

If We Make It, Will They Take It? Attitudes Toward the Acceptability of Chlamydia Point-of-Care Testing Among Adolescents and Young Adults

Peter Coronel Pastolero, MD,* Amy Suss, MD,*
Rhonda Cambridge, MD, MPH,* and Margaret R. Hammerschlag, MD†

Background: Adolescent women, 15 to 19 years of age, have the highest rate of *Chlamydia trachomatis* infection in the United States. The objective of this study was to ascertain knowledge and experience of *C. trachomatis* and acceptance of *C. trachomatis* point-of-care testing (POCT) if made available over-the-counter (OTC). Currently, there are no tests for *C. trachomatis* available OTC for purchase.

Methods: Patients attending adolescent clinics at University Hospital of Brooklyn and Kings County Hospital received an anonymous 12-item questionnaire. Both clinics serve predominantly African and Caribbean American urban populations. Questions included demographics, sexual orientation, chlamydia knowledge, testing history, prior infection, partner notification, and acceptance of OTC POCT for *C. trachomatis*.

Results: Surveys from 151 patients (116 women, 35 men) aged 12 to 21 years (mean age, 17.6 years) were analyzed. Only 34 of the 151 (22.5%) respondents understood *C. trachomatis* transmission; 31 (20.5%) knew its complications. Sixty-seven (44.4%) would purchase an OTC test but 101 (66.8%) would pay no more than \$20. All 151 patients reported that they would follow-up with doctor if positive; 143 (94.7%) would notify partners, although 5 of the 31 (16.1%) women with prior infection did not notify partners.

Conclusions: Nearly half (44%) of adolescents in our population would be interested in using a potential OTC test for *C. trachomatis*. Cost was a major disincentive. Knowledge of infection remains cursory. However, those with a history of *C. trachomatis* infection and familiar with its complications were more interested in purchasing a home test. Although 100% of the respondents reported that they would follow-up with their physician if they tested positive, past behavior suggests that partner notification might be suboptimal.

Chlamydia trachomatis remains the most frequently reported sexually transmitted bacterial infection in the United States.¹ Although the Centers for Disease Control and Prevention (CDC) recommends that adolescent women be screened yearly, more frequently if they have a new sexual partner, the rates of reported cases of *C. trachomatis* from 2014 to 2019 were the highest among adolescents and young adults aged 15 to 24 years, who in 2019 made up almost two thirds (61%) of all cases. Among women aged 15 to 24 years, the overall rate of reported cases of *C. trachomatis*

was 3728.1 cases per 100,000 reflecting a 10% increase since 2015.² Despite the number of cases reported, *C. trachomatis* may still be underreported as the majority of women do not exhibit symptoms and are left untested and untreated, predisposing much of the population to the risk of developing significant medical sequelae, such as pelvic inflammatory disease and infertility.

In a 2019 audit of adolescent women screened in one of our clinical sites, 99 of 636 (15.6%) were positive for *C. trachomatis*. The prevalence of *C. trachomatis* infection in our population is consistent with reported rates by the CDC. The rates of young African American women are nearly 5 times greater than their non-Hispanic White counterparts and 10 times greater than their Asian counterparts.² The development of an over-the-counter (OTC) point-of-care test (POCT) for *C. trachomatis* is being explored as a possible solution to increase screening and shorten time to treatment.³⁻⁶

Although several studies indicated that POCT for *C. trachomatis* would decrease overall chlamydia disease burden, the theoretical impact is directly proportional to public participation and buy-in.^{3,4,6} Whether an OTC POCT would be bought and used is uncertain. There is a precedent for speculation; an OTC human immunodeficiency virus (HIV) test was approved by the US Food and Drug Administration in 2012, but its use has been limited by cost and accessibility.⁷ Few studies have explored the attitudes of young African American men and women toward home POCT for *C. trachomatis*.^{8,9} We conducted a survey of adolescents attending 2 urban health clinics in Brooklyn. The goals of the survey were to ascertain (1) adolescents' knowledge about chlamydia, (2) determine if an OTC test would be purchased, and if (3) adolescents would seek treatment for themselves and their partners.

METHODS

Institutional review board approval was obtained before administration of an anonymous 12-item questionnaire to adolescents, aged 12 to 21 years, attending the adolescent health clinics at Kings County Hospital and University Hospital of Brooklyn, NY. Participants were polled on demographics, personal history, and knowledge of *C. trachomatis*, as well as attitudes toward an OTC POCT for *C. trachomatis* if available. If a parent or guardian was present at the visit, the patient was not asked to participate in the study to ensure confidentiality. To avoid return patients filling out the questionnaire more than once, participants were asked if they had completed a questionnaire previously by their provider. Completed questionnaires were collected by the investigators (P.P., A.S., R.C.) at the end of their clinic visit. After completion of their visit, investigators engaged participants in sexually transmitted infection (STI) counseling and education, including a printed chlamydia information package (<http://links.lww.com/OLQ/A759>) from the Epic-Elsevier integrated electronic health education system.

RESULTS

Completed questionnaires were obtained from 151 adolescents, 116 women and 35 men, 12 to 21 years of age (mean, 17.6 years;

From the *Division of Adolescent Medicine and †Division of Pediatric Infectious Diseases, Department of Pediatrics, SUNY Downstate Health Sciences University, Brooklyn, NY

Conflict of Interest and Sources of Funding: None declared.

Correspondence: Peter Coronel Pastolero, MD, Children's Hospital at Brooklyn, Division of Adolescent Medicine, Department of Pediatrics, MSC 49, 450 Clarkson Ave, Brooklyn, NY 11203. E-mail: peter.pastolero@downstate.edu. Received for publication May 17, 2021, and accepted September 10, 2021. Supplemental digital content is available for this article. Direct URL citations appear in the printed text, and links to the digital files are provided in the HTML text of this article on the journal's Web site (<http://www.stdjournal.com>).

DOI: 10.1097/OLQ.0000000000001563

Copyright © 2021 American Sexually Transmitted Diseases Association. All rights reserved.

TABLE 1. Demographics and *C. trachomatis* Survey Results

	Females	Males
n (%)	116/151 (76.8)	35/151 (23.2)
Age, y		
Age 12–14	5 (4.3)	1 (2.9)
Age 15–17	50 (43.1)	13 (37.1)
Age 18–21	61 (52.5)	21 (60)
Sexual orientation		
Straight	100 (86.2)	35 (100)
Gay	1 (0.8)	0
Bisexual	15 (12.9)	0
Other nonbinary	0	0
Previously tested		
Yes	62 (53.4)	17 (48.6)
No	34 (29.3)	16 (45.7)
Not sure	20 (17.2)	2 (5.7)
Results of previous test		
Positive	31 (50)	6 (35.3)
Negative	30 (48.3)	11 (64.7)
Not sure	1 (1.6)	0
Previously treated for <i>C. trachomatis</i>		
Yes	31 (100)	6 (100)
No	0	0
Was partner informed?		
Yes	26 (83.8)	6 (100)
No	5 (16.1)	0
How was partner informed?		
In person	16 (61.5)	3 (50)
Phone call	7 (26.9)	0
Text message	3 (11.5)	3 (50)
Was partner treated by their doctor or patient's doctor?		
Patient's doctor	9 (34.6)	1 (16.7)
Partner's doctor	16 (61.5)	5 (83.3)
Unknown	1 (3.8)	0
Would you buy an OTC test for chlamydia?		
Yes	55 (47.4)	12 (34.2)
No	39 (33.6)	13 (37.1)
Not sure	22 (19)	10 (28.6)
What is the most you would pay for an OTC test?		
\$0	5 (4.3)	0
\$10	44 (37.9)	8 (22.9)
\$20	30 (25.9)	14 (40)
\$30	19 (16.4)	4 (11.4)
\$40	9 (7.8)	3 (8.6)
\$50	9 (7.8)	6 (17.1)
If the test were positive, would you go to your doctor?		
Yes	116 (100)	35 (100)
No	0	0
Not sure	0	0
If the test were positive, would you notify your partner of the result?		
Yes	110 (94.8)	33 (94.3)
No	4 (3.4)	1 (2.9)
Not sure	2 (1.7)	1 (2.9)
If the test were positive, would you get treatment for your partner from your own doctor if available?		
Yes	110 (100)	33 (100)
No	0	0
Not sure	0	0

median, 17 years). Characteristics and *C. trachomatis* history of participants including their attitudes toward a potential OTC *C. trachomatis* test are shown in Table 1. Thirty-one of 62 (50%) women and 6 of 17 (35.3%) men previously screened for *C. trachomatis* had a positive result; all 37 reported receiving treatment for themselves. Most (86.4%) notified their partners but, 5 of the 31 (16%) women did not inform their partners. Of those notified, 21 of 32 (65.6%) sought treatment from their own medical providers, whereas 10 (31.3%) received treatment from the participant's provider. One

partner was lost to follow-up. Altogether, 67 (44.3%) would purchase an OTC test but 101 (66.8%) would pay no more than \$20. All 151 reported they would see their doctor if the test were positive, 143 of 151 (94.7%) would notify partners. One hundred ten of 116 (94.8%) women and all 35 (100%) men would tell their partner if a POCT was positive for *C. trachomatis*.

One hundred five (69.5%) of the respondents claimed having some prior knowledge of *C. trachomatis*. When polled about transmission, only 34 (22.5%) of the respondents correctly cited that it can be transmitted by vaginal, oral, and anal sex, as shown in Table 2. When asked to describe in their own words, “What happens if you are not treated for *C. trachomatis*?”, only 32 (21.2%) respondents were able to identify adverse outcomes, such as PID and infertility:

You can develop stomach pain and may not be able to have kids in the future. (respondent 64)

It can get more severe, and your reproductive organs can become dysfunctional. (respondent 74)

The fallopian tubes can be messed with, and you can get discharge and pain. (respondent 86)

Examples of inaccurate responses include:

They will basically live with it. (respondent 104)

You might die if you do not take care of the virus. (respondent 121)

History of *C. trachomatis* infection and knowledge of its complications influenced questionnaire responses as highlighted in Table 3. Twenty-seven of 37 (73%) respondents who reported a history of chlamydia infection indicated they would buy a POCT if made available as compared with the 20 (48.8%) who never had the infection ($P < 0.05$). Twenty-two of 32 (68.7%) respondents who were aware of complications of untreated *C. trachomatis* also indicated they would buy a test versus the 45 (37.8%) who were not aware of the complications ($P < 0.05$). Knowledge of transmission was not associated with likelihood to purchase a test (Table 3).

DISCUSSION

This cross-sectional survey demonstrated that nearly half of our subjects (44.4%) expressed interest in purchasing an OTC POCT for *C. trachomatis*. These results contrast the few published studies regarding patient attitudes toward POCT. Chow et al⁸ conducted a similar survey in San Diego with mostly White and Asian patients 18 years of age and older. Despite findings that remain consistent between both our populations, such as an increased likelihood to purchase a test with a history of infection, as well as a general sense to follow-up with a provider after a positive

TABLE 2. Self-Reported Knowledge of *C. trachomatis* and Its Transmission

	n (%)
Do you know what chlamydia is?	
Yes	105 (69.5)
No	25 (16.6)
Not sure	21 (13.9)
How is chlamydia transmitted?	
Vaginal	68 (45)
Oral	7 (4.6)
Anal	3 (2)
Vaginal/oral	21 (13.9)
Vaginal/anal	4 (2.6)
Vaginal/oral/anal	34 (22.5)
Not sure	14 (9.3)

TABLE 3. Fisher Exact Test Comparing Interest in Purchasing OTC Home POC Testing With History and Knowledge of *C. trachomatis*

	History of Infection			Knowledge of Transmission			Knowledge of Complications		
	Yes (n = 37)	No (n = 41)	P	Yes (n = 34)	No (n = 117)	P	Yes (n = 32)	No (n = 119)	P
Interest purchasing OTC home POC testing	27 (73%)	20 (48.7%)	0.038	17 (50%)	67 (57.3%)	0.5569	22 (68.8%)	45 (37.8%)	0.0024

Note: statistically significant values ($P < 0.5$) are shown in bold emphasis.

result, they report a higher overall acceptance rate of 77%. While specific demographic information, such as household income and racial demographics, were excluded from our survey to avoid adolescents filling out longer forms, attendees of our clinical sites are reflective of the East Flatbush community. A 2019 census reports 86% of East Flatbush residents identify as Black with a median annual income of \$60,895 with 42% of households earning under \$50,000 annually.⁹ As the prevalence of *C. trachomatis* is highest among African Americans and drops significantly after the age of 24 years,² the comparative lack of interest expressed by our respondents may be indicative of the unique barriers that may limit the accessibility of home chlamydia screening in our population.

Although further investigation is required to ascertain why women in our population younger than 21 years appear less interested in OTC testing, we can speculate that issues of insufficient knowledge of *C. trachomatis* as well as the overall cost for testing are significant barriers to acceptance. Only 22.5% of the respondents knew how *C. trachomatis* was transmitted, and only 20.5% knew the complications of infection, demonstrating that many adolescents may not know their risk. Without this knowledge, it seems probable that OTC testing may be used in primarily symptomatic individuals, potentially missing most cases which are asymptomatic.¹⁰ The correlation between purchasing a test, history of infection, and knowledge of complications further underscores this barrier to acceptance of OTC testing. In addition, cost appears to be a major disincentive as most respondents did not want to pay more than \$20, consistent with other urban adolescent populations similarly surveyed in Baltimore and Cincinnati by Widdice et al.¹¹ Considering screening and treatment for STIs are free and confidential services offered by many adolescent clinics in urban settings, such as New York City,¹² it is uncertain how many would choose the costlier alternative in exchange for convenience. The adolescents polled in this study were recruited from these clinics, which may reflect bias because they are familiar with the more affordable option.

In addition to the comparative hesitancy toward the purchase of an OTC POCT for *C. trachomatis*, some adolescents in our population are likewise hesitant to notify partners of a positive result. Although 5.2% women expressed uncertainty in whether they would tell their partners of a positive OTC test, historically, 16% of those who previously had *C. trachomatis* infection did not tell their partners. The discrepancies between reported past behaviors and the answers provided may be the result of a social desirability bias held by those who frequent our clinical sites who wish to provide favorable answers to their providers despite being assured anonymity of the survey. Regardless, the impact of partner notification in the prevention of *C. trachomatis* cannot be understated. Along with screening, partner notification has been estimated to have the largest impact on *C. trachomatis* prevention; the combination of the 2 possibly accounting for up to 2.3 million infections being averted in women aged 15 to 24 years between 2000 and 2015.¹³ Although OTC testing may provide increased access to screening, efforts to address partner notification hesitancy are likely to remain necessary and may prove challenging if testing is done independent of a visit with a health care provider.

Understanding barriers toward acceptance of *C. trachomatis* testing among men has undeniable value to the health of young women. However, as only 35 men were polled in this study and all identified as heterosexual, our insight into male attitudes toward OTC testing remains limited. Of those men surveyed, 34.3% of respondents reported they would purchase a test. A narrative review of the barriers that limit acceptability of *C. trachomatis* testing in young men conducted by Balfe et al¹⁴ found several influences that impact their decision for testing included feelings of shame, vulnerability, and perceived damage to one's masculinity. Privately self-testing for *C. trachomatis* at home may help to eliminate these concerns, but the obstacle of purchasing the test publicly in a pharmacy may present the comparable issues that limit the utilization of OTC HIV testing.⁷ As OTC HIV tests are already commercially available, their utilization may be telling of how an OTC chlamydia test may be received when brought to market. Despite the similar barriers of price and access, the commercial availability of OTC HIV tests has added to the HIV prevention arsenal of high-risk groups including men who have sex with men by allowing “point-of-sex” screening.^{15,16} Further research is needed to continue to explore male attitudes toward a home chlamydia POCT, including the attitudes among men who have sex with men and others who engage in high-risk sexual behaviors.

When the barriers of price and privacy are lifted, home testing has been shown to bridge the gaps between high-risk communities and necessary STI care. For instance, in response to a statewide mandated “stay at home” order to curb community transmission of COVID19, New York-Presbyterian Hospital's HIV Prevention Program established an at-home STI testing program that ran through the summer of 2020. The program sent self-collection STI kits to the homes of 201 HIV-positive or HIV-exposed patients; the STI prevalence was 12.8% in the 149 kits that were returned. This initiative enabled New York-Presbyterian Hospital's HIV Prevention Program to continue to provide treatment and care to their patients despite the extenuating circumstances of a global pandemic.¹⁷ Given the state of limited access to health care precipitated by the COVID19 pandemic, home-based STI screening and treatment services are likely to become part of a new normal and may prove to be an effective adjunct to combat rising chlamydia disease burden. Further studies, including community feedback, may help guide the implementation of home-testing projects accordingly to optimize their utilization in high-risk populations like ours.

Although having increased commercial access to STI testing may open the door to high-risk groups, the promise of home testing for *C. trachomatis* is not without controversy; certain challenges arise, such as ensuring linkage-to-care, appropriate antibiotic management, partner therapy, and STI surveillance of overall disease burden.^{18–20} Despite all respondents saying they would see their doctor after a positive test, there is still no guarantee of linkage-to-care, as well as appropriate treatment and surveillance of disease. Adoption of a POCT in a clinical environment, such as a primary care, urgent care, or emergency department setting, may be able to reconcile these problems. Surveys performed by Widdice et al¹¹ and Gettinger et al²¹ demonstrate an increased level of willingness to wait up to 30 minutes when presented with

the possibility of rapid results suggesting high public acceptance for a POCT in a clinical environment. Furthermore, in 2020, the CDC updated their recommendations for primary care clinics offering quality sexual health services, which included recommendations to incorporate screening and assessment of common STIs, including urogenital and extragenital laboratory testing for *C. trachomatis*. The updated recommendations additionally encourage primary care sites to adopt same-day, on-site results to reduce diagnostic delays, community transmission, costly presumptive antibiotic management, and cost of staff needed to follow-up on positive tests and verify treatment.²² When considering the development of future *C. trachomatis* tests, it is clear that the emphasis should be on ensuring accurate and rapid results with commercial availability for home testing being an additional asset.

New technologies are being developed to address existing health care disparities, such as the increased burden of *C. trachomatis* in African American communities, as well as new challenges, such as delivering health care amid a global pandemic. It is easy to presume that increasing access to new testing technologies, such as making a potential POCT available OTC, will lead to improvement in overall disease burden. However, the success of such interventions hinge on the degree of public acceptance and participation. We sought to explore the attitudes of the demographic that is of the highest concern for *C. trachomatis*: young African Americans. What we found is that factors of STI education and price may limit accessibility to the conceivable asset of home chlamydia testing in our population. As nearly half our respondents report interest in purchasing an OTC POCT for *C. trachomatis*, there is potential for successful integration of home testing into our current repertoire of STI preventive services. Whether that potential can be realized requires additional research and interventions to address the barriers identified in our study and any barriers not mentioned here. The results of our exploratory study warrant further investigation as to whether our findings may be extrapolated to other populations. In addition, as this was a written survey, we are unable to identify other factors that contributed to the acceptance rate of OTC POCT beyond those answers provided in the questionnaire.

REFERENCES

- Centers for Disease Control and Prevention: Chlamydia CDC fact sheet, 2019. Available at: <https://www.cdc.gov/std/chlamydia/stdfact-chlamydia-detailed.htm>. Accessed July 22, 2021.
- Centers for Disease Control and Prevention: Sexually transmitted diseases surveillance, 2019. Available at: <https://www.cdc.gov/std/statistics/2019/overview.htm#chlamydia>. Accessed May 1, 2021.
- Van Der Pol B. Making the most of point-of-care testing for sexually transmitted diseases. *Clin Infect Dis* 2020; 70:1824–1825.
- Gift TL, Pate MS, Hook EW 3rd, et al. The rapid test paradox: When fewer cases detected lead to more cases treated: A decision analysis of tests for *Chlamydia trachomatis*. *Sex Transm Dis* 1999; 26:232–240.
- Hsieh YH, Hogan MT, Barnes M, et al. Perceptions of an ideal point-of-care test for sexually transmitted infections—a qualitative study of focus group discussions with medical providers. *PLoS One* 2010; 5:e14144.
- Rönn MM, Menzies NA, Gift TL, et al. Potential for point-of-care tests to reduce chlamydia-associated burden in the United States: A mathematical modeling analysis. *Clin Infect Dis* 2020; 70:1816–1823.
- Hawk ME, Chung A, Creasy SL, et al. A scoping review of patient preferences for HIV self-testing services in the United States: Implications for harm reduction. *Patient Prefer Adherence* 2020; 14:2365–2375.
- Chow K, Edi R, Gin G, et al. Attitudes of women participating in a clinical trial on point-of-care testing and home testing for STIs. *Int J STD AIDS* 2020; 31:1352–1358.
- Census Reporter: NYC-Brooklyn Community District 17—East Flatbush, Farragut & Rugby PUMA, NY, 2019. Available at: <https://censusreporter.org/profiles/79500US3604010-nyc-brooklyn-community-district-17-east-flatbush-farragut-rugby-puma-ny>. Accessed August 10, 2021.
- Farley TA, Cohen DA, Elkins W. Asymptomatic sexually transmitted diseases: The case for screening. *Prev Med* 2003; 36:502–509.
- Widdice LE, Hsieh YH, Silver B, et al. Performance of the Atlas Genetics Rapid Test for *Chlamydia trachomatis* and women's attitudes toward point-of-care testing. *Sex Transm Dis* 2018; 45:723–727.
- NYC Health. Teen Clinics, 2014. Available at: <https://www1.nyc.gov/assets/doh/downloads/pdf/std/teens-clinics.pdf>. Accessed June 10, 2020.
- Rönn MM, Tuite AR, Menzies NA, et al. The impact of screening and partner notification on chlamydia prevalence and numbers of infections averted in the United States, 2000–2015: Evaluation of epidemiologic trends using a pair-formation transmission model. *Am J Epidemiol* 2019; 188:545–554.
- Balfé M, Brugha R, O'Connell E, et al. Men's attitudes towards chlamydia screening: A narrative review. *Sex Health* 2012; 9:120–130.
- Carballo-Diéguez A, Frasca T, Dolezal C, et al. Will gay and bisexually active men at high risk of infection use over-the-counter rapid HIV tests to screen sexual partners? *J Sex Res* 2012; 49:379–387.
- Carballo-Diéguez A, Frasca T, Balan I, et al. Use of a rapid HIV home test prevents HIV exposure in a high risk sample of men who have sex with men. *AIDS Behav* 2012; 16:1753–1760.
- Carnevale C, Richards P, Cohall R, et al. At-home testing for sexually transmitted infections during the COVID-19 pandemic. *Sex Transm Dis* 2021; 48:e11–e14.
- Fajardo-Bernal L, Aponte-Gonzalez J, Vigil P, et al. Home-based versus clinic-based specimen collection in the management of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections. *Cochrane Database Syst Rev* 2015; CD011317.
- Niccolai LM, Winston DM. Physicians' opinions on partner management for nonviral sexually transmitted infections. *Am J Prev Med* 2005; 28:229–233.
- Peterman TA, Kreisel K, Habel MA, et al. Preparing for the chlamydia and gonorrhea self-test. *Sex Transm Dis* 2018; 45:e7–e9.
- Gettinger J, Van Wagoner N, Daniels B, et al. Patients are willing to wait for rapid sexually transmitted infection results in a university student health clinic. *Sex Transm Dis* 2020; 47:67–69.
- Barrow RY, Ahmed F, Bolan GA, et al. Recommendations for providing quality sexually transmitted diseases clinical services, 2020. *MMWR Recomm Rep* 2020; 68:1–20.