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Color-Coded Audio Computer-Assisted Self-Interviews (C-ACASI) for Poorly Educated Men and Women in a Semi-rural Area of South India: “Good, Scary and Thrilling”

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Abstract

It is challenging to collect accurate and complete data on sensitive issues such as sexual behaviors. Our objective was to explore experience and perceptions regarding the use of a locally programmed color-coded audio computer-assisted self interview (C-ACASI) system among men and women in a semi-rural setting in south India. We conducted a mixed-methods cross-sectional survey using semi-structured interviews among 89 truck drivers and 101 truck driver wives who had participated earlier in the C-ACASI survey across a predominantly rural district in Tamil Nadu. To assess the color-coded format used, descriptive quantitative analysis was coupled with thematic content analysis of qualitative data. Only 10 % of participants had ever used a computer before. Nearly 75 % did not report any problem in using C-ACASI. The length of the C-ACASI survey was acceptable to 98 % of participants. Overall, 87 % of wives and 73 % of truck drivers stated that C-ACASI was user-friendly and felt comfortable in responding to the sensitive questions. Nearly all (97 %) participants reported that using C-ACASI encouraged them to respond honestly compared to face-to-face personal interviews. Both the drivers and wives expressed that C-ACASI provided confidentiality, privacy, anonymity, and an easy mechanism for responding truthfully to potentially embarrassing questions about their personal sexual relationships. It is feasible and acceptable to use C-ACASI for collecting sensitive data from poorly computer-literate, non-English-speaking, predominantly rural populations of women and men. Our findings support the implementation of effective and culturally sensitive C-ACASI for data collection, albeit with additional validation.

Keywords

Color-coded ACASI; Computer interview; Sensitive questions; Acceptability; Rural India

Introduction

Data collection tools and techniques are some of the most essential elements for research. They attain greater significance in research concerning issues that are sensitive, stigmatizing or illegal, such as HIV/sexually transmitted infection (STI) history, sexual behavior, condom use, intimate partner relationships, drug use, sexuality, and race/ethnicity [1–4]. The information from such cases hinges upon the veracity and integrity of reporting by the study participants and the accuracy of their measurement [4, 5]. Behaviors are difficult to document, and are often based on self-reporting that is likely to suffer from recall and social desirability biases. The education level of the respondents and their level of understanding of the pattern of questionnaires pose further challenges to validity of data collection [1].

The accuracy and completeness of collecting data on sensitive and personal issues, including sexual behaviors, may be enhanced by any mode that is culturally and procedurally acceptable to the participants and interviewers, easy to use, less time-consuming, ensures privacy and anonymity, minimizes errors in data collection/measurement/entry/retrieval, and eliminates interviewer bias [1, 2, 4, 6, 7]. A technological advancement in this area is computer programming of questionnaires, which began in the late 1980s with the introduction of interviewer-administered computer-assisted personal interviews [2, 8]. This led to computer-assisted self-interviewing that further evolved into audio computer-assisted self-interviews (ACASI) [9]. A detailed review by Langhaug et al. provides evidence that computer-assisted methods improve the quality of socially sensitive data [10].

ACASI is increasingly being used as a data collection tool in research settings [11–14], and has been feasible and acceptable in numerous developing country settings [3, 7, 8, 10, 15–23]. Studies in the United States, Tanzania, and Malawi have shown that ACASI is preferred to interviewer-administered questionnaires for sensitive questions [2, 3, 7, 24–26]. However, studies among adolescents in South Africa and young adults in Peru showed no difference in preference between ACASI and interviewer-administered interviews [27, 28]. In developing countries, ACASI has been utilized to collect information on sexual behaviors, substance use, psychosocial status, HIV-attitudes, and adherence to antiretroviral treatment or other interventions among high-risk groups (sex workers, drug users) [23, 29, 30], and the general population (adolescents, students, youth, and adults) [7, 8, 16, 18–22, 29, 31]. Four studies have utilized ACASI in urban settings in India, including sexual behaviors of adolescents in Delhi [21], young unmarried men in Pune [18], adults in Chennai slums [8], and domestic violence, household decision-making, and spousal communication among young married women in Bangalore [32]. These studies have demonstrated that ACASI is feasible and acceptable among urban populations in India with high education levels. To date, no studies have been published evaluating the feasibility and acceptability of ACASI in a rural Indian setting with relatively low education levels and little exposure to computers. We conducted a color-coded ACASI (C-ACASI)-based survey on HIV/STI-related risk behaviors in a predominantly rural district in south India. Using a mixed-methods approach, we describe the experiences and perceptions of using color-coded ACASI, and discuss the implications of our findings for behavioral research in poorly educated populations in rural settings in India.

Methods

Study protocols and materials were approved by the UCLA IRB and the Ethics Committee of National Institute of Epidemiology, Indian Council of Medical Research, Chennai, India. Between June and October, 2010, we conducted a cross-sectional, household computer-based survey among 18–49-year-old wives of truck drivers and their husbands in the Namakkal district of Tamil Nadu, about 380 km southwest of Chennai. The district has a

total population of 1,721,179, and is 63.5 % rural. The male and female literacy rates in Namakkal district are 83 % and 67 %, respectively, some of the lowest in the state [33]. Stratified cluster sampling was used to attain a randomly selected sample from a list of married truck drivers and wives, which was obtained from the local truckers' associations and NGOs. Eligible couples were residents of Namakkal for at least 6 months and had no known cognitive disabilities.

Design of the C-ACASI

We first designed a paper-and-pencil interviewer-administered (PAPI) structured questionnaire that was first written in English and then translated into Tamil, the local language of the study participants. We pilot tested the Tamil version of the PAPI questionnaire and revised the language and structure, as needed. The C-ACASI was made up of sensitive items of the PAPI questionnaire related to HIV/STI-related risk behaviors, such as numbers and types of sexual partners, sexual practices with spouse and other partners, sexual relationship power of wives, attitudes toward gender norms in the marital relationship, and HIV/AIDS-related knowledge, attitudes and risk perceptions, as well as a practice module with 11 items to orient the participants to the structure and function of the C-ACASI. Questions were uploaded to the dashboards in the same sequence in which they were intended to be answered by the participants as per the logical flow and skip patterns. The dashboards and flow diagrams (Fig. 1) were critical in programming the logical sequence of questions in the C-ACASI, considering the length and complexity of the questionnaires that included sub-questions, multiple responses, and skip sequences.

The C-ACASI survey was programmed in Microsoft Visual Studio 6.0, using Microsoft Visual Basic 6.0 language. The questions and associated codes, as well as the responses keyed in by the participants, were stored in different tables in the database. The database foundation was provided by Microsoft Access 2003 and 2007 linked to the user interface on each of the laptop computers used for the survey. We digitally audio-recorded the text of the question, including the valid responses and instructions to the participant in Tamil language pronounced by the same gender for the truck driver and wife questionnaires to maintain consistency throughout the interview. Response categories (e.g. yes/no) were linked to a unique color that was also displayed on a specific alphabet/symbol button on the keyboard, using colored stickers in order to simplify the process of responding to questions and to accommodate participants' inability to read and/or type (Fig. 2). The number keys were used exclusively for entering numeric responses such as age, date, number of partners, etc.

The screen in the C-ACASI displayed the question ID and the color-coded valid response bars (for categorical responses) or a blank box (for numeric responses). Neither the question nor the response texts were displayed on the screen to further ensure privacy and confidentiality for the participants. In addition, the right side of the screen displayed the participant ID number, current date and time, and "NEXT" and "PREVIOUS" arrow buttons to navigate to the next or previous questions. Each question had a pre-recorded digital sound file with the text, valid responses, and instructions to the participant that were played for each new question, which were heard through headphones to maintain privacy. If required, only the investigators could decode the question by referring to the question ID. The participant could also replay the question and valid responses by pressing a button on the keyboard (marked as "headphone"—also displayed on the right side of the screen). The entry of a response was marked by the change in the color of the corresponding response bar on the screen to grey, along with a "beep" sound. A "Thank you" screen indicated the end of the survey.

C-ACASI Survey

Interviewers were hired locally who spoke the local language, Tamil, and had low to medium exposure to computers. They underwent two-day training on handling the laptops and using C-ACASI software, as well as training for troubleshooting and having mock-interviews. The interviewers approached all the participants at their households to explain the purpose and procedure for the study and asked if they were willing to participate. They obtained informed consent and administered the interviews in the participants' homes' if adequate privacy could be maintained. If not, the interviewer either returned at another time convenient to the participant or the participant was invited to a suitable place nearby.

A trained interviewer of the same gender as the participant first conducted a face-to-face computer-assisted interview for the general questions. Participants were then instructed on the use of the laptop computer and completed the C-ACASI practice module, after which they could themselves enter the data into the system unassisted. The interviewers were available to clarify any questions and, if needed, to assist in using C-ACASI.

Semi-structured Interviews

4 months after the C-ACASI survey, we conducted semi-structured interviews (SSIs) over a period of 1 month among the truck drivers and wives who had participated in the C-ACASI survey, and had returned to collect their HIV test results. The same interviewers who administered the C-ACASI survey also conducted the SSIs in private rooms at the study clinic, using a SSI guide with probes to collect data on experience with and perceptions about the C-ACASI system in terms of its user-friendliness, comfort, perceived confidentiality, and the participants' honesty in answering the sensitive questions. The interviewers made verbatim notes (in Tamil) of the responses without any personal identifiers. The interviewers did not know how the participants had answered questions in the C-ACASI survey.

Data Analysis

Socio-demographic characteristics of participants completing the C-ACASI and the SSIs were compared, using Chi square test for proportions and *t* test for means. The notes from the SSIs were translated from Tamil to English, and were cross-checked by another person for quality assurance, using the "forward-backward" translation procedure. Based on the SSI guide, we developed the first set of codes (TB). The SSI transcripts were then reviewed and analyzed by TB and PSS, and emergent themes were identified and discussed. Frequency of responses from the SSIs was summarized using proportions. Analysis of the C-ACASI survey data will be published in a forthcoming manuscript.

Results

In total, 486 wives and 473 truck drivers completed the C-ACASI survey, which was an overall response rate of 95 %. SSIs were conducted among 101 (21 %) wives and 89 (19 %) truck drivers whose average age was 30 years (range 20–47 years) and 35 years (range 25–48 years), respectively. Among those who participated in the C-ACASI survey, 305 (63 %) wives and 275 (58 %) truck drivers were either illiterate or only had primary level (upto 5 years) education. SSI and C-ACASI survey participants did not differ significantly in age (wives), education level, source of income, HIV status, and time needed to complete the C-ACASI survey (Table 1). 98 % (186/190) of participants stated that the length of the survey was acceptable.

Lack of Computer Experience Was Not a Major Obstacle

Only 9.7 % (9/93) of wives and 10.6 % (9/85) of truck drivers had ever used a computer prior to completing the C-ACASI survey. This could have been a major obstacle against their ability to navigate through the C-ACASI, but 75.8 % (72/95) of wives and 77.1 % (64/83) of truck drivers did not encounter any problems using C-ACASI (Table 2). Answering questions using a computer and headphones was a unique experience for all of the participants. Many expressed a feeling of anxiety and apprehensiveness in the beginning, but they were eventually able to navigate through the system with ease (Table 3). Most participants pressed the “repeat button” with the “headphone picture” if they were not able to understand a question when hearing it for the first time. A few also asked interviewers for clarification.

For 17.4 % (16/92) of wives and 20.5 % (17/83) of truck drivers, using C-ACASI was devoid of any inter-personal interactions they would have liked (Table 2). They stated that in the absence of an interviewer, they experienced difficulty in understanding some of the questions or the language (Table 3).

C-ACASI was User-friendly

Overall, 87.2 % (2/94) of wives and 72.6 % (61/84) of truck drivers felt that C-ACASI was user-friendly (Table 2). Both truck drivers and their wives reported feeling comfortable in responding to the questions through C-ACASI because of the mechanism and structure of the system. The participants said that “using the keyboard was easy”, as they “only press the colored buttons” to answer the questions (Table 3).

C-ACASI Improved Confidentiality for Answering Sensitive Questions

Most participants felt that C-ACASI was very suitable for responding to sensitive questions, especially about sexual behaviors, and spared them embarrassment with another person, as it provided greater confidentiality and privacy than face-to-face interviewing (Table 3). Among the wives, 91.8 % (89/97), and among the truck drivers, 90.6 % (77/85), felt that by using C-ACASI, their responses would not be known to others, including the interviewers (Table 2).

Only a few participants doubted the confidentiality of their responses, and stated: “It will be known to people nearby” [T56, 32 years old]; “I think while pressing buttons the persons behind us may have seen the answers” [W66, 24 years old].

ACASI Elicited More Truthful Responses

Most participants (97 % of wives, 98.9 % of truck drivers) felt that using the C-ACASI made them more willing to respond to sensitive questions truthfully (Tables 2 and 3). The truck drivers indicated that if those questions had been asked by an interviewer, they would have responded differently. According to the wives, the veracity of their responses would be dubious if they had been asked by an interviewer. However, some participants stated that the mode of interview would not have affected their responses (Table 3).

Discussion

We designed and locally programmed a color-coded computer-assisted interview system for data collection for a study on HIV/STI-related risk behaviors among a mostly rural population of truck drivers and their wives in south India. The C-ACASI system functioned without many problems on laptop computers carried house-to-house for data collection. The study population was naïve to participation in a research study, as well as to the use of

computers. Using C-ACASI was a unique experience for them, and was well accepted, but with initial apprehension.

Similar to other studies in other developing countries and the United States [3, 10, 15, 19, 24, 34], we found that C-ACASI was acceptable, easy to use, and more likely to elicit truthful reporting of sensitive information by both the truck drivers and their wives. More than 90 % of the participants in our study believed that their responses on C-ACASI would be confidential. Most participants indicated they would respond truthfully to sensitive questions with a computer rather than a face-to-face interview. Other studies have shown that ACASI is preferred over interviewer-administered questionnaires for sensitive questions [2, 3, 7, 24–26]. Compared to face-to-face interviews, increased reporting of sexual behaviors has been possible with ACASI studies among women in Brazil and Zimbabwe [12, 31], urban men in India [21], and female adolescents in Malawi [7]. Our study indicates that it is feasible to use ACASI among individuals with low education levels in India. This was made possible by the use of headphones to hear the audio-recorded questions, menu of responses and provide instructions such that the participants did not need to read from the computer screen. Even if a question was not understood initially, the participants could push a button to hear it again. Participants of the National Household Survey on Drug Abuse with poor reading skills also reported the benefit of using audio to understand the questions [35]. Further, the study interviewers were available to clarify any issues, if required. We believe that the feasibility and acceptability of C-ACASI was enhanced by the color-coded responses to each question visible on the screen that could be chosen by the participant, using the colored keys on the computer. Evidence from studies among young men in Indian slums, and rural youth in Malawi and Kenya also suggest that ACASI performs well in populations with low literacy [7, 16, 18].

Almost all of the participants felt that C-ACASI provided a private environment to answer the sensitive questions truthfully, which is consistent with studies that show that ACASI may minimize social desirability bias, leading to more accurate data [3, 15]. An exploratory qualitative analysis of perceptions of ACASI among HIV-positive women in American cities concluded that ACASI ensured privacy, leading to more truthful responses and minimized socially desirable responses [36]. Using headphones also helped to create a “private space” for the participants to respond to the questions without being concerned about being judged by the interviewer. Other researchers have suggested that ACASI may be helpful in providing an impersonal and anonymous interaction for the participants to be less influenced by the interviewer [37]. In our study, only 10 % of the truck drivers and the wives had ever used a computer. According to a review of questionnaire delivery modes in developing countries, people from countries where the use of computers is less common expressed a higher sense of trust and privacy when using ACASI [10]. In our study, we found several missing responses for questions related to extra-marital partners, anal intercourse, and men having sex with other men (data not shown). A study by the National Institute of Mental Health Group also reported that married respondents in slums of Chennai gave unreliable responses on sexual activity, despite exhibiting a high comfort level with ACASI [8]. Studies in India among populations with low literacy levels and little exposure to computers, such as unmarried adolescent girls in Delhi slums and unmarried men from slums in Pune did not report higher levels of sexual behaviors on ACASI compared to other modes of interview [18, 21]. In some populations in India, there may be cultural barriers when discussing such sensitive and stigmatizing issues, even in private. Unfamiliarity with certain terms for sexual activities or misinterpretation of questions could also lead to poorer responses to such questions, regardless of the mode of data collection. To minimize such discrepancies, we modified the language and tone of the questions in the survey, based on the pilot study. Additionally, the participants may have been too embarrassed to approach the interviewers to ask for clarification of terms about sexual behavior. Further, sexual

behaviors such as anal intercourse with women or men, although previously reported in rural India, may not be very common and are more stigmatizing [38, 39].

We experienced several logistical advantages using C-ACASI for data collection. We required fewer interviewers, and could do more interviews in a single day, as they were conducted in the participants' homes or nearby. We used four laptops, two each for the truck drivers and the wives. There were data entry advantages, such as improved quality and less time and personnel required for data entry and cleaning. Other studies also report minimal data entry errors with ACASI [27, 28]. Data were stored digitally, thus saving paper and storage issues, and helping to ensure data safety and confidentiality. The overall study cost was also reduced, in spite of the cost of software and equipment. Other logistical issues, including hardware and software function, security of equipment and data, and data collection protocols, are pertinent to using ACASI in the field. There were instances of power outage and power cord breakdowns in the field site that resulted in loss of some data during the initial days of field work. A secure power source at the study site and an extra battery pack and power cords should be ensured [24].

Some participants in our study had unusually fast completion times on C-ACASI. This implies that either they did not complete the questionnaire or did not give due attention to the task. Our C-ACASI allowed the participants to refuse responses to any question. It is suggested that ACASI systems should be designed in a way that the user is not able to move to the next question without answering the current question [9]. Although, this ensures less "missing data", it could potentially drive the participant to give untruthful answers. An alternative is to provide the option of "REFUSE/PREFER NOT TO ANSWER" if users wished to proceed further [9]. This makes it possible to account for the missing data that would have emerged in the absence of such an option. However, there is a risk of overuse/misuse of this option, more so for sensitive questions, so monitoring of the participants and data may be needed. If there is a skip attached to any of the responses, it potentially leads to loss of information for the skipped questions [8]. We did not program this option into our system. Data quality checks are usually directly programmed into the ACASI system [5, 8, 9]. We did not incorporate any consistency checks or response constraints in the software program. Consequently, we found a few inconsistencies between questions, so we could not use some of the data. There was some loss of data, as a few USB flash drives used for daily backup of data were corrupted. Such technical problems could be avoided by a mechanism of online collection of data into a centralized ACASI or transfer of data to centralized database through laptops equipped with internet access [9].

Our semi-structured interviews were not conducted among a random sample of participants who took the C-ACASI survey, which may affect the generalizability of our findings. However, characteristics of the participants were similar on post hoc comparison. This is the first study to report design, implementation, and perceptions of C-ACASI in a semi-rural area of India. Both the truck drivers and their wives found C-ACASI easy to use, and were comfortable reporting sensitive information more truthfully. Thus, there was potentially less misreporting and minimal refusal for participation in the survey. C-ACASI is a feasible and acceptable method for collecting sensitive data in poorly educated, low computer-literacy, rural settings among non-English-speaking populations of women and men.

References

1. Catania JA, Gibson DR, Chitwood DD, Coates TJ. Methodological problems in AIDS behavioral research: influences on measurement error and participation bias in studies of sexual behavior. *Psychol Bull.* 1990; 108(3):339–62. [PubMed: 2270232]

2. Turner CF, Ku L, Rogers SM, Lindberg LD, Pleck JH, Sonenstein FL. Adolescent sexual behavior, drug use, and violence: increased reporting with computer survey technology. *Science*. 1998; 280(5365):867–73. [PubMed: 9572724]
3. Metzger DS, Koblin B, Turner C, et al. Randomized controlled trial of audio computer-assisted self-interviewing: utility and acceptability in longitudinal studies. HIVNET Vaccine Preparedness Study Protocol Team. *Am J Epidemiol*. 2000; 152(2):99–106. [PubMed: 10909945]
4. Tourangeau R, Yan T. Sensitive questions in surveys. *Psychol Bull*. 2007; 133(5):859–83. [PubMed: 17723033]
5. Gribble J. Interview mode and measurement of sexual behaviors: methodological issues. *J Sex Res*. 1999; 36(1):16–24. [PubMed: 23226876]
6. Fenton KA, Johnson AM, McManus S, Erens B. Measuring sexual behaviour: methodological challenges in survey research. *Sex Transm Infect*. 2001; 77(2):84–92. [PubMed: 11287683]
7. Mensch BS, Hewett PC, Gregory R, Helleringer S. Sexual behavior and STI/HIV status among adolescents in rural Malawi: an evaluation of the effect of interview mode on reporting. *Studies Family Plan*. 2008; 39(4):321–34.
8. NIMH Collaborative HIV/STD Prevention Trial Group. The feasibility of audio computer-assisted self-interviewing in international settings. *AIDS*. 2007; 21(Suppl 2):S49–58.
9. NIMH Multisite HIV/STD Prevention Trial for African American Couples Group. Designing an audio computer-assisted self-interview (ACASI) system in a multisite trial: a brief report. *J Acquir Immune Defic Syndr*. 2008; 49(Suppl 1):S52–8. [PubMed: 18724191]
10. Langhaug LF, Cheung YB, Pascoe SJS, et al. How you ask really matters: randomised comparison of four sexual behaviour questionnaire delivery modes in Zimbabwean youth. *Sex Transm Infect*. 2010; 87(2):165–73. [PubMed: 20943824]
11. Reichmann WM, Losina E, Seage GR, et al. Does modality of survey administration impact data quality: audio computer assisted self interview (ACASI) versus self-administered pen and paper? *PLoS ONE*. 2010; 5(1):e8728. [PubMed: 20090953]
12. Minnis AM, Muchini A, Shiboski S, et al. Audio computer-assisted self-interviewing in reproductive health research: reliability assessment among women in Harare. *Zimb Contracept*. 2007; 75(1):59–65.
13. Edwards SL, Slattery ML, Murtaugh MA, et al. Development and use of touch-screen audio computer-assisted self-interviewing in a study of American Indians. *Am J Epidemiol*. 2007; 165(11):1336–42. [PubMed: 17379618]
14. Gribble JN, Miller HG, Cooley PC, Catania JA, Pollack L, Turner CF. The impact of T-ACASI interviewing on reported drug use among men who have sex with men. *Subst Use Misuse*. 2000; 35(6–8):869–90. [PubMed: 10847215]
15. van de Wijgert J, Padian N, Shiboski S, Turner C. Is audio computer-assisted self-interviewing a feasible method of surveying in Zimbabwe? *Int J Epidemiol*. 2000; 29(5):885–90. [PubMed: 11034973]
16. Hewett PC, Mensch BS, Erulkar AS. Consistency in the reporting of sexual behaviour by adolescent girls in Kenya: a comparison of interviewing methods. *Sex Transm Infect*. 2004; 80(Suppl 2):43–8. [PubMed: 14755035]
17. Mensch BS, Hewett PC, Abbott S, et al. Assessing the reporting of adherence and sexual activity in a simulated microbicide trial in South Africa: an interview mode experiment using a placebo gel. *AIDS Behav*. 2011; 15(2):407–21. [PubMed: 20886278]
18. Potdar R, Koenig MA. Does Audio-CASI improve reports of risky behavior? Evidence from a randomized field trial among young urban men in India. *Studies Family Plan*. 2005; 36(2):107–16.
19. Le LC, Blum RW, Magnani R, Hewett PC, Do HM. A pilot of audio computer-assisted self-interview for youth reproductive health research in Vietnam. *J Adolesc Hlth*. 2006; 38(6):740–7.
20. van Griensven F, Naorat S, Kilmarx PH, et al. Palmtop-assisted self-interviewing for the collection of sensitive behavioral data: randomized trial with drug use urine testing. *Am J Epidemiol*. 2006; 163(3):271–8. [PubMed: 16357109]
21. Jaya J, Hindin MJ, Ahmed S. Differences in young people's reports of sexual behaviors according to interview methodology: a randomized trial in India. *Am J Pub Hlth*. 2008; 98(1):169–74.

22. Gutierrez JP, Torres-Pereda P. Acceptability and reliability of an adolescent risk behavior questionnaire administered with audio and computer support. *Rev Panam Salud Publica*. 2009; 25(5):418–22. [PubMed: 19695131]
23. Judd A, Rhodes T, Johnston LG, et al. Improving survey methods in sero-epidemiological studies of injecting drug users: a case example of two cross sectional surveys in Serbia and Montenegro. *BMC Infect Dis*. 2009; 9:14. [PubMed: 19203380]
24. Pluhar E, McDonnell Holstad M, et al. Implementation of audio computer-assisted interviewing software in HIV/AIDS research. *J Assoc Nurses AIDS Care*. 2007; 18(4):51–63. [PubMed: 17662924]
25. Plummer ML, Ross DA, Wight D, et al. “A bit more truthful”: the validity of adolescent sexual behaviour data collected in rural northern Tanzania using five methods. *Sex Transm Infect*. 2004; 80(Suppl 2):49–56.
26. Plummer ML, Wight D, Ross DA, et al. Asking semi-literate adolescents about sexual behaviour: the validity of assisted self-completion questionnaire (ASCQ) data in rural Tanzania. *Trop Med Int Hlth*. 2004; 9(6):737–54.
27. Jaspan HB, Flisher AJ, Myer L, et al. Brief report: methods for collecting sexual behaviour information from South African adolescents—a comparison of paper versus personal digital assistant questionnaires. *J Adolesc*. 2007; 30(2):353–9. [PubMed: 17187853]
28. Bernabe-Ortiz A, Curioso WH, Gonzales MA, et al. Handheld computers for self-administered sensitive data collection: a comparative study in Peru. *BMC Med Inform Decis Mak*. 2008; 8:11. [PubMed: 18366687]
29. van der Elst EM, Okuku HS, Nakanya P, et al. Is audio computer-assisted self-interview (ACASI) useful in risk behaviour assessment of female and male sex workers, Mombasa, Kenya? *PLoS ONE*. 2009; 4(5):e5340. [PubMed: 19412535]
30. Simoes AA, Bastos FI, Moreira RI, Lynch KG, Metzger DS. Acceptability of audio computer-assisted self-interview (ACASI) among substance abusers seeking treatment in Rio de Janeiro. *Brazil Drug Alcohol Depend*. 2006; 82(Suppl 1):S103–7.
31. Hewett PC, Mensch BS, Ribeiro MC, et al. Using sexually transmitted infection biomarkers to validate reporting of sexual behavior within a randomized, experimental evaluation of interviewing methods. *Am J Epidemiol*. 2008; 168(2):202–11. [PubMed: 18525081]
32. Rathod SD, Minnis AM, Subbiah K, Krishnan S. ACASI and face-to-face interviews yield inconsistent estimates of domestic violence among women in India: The Samata Health Study 2005–2009. *J Interpers Violence*. 2011; 26(12):2437–56. [PubMed: 21282116]
33. Census of India. Population Totals of Namakkal District. New Delhi: Registrar General of India; 2001. <http://www.namakkal.tn.nic.in/census.htm#2> [Accessed 18 Dec 2007]
34. Kissinger P, Rice J, Farley T, et al. Application of computer-assisted interviews to sexual behavior research. *Am J Epidemiol*. 1999; 149(10):950–4. [PubMed: 10342804]
35. Substance Abuse and Mental Health Services Administration. [Accessed 16 May 2011] Executive Summary: Development of Computer-Assisted Interviewing Procedures for the National Household Survey on Drug Abuse. 2008. <http://www.oas.samhsa.gov/nhsda/CompAssistInterview/es.htm>
36. Estes LJ, Lloyd LE, Teti M, et al. Perceptions of audio computer-assisted self-interviewing (ACASI) among women in an HIV-positive prevention program. *PLoS ONE*. 2010; 5(2):e9149. [PubMed: 20161771]
37. Jones R. Relationships of sexual imposition, dyadic trust, and sensation seeking with sexual risk behavior in young urban women. *Res Nurs Hlth*. 2004; 27(3):185–97.
38. Verma RK, Collumbien M. Homosexual activity among rural Indian men: implications for HIV interventions. *AIDS*. 2004; 18(13):1845–7. [PubMed: 15316346]
39. Asthana S, Oostvogels R. The social construction of male ‘homosexuality’ in India: implications for HIV transmission and prevention. *Soc Sci Med*. 2001; 52(5):707–21. [PubMed: 11218175]

Fig. 1.
Example of C-ACASI flow diagram for collecting sexual behavioural data from the wives of truck drivers

Fig. 2.
Laptop computer with colored stickers on specific keys on the keyboard

Characteristics of wives and truck drivers completing C-ACASI and semi-structured interviews (SSI) in Namakkal district, Tamil Nadu, India, 2010

Table 1

Characteristics	Wives		Truck drivers		p value
	C-ACASI (N = 486) n (%)	SSI (N = 101) n (%)	C-ACASI (N = 473) n (%)	SSI (N = 89) n (%)	
Age (mean± SD) years	30.1± 6.3	29.1± 5.8	36.7± 6.6	35.2± 5.2	0.043
Education					
Illiterate	147 (30.3)	21 (20.4)	80 (17.0)	9 (10.8)	0.347
Primary school	158 (32.5)	41 (40.8)	195 (41.2)	38 (42.2)	
Secondary school	181 (37.2)	39 (38.8)	198 (41.8)	42 (47.0)	
Income source					
None	131 (26.9)	24 (23.5)			
Agricultural labor	201 (41.3)	43 (42.9)			
Non-agriculture	154 (31.8)	34 (33.7)	473 (100.0)	89 (100.0)	
HIV-positive	9 (1.8)	3 (3.0)	8 (1.7)	3 (3.4)	0.393
Time to complete C-ACASI (mean± SD) min	25± 12	27± 12	22± 10	21± 12	0.462

Table 2

Experience and perceptions of C-ACASI among wives and truck drivers, Namakkal district, Tamil Nadu, India, 2010

Characteristics	Wives			Truck drivers		
	N	n	%	N	n	%
Sub-district	101			89		
Namakkal		24	23.8		26	29.2
Rasipuram		32	31.7		34	38.2
Truchengode		35	34.7		19	21.4
Paramathi-velur		10	9.9		10	11.2
Disliked some questions ^a	101	76	75.2	89	67	75.3
About anal sex with men/transgenders		47	46.5		43	48.3
About sex with other partners		44	43.5		20	22.4
About sex for money		12	11.9		6	6.7
About sexual behaviors in general		10	9.9		14	15.7
About AIDS		2	2.0		3	3.4
Had seen computer before	94	37	39.4	86	39	45.4
Had used computer before	93	9	9.7	85	9	10.6
No problems using C-ACASI	95	72	75.8	83	64	77.1
ACASI easy to use	94	82	87.2	84	61	72.6
Answered truthfully because of C-ACASI	99	96	97.0	87	86	98.9
Confidentiality ensured with C-ACASI	97	89	91.8	85	77	90.6
Missed interpersonal interaction	92	16	17.4	83	17	20.5

^aResponses not mutually exclusive

Table 3

Thematic quotations on using C-ACASI by truck drivers and wives participating in semi-structured interviews, Namakkal district, Tamil Nadu, India 2010

Theme	Wives	Truck-drivers
Computer experience	"Questions asked by computer was different... First it was fearful, while repeating the questions it was easy." [W32, 24years old]	"Questions through computer is different to me... (it) was scary and thrilling...once the headphone was put I had some unknown feelings." [T52, 35years old]
	"...(using ACASI was) very nice, shivering and new experience..." [W35, 27years old]	"Few questions were not understood so I clarified through workers (interviewer)" [T36, 37years old]
	"Yes, it was difficult and answering through computer also difficult" [W72, 32years]	
User- friendliness	"...we could understand because it asked very slowly and patiently" [W76, 24years old]	"...very clear questions in computer" [T42, 35years old]
	"...we can hear questions many times" [W9, 31years old] "...I did not have to answer orally or write anything" [W41, 42years old]	"questions were asked slowly and clearly" [T28, 29years old]
	"...computer was asking questions... instead of once it was asking many times" [W98, 36years old]	
Confidentiality of sensitive information	"It was good (experience)...we cannot answer to these questions to an unknown person...since it is a computer we answered easily." [W74, 35years old]	"...only ID allotted without name and address" [T26, 35years old]
	"...yes, I hope answers will be kept confidential (as it is) without name and address" [W85, 29years old]	"...it was good (experience). At the same time (it would have been) embarrassing to answer to doctor or unknown person...but answering with a computer (was) comfortable...without embarrassment or irritation." [T15 -36years old] "...I was alone in the room and nobody was with me" [T78, -30years old]
	"...Questions were not heard by any other (person) so it was easy to give true answers" [W4, 32years old]	
Truthful answers to ACASI compared to face-to-face interview	"May be different answers, because if any person asked questions face-to-face I will be embarrassed... answering through computer is comfortable for us" [W9, 31years old]	"(I was) able to give true answers as questions asked by computer" [T89, -25years old]
		"(I was) able to answer honestly as a person was not asking the questions" [T31, 45years old]
		"our answers may be different because we are embarrassed to answer to unknown person and easy to answer to the computer" [T85, 30years old]
	"Definitely it will be a different answer...I (would) feel embarrassed to speak regarding sexual relationship with unknown person" [W35, 27years old]	"may be different answers...feel hesitant to answer questions to new person" [T58, 44years old]