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Factors associated with screening for sexually transmitted infections

Stephanie L. SKALA, BS, **Gina M. SECURA, PhD, MPH**, and **Jeffrey F. PEIPERT, MD, PhD**
Washington University in St. Louis School of Medicine, Division of Clinical Research, Department of Obstetrics and Gynecology

Abstract

Objective—To determine predictors of completion of free annual sexually transmitted infection screening among sexually active young women 25 years of age and younger.

Study Design—We analyzed survey data from 2,607 sexually active women enrolled in the Contraceptive CHOICE Project, a prospective cohort study. We evaluated demographic characteristics, sexual risk behaviors, relationship characteristics, and contraceptive method. Receipt of a home or clinic-based test kit within 56 days of the 12-month survey constituted a completed screen. A multivariable model to predict screening completion was created using Poisson regression with robust error variance.

Results—Fifty-seven percent of women completed screening. Screening completion was most strongly associated with a college education or higher (RR_{adj}=1.2, 95% CI: 1.1, 1.3) and home-based testing (RR_{adj}=1.3, 95% CI: 1.2, 1.5).

Conclusions—Free and home-based testing increased screening rates among young women. To meet annual testing guidelines the availability and use of home testing kits should increase.

Keywords

Chlamydia screening; contraception; young women

Introduction

Each year in the United States there are an estimated 2.8 million new cases of C*hlamydia trachomatis* (CT) infection[1] and 718,000 new cases of *Neisseria gonorrhoeae* (GC) infection.[2] The majority of both infections are reported among women ages 15–24 years.[3] Chlamydia and gonorrhea are referred to as “silent infections,” due to the fact that they are often asymptomatic. Untreated infections may spread to the fallopian tubes or uterus and cause pelvic inflammatory disease (PID). Uterine and tubal damage can have long-term sequelae including infertility, ectopic pregnancy, and chronic pelvic pain.

Correspondence to: Gina M. Secura, PhD, MPH, Campus Box 8219, Washington University in St. Louis School of Medicine, 4533 Clayton Avenue, St. Louis, Missouri 63110, Phone: 314-747-4393, Fax: 314-747-4019, securag@wustl.edu.
Study conducted in Saint Louis, MO

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Although the Centers for Disease Control and Prevention (CDC) recommends annual CT screening for all sexually active women 25 years or younger, the 2007 national annual screening rate among sexually active women 16–25 years was only 41.6%.[1] The low screening rate is most likely influenced by multiple factors including lack of access to healthcare, transportation and financial limitations,[4,5] and concerns about confidentiality, waiting times, or the social consequences of a positive test result.[5,6,7] Because of the asymptomatic nature of these infections women may not appreciate the importance of annual screening[4,5]; whereas providers may fail to take a sexual history and perform the recommended CT screening.[8]

The purpose of this analysis was to determine the factors associated with sexually transmitted infection (STI) screening behavior in young sexually active women offered free STI screening 12 months after enrollment in the Contraceptive CHOICE Project. We hypothesized that completion of STI screening at 12 months may be related to demographic characteristics, sexual risk behaviors, relationship characteristics, and contraceptive method used. We were especially interested in whether the use of long-acting reversible contraceptive (LARC) methods (e.g., levonorgestrel IUS, copper IUD, and etonorgestrel subdermal implant) is a significant predictor of completion of annual STI screening. As LARC use increases, there may be concern that young women will not seek gynecological care (including STI screening) on an annual basis because these contraceptive methods are effective for 3–10 years.

Materials and Methods

The Contraceptive CHOICE Project (CHOICE) is an on-going prospective cohort study of 9,256 women from the St. Louis region seeking to increase the use of LARC by removing financial barriers and decrease rates of unintended pregnancy.[9] Participants are recruited from two abortion clinics, eight community-based clinics, and university-affiliated medical clinics. Women are eligible to participate in CHOICE if they are: 1) are 14–45 years of age; 2) are not currently using a contraceptive method or are willing to start a new method of reversible contraception; 3) speak English or Spanish; 4) have not had a hysterectomy or tubal ligation; 4) do not desire pregnancy in the next year; and 5) are sexually active with a male partner or plan to become sexually active in the next 6 months. Informed consent is obtained from all participants. Approval was obtained from the Washington University School of Medicine Human Research Protection Office prior to participant recruitment. Each participant is provided with contraception of her choice at no cost for the 2–3 years she is in the study. Follow-up interviews are conducted by telephone at 3 months, 6 months, and every 6 months thereafter. Questions are asked regarding demographic characteristics, pregnancy, sexual behaviors, STI history, contraceptive use and satisfaction, and experiences of depression, violence, and discrimination.

CHOICE offers CT and GC screening and treatment at no cost to all participants at study enrollment and at the time of each annual telephone interview. During the in-person enrollment session participants are instructed and complete a self-collected vaginal swab for *C. trachomatis* and *N. gonorrhoeae* screening using the BDProbeTec ET instrument (Becton Dickinson, Sparks, MD). For annual screening, women undergo either clinic screening or home screening where the same collection kit used at enrollment is mailed to the participant. Detailed and illustrated instructions are included with the collection kit. Specimens are returned to the CHOICE office in a prepaid and preaddressed mailer. The same collection kits are used for women who complete screening at selected family planning clinics. CHOICE receives completed test kits from the clinics within 5 days of collection and directly from participants via US Postal Service every day. All specimens are sent to an independent laboratory for testing.

Women included in this analysis were 25 years of age or younger at the time of study enrollment and reported vaginal or anal sex during the 12 months post-enrollment. Because STI screening is offered upon completion of the 12-month interview, women must have completed this interview to be included in the analysis. A specimen received from a home kit or clinic within 56 days after the 12-month interview is considered a complete annual test.

Some women in the sample were involved in substudies with respect to testing site (home versus clinic) (Figure 1). Women who completed their 12-month interview from August to December 2008 were involved in an observational study and given a choice of home versus clinic-based screening. Research assistants used a standard script to offer screening. From January 2009 through August 2009 women using a LARC method at the 12-month interview who agreed to randomization were randomly assigned to home versus clinic-based screening. Women who completed their 12-month interview during the remaining 16 months included in this analysis were offered home-based screening. Women may decline annual screening altogether.

We analyzed data collected from the baseline, 3-, 6-, and 12-month interviews. We specifically examined demographic and reproductive characteristics, contraceptive methods, health-seeking behaviors, and relationship factors. Comparisons were made using χ^2 for categorical variables and logistic regression for multivariate analyses. Poisson regression with robust error variance was used to determine predictors of completion of 12-month STI screening. This technique was used because the outcomes of interest occurred more than 10% of the time and it provides a conservative estimate of the relative risk. Variables were included in the final multivariable model if they were significant upon univariate analysis. LARC use was included in the model because we were particularly interested in its predictive value for completion of STI screening. Multicollinearity was examined using the variance inflation factor for all variables included in the models; all variables had a variance inflation factor of less than 10. Statistical analyses were performed using SAS Software (v. 9.2.; SAS Institute, Cary, NC).

Results

Of the first 5,087 women enrolled in CHOICE from August 2007 through December 2009, 51% (n=2,607) met the inclusion criteria for this analysis (Figure 1). Baseline characteristics of young women who met the inclusion criteria for this analysis did not differ significantly from young women 25 years or less enrolled in CHOICE. Of the 2,480 women excluded, 73% (n=1,799) were older than 25 years and 22% did not complete their 12-month survey. Only 182 participants (7%) declined STI screening when offered during their 12-month interview. A participant was more likely to outright decline screening if she reported a pregnancy in the past year (RR_{adj}=0.86, 95% CI: 0.80, 0.94).

Among the 2,425 women who accepted STI screening, more than half (57%) completed the test. The demographic and behavioral characteristics of women who completed screening compared to women who did not complete screening are shown in Table 1. The two groups did not differ by age, current marital status, STI history, recent genitourinary symptoms, existence of a main partner, or recent PAP testing. Although all women used self-collection kits, women who did so at home were more likely to complete the test than women who did so in the clinic (59.6% versus 45.0%).

Table 2 presents the factors significantly associated with screening. In univariate analyses race, insurance, and low socioeconomic status were significantly associated with reduced STI screening. Black and other non-white women were less likely to complete screening

compared to white women (RR=0.89, 95% CI: 0.83, 0.96 and RR=0.87, 95% CI: 0.76, 1.00, respectively). It is important to note that while black and other non-white women were statistically significantly less likely to complete screening, the screening rate was also low among white women (61.2%). Women with Medicaid were less likely than women with private insurance to complete screening (RR=0.78, 95% CI: 0.69, 0.89). Similarly, women who received public assistance or had trouble paying for basic necessities during the past 12 months were less likely to complete screening (RR=0.89, 95% CI: 0.84, 0.96). Conversely, women with a college level education or higher were more likely to complete screening compared to women with some college education (RR=1.22, 95% CI: 1.13, 1.32).

Women who reported LARC use (RR=0.93, 95% CI: 0.87, 1.00) or pregnancy in the past year (RR=0.76, 95% CI: 0.60, 0.95) were less likely to complete screening at 12 months. Women who reported older age at first intercourse (RR=1.16, 95% CI: 1.06, 1.28), other partners in the past year (RR=1.13, 95% CI: 1.03, 1.23), new partners in the past year (RR=1.11, 95% CI: 1.03, 1.19), or home testing (RR=1.32, 95% CI: 1.17, 1.49) were more likely to complete screening in the crude (univariate) analysis.

Our results of the multivariable analysis are shown in Table 2. The ten statistically significant factors from the univariate analyses were included in the final model. Three factors were found to be positively associated with screening: college graduate or higher education (RR_{adj}=1.19, 95% CI: 1.09, 1.29), new partners in the past year (RR_{adj}=1.08, 95% CI: 1.00, 1.16), and use of the home testing kit (RR_{adj}=1.33, 95% CI: 1.18, 1.50). Contraceptive method (LARC versus non-LARC) was no longer associated with completing the STI screening test.

We analyzed the 266 women who were included in the observational study examining preference for either home or clinic screening. Among this sub-group, the only significant factors associated with STI screening were LARC use (RR_{adj}=0.82, 95% CI: 0.68, 0.98) and home testing (RR_{adj}=2.87, 95% CI: 1.84, 4.49). Similarly, we analyzed separately the 329 LARC users involved in a randomized clinical trial examining differences in completion rate between women using a home kit versus clinic screening. The three significant predictors of completion in multivariable analyses were college education or higher (RR_{adj}=1.46, 95% CI: 1.15, 1.84), new partners in the past year (RR_{adj}=1.28, 95% CI: 1.03, 1.59), and home testing (RR_{adj}=2.15, 95% CI: 1.66, 2.80). Among the remaining 1,830 women not involved in either of these substudies, the only significant predictor for completion was a high level of education (RR_{adj}=1.13, 95% CI: 1.03, 1.25).

Comment

Among young women enrolled in the Contraceptive CHOICE project, education level and home-based testing site were the two strongest predictors for completion of annual STI screening. Women with a college degree or higher were more likely to complete screening, possibly due to a higher degree of familiarity with the healthcare system or a better understanding of the importance of getting screened for asymptomatic infections. Previous studies have found that education level has a positive impact on adherence to screening guidelines for both breast cancer and colorectal cancer.[10,11]

Our finding that women were more likely to complete screening at home is consistent with previous studies that have shown women prefer home testing kits.[12,13] We observed a 54% screening rate among women 16–25 years old in our study which is higher than the national screening rate for the same age group estimated by HEDIS based on claims data and visits reported by health plans (41.6%).[1] This difference may be in part due to the availability and preference of home testing among our study participants.

Previous studies have found history of STI and genitourinary complaints to be related to screening behavior, but we did not find these factors to be significant predictors of screening completion.[14,15] We found that LARC use was not associated with completion of STI screening once other factors are taken into account. Critics of LARC methods argue that women who use these methods will be less likely to seek routine care on an annual basis. It is promising that we did not find reduced screening to be the case among 1,335 LARC users. This finding may also be due to the availability of home-based testing in our study.

Strengths of this analysis include the large sample size, removal of common STI screening barriers including cost, and lack of a provider bias because screening is offered to all women upon completion of the 12-month interview. Our analysis is not without limitations; the generalizability of our results is limited by the fact that women enrolled in a contraceptive study may be different from women in the general population. In addition, all participants in our study were reminded about annual STI screening, which may not be representative of the real world where patients are often responsible for making their own arrangements for annual screening. Furthermore, we only captured screening that occurred through the CHOICE Project. Consequently, women who tested outside the study may have been missed which may result in an underestimate of our screening rate. Women included in this analysis may have been involved in one of two substudies (i.e., observational study or randomized clinical trial) comparing acceptability of home and clinic screening. To account for these differences we presented a separate analysis for each of the groups represented in the overall study sample.

Among a group of young women where annual STI screening is recommended, we found that screening increases among educated women and with the availability of home-based testing. It is important to understand the characteristics of women who complete recommended STI screening in order to determine missed opportunities for successful screening. A better understanding of reasons why young women do not obtain screening may help establish more effective strategies to increase annual screening of young women and women at increased risk.

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References

1. Centers for Disease Control and Prevention. Chlamydia Screening Among Sexually Active Young Female Enrollees of Health Plans --- United States, 2000--2007. MMWR Morb Mortal Wkly Rep. 2009; 58:362–365. [PubMed: 19373196]
2. Centers for Disease Control and Prevention. [Accessed August 11, 2011.] Infertility & STDs – STD Information from CDC [CDC STD Web site]. July 21. 2011 Available at: http://www.cdc.gov/std/infertility/default.htm
3. Centers for Disease Control and Prevention. [Accessed August 11, 2011.] Chlamydia and Gonorrhea – Two Most Commonly Reported Infectious Diseases in the United States [CDC Data & Statistics Feature Web site. April 22. 2011 Available at: http://www.cdc.gov/Features/dsSTDData/
4. Tilson EC, Sanchez V, Ford CL, et al. Barriers to asymptomatic screening and other STD services for adolescents and young adults: focus group discussions. BMC Public Health. 2004; 4:21. [PubMed: 15189565]
5. Blake DR, Lemay CA, Indurkhya A. Correlates of Readiness to Receive Chlamydia Screening Among 2 Populations of Youths. Arch Pediatr Adolesc Med. 2007; 161:1088–1094. [PubMed: 17984412]

6. Chacko MR, von Sternberg K, Velasquez MM, et al. Young Women's Perspective of the Pros and Cons to Seeking Screening for Chlamydia and Gonorrhea: An Exploratory Study. J Pediatr Adolesc Gynecol. 2008; 21:187–193. [PubMed: 18656072]
7. Chacko MR, Wiemann CM, Smith PB. Chlamydia and Gonorrhea Screening in Asymptomatic Young Women. J Pediatr Adolesc Gynecol. 2004; 17:169–178. [PubMed: 15125902]
8. Centers for Disease Control and Prevention. CDC Grand Rounds: Chlamydia Prevention: Challenges and Strategies for Reducing Disease Burden and Sequelae. MMWR Morb Mortal Wkly Rep. 2011; 60(12):370–373. [PubMed: 21451447]
9. Secura GM, Allsworth JE, Madden T, et al. The Contraceptive CHOICE Project: reducing barriers to long-acting reversible contraception. Am J Obstet Gynecol. 2010; 203:e1–7. [PubMed: 20541171]
10. Phillips KA, Kerlikowske K, Baker LC, et al. Factors Associated with Women's Adherence to Mammography Screening Guidelines. HSR: Health Services Research. 1998; 33(1):29–53.
11. Ata A, Elzey JD, Insaf TZ, et al. Colorectal cancer prevention: Adherence patterns and correlates of tests done for screening purposes within United States populations. Cancer Detection and Prevention. 2006; 30:134–143. [PubMed: 16638628]
12. Graseck AS, Secura GM, Allsworth JE, et al. Home Compared With Clinic-Based Screening for Sexually Transmitted Infections: A Randomized Controlled Trial. Obstet Gynecol. 2010; 116(6): 1311–1318. [PubMed: 21099596]
13. Cook RL, Østergaard L, Hillier SL, et al. Home screening for sexually transmitted diseases in high-risk young women: randomized controlled trial. Sex Transm Infect. 2007; 83:286–91. [PubMed: 17301105]
14. Wiehe SE, Rosenman MB, Wang J, et al. Chlamydia Screening Among Young Women: Individual- and Provider-Level Differences in Testing. Pediatrics. 2011; 127:336–344.
15. Heijne JC, Tao G, Kent CK, et al. Uptake of Regular Chlamydia Testing by U.S. Women: A Longitudinal Study. American Journal of Preventive Medicine. 2010; 39:243–250. [PubMed: 20709256]

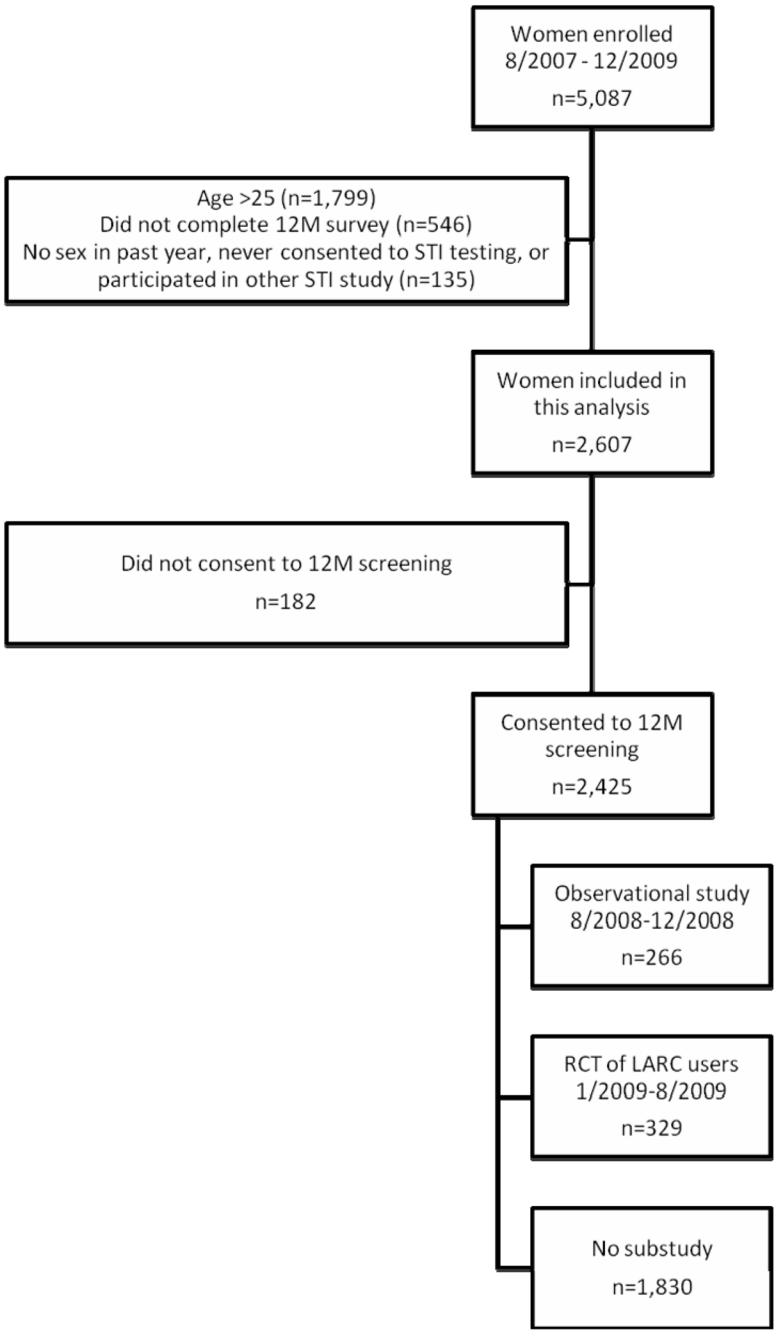

Figure 1.
Inclusion criteria for overall analysis sample and the substudies.

Table 1

Factors associated with completion of 12-month STI screening among women 25 years or younger enrolled in CHOICE.

Characteristic	Completed STI Testing n=1392		Did Not Complete STI Testing n=1033		p-value
	n	%	n	%	
Race					**<0.01**
Black	612	54.5	511	45.5	
White	667	61.2	422	38.8	
Other	105	53.3	92	46.7	
Age (years)					0.59
14–17	90	58.8	63	41.2	
18–19	215	56.7	164	43.3	
20–22	505	55.9	399	44.1	
23–25	582	58.8	407	41.2	
Marital status at time of 12M survey					0.21
Single	966	58.3	692	41.7	
Married/living with a partner	425	55.6	340	44.4	
Education level at time of 12M survey					**<0.01**
≤High school	402	51.7	375	48.3	
Some college	634	56.2	495	43.8	
College degree/graduate school	355	68.7	162	31.3	
Type of insurance at time of 12M survey					**<0.01**
None	498	56.8	378	43.2	
Private/student/parent/military	738	60.4	483	39.6	
Medicare/Medicaid/disability	149	47.3	166	52.7	
Low socioeconomic status[a] at time of 12M survey					**<0.01**
Yes	645	54.2	546	45.8	
No	747	60.5	487	39.5	
Age at first intercourse					**<0.01**
< 14	123	53.5	107	46.5	
14–18	1089	56.7	833	43.3	
19+	180	65.9	93	34.1	

Characteristic	Completed STI Testing n=1392		Did Not Complete STI Testing n=1033		p-value
	n	%	n	%	
Main partner in past 30 days at time of 12M survey					0.28
Yes	1200	57.0	905	43.0	
No	188	60.3	124	39.7	
Other partners reported in the past year					**<0.05**
Yes	224	63.5	129	36.5	
No	1168	56.4	904	43.6	
New partners reported in the past year					**<0.01**
Yes	558	61.1	356	38.9	
No	834	55.2	677	44.8	
STI[b] diagnosis in lifetime					0.65
Yes	895	57.7	655	42.3	
No	497	56.8	378	43.2	
STI symptoms[c] in past 7 days					0.36
At least 1	327	59.3	224	40.7	
None	1036	57.1	777	42.9	
Pregnant in past year					**<0.01**
Yes	43	43.9	55	56.1	
No	1349	58.0	978	42.0	
PAP smear in past year					0.43
Yes	687	58.2	494	41.8	
No	696	56.6	534	43.4	
Contraceptive method at time of 12M survey					**<0.05**
LARC	741	55.5	594	44.5	
Non-LARC	651	59.7	439	40.3	
Testing site					**<0.01**
Home	1229	59.6	834	40.4	
Clinic	163	45.0	199	55.0	

LARC, long-acting reversible contraceptive methods; *STI*, sexually transmitted infection; *WIC*: Women, Infants, and Children Supplemental Nutrition Program.

[a]Receiving public assistance (food stamps, WIC, welfare, unemployment) or having trouble paying for basic necessities (transportation, housing, medical expenses, food);

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[b] *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, *Trichomonas vaginalis*, syphilis, herpes, or HIV;

[c] More discharge or staining than normal, vaginal itching, abnormal odor, pain with urination, pain with intercourse, abdominal or pelvic pain, or any other symptoms of a vaginal infection.

Table 2

Crude and adjusted relative risks for demographic and behavioral characteristics associated with STI screening completion among women 25 years or younger enrolled in CHOICE.

Characteristic	Univariate Models	Multivariable Model
	RR (95% CI)	RR (95% CI)
Race		
Black	**0.89 (0.83–0.96)**	0.97 (0.90–1.04)
White	Referent	Referent
Other	**0.87 (0.76–1.00)**	0.89 (0.77–1.02)
Education level at time of 12M survey		
≤High school	0.92 (0.85–1.00)	0.95 (0.87–1.03)
Some college	Referent	Referent
College degree/ graduate school	**1.22 (1.13–1.32)**	**1.19 (1.09–1.29)**
Type of insurance at time of 12M survey		
None	0.94 (0.87–1.01)	1.01 (0.94–1.10)
Private/student/parent/military	Referent	Referent
Medicare/Medicaid/disability	**0.78 (0.69–0.89)**	0.89 (0.77–1.02)
Low socioeconomic status[a] at time of 12M survey	**0.89 (0.84–0.96)**	0.98 (0.90–1.06)
Age at first intercourse		
< 14	0.94 (0.83–1.07)	0.99 (0.87–1.12)
14–18	Referent	Referent
19+	**1.16 (1.06–1.28)**	1.04 (0.94–1.15)
Reported having other partners in the past year	**1.13 (1.03–1.23)**	1.08 (0.98–1.19)
Reported having new partners in the past year	**1.11 (1.03–1.19)**	**1.08 (1.00–1.16)**
Pregnant in the past year	**0.76 (0.60–0.95)**	0.81 (0.64–1.01)
Contraceptive method at time of 12M survey		
LARC	**0.93 (0.87–1.00)**	0.95 (0.89–1.02)
Non-LARC	Referent	Referent
Testing site		
Home	**1.32 (1.17–1.49)**	**1.33 (1.18–1.50)**
Clinic	Referent	Referent

LARC, long-acting reversible contraceptive methods; *WIC*: Women, Infants, and Children Supplemental Nutrition Program.

[a]Receiving public assistance (food stamps, WIC, welfare, unemployment) or having trouble paying for basic necessities (transportation, housing, medical expenses, food).