

Acceptance, Communication Mode, and Use of Audio Computer-Assisted Self-Interviewing Using Touch Screen to Identify Risk Factors Among Pregnant Minority Women

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Abstract

This paper evaluates the acceptability, communication mode, and use of audio computer-assisted self-interviewing (ACASI) among minority pregnant women receiving prenatal care in six Washington, DC, sites. We screened 2,913 women for demographic eligibility (at least 18 years old, less than 29 weeks' gestation, black or Hispanic) and risk of harm from smoking, environmental tobacco smoke exposure, depression, or intimate partner violence. Questions were displayed on touch-screen laptop monitors and heard through earphones. The mean length of time to complete the screening interview was almost 6 minutes.

We compared ACASI experience, which included difficulty in using the computer, acceptability (enjoyment), and preferred communication mode, across sites, across the eligibility and risk groups, and across a subset of 878 enrolled women for whom we had information on educational attainment and receipt of WIC (the Supplemental Nutrition Program for Women, Infants, and Children, a proxy for income). Respondents reported that ACASI was not difficult to use and that they liked using the computer. Respondents who were black or Hispanic enjoyed it significantly more than did respondents of other races/ethnicities. Of the respondents who were demographically eligible and who were black or Hispanic, those who had lower education levels listened to questions significantly more than did their counterparts. Mainly listening vs. listening and reading did not impact burden in terms of the length of time it took to complete the screener.

The acceptance of ACASI as a screening tool opens the door for more uses of this technology in health-related fields. The laptop computer and headphones provide privacy and mobility, so the technology can be used to ask sensitive questions in almost any locale, including busy clinic settings.

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Introduction

To implement behavior modification(s) in an at-risk population, individuals in the population must first be identified. Self-reported risk behavior may be invalid if individuals refuse to disclose or minimize their reporting of this information; thus, a screening process that elicits honest responses is essential. One means of achieving this objective is the use of audio computer-assisted self-interviewing (ACASI). In addition to providing a private environment in which to report risky behaviors, the ACASI touch screen makes the tool easy to use and the audio recording addresses the issue of illiteracy, an inherent problem when using self-administered data forms.

Although differences in prevalence rates of risky behaviors between studies may be explained by differences in question wording, characteristics of the populations, or other variations, differences in mode of data collection cannot be dismissed. The impact of ACASI as a viable data collection tool for reporting risky behavior has been demonstrated. In two different studies, pregnant women using ACASI self-reported 12 percent and 18 percent prevalence of high-risk drinking.^{1,2} This compares with 6 percent and 11 percent prevalence of alcohol use among pregnant women identified through paper and pencil self-administered interviews.^{3,4} In a study comparing ACASI with telephone responses, when screened using ACASI, 74 percent of African-American adolescents reported having engaged in sexual intercourse in the past 3 months, compared with 56 percent who were interviewed by telephone (odds ratio [OR]=1.9, 95% confidence interval [CI]=1.1–3.5).⁵

In another study comparing ACASI with conventional paper and pencil self-administered questionnaires, when using ACASI male adolescents reported significantly more male-male sexual behaviors, with adjusted odds ratios ranging from 2.3 to 7.8, significantly more drug use, with adjusted odds ratios ranging from 1.3 to 9.6, and the combination of sexual contact with drug use, with adjusted odds ratios ranging from 1.9 to 17.1.⁶ When using ACASI, HIV-seropositive respondents were significantly less likely than similar respondents

using paper and pencil questionnaires to give socially desirable answers in response to questions regarding condom use, condom use frequency, and preventive behaviors.⁷ Sexually active women were significantly more likely to report engaging in anal sex (OR=9.0, 95% CI=1.1–71.0),⁸ and injecting drug users reported significantly more unsafe drug-related behaviors such as sharing, renting, or selling used syringes.⁹ Research conducted in Thailand suggests that ACASI may lead to increased reporting of behaviors such as unprotected intercourse, coerced sex, unwanted pregnancy, sexually transmitted diseases, and drug use.¹⁰

Screening for risks and risk behaviors in health settings should become standard practice if clinicians are to provide appropriate interventions.¹¹ ACASI has been successfully used across a broad range of risks and risk behaviors: depressive symptoms¹² and psychiatric disorders¹³ among adolescents, alcohol screening,¹⁴ eating behaviors,¹⁵ intimate partner violence screening,¹⁶ and abuse among persons with disabilities.¹⁷ In particular, Renker and Tonkin (2007) reported that participants indicated not only preferring a computer format, with the associated anonymity, but also that they responded more truthfully to the questions than they would have to an interviewer.¹⁶

Evidence exists that respondents do accept ACASI. When queried about their ACASI experience, black pregnant women overwhelmingly reported liking it and finding it easy to use.¹ ACASI was acceptable to 89 percent of the respondents interviewed in urban sexually transmitted disease clinics,¹⁸ and adolescent boys and their fathers revealed a high level of acceptance of ACASI during cognitive interviews.¹⁹ In using ACASI to measure medication adherence to treat latent tuberculosis infection, 86 percent of the respondents were very satisfied with the experience.²⁰ In a field test with injection drug users, participants were assigned to either a personal interview or a mixed personal and ACASI interview. In addition to reporting more risk behaviors, 92 percent of ACASI respondents said they liked using the computer, and 41 percent said they would prefer to use the computer solely.²¹ In a randomized controlled trial comparing

ACASI with interviewer-administered questionnaires, more than 90 percent of Brazilian drug users who completed ACASI reported no problem using the computer.²²

The value of ACASI has been well demonstrated, and the acceptability of ACASI by respondents is good. Self-administration of questionnaires for sensitive issues results in responses that are more accurate than those given to interviewers. In addition, ACASI allows for use of complex fill, skip, and edit checks as well as branching and providing prompts.^{23,24} ACASI also permits accurate responses across a broad range of literacy levels. In particular, it is appropriate for use when the respondents are not sufficiently literate to complete a paper and pencil questionnaire, as it simplifies the response task. This factor is crucial because screening for risky behaviors often involves populations with low literacy capabilities. Listening and having the responses highlighted as they are heard and using the touch screen increase the likelihood that the respondents will understand the questions and responses. However, little is known about whether respondents actually listen to the questions and responses. In this paper, we report on the acceptability, communication mode, and use of ACASI as a screening tool among minority pregnant women in the Healthy Outcomes of Pregnancy Education (Project DC-HOPE) study.

Methods

Background

Project DC-HOPE is part of the National Institutes of Health (NIH)-DC Initiative to Reduce Infant Mortality in Minority Populations in Washington, DC (DC Initiative). The DC Initiative is a collaborative effort involving the Children's National Medical Center, George Washington University, Georgetown University, Howard University, the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD), and RTI International. NICHD is part of the NIH, within the US Department of Health and Human Services. This randomized controlled trial was initiated with the goals of (1) reducing the prevalence of specific risk factors linked to adverse pregnancy outcomes by

providing integrated health behavior counseling to pregnant black women and Latinas in Washington, DC, and (2) improving pregnancy outcomes.²⁵⁻²⁸

Project DC-HOPE provided pregnant women with an individualized, integrated, clinic-based intervention targeting biological risk (active smoking or environmental tobacco smoke exposure) and psychosocial risk (depression and intimate partner violence).²⁶ We approached women in six Washington, DC, prenatal clinics between July 2003 and October 2005, informed them about the study, and gained their written consent to participate. We then screened them for eligibility, and if the women were eligible, we recruited them and gained their written consent to participate in the trial. After the women completed a baseline telephone interview, we assigned them to either the intervention group or the usual care group, using site and risk block randomization methodology, which took into account the recruitment site as well as the number and type of declared risks. The study was approved by the institutional review boards of the DC Initiative collaborators and of those sites that had IRBs.

We determined demographic eligibility and the presence of risk factors through an ACASI screening questionnaire. To be demographically eligible, women needed to be less than 29 weeks of gestation at recruitment; black or Latina; at least 18 years old; and living in the District of Columbia. In addition, they needed to self-report at least one targeted risk factor: cigarette smoking; environmental tobacco smoke exposure; depression; or intimate partner violence. We adapted questions on cigarette smoking and exposure to tobacco smoke from the Robert Wood Johnson Foundation's Smoke-Free Families (SFF) core screening and baseline questionnaires,²⁹ and we used the seven-item Beck Depression Inventory (BDI)-FastScreen³⁰ to identify depression risk. If a woman reported suicidal ideation based on one of the BDI items, she was not eligible for the study. We terminated the screening questionnaire and informed the clinic staff so that they could intervene appropriately. We identified intimate partner violence using items adapted from the Abuse Assessment Screen.³¹

The ACASI questionnaire began with six training questions. Women listened to digitally recorded questions on headphones that were connected to a laptop computer. As the woman heard a response choice, it was highlighted on the screen. She answered the question by touching the chosen response option on the screen. The woman did not need to wait for the audio to be completed before selecting a response option.

A study staff member was available for assistance with the first six questions. Thirty-nine questions related to eligibility criteria, followed by three questions on the acceptability and experience of using the computer and the woman's preference of communication mode. The first, *How difficult was it to use the computer to answer the survey questions?* was ranked on a 3-point scale from "Not difficult" to "Very difficult." Then the respondent was asked, *How much did you like answering the questionnaire using the computer?* ranked on a 5-point scale from "I liked it a lot" to "I disliked it a lot." Finally, to assess communication mode and how women used the computer, they were asked whether they mostly listened, mostly read, or both.

We approached a total of 6,202 women as they presented at the clinic sites. Of these, the research assistants determined that 1,989 were ineligible (not pregnant, non-English-speaking, less than 18 years old, too close to delivery) through a brief verbal interview. Of the remaining 4,213 approached for ACASI administration, 649 refused, 651 consented but were unable to complete the screener, and 2,913 women consented and completed the ACASI screener. In most cases, women did not complete the ACASI questionnaire because they were called in for their prenatal appointment before finishing and did not return to complete the screener.

Statistical Analysis

We conducted bivariate analysis of completion time for sites by eligibility and communication mode. We then developed general linear models to predict completion time by site, eligibility, and communication mode.

We collapsed response categories for the three questions on the experience of using the computer to create three dichotomous outcome variables, because of small numbers in some response categories.

These outcome variables were (1) difficulty of use: not difficult versus somewhat or very difficult; (2) enjoyment of use: liked a little or a lot versus feeling neutral or disliking it; and (3) preferred mode of communication: listening to the questions being read (mostly listening or both reading and listening) versus mostly reading (use, acceptability, and communication mode, respectively).

We examined bivariate associations of these three outcomes with various sociodemographic characteristics (eligibility status, race/ethnicity, gestational age, and residency) and risk characteristics (smoking, depression, and intimate partner violence risks) using Fisher's exact tests. Because of the potential for confounding among our demographic and risk characteristics, we then used logistic regression to obtain adjusted independent odds ratios for each characteristic. We created separate regression models to include demographic characteristics and risk characteristics, given that only demographically eligible women continued to respond to the risk assessment questions.

Finally, to evaluate the effects of socioeconomic status (SES) on ACASI enjoyment and experience, we ran logistic models including risk and SES characteristics on a subset of the population. This subset of 878 women included only those who (1) responded to the ACASI acceptability questions and (2) completed the baseline interview (enrolled in the study), thereby providing information on educational attainment and income. Because the income question had high levels of missing data, we used receipt of assistance from the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) as a proxy for low income. We ran these models for just two outcome variables: enjoyment of use and mode of communication. Difficulty of use was excluded because the small number of women ($n = 7$) who found the computer difficult to use would not have permitted meaningful analyses.

Results

Of the 2,913 women who completed the screener, 2,403 women answered questions about their experience of using the computer to complete the screening questionnaire. Table 1 presents the demographic and risk characteristics of these women.

The respondents reported overwhelmingly that ACASI was not difficult to use, with less than 3 percent finding it somewhat or very difficult to use. More than two-thirds of the women reported liking using the computer a lot, and less than 1 percent of women disliked it. Sixty-one percent of women both read and listened to the computer. Twenty-nine percent mostly read the questions and responses, and the remaining 10 percent mostly listened (Table 2).

Table 1. Demographic and risk characteristics of ACASI respondents

Characteristic	n	%
Demographic Characteristics		
Demographically eligible from ACASI	1,626	67.7
Black or Hispanic	2,077	86.9
Currently pregnant	2,391	99.7
28 weeks pregnant or less	1,804	75.5
18 years or older	2,387	99.3
Washington, DC, resident	1,962	81.7
Risk Characteristics		
Smoking risk	1,130	70.0
Depression risk	420	26.0
Intimate partner violence risk	231	14.3
Any risk factor	1,219	75.5
Total Respondents	2,403	—

We found no associations between demographic eligibility, race/ethnicity, or Washington, DC, residency and the perception of difficulty in using the computer (Table 3). Women who did not know their gestational age were 4.2 times as likely to find the computer difficult as those at 28 weeks of gestation or more (95% CI:1.6–10.9). However, the sample size for the group who did not know their gestational age and who found the computer difficult to use is very small, leading to wide variability in this estimate.

Among women who were demographically eligible, those with depression risk were 4.6 times as likely to report that the computer was somewhat or very difficult to use (95% CI:2.3–9.4). No significant differences were found among other risk groups.

Table 2. Respondents' experience using ACASI

Question	n	%
(1) How difficult was it to use the computer to answer the survey questions?		
1. Not difficult	2,345	97.8
2. Somewhat difficult	47	2.0
3. Very difficult	7	0.3
(2) How much did you like answering the questionnaire using the computer?		
1. I liked it a lot	1,619	67.5
2. I liked it a little	316	13.2
3. I neither liked nor disliked it	445	18.5
4. I disliked it a little	11	0.5
5. I disliked it a lot	8	0.3
(3) When answering the survey questions, did you...		
1. Mostly listen but not always read the questions on the screen	230	9.6
2. Generally read the question on the screen and listen	1,469	61.3
3. Mostly read the questions on the screen, but not always listen	699	29.2

Table 3. Reported difficulty of computer use, by demographic and risk characteristics

Characteristic	Not Difficult n (%)	Somewhat or very difficult n (%)	Unadjusted odds ratio (95% CI) ^a	Adjusted odds ratio (95% CI) ^a
Demographic Characteristics				
Demographically eligible from ACASI^b				
Yes	1,586 (97.8%)	36 (2.2%)	1.0 (0.5, 1.8)	n/a
No	759 (97.7%)	18 (2.3%)		
Black or Hispanic				
Yes	2,026 (97.7%)	47 (2.3%)	1.4 (.6, 4.7)	1.5 (0.6, 3.8)
No	309 (98.4%)	5 (1.6%)		
28 weeks pregnant or less^b				
Don't know	65 (90.3%)	33 (1.8%)	36.3 (14.9, 100.2)	4.2 (1.6, 10.9)
Yes	1,767 (98.2%)	14 (2.7%)	0.6 (0.2, 1.7)	0.7 (0.4, 1.3)
No	501 (97.3%)	7 (9.7%)		
Washington, DC, resident				
Yes	1,915 (97.8%)	43 (2.2%)	0.9 (0.4, 1.9)	0.7 (0.4, 1.5)
No	430 (97.5%)	11 (2.5%)		
Risk Characteristics^a				
Smoking risk				
Yes	1,100 (97.7%)	26 (2.3%)	1.1 (0.5, 2.6)	0.8 (0.4, 1.7)
No	474 (97.9%)	10 (2.1%)		
Depression risk^b				
Yes	395 (94.7%)	22 (5.3%)	4.7 (2.3, 10.0)	4.6 (2.3, 9.4)
No	1,179 (98.8%)	14 (1.2%)		
Intimate partner violence risk				
Yes	221 (96.1%)	9 (3.9%)	2.0 (0.8, 4.5)	1.3 (0.6, 3.0)
No	1,353 (98.0%)	27 (2.0%)		
Any risk factor				
Yes	1,187 (97.7%)	28 (2.3%)	1.1 (0.5, 2.9)	n/a
No	387 (98.0%)	8 (2.0%)		

CI = confidence interval. n/a = not applicable.

Note: Risk characteristics are presented for demographically eligible women, n = 1,626.

^a Odds ratios are not presented for the reference cell. We have modeled the odds of finding ACASI somewhat or very difficult.

^b Significant bivariate association, $p < 0.05$.

Mothers who were demographically eligible for the study enjoyed using the computer more than did mothers who were demographically ineligible (Table 4). Among those demographically eligible, women without intimate partner violence risk were

twice as likely to enjoy using the computer as were those with this risk (95 percent CI: 0.4–0.7).

Respondents who were black or Hispanic and those who lived in Washington, DC, were more likely to

Table 4. Reported enjoyment of using computer, by demographic and risk characteristics

Characteristic	Liked a little or a lot n (%)	Neutral or disliked n (%)	Unadjusted odds ratio (95% CI) ^a	Adjusted odds ratio (95% CI) ^a
Demographic Characteristics				
Demographically eligible from ACASI^b				
Yes	1,346 (83.0%)	276 (17.0%)	0.6 (0.5, 0.8)	n/a
No	589 (75.8%)	188 (24.2%)		
Black or Hispanic^b				
Yes	1,736 (83.7%)	337 (16.3%)	0.3 (0.2, 0.4)	2.9 (2.2, 3.7)
No	193 (61.5%)	121 (38.5%)		
28 weeks pregnant or less^b				
Don't know	64 (88.9%)	8 (11.1%)	0.6 (0.2, 1.3)	1.3 (0.6, 2.9)
Yes	1,433 (79.6%)	367 (20.4%)	1.2 (1.0, 1.6)	0.8 (0.6, 1.0)
No	427 (82.9%)	88 (17.1%)		
Washington, DC, resident				
Yes	1,618 (82.6%)	340 (17.4%)	0.5 (0.4, 0.7)	1.4 (1.1, 1.8)
No	317 (71.9%)	124 (28.1%)		
Risk Characteristics^a				
Smoking risk				
Yes	947 (84.1%)	179 (15.9%)	0.8 (0.6, 1.1)	1.3 (1.0, 1.7)
No	394 (81.4%)	90 (18.6%)		
Depression risk^b				
Yes	353 (84.7%)	64 (15.4%)	0.9 (0.6, 1.2)	1.3 (0.9, 1.8)
No	988 (82.8%)	205 (17.2%)		
Intimate partner violence risk^b				
Yes	175 (76.1%)	55 (23.9%)	1.7 (1.2, 2.4)	0.5 (0.4, 0.7)
No	1,166 (84.5%)	214 (15.5%)		
Any risk factor				
Yes	1,019 (83.9%)	196 (16.1%)	0.8 (0.6, 1.2)	n/a
No	322 (81.5%)	73 (18.5%)		

CI = confidence interval. n/a = not applicable.

Note: Risk characteristics are presented for demographically eligible women, n = 1,626.

^a Odds ratios are not presented for the reference cell. We have modeled the odds of liking the ACASI a little or a lot.

^b Significant bivariate association, $p < 0.05$.

listen to the questions being read than were their counterparts (Table 5). In addition, women who did not know their gestational age were 4.0 times as likely to listen to the questions as those whose gestational age was greater than 28 weeks (95% CI:1.8–8.9). Among women who were demographically eligible, those with smoking risk were 1.5 times as likely to listen to the questions being read as those without this risk (95% CI:1.2–2.0).

Among women for whom SES data were available from the baseline interview, we developed logistic regression models predicting enjoyment using the computer and mode of communication, with education, WIC, and the three risk factors as covariates. Educational attainment was a significant predictor of both computer enjoyment and mode of communication. Women with less than a high school education, or with a high school diploma or

Table 5. Mode of communication using ACASI, by demographic and risk characteristics

Characteristic	Listen at all n (%)	Mostly read n (%)	Unadjusted odds ratio (95% CI) ^a	Adjusted odds ratio (95% CI) ^a
Demographic Characteristics				
Demographically eligible from ACASI^b				
Yes	1,228 (75.7%)	394 (24.3%)	0.5 (0.4, 0.6)	n/a
No	471 (60.7%)	305 (39.3%)		
Black or Hispanic^b				
Yes	1,547 (74.6%)	526 (25.4%)	0.3 (0.2, 0.4)	3.0 (2.3, 3.9)
No	143 (45.7%)	170 (54.3%)		
28 weeks pregnant or less^b				
Don't know	65 (90.3%)	7 (9.7%)	0.2 (0.1, 0.5)	4.0 (1.8, 8.9)
Yes	1,280 (71.2%)	519 (28.9%)	0.8 (0.7, 1.0)	1.2 (1.0, 1.5)
No	346 (67.2%)	169 (32.8%)		
Washington, DC, resident^b				
Yes	1,448 (74.0%)	510 (26.1%)	0.5 (0.4, 0.6)	1.6 (1.3, 2.0)
No	251 (57.1%)	189 (43.0%)		
Risk Characteristics^a				
Smoking risk^b				
Yes	880 (78.2%)	246 (21.9%)	0.6 (0.5, 0.8)	1.5 (1.2, 2.0)
No	339 (70.0%)	145 (30.0%)		
Depression risk^b				
Yes	323 (77.5%)	94 (22.5%)	0.9 (0.7, 1.2)	1.1 (0.8, 1.4)
No	896 (75.1%)	297 (24.9%)		
Intimate partner violence risk				
Yes	175 (76.1%)	55 (23.9%)	1.0 (0.7, 1.4)	0.9 (0.6, 1.3)
No	1,044 (75.7%)	336 (24.4%)		
Any risk factor^b				
Yes	942 (77.5%)	273 (22.5%)	0.6 (0.5, 0.9)	n/a
No	277 (70.1%)	118 (29.9%)		

CI = confidence interval. n/a = not applicable.

Note: Risk characteristics are presented for demographically eligible women, n = 1,626.

^a Odds ratios are not presented for the reference cell. We have modeled the odds of listening to the questions being read.

^b Significant bivariate association, $p < 0.05$.

GED, were significantly more likely to enjoy using the computer and to listen to the questions being read than were those with some college education (Table 6). Receipt of WIC was not significantly related to computer enjoyment or mode of communication. Regarding difficulty of use, we did not develop a logistic model because 98 percent of respondents had no difficulty using the computer to answer the screening questions.

For the 2,913 women who completed the ACASI screening, the mean time for completion was 4.8 minutes. Table 7 shows the average mean time for completion of the ACASI screening by eligibility, site, and communication mode. For demographically eligible women, the mean completion time was 5.8 minutes, and for those ineligible, the mean completion time was 2.3 minutes. Mean completion

Table 6. Adjusted odds ratios for predicting respondents' computer enjoyment and preferred ACASI communication mode

Characteristic	Question 2: Liked using the computer a little or a lot n (%)	Question 3: Mostly listened or both read and listened n (%)	Question 2: Liked using the computer a little or a lot AOR (95% CI)	Question 3: Mostly listened or both read and listened AOR (95% CI)
Receives WIC^a				
Yes	306 (84.3%)	281 (77.4%)	0.9 (0.6, 1.4)	n/a
No	434 (84.3%)	409 (79.7%)	Referent	0.8 (0.6, 1.1)
Education^b				
Less than high school	225 (86.5%)	219 (84.2%)	1.8 (1.1, 3.0)	2.2 (1.4, 3.5)
High school graduate/GED	347 (86.8%)	319 (79.8%)	1.8 (1.2, 2.9)	1.6 (1.1, 2.4)
Some college	168 (77.8%)	152 (70.4%)	Referent	Referent

AOR = adjusted odds ratio. CI = confidence interval. n/a = not applicable. WIC = Supplemental Nutrition Program for Women, Infants, and Children.

Note: Population was subset for women with baseline data, n = 878. The logistic regression also accounted for smoking, depression, and intimate partner violence.

^a Of the enrolled women, 41.5 percent were receiving WIC.

^b Of the enrolled women, 29.6 percent had less than high school education, and 45.7 percent had a high school degree or GED.

Table 7. Duration of ACASI: mean time (minimum–maximum) in minutes, by communication mode, eligibility, and site

	Listen Only	Read Only	Listen and Read	Total
Eligibility				
Eligible	5.68 (2.68–25.55)	5.11 (2.55–20.55)	6.18 (2.88–36.02)	5.78 (2.25–36.02)
Ineligible	2.58 (1.08–6.42)	2.05 (0.92–8.03)	2.60 (0.83–7.18)	2.34 (0.58–8.37)
Site				
A	4.71 (2.20–7.33)	4.43 (1.50–9.38)	5.73 (0.83–36.02)	5.38 (0.83–36.02)
B	4.91 (1.65–7.23)	4.54 (1.72–10.35)	5.78 (1.60–11.37)	5.09 (0.58–22.62)
C	4.11 (1.08–13.97)	3.25 (0.92–11.88)	4.18 (0.85–12.60)	3.73 (0.68–13.97)
D	6.02 (2.25–13.57)	4.53 (1.50–20.55)	5.57 (1.20–11.33)	5.33 (1.20–20.55)
E	4.91 (1.10–10.33)	4.37 (1.08–13.00)	5.19 (1.33–15.60)	4.99 (1.08–15.60)
F	5.31 (1.87–25.55)	4.25 (1.07–8.27)	5.39 (1.42–20.47)	5.08 (1.07–25.55)
Total	4.97 (1.08–25.55)	3.76 (0.92–20.55)	5.14 (0.83–36.02)	4.75 (0.58–36.02)

time by site ranged from 3.7 minutes to 5.4 minutes. Average completion time by site ranged from 5.2 minutes to 6.2 minutes for eligible women and from 2 minutes to 2.9 minutes for ineligible women (data not shown). Site C, which had the highest percentage of women who were high school graduates or had some college education and were working, showed the shortest completion time among ineligible (2 minutes) and eligible (5.2 minutes) women (data not shown).

Mean completion time of ACASI by communication mode increased from 3.8 minutes for women who read the questions on the screen to 5.0 minutes for those who listened to the questions and to 5.1 minutes for those who both read and listened. The pattern of time spent (*read only* was the shortest, followed by *listen only*, with *listen and read* the longest) was similar for eligible and ineligible women and overall. Completion time for ineligible women was approximately 3 minutes shorter than that for eligible women because once a woman was determined to be ineligible, the ACASI program skipped the rest of the screening questions. We developed a multiple regression model predicting ACASI completion time by site, eligibility, and communication mode (not shown). The results showed that each of the three covariates was significant at $p < .001$. The model fit was significant ($p < .001$), and the three covariates explained 49.6 percent of the variation in the completion time, thus implying a large effect size of 0.984.

Discussion

Women who consented and completed the ACASI screener overwhelmingly reported enjoying using the computer and found it easy to use. The majority of women, regardless of background, reported that they liked using the computer “a lot” to answer the survey questions. Furthermore, women who were demographically eligible for the study, and therefore answered more questions, enjoyed using the computer more than did women who were demographically ineligible. Respondents who were black or Hispanic and who were Washington, DC, residents enjoyed using the computer significantly

more than their counterparts. This may be explained by the novelty of the experience, given the lack of computer access in such populations.^{32,33} Those with intimate partner violence risk tended to feel less positive about using the computer than did women without this risk. Possibly, for these women, answering the intimate partner violence questions affected their experience.

For population groups with limited reading skills, the only alternative to self-administered reporting is for an interviewer to read potentially stigmatizing questions and responses aloud. ACASI provides a major benefit over face-to-face interviewing in that interviewees can listen to the question being read while also seeing the question on the screen. This dual communication mode allows respondents to choose the mode most effective for them.

In our study, the majority of the respondents mostly or generally listened to the questions. Within our respondent pool, we found that women coming from the more underserved populations as well as those with lower education levels tended to listen to the questions more than did their counterparts. This finding is generally consistent with the original intentions of the ACASI developers.²³

As might be predicted, those who mostly read the questions completed the ACASI in less time than those who mostly listened or read and listened, but the groups did not differ substantially in the mean completion time. The fact that using the audio feature of ACASI does not affect burden is reassuring for those who want to consider using this mode of survey. As previously noted, ACASI enhances the ability to screen for a broad range of risks and risk behaviors in a clinical setting^{11,17}; furthermore, it does this without interfering with the routine activities of the clinic.

The women in our study reported sensitive information and risky behavior at a higher prevalence using ACASI than did respondents in published studies using other reporting means. For example, 22 percent of our pregnant respondents reported that they currently smoke cigarettes. In comparison, using interviewer-collected data, the National Institute on Drug Abuse and the Substance Abuse

and Mental Health Services Administration reported tobacco use rates of 21 percent³⁴ and 20 percent,³⁵ respectively, among pregnant women. Data abstracted from birth certificates by the National Center for Health Statistics indicated that 12 percent of women giving birth reported that they smoked cigarettes.³⁶ In addition, 14 percent of our pregnant respondents reported intimate partner violence during the past year, compared with 10 percent prevalence of abuse reported by a multiethnic population-based sample of women ages 18 to 64 years during in-person, clinic-based interviews.³⁷

ACASI administration for eligibility screening in similar randomized controlled trials is recommended because of its ease of use and because it is a reliable and quick method for screening. On average, the completion time was less than 5 minutes. This means that administering ACASI screening in the busy environment of prenatal clinics does not occupy a lot of patients' time and can provide health professionals with needed and reliable information.

Study strengths include the novelty of exploring the ACASI communication mode, the large sample size, use within a population of pregnant minority women, verification of the ability to conduct ACASI screening within a busy clinic setting, and the touch-screen interface. Our study reinforces conclusions of the previous literature regarding the ability to screen for risk factors in public health settings. Screening for risks is an important part of the mainstream of preventive medicine. The novelty of exploring communication mode (listen only, read only, or listen and read) strengthens the ACASI literature.

Our study does have some limitations. Our results may apply only to lower-income, urban, minority women who seek prenatal care and thus may not be more broadly generalizable. In our study, out of 4,213 women approached, 15 percent ($n = 649$) refused to complete the ACASI screener. Because women were not queried about the reason(s) for their refusal, we can only speculate as to why they declined to participate. Some may have refused because of their unfamiliarity with computers. We included only two sociodemographic variables (education level and WIC participation) as possible correlates for time

spent in completing ACASI and only for a subset of the sample. Data on other predictors that might be correlated with completion time were not examined.

Future research should determine the reasons for refusing to participate in ACASI screening. Furthermore, for those who do participate, researchers should ask more probing questions about the ACASI experience. For example, researchers might ask respondents their reasons for choosing a particular communication mode, or they might pose additional sociodemographic questions. Determining whether our results are generalizable to other populations could be helpful in identifying women at risk for adverse pregnancy outcomes and in exploring the possibility of incorporating a brief intervention to address these risks at the end of the screening.

Conclusion

Acceptance of ACASI as a screening tool in this study opens the door for increased use of this technology in health-related fields. Its advantages are numerous. Implementation is standardized for all respondents and is not subject to the variations that interviewers may impose when conducting an interview. Complex question ordering and skip patterns and mathematical calculations (e.g., scoring questionnaire scale items) can be programmed, providing ease in navigating the questionnaire. Data are available immediately. The laptop computer and headphones provide privacy and mobility; thus, the technology can be used to ask sensitive questions in almost any locale, including busy clinic settings. Knowledge of computers is not necessary with the touch-screen component. The audio recording of the questions and answer choices provides an alternative to an interviewer reading potentially stigmatizing questions aloud to population groups with limited reading skills. We are encouraged that our respondents, especially those with less education and more likely to have limited reading skills, overwhelmingly reported listening to the questions; this finding reassures us that they understood the questions in a survey mode that did not jeopardize their privacy.

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