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Audio-Computer Interviewing to Measure Risk Behavior for HIV Among Injecting Drug Users: A Quasi-Randomized Trial

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Audio-computer interviewing to measure risk behaviour for HIV among injecting drug users: a quasi-randomised trial

Don C Des Jarlais, Denise Paone, Judith Milliken, Charles F Turner, Heather Miller, James Gribble, Qiuhu Shi, Holly Hagan, Samuel R Friedman

Summary

Background We aimed to assess audio-computer-assisted self-interviewing (audio-CASI) as a method of reducing under-reporting of HIV risk behaviour among injecting drug users.

Methods Injecting drug users were interviewed at syringe-exchange programmes in four US cities. Potential respondents were randomly selected from participants in the syringe exchanges, with weekly alternate assignment to either traditional face-to-face interviews or audio-CASI. The questionnaire included items on sociodemographic characteristics, drug use, and HIV risk behaviours for 30 days preceding the interview. We calculated odds ratios for the difference in reporting of HIV risk behaviours between interview methods.

Findings 757 respondents were interviewed face-to-face, and 724 were interviewed by audio-CASI. More respondents reported HIV risk behaviours and other sensitive behaviours in audio-CASI than in face-to-face interviews (odds ratios for reporting of rented or bought used injection equipment in audio-CASI *vs* face-to-face interview 2·1 [95% CI 1·4–3·3] p=0·001; for injection with borrowed used injection equipment 1·5 [1·1–2·2] p=0·02; for renting or selling used equipment 2·3 [1·3–4·0] p=0·003).

Interpretation Although validation of these self-reported behaviours was not possible, we propose that audio-CASI enables substantially more complete reporting of HIV risk behaviour. More complete reporting might increase understanding of the dynamics of HIV transmission and make the assessment of HIV-prevention efforts easier.

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Introduction

HIV is transmitted primarily through unprotected sexual intercourse and the sharing of equipment for injecting illicit drugs. The AIDS epidemic has greatly increased the need for good measurement of such socially sensitive behaviour.[1,2] Accurate measurement of private and socially stigmatised behaviour is difficult in social science and health research. Some research participants will falsely claim to have engaged in the most extreme behaviours, but overall socially sensitive behaviour is under-reported.[3,4]

Good measurement of socially sensitive behaviours is of particular importance in evaluation of HIV-prevention programmes.[5] Calculation of HIV incidence is the most desirable outcome measure, but very few research programmes can afford the expense of that method. The counselling and testing usually needed to collect data on HIV incidence may in itself influence social behaviours associated with HIV risk, and reduce the degree to which results can be generalised. Other biological outcome measures, such as other sexually transmitted diseases, hepatitis B, and hepatitis C, can be used, but these are also expensive to measure, and the relation between incidence of these other infectious disorders and HIV incidence may vary in space and time.

Most research evaluation of HIV-prevention programmes has to rely upon self-reported risk behaviours as its primary outcome measure.[5] Self-reported HIV-risk behaviour among participants in HIV-prevention programmes may be biased. In addition to the usual pressures to under-report sensitive behaviours, participants in HIV-prevention programmes may feel pressure to please programme staff or to defend what they see as valuable services, which may lead to additional under-reporting of HIV-risk behaviour.

Audio-computer-assisted self-interviewing (audio-CASI) has been developed recently for interview-based research. In audio-CASI, computers are programmed to display a question on a computer screen, while simultaneously the respondent hears the question and response categories through headphones. The respondent answers each question by pressing the appropriate computer key. Audio-CASI thus allows greater respondent privacy than traditional face-to-face interviews. When audio-CASI is used properly, no-one

other than the individual respondent sees their responses to any questions. Audio-CASI does not require the respondent to be literate, since questions and answers are heard through headphones, nor must the respondent be questionnaire-literate, since appropriate skip patterns can be programmed into the computer without the respondent having to follow complicated instructions. Several studies of audio-CASI with populations at low risk for AIDS show that this method reduces under-reporting of sensitive behaviours compared with traditional face-to-face interviews or self-administered questionnaires.[6-8]

We studied the use of audio-CASI to measure HIV risk behaviours among injecting drug users who participated in syringe-exchange programmes. Our hypothesis was that the use of audio-CASI would lead to higher rates of reporting of behaviours associated with HIV infection. We also assessed the implications of the audio-CASI data for the control of blood-borne viruses among injecting drug users.

Methods

Data collection

We collected data at four different syringe-exchange programmes in the USA: New York City (NY), Chicago (IL), Tacoma (WA), and Los Angeles (CA). All of these programmes provide single-unit syringes with attached needles, and additional on-site and referral services to participants. Data were collected in 1997 and 1998. The four programmes exchanged syringes at 12 locations that served different subpopulations of injecting drug users in each city.

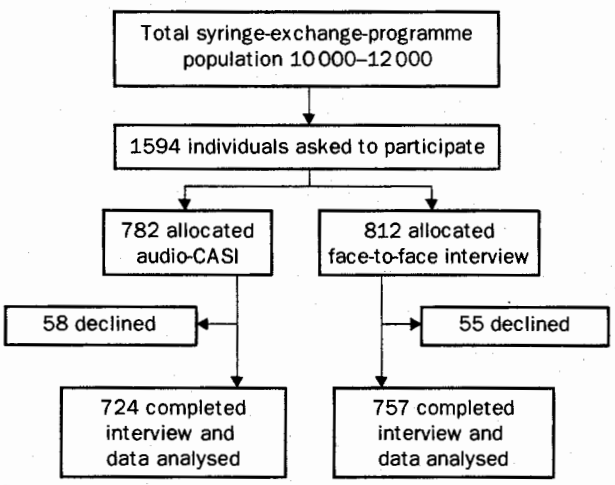
Two fieldworkers worked at each syringe-exchange programme. All fieldworkers had 2 days' training to explain the specific research aims, participant selection, informed consent, questionnaire content, traditional face-to-face interviews, and audio-CASI procedures. Weekly telephone contact with fieldworkers allowed quality control and resolution of any problems that arose.

Study design

We recruited participants from people waiting in line at the syringe-exchange programmes. The only inclusion criterion was being an active participant in the exchange. At each site, fieldworkers used random-number tables to assign a number (n) to each person in the line. The ninth person in line to exchange syringes was then asked if he or she would be willing to participate in a research study. The study was explained, and oral informed consent obtained. As part of the informed consent, participants were told that their decision to participate and their answers to the questions would not affect the services they were receiving at the programme. A single unique code number was generated for each participant. Names were not used.

If the random selection procedure selected someone who had already participated in the study, we allowed that person to participate again. This procedure removed possible motivation to misreport previous participation, and meant that some people who initially declined to participate were later asked to participate, although we could not track which people had previously declined to participate. Our selection procedure was controlled by the fieldworkers, and was designed to prevent active volunteering among potential participants. Active volunteering might have led to strong self-selection bias in our study, and might have disrupted the exchange-programme operations. Use of random-number tables also prevented fieldworkers from selecting "more desirable" participants themselves.

The questionnaire covered sociodemographic characteristics, drug use, sexual behaviours, and HIV risk behaviour for 30 days before interview. Data collection was kept separate from the services provided by the exchange programmes, and data on individuals were not given to the programme staff.



Trial profile

Traditional face-to-face interviewing and audio-CASI were used in alternate weeks at each site. From our previous research and from discussions with staff at syringe-exchange programmes, we were certain that there was no weekly periodicity in exchange-programme participation, although some programmes have seasonal periodicity. Fieldworkers did not switch between audio-CASI and face-to-face interview during the course of any interview. Participants were paid US$10 upon completion of the interview.

The study design required equal numbers of participants to be recruited at each location. However, data collection was more efficient at the larger syringe-exchange programmes, which were open for longer each week and had greater attendance than the smaller programmes. We therefore reallocated data-collection resources to recruit participants from each exchange in rough proportion to the number of participants who used each exchange. The study was approved by the Committee on Scientific Affairs of the Beth Israel Medical Center, New York, NY; USA, which serves as the Institutional Review Board. Annual progress reports were also approved in this way.

Statistical analysis

We analysed data from the first interview with each participant by use of SAS (version 6.11). Responses to questions on HIV-related behaviour were classified as presence or absence of each behaviour. We used χ^2 tests to compare the proportion of participants who reported a specific behaviour on audio-CASI to the proportion who reported the behaviour in face-to-face interview. We calculated odds ratios with 95% CIs to assess the degree of difference between behaviours reported by the two interview methods. We used multiple logistic regression to adjust the odds ratios for interview site and for sociodemographic characteristics of the participants.

The planned sample size for the study was 1600 participants: 800 in each data-collection group. This sample size allowed detection of modest differences between data-collection methods—odds ratios greater than 1·3 or less than 0·8. The study took account of geographical and sociodemographic diversity among participants, but the sample size was not large enough to address possible systematic variations in response to audio-CASI interviewing by site or by subgroups of participants.

Results

1594 individuals were asked to participate. We did 724 audio-CASI and 757 face-to-face interviews (figure), and all interviews were fully completed. 113 people declined to participate, 58 in weeks of audio-CASI and 55 in weeks of face-to-face interviews. Although fieldworkers may not have reported all instances of potential participants declining to participate, declining to

	Audio-CASI	Face-to-face	Total
Sex			
Male	514 (71·0)	505 (66·7)	1019 (68·8)
Female	209 (28·9)	247 (32·6)	456 (30·8)
Data missing	1 (0·1)	5 (0·7)	6 (0·4)
Race/ethnicity			
White	289 (40·0)	273 (36·1)	562 (37·9)
African-American	318 (43·9)	329 (43·5)	647 (43·7)
Hispanic	79 (10·9)	113 (14·9)	192 (13·0)
Other	37 (5·1)	39 (5·2)	76 (5·1)
Data missing	1 (0·1)	3 (0·4)	4 (0·3)
Age (years)			
<30	86 (11·9)	67 (8·9)	153 (10·3)
30–39	205 (28·3)	250 (33·0)	455 (30·7)
40+	413 (57·0)	439 (58·0)	852 (57·5)
Data missing	20 (2·8)	1 (0·1)	21 (1·4)
Syringe-exchange programme			
Chicago	326 (48·9)	341 (51·1)	667 (100)
Los Angeles	35 (27·8)	91 (72·2)	126 (100)
New York	174 (54·7)	144 (45·3)	318 (100)
Tacoma	189 (51·1)	181 (48·9)	370 (100)
Total	724 (48·9)	757 (51·1)	1481 (100)

Data are number of participants (%).

Table 1: **Baseline characteristics of participants by interview method**

participate was rare. When people were asked why they declined to participate, they usually replied that they "did not have the time now", or were "too busy now", but that they would be willing to participate at a later time. All those who declined to participate did so before being told which type of interview would be used. No potential participant said that a preference for one of the interview methods was a factor in deciding to take part.

Table 1 shows sociodemographic characteristics of participants by the two interview methods. Differences in sociodemographic characteristics by interview method were relatively small (≤4%). At all sites, most participants were men (range 62%–72%), and most were aged 40 years or older (range 35%–82%). There was some variation in sociodemographic characteristics of participants between sites. The largest variations in sociodemographic characteristics were for race or ethnicity. Differences in sociodemographic characteristics between the programmes reflect differences in the populations of injecting drug users and in the location of each syringe-exchange programme in the different cities.

We analysed missing answers for each interview method for eight drug-injection and sexual behaviours: frequency of drug injection, injecting with rented or bought used "works" (needles, syringes), injecting with borrowed used works, renting or selling used works, lending or giving used works to others, frequency of sexual intercourse, frequency of sex with an opposite-sex partner, and frequency of sex with a same-sex partner. There were very few missing data on these questions. By audio-CASI all participants responded to all of these questions, even though the computer allowed participants to skip questions. By face-to-face interview, the number of respondents with missing data ranged between 0·2% and 1% for these questions. No-one in audio-CASI or face-to-face interview gave extreme responses to all of these eight questions. There was no indication that participants were trying to subvert the research or the programmes.

There was a consistent pattern of more HIV risk behaviour and less protective behaviour (consistent condom use) reported by audio-CASI than in face-to-face interviews (table 2). All odds ratios for differential reporting of risk and protective behaviours (1·5 or higher, 0·7 or lower, respectively) are probably of epidemiological importance. Adjusted odds ratios were almost identical to the unadjusted odds ratios.

As with HIV risk behaviours, audio-CASI gave consistently more reporting of socially "sensitive" behaviours and less reporting of socially "approved" behaviours than face-to-face interviews (table 3). For example, syringe-exchange programmes distribute alcohol wipes and encourage injecting-drug users to use them before every injection. Use of alcohol wipes is an approved behaviour for participants in syringe-exchange programmes, and non-use is a sensitive behaviour.

More participants in audio-CASI than in face-to-face interviews reported that they were not currently injecting drugs (no injecting in previous 30 days). Many syringe-exchange programmes have rules restricting participation to people who are current injectors. Despite these formal rules, some people who do not inject drugs will visit an exchange to obtain sterile injection equipment for sexual partners, relatives, and friends. These violations of exchange-programme rules probably help to reduce HIV risk behaviours, but "not injecting" may not be admitted by exchange-programme participants.

Similar proportions of participants reported being sexually active (any sexual intercourse in the previous 30 days) in each interview mode (60% audio-CASI, 62% face-to-face, odds ratio 0·9, p=0·05). However, in audio-CASI more participants reported same-sex sexual activity and fewer reported opposite-sex sexual activity. Same-sex sex may be socially sensitive for participants in syringe-exchange programmes because they fear homophobic reactions common in US society as a whole, and because same-sex sexual activity is associated with higher rates of HIV infection among both male and female injecting drug users.[9] The odds ratios for increased reporting of same-sex sexual activity in audio-CASI versus face-to-face interviews were similar for men and women (2·4 [95% CI 1·3–4·7] for men, 1·9 [0·96–3·9] for women). Opposite-sex sexual activity may be an "approved" behaviour among the participants, and the effect of interview method similar to those for use of condoms and use of alcohol wipes. Paying for sex may also be a socially sensitive behaviour among participants

Affirmative response*	Audio-CASI	Face-to-face	Difference between groups (%)	Odds ratio (95% CI)	p	Adjusted odds ratio (95% CI)†	Adjusted p
Divided drugs with syringe	297 (41%)	225 (30%)	11	1·6 (1·3–2·0)	0·001	1·6 (1·2–2·0)	0·0002
Injected with rented or bought used works	58 (8%)	30 (4%)	4	2·1 (1·4–3·3)	0·001	2·1 (1·3–3·4)	0·002
Injected with borrowed used works	80 (11%)	53 (7%)	4	1·5 (1·1–2·2)	0·02	1·5 (1·0–2·2)	0·03
Rented or sold used works	43 (6%)	23 (3%)	3	2·3 (1·3–4·0)	0·003	2·1 (1·2–3·8)	0·01
Gave or lent used works	94 (13%)	68 (9%)	4	1·5 (1·1–2·1)	0·01	1·5 (1·0–2·1)	0·03
Always used condoms with primary partner of opposite sex	80 (22%)	121 (29%)	−7	0·7 (0·5–1·0)	0·03	0·7 (0·5–1·0)	0·06
Always used condoms with occasional partner of opposite sex	84 (47%)	99 (64%)	−17	0·5 (0·3–0·8)	0·002	0·5 (0·3–0·8)	0·01

*Skip patterns were used to avoid asking irrelevant questions. †Adjusted for sociodemographic characteristics and site.

Table 2: **Reported behaviour likely to increase or decrease risk of HIV transmission in 30 days before interview, by interview method**

Affirmative response*	Audio-CASI	Face-to-face	Difference between groups (%)	Odds ratio (95% CI)	p	Adjusted odds ratio (95% CI)†	Adjusted p
Not injecting	22 (3%)	8 (1%)	2	2·6 (1·2–5·4)	0·01	2·6 (1·2–5·6)	0·02
Always used alcohol wipe	273 (39%)	375 (50%)	−11	0·6 (0·5–0·8)	0·001	0·6 (0·5–0·8)	0·0001
Sex with same-sex partner	44 (10%)	23 (5%)	5	2·1 (1·3–3·5)	0·004	2·3 (1·3–4·1)	0·003
Sex with opposite-sex partner	384 (88%)	453 (98%)	−10	0·1 (0·07–0·3)	0·001	0·1 (0·06–0·3)	0·0001
Paid for sex with opposite-sex partner	31 (8%)	18 (4%)	4	2·3 (1·2–4·3)	0·008	2·2 (1·1–4·2)	0·02

*Skip pattems were used to avoid asking irrelevant questions. †Adjusted for sociodemographic characteristics and site.

Table 3: **Reported socially "sensitive" behaviour in 30 days before interview, by interview method**

in syringe-exchange programmes because of a possible association with HIV risk, or because of the implication that one is not able to obtain sex without payment.

With audio-CASI, participants reported income from illegal sources, recent imprisonment, living in shelters, and selling injection equipment from the exchange significantly more frequently than with face-to-face interviewing. We also found that audio-CASI participants expressed more negative attitudes towards syringe-exchange staff than face-to-face interviewees (data not shown, available from D C Des J). We did not record any instances in which face-to-face interviews led to significantly more frequent reporting of socially sensitive behaviours than audio-CASI.

In multiple logistic regression, we noted differences in the reporting of sensitive behaviours by site and by sociodemographic group. Since these differences were independent of data-collection method, we presume that they reflect real differences in the prevalence of sensitive behaviour among sites and among demographic subgroups. Our sample size was not large enough to systematically assess the confounding effects of site, sociodemographic characteristics, and differences in the "real" rates of engaging in sensitive behaviours on possible site or subgroup differences in response to audio-CASI data collection. Since each fieldworker worked at only one site, the characteristics of the fieldworkers and their interview technique would also be confounders.

We checked unadjusted and adjusted odds ratios (tables 2, 3) for "counter-examples"—instances in which there was significantly more reporting of HIV risk behaviour in face-to-face interviewing than in audio-CASI. Counter-examples would show intersite differences and caution against adoption of audio-CASI methods across all sites. Among the 96 odds ratios calculated, there were no significant counter-examples ($p>0·19$). At all sites there was significantly more reporting of sensitive behaviours in audio-CASI.

Discussion

Readiness to participate, the high degree of interview completion, the small amount of missing data for sensitive questions, and the lack of frivolous responses all suggest that our study group found both audio-CASI and face-to-face interviews acceptable methods for data collection. We believe that the use of random-number tables for participant selection and weekly alternation of interview methods created unbiased assignment of participants to interview method. The nature of the study precluded the possibility of blinding participants to the experimental conditions. Thus, bias may have appeared in participants' responses depending on the interview method assigned. Such bias might be manifested in different degrees of participation, different rates of interview completion, and different amounts of missing data for key questions in the interview. We did not observe any bias in responding to the assigned interview method, and we conclude that there is at most minimal bias in our data.

Participants in audio-CASI were more likely to report HIV risk behaviours, and less likely to report protective behaviours than participants in traditional face-to-face interviews. We could not independently validate the self-reported risk behaviours in either interview method, and so we are not absolutely certain that the audio-CASI results are closer to the true rates of risk behaviour than the face-to-face interview results. Indeed, validation of many of the risk behaviours, particularly sexual behaviours, would require an unacceptable invasion of privacy.

Increased reporting of HIV risk behaviour is part of a larger pattern of increased reporting of sensitive behaviours with the audio-CASI method, including differences in reporting of same-sex sexual activities, not using alcohol wipes, and abstinence from drug injection. We do not know why audio-CASI participants would have reported sensitive behaviours if they did not actually engage in those behaviours. We therefore conclude that the audio-CASI method led to more complete reporting of sensitive behaviours among our syringe-exchange participants. We cannot say whether more complete reporting results from greater privacy when using audio-CASI, or from the more scientific appearance of a computer-based study.

The four syringe-exchange programmes in this study were a convenience sample, so generalisation to other programmes is an empirical issue. Similarly, generalisation to other HIV-prevention programmes and other populations at relatively high risk of HIV infection awaits further research.

Data on HIV risk behaviour collected from injecting drug users in face-to-face interviews are not necessarily invalid. There is substantial evidence for the validity of face-to-face interview data from injecting drug users, including studies that used HIV infection as the criterion for validity.[10,11] Audio-CASI may be an important improvement on face-to-face interviews for collecting data on HIV risk behaviour, but face-to-face interview data are still valid.

Our data show that there is substantially more HIV risk behaviour among participants in syringe-exchange programmes than has been reported by face-to-face interviews.[12,13] Studies of HIV incidence that used face-to-face interviews at syringe-exchange programmes showed low incidence rates except in Montreal and Vancouver.[13,14] Studies in Tacoma[15] and New York City[16] showed low incidence of HIV: 0·3 cases per 100 person-years in Tacoma, where HIV-1 seroprevalence was 5% among injecting drug users, and 1·5 cases per 100 person-years in New York City, where HIV-1 seroprevalence was about 40% among injecting drug users. Our study suggests that traditional face-to-face

interviews tend to under-report actual HIV incidence.

Our data also show that there is room for improvement in reducing risk behaviours among participants in syringe-exchange programmes. In some areas, these programmes have led to extremely low rates of HIV transmission among injecting drug users, without control of hepatitis B and hepatitis C transmission,[17,18] both of which are more efficiently transmitted through sharing injection equipment than is HIV.[19] Ideally, better measurement of risk behaviours will lead to programme improvements, better control of hepatitis B and C transmission, and control of HIV transmission among injecting drug users.

We believe that more complete reporting of risk behaviour is important in many types of HIV research, including: evaluation of HIV-prevention efforts; studies of critical phases in HIV epidemics; and mathematical modelling of HIV transmission. Many modelling studies use self-reported HIV risk behaviour to estimate behavioural patterns.[20–22] We suggest that the probability of actual HIV transmission in each "risky act" may be around 50–66% that of the estimated probability in previous studies. Further research is needed to assess the sensitivity of specific behaviours among different populations and in different social contexts.

Contributors

Don C Des Jarlais was the principal investigator, with responsibility for overall scientific work, from formulation of hypotheses to preparation of the paper; Denise Paone waas responsible for instrument development and training of data-collection staff; Judith Milliken oversaw field data collection and maintained overall scientific integrity of data collection; Charles F Turner, one of the developers of audio-CASI, contributed to overall research design; Heather Miller contributed to hypotheses design and overall research design; James Gribble supervised audio-CASI field operations; Qiuhu Shi did primary statistical analysis; Holly Hagan contributed to overall research design and supervised fieldwork at one site; and Samuel R Friedman contributed to research design and the preparation of the paper.

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