't like questions	39 (28%)
Had to tend to an emergency	17 (12%)
Accidentally hung up	9 (7%)
Hung up to take another call	6 (4%)
Didn't like answering to computer	4 (3%)
Thought interview was finished	4 (3%)
No reason ascertained	14 (10%)

Table 7. Results of Offering Payment to Respondents

Number selected to be offered payment	130
Number actually contacted	93 (72%)
Number who completed survey	48
Number who refused payment	34
Number who did not refuse but who did not complete survey	11
Number who could not be contacted	37 (28%)