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Characteristics of youth agreeing to electronic sexually transmitted infection risk assessment in the emergency department

Fahd A Ahmad¹, Donna B Jeffe², Katie Plax¹, Kenneth B Schechtman³, Dwight E Doerhoff⁴, Jane M Garbutt^{1,2}, and David M Jaffe⁵

¹Department of Pediatrics, Washington University School of Medicine, St. Louis, Missouri, USA

²Department of Internal Medicine, Washington University School of Medicine, St. Louis, Missouri, USA

³Division of Biostatistics, Washington University School of Medicine, St. Louis, Missouri, USA

⁴Wellsoft Corporation, Somerset, New Jersey, USA

⁵American Academy of Pediatrics, Chicago, Illinois, USA

Abstract

Objectives—Adolescents and young adults are at high risk for sexually transmitted infections (STIs). We previously reported an increase in STI testing of adolescents in our ED by obtaining a sexual history using an Audio-enhanced Computer-Assisted Self-Interview (ACASI). We now examine associations among demographics, sexual behaviour, chief complaint and willingness to be tested.

Methods—This was a prospective study conducted in a paediatric ED between April and December 2011. After triage, eligible patients between 15 and 21 years presenting with non-life-threatening conditions were asked to participate in the study. Consenting participants used an ACASI to provide their demographic data and answer questions about their sexual history and willingness to be tested. Our primary outcome was the association of demographics, chief complaint and ACASI recommendation with the participant's willingness to be tested.

Correspondence to, Dr Fahd A Ahmad, Department of Pediatrics, Washington University School of Medicine, 660 S. Euclid Ave, Campus Box 8116, St. Louis, MO 63110, USA; fahd.ahmad@wustl.edu.

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Results—We approached 1337 patients, of whom 800 (59%) enrolled and completed the ACASI. Eleven who did not answer questions related to their sexual history were excluded from analysis. Of 789 participants, 461 (58.4%) were female and median age was 16.9 years (IQR 16.0–17.8); 509 (64.5%) endorsed a history of anal, oral and/or vaginal intercourse. Disclosing a sexual history and willingness to be tested did not differ significantly by gender. 131 (16.6%) had a chief complaint potentially referable to an STI; among the 658 participants with non-STI-related complaints, 412 (62.6%) were sexually active, many of whom disclosed risky behaviours, including multiple partners (46.4%) and inconsistent condom use (43.7%). The ACASI identified 419 patients as needing immediate STI testing; the majority (81%) did not have a chief complaint potentially related to STIs. 697 (88.3%) participants were willing to receive STI testing. Most (94.6%) of the patients with STI-related complaints were willing to be tested, and 92.1% of patients with a recommendation for immediate testing by the ACASI indicated a willingness to be tested.

Conclusions—Adolescents were willing to disclose sexual activity via electronic questionnaires and were willing to receive STI testing, even when their chief complaint was not STI related. The ACASI facilitated identification of adolescent ED patients needing STI testing regardless of chief complaint.

INTRODUCTION

Chlamydia trachomatis and *Neisseria gonorrhoeae* cause sexually transmitted infections (STIs) with a high level of morbidity when untreated and have a high burden of disease in the USA and elsewhere.¹ In 2015, 1.5 million cases of chlamydia and 400 000 cases of gonorrhoea were reported in the USA, an increase over recent years,² and Europe has reported similar numbers of infections in the past decade.³ WHO reports that worldwide there are >130 million new chlamydia infections and 78 million new gonorrhoea infections each year.⁴ Infection puts women at higher risk for pelvic inflammatory disease, ectopic pregnancies and infertility.¹ The Centers for Disease Control and Prevention (CDC) recommends that all sexually active women younger than age 25 receive annual testing for chlamydia and gonorrhoea,¹ and that men who have sex with men or men living in high STI prevalence areas receive annual testing. Adolescents and young adults are at the highest risk for infection and their sequelae; however, they are the least likely group to receive preventive or STI screening.^{5–7} Adolescents often seek episodic care in the ED,^{8–10} offering an opportunity for large-scale STI screening and testing. While universal HIV testing is now offered in many EDs,^{11–13} universal or risk-based gonorrhoea and chlamydia testing is not standard practice in the ED setting, even though these STIs are more prevalent than HIV in the USA.² Higher-cost tests and longer turnaround time for results may inhibit adoption of such practices, and improved methods to identify at-risk patients are needed.

Audio-enhanced Computer-Assisted Self-Interviews (ACASIs) have been used to obtain accurate sexual histories from adolescents in settings outside the ED.^{14–18} We previously described how we developed an ACASI to obtain a sexual history from adolescent/young adult patients in the ED and how it was used to increase gonorrhoea and chlamydia screening and testing in a paediatric ED setting.¹⁹ The purpose of this paper was to examine

associations among demographics, sexual behaviour, chief complaint and willingness to be tested.

MATERIALS AND METHODS

As described previously,¹⁹ we tested the ACASI in the ED of an urban, tertiary care, free-standing children's hospital, which treats approximately 50 000 patients annually, serving many youth from a Metropolitan Service Area with a high STI prevalence.¹²⁰ Following institutional review board approval at Washington University School of Medicine, participants reported demographic and sexual-behaviour information using an ACASI delivered on a laptop computer. An integrated software program created a recommendation for STI testing based on each participant's responses and CDC testing recommendations. The ACASI questions and the decision tree used to determine testing recommendations are published.¹⁹ We developed questions in collaboration with experts in paediatric emergency medicine, adolescent medicine, health behaviour research and paediatric infectious disease. Using cognitive interviews,²¹ items were pilot tested with adolescents at a local youth wellness centre that routinely provides STI testing and care to high-risk youth. During these interviews, we asked participants about their comprehension of words, questions, explanations and procedures in the ACASI. We collected data anonymously and used participants' feedback to improve the ACASI prior to use in the ED.

ED patients 15–21 years of age with non-life-threatening conditions at triage (Emergency Severity Index categories 2–5) were eligible for participation. We excluded patients who were victims of abuse, presented with psychiatric chief complaints or were unable to use a computer independently.

Our study aimed to approximate how we would use this intervention in a non-research setting. ED staff provided eligible patients and their parents/guardians, if present, a brochure during triage; the brochure described a confidential, general health screening process for youth without disclosing the specific topic of the screening.

After triage, trained research assistants (RAs) approached patients to further screen and enrol them. Patients under age 18 years who were unaccompanied by a parent/guardian had a waiver of parental consent and could provide assent without parental knowledge. When a parent/guardian was present, their consent was required; however, they were not told the content or purpose of the ACASI. Participants were given privacy to learn about the purpose of the study and to use the ACASI, which is in accordance with Missouri state law. The law provides healthcare providers the ability to interview minors privately regarding sensitive topics after asking family to leave the room and to provide medical care for STIs without parent/guardian consent.

Using the ACASI, study participants were asked whether or not they ever had anal, oral or vaginal intercourse. Those who answered 'yes' to any of the three were asked follow-up questions to determine who met criteria for gonorrhoea and chlamydia testing per CDC guidelines.¹ All participants were asked if they were willing to receive STI testing. Those who indicated they were not willing to receive testing were asked to pick a reason from a

preset list or to type in their reason. After answering this question, they were shown their STI testing recommendation. A summary of patients' answers and their testing recommendation was integrated into the ED electronic medical record (EMR).

RAs activated an electronic flag in the EMR to alert clinicians when a participant summary was available for review, similar to flags indicating newly available radiology results. Review of the patient summary and the decision to order STI tests were at the discretion of the treating clinicians. STI tests were ordered based on the ACASI results or as the ED provider deemed necessary based on their own evaluation. In some instances, the ED provider may have failed to review the ACASI results and did not order testing per the ACASI's recommendation. In other instances, providers might have ordered testing based on the patient's complaint or exam, irrespective of the ACASI results. Also possible is that the ACASI recommended testing but the ED provider chose not to order testing based on his or her own clinical judgement.

We considered genitourinary and gynaecological complaints, as well as abdominal pain in women, as potentially referable to an STI. Positive tests were followed up by our ED pediatric nurse practitioners (PNPs), consistent with regular ED procedures. PNPs notified all patients directly of positive tests, including minors. Patients with positive test results who did not receive empiric antibiotic treatment in the ED were given other options: a return visit to the ED for medication, a prescription called to a pharmacy or a referral to another healthcare location.¹⁹

Outcome measures

The primary outcome of interest was patients' willingness to be tested. We examined this outcome in relation to various demographic characteristics, sexual history and chief complaint. Secondary outcome was the proportion of patients without an STI-related complaint for whom the ACASI recommended testing.

Statistical analysis

Only participants who answered 'yes' or 'no' to at least one of the three questions about sexual intercourse were included in this analysis. We examined univariate associations among the categorical demographic variables, sexual behaviours, ED chief complaints and willingness to be tested using χ^2 and Fisher's exact tests, as appropriate, and compared median ages between groups using the Mann-Whitney U test.

Percentages and p values in the tables reflect only data from those participants who provided a response to that question. Items with missing responses are noted in the tables. Two-tailed p values < 0.05 were considered significant. Analyses were performed using IBM SPSS Statistics V.22.0.0.0.

RESULTS

Demographics and ACASI participation

We approached 1337 eligible patients and enrolled 800 (figure 1); reasons for refusing participation were not captured. Using data from the EMR, the 800 patients who completed

the ACASI were similar in age to patients who were approached but refused (median (IQR) 16.7 (15.8–17.6) vs 16.7 (15.8–17.7), respectively). A higher proportion of women than men enrolled (62.5% (467/747) vs 56.4% (333/590), $p = 0.02$), and a higher proportion of African-Americans enrolled compared with whites (63.9% (544/851) vs 53.1% (232/437), $p < 0.01$). The overall proportion of African-Americans to white patients approached for enrolment was representative of the racial distribution of patients seen in our ED. We did not see a significant difference in the proportion of patients with a chief complaint referable to an STI between participants and non-participants (16% (128/800) vs 21.1% (75/536), $p = 0.3$). Rates of missing data were very low, ranging from 0% (multiple items) to 1.4% (consistency of condom use).

Disclosure of sexual history

Of the 800 ACASI participants, 789 responded to at least one of the three questions about their history of anal, oral and/or vaginal sexual intercourse and were included in the analysis. Of these 789, 509 (64.5%) endorsed a history of any sexual intercourse. Patient characteristics based on their disclosure of a sexual history are shown in table 1.

Among the 509 patients who disclosed a sexual history, 78 (7.9%) disclosed anal intercourse, 318 (40.3%) disclosed oral intercourse and 479 (60.7%) disclosed vaginal intercourse. Many reported other behavioural risk factors for an STI, including multiple partners (46.9%) and inconsistent condom use (48.9%). Women were less likely than men to have had multiple partners in the preceding 12 months (40.8% (125/306) vs 56.2% (113/201), $p = 0.02$); however, they were more likely than men to have received STI testing in the past (53.4% (163/305) vs 25.3% (51/201), $p < 0.01$).

ED chief complaints

There were 131 patients with ED complaints referable to an STI; a greater proportion of women than men presented with a chief complaint potentially related to an STI (table 2). Patients with an STI-related complaint were more likely to report any sexual intercourse ($p = 0.01$), inconsistent condom use ($p < 0.001$), as well as prior STI testing ($p < 0.001$) and positive tests for gonorrhoea or chlamydia ($p < 0.001$) than those with non-STI-related complaints (table 2). We did not observe a significant association between the ED chief complaint and either age or number of new or total sexual partners.

Of the 131 patients with complaints potentially referable to an STI, 97 had a history of intercourse. Many patients in this group endorsed a history of dysuria (30/92), dyspareunia (17/90) and genital discharge (39/93). Our system automatically generated a recommendation for immediate testing for sexually active patients who endorsed these symptoms. Only a small proportion of this group (31/96) indicated they always used condoms.

In total, 340 patients without complaints potentially referable to an STI received a recommendation for immediate testing. Compared with those with chief complaints potentially referable to STIs, this group was less likely to have had gonorrhoea or chlamydia in the past (each $p < 0.001$). No statistically significant difference was found between those

with STI-related and unrelated complaints in the ACASI recommendation for testing (79/131 vs 340/658, $p = 0.07$).

Willingness to receive STI testing

Among the 789 participants, 781 patients answered the question about their willingness to be tested for gonorrhoea and chlamydia during the ED visit. Of these, 697 (89.2%) indicated they were willing to receive STI testing if recommended during their ED visit. Willingness to be tested did not differ significantly by age or gender (table 3). Figure 1 characterises the relationship between ED chief complaint, patients' willingness to receive testing and their testing recommendation. A substantial proportion of patients whose complaints were not referable to an STI were willing to receive testing and received a recommendation for STI testing by the ACASI. This included 234 participants who were willing to receive testing despite reporting they had not previously had intercourse.

Among the 417 patients who were classified as in need of testing, 384 (92.1%) indicated they would be willing to receive testing before we told them their recommendation. Thirty-two patients provided reasons why they would not want testing. Twenty-eight (87.5%) indicated they did not think they needed testing, two were worried about people finding out and one each was worried about cost or thought they had been tested recently enough to not require testing.

DISCUSSION

We previously reported that the ACASI identified >50% of participants as needing STI testing, and this resulted in an increase in STI testing among adolescents in our ED.¹⁹ To our knowledge, the current study is the first to both capture a sexual history via an ACASI and determine patients' willingness to receive STI testing in the ED regardless of ED chief complaint. In this study, we found that many participants with ED complaints unrelated to STIs disclosed high-risk sexual behaviours, and most participants (including those without high-risk activities) were willing to receive STI testing during the ED visit.

This finding has clinical implications as it demonstrates patient acceptance of augmented STI screening and testing in the ED, which is significant because 638 (80.9%) of all 789 participants were 15–17 years of age, an age group that carries a high burden of STIs.¹ The ACASI allowed us to collect data easily and confidentially, and participants were willing to disclose many details of their sexual history. Participants answered all questions with few exceptions, supporting the feasibility of using the ACASI to collect sensitive data, even when the reason for the visit is unrelated to STIs.

Eighty per cent of sexually active participants in this study were receiving care for issues unrelated to STIs, many of whom would be unlikely to receive STI testing without augmented screening methods. Nevertheless, 89% of 781 participants were willing to receive STI testing during their ED visit despite receiving care in the ED for unrelated issues. The ability to electronically capture this information and use it to screen patients for STI testing has advantages over other methods of collecting this information. Determining STI risk using the ACASI has the potential to reduce or eliminate healthcare provider,

socioeconomic and racial biases and disparities in STI testing²² in the ED and elsewhere. including the ACASI's ability to facilitate patients' private and confidential disclosure of sensitive information regarding STI risk, regardless of their ED complaint.

Our participants reported they preferred this mode of disclosure to face-to-face interviews,¹⁹ offering options for its application even in patients whose complaints do not relate to STIs. 15–182324 Potential barriers to gathering sexual history information in the ED might include lack of time or the limited privacy in the ED environment. Studies in other settings have demonstrated varying levels of comfort and skill on the part of healthcare providers in soliciting sexual histories from patients,^{25–27} problems that are largely bypassed using an ACASI. Employing the ACASI in the ED allows an efficient approach to screen and test for STIs as universal screening would lead to testing many patients with no risk of infection. Though nearly all patients in our study were willing to receive testing, many participants were not sexually active and would not benefit from testing.

Reed *et al*²⁸ interviewed 40 adolescents and their parents to explore attitudes towards offering universal gonorrhoea/chlamydia screening in the paediatric ED. In that study, 93% of adolescents and 98% of parents indicated they would support universal STI screening in the ED, but due to concerns about embarrassment and confidentiality, many adolescents stated they preferred that STI screening be conducted privately via a tablet computer instead of face-to-face interview. Findings from this study corroborate our finding that the majority of adolescent patients in the ED prefer to be screened for STIs using a computer-assisted interview.

Importantly, the proportion of participants in our study reporting a history of sexual behaviours was similar to or higher than the proportions reported on the Youth Risk Behavioral Surveillance System,²⁹³⁰ an anonymous, national survey of high-school youth in the USA. Our participants' willingness to disclose similar information on an identifiable basis for the purpose of STI screening in an ED setting speaks to the value of the use of an ACASI for identifying youth and young adults at risk of STIs, even when the ED chief complaint and symptoms are not referable to an STI.

The high level of willingness to receive STI testing, regardless of reason for visit, demonstrates that further exploration and potential full-time implementation of risk-based STI testing is needed. The ACASI warrants testing in other EDs as well as other healthcare locations, such as primary care settings, to facilitate identification of youth in need of STI testing. Use of the ACASI for STI screening also would benefit from cost-effectiveness analysis to help determine where risk-based screening may be appropriate. Risk-based screening has been examined using theoretical paradigms;³¹ however, observational studies providing real-world, cost-effectiveness evaluations are needed.

Limitations

Our ACASI was tested on a convenience sample of patients at a single paediatric ED in a US city, which might limit the generalisability of our findings. Approximately one-third of those patients approached refused to participate, and it is possible that this group would not have been as forthcoming as those who agreed to be in the study. We also received no information

regarding sexual history or willingness to receive STI testing from patients who refused to participate in the study. In addition, self-protection bias is a concern in studies involving the collection of self-reported sensitive information. While the ACASI was completed in private with an expectation of privacy and confidentiality, participants were told the responses were not anonymous and were linked to STI testing during the ED visit. Nevertheless, the vast majority of respondents answered all or nearly all of the ACASI questions. We identified three patients whose ACASI-obtained sexual history differed from that documented by the ED provider, but we do not know to what extent, if any, this might have occurred with other participants.

CONCLUSION

Nearly two-thirds of participants in this study disclosed detailed and sensitive information about their sexual behaviours via the ACASI. The need for STI testing determined by participants' responses to the ACASI did not differ significantly by ED chief complaint, and 89.2% of participants were willing to receive STI testing. Without the assistance offered by the ACASI in processing patient-reported behavioural information, neither the patient nor the ED provider may realise a patient's STI risk or need for testing. Although ED providers might be aware of STI testing recommendations, it is not realistic in busy ED settings to expect providers to ask the appropriate questions to determine patients' STI risk and apply that knowledge in real time to care for all patients as many present with non-STI-related complaints. The ACASI holds promise as a risk-based screening method to identify teens and young adults at risk for STIs during ED visits, which is especially salient in areas with a high prevalence of STIs.

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Key messages

What is already known on this subject?

- ▶ Adolescents are at high risk for sexually transmitted infections (STIs), yet many receive insufficient testing.
- ▶ Many adolescents at risk for STIs receive episodic ED care for reasons unrelated to STIs.
- ▶ Studies to directly determine if they are willing to receiving STI testing when in the ED for unrelated reasons have not been performed.

What this study adds?

- ▶ Our study suggests that adolescents are willing to disclose their sexual history via electronic questionnaires and receive STI testing in the ED, even if their visit is for an unrelated reason.

Figure 1.

Breakdown of patients based on ED chief complaint, patient willingness to receive sexually transmitted infection (STI) testing during the ED visit and STI testing recommendation.

Missing data represent participants who did not answer the question.

Table 1

Participant demographics by disclosure of any sexual intercourse (n = 789)

Demographics	History of sexual intercourse [*]		p Value
	Yes (n = 509)	No (n = 280)	
Age, n (years, %)			<0.001
15	91 (44.6)	113 (55.4)	
16	131 (61.5)	82 (38.5)	
17	166 (75.1)	55 (24.9)	
18–21	121 (80.1)	30 (19.9)	
Gender, n (%)			0.19
Female	306 (66.4)	155 (33.6)	
Male	203 (61.9)	125 (38.1)	
Hispanic/Latino ethnicity, n (%) [†]			0.03
Yes	15 (46.9)	17 (53.1)	
No	484 (65.2)	258 (34.8)	
Race, n (%)			<0.001
African-American	367 (72.7)	138 (27.3)	
White	107 (48.0)	116 (52.0)	
Multiracial	35 (57.4)	26 (42.6)	
Insurance status, n (%)			<0.001
Medicaid	366 (74.5)	125 (25.5)	
Private/military	115 (44.7)	142 (55.3)	
None	28 (68.3)	13 (31.7)	
Self-report access to medical care, n (%) [†]			0.55
Yes	441 (65.3)	234 (34.7)	
No	68 (62.4)	41 (37.6)	

^{*} Percentages shown are for row totals.

[†] Item has missing responses.

Table 2

Patient characteristics by ED chief complaint (n = 789)

ACASI responses	Chief complaint potentially STI related?*		p Value
	Yes (n = 131)	No (n = 658)	
Age in years, median (IQR)	17.1 (16.1–17.0)	16.9 (16.0–17.7)	0.93
Gender, n (%)			<0.001
Female	117 (25.4)	344 (74.6)	
Male	14 (4.3)	314 (95.7)	
History of any sexual intercourse, n (%)			0.01
Yes	97 (19.1)	412 (80.9)	
No	34 (12.1)	246 (87.9)	
New partners in the past three months, n (%) ^{†‡}			0.93
0	31 (20.22)	122 (79.7)	
1	51 (18.9)	219 (81.1)	
2	15 (18.5)	66 (81.5)	
Total partners in the past three months, n (%) ^{†‡}			0.31
0	13 (13.8)	81 (86.2)	
1	62 (20.9)	235 (79.1)	
2	21 (18.3)	94 (81.7)	
Total partners in the past 12 months, n (%) ^{†‡}			0.62
0	5 (13.2)	33 (86.8)	
1	45 (19.5)	186 (80.5)	
2	47 (19.7)	191 (80.3)	
Condom use, n (%) ^{†‡}			<0.001
Never	20 (33.3)	40 (66.7)	
Sometimes	45 (24.3)	140 (75.7)	
Always	31 (12.1)	226 (87.9)	
Ever tested for chlamydia or gonorrhoea, n (%) ^{†‡}			<0.001

	Chief complaint potentially STI related? [*]		
ACASI responses	Yes (n = 131)	No (n = 658)	p Value
Yes	59 (27.6)	155 (72.4)	
No	30 (12.4)	212 (87.6)	
Don't know	8 (16.0)	42 (84.0)	
Past positive test for chlamydia or gonorrhoea, ^{†‡} n (%)			<0.001
Yes	31 (34.1)	60 (65.9)	
No	64 (16.5)	325 (83.5)	
Don't know	2 (9.1)	20 (90.9)	
ACASI recommended STI testing during ED visit, n (%)			0.07
Yes	79 (18.9)	340 (81.1)	
No	52 (14.1)	318 (85.9)	

^{*} All genitourinary or gynaecological complaints, and abdominal pain in women; percentages shown are for row totals.

[†] Item has missing responses.

[‡] Among the 509 who endorsed a history of any intercourse.

ACASI, Audio-enhanced Computer-Assisted Self-Interview; STI, sexually transmitted infection.

Table 3

Patient characteristics by willingness to be tested for STIs (n = 781)

Characteristics	Willing to be tested during visit?*		p Value
	Yes (n = 697)	No (n = 84)	
Age in years, median (IQR)	16.9 (16.0–17.8)	16.9 (15.9–17.6)	0.93
Gender, n (%)			0.79
Female	409 (89.5)	48 (10.5)	
Male	288 (88.9)	36 (11.1)	
History of any sexual intercourse, n (%)			0.003
Yes	463 (91.7)	42 (8.3)	
No	234 (84.8)	42 (15.2)	
Condom use, n (%) ^{†‡}			0.1
Never	57 (96.6)	2 (3.4)	
Sometimes	172 (93.5)	12 (6.5)	
Always	228 (89.1)	28 (10.9)	
New partners in the past three months, n (%) ^{†‡}			0.003
0	132 (86.8)	20 (13.2)	
1	246 (91.8)	22 (8.2)	
2	81 (100)	0	
Total partners in the past three months, n (%) ^{†‡}			0.1
0	85 (90.4)	9 (9.6)	
1	265 (90.2)	29 (9.8)	
2	110 (96.5)	4 (3.5)	
Total partners in the past 12 months, n (%) ^{†‡}			0.04
0	35 (92.1)	3 (7.9)	
1	204 (88.3)	27 (11.7)	
2	223 (94.9)	12 (5.1)	
Ever tested for gonorrhoea/chlamydia [‡]			0.08
Yes	201 (94.8)	11 (5.2)	

Characteristics	Willing to be tested during visit? [*]		p Value
	Yes (n = 697)	No (n = 84)	
No	217 (89.7)	25 (10.3)	
Don't know	43 (87.8)	6 (12.2)	
ACASI recommended STI testing during ED visit, n (%)			0.03
Yes	384 (92.1)	33 (7.9)	
No	313 (86.0)	51 (14.0)	
Chief complaint related to STIs			0.03
Yes	123 (94.6)	7 (5.4)	
No	574 (88.2)	77 (11.8)	

^{*} Question asked before being shown their testing recommendation; from the 781 who answered this question; percentages shown are for row totals.

[†] Item has missing responses.

[‡] Among the 505 who endorsed a history of any intercourse.

ACASI, Audio-enhanced Computer-Assisted Self-Interview STI, sexually transmitted infection.