HHS Public Access

Author manuscript

Sex Transm Dis. Author manuscript; available in PMC 2019 December 04.

Published in final edited form as:

Sex Transm Dis. 2013 April ; 40(4): 335–337. doi:10.1097/OLQ.0b013e31827cd60d.

Chlamydia trachomatis Infection Among Women 26 to 39 Years of Age in the United States, 1999 to 2010

Elizabeth A. Torrone, MSPH, PhD[*], **William M. Geisler, MD, MPH**[†], **Thomas L. Gift, PhD**[‡], **Hillard S. Weinstock, MD, MPH**[*]

[*]Surveillance and Data Management Branch, Division of STD Prevention, Centers for Disease Control and Prevention, Atlanta, GA;

[†]Department of Medicine, University of Alabama at Birmingham, Birmingham, AL;

[‡]Health Services Research and Evaluation Branch, Division of STD Prevention, Centers for Disease Control and Prevention, Atlanta, GA

Abstract

Using data from a nationally representative survey, we identified predictors of chlamydial infection in women aged 26 to 39 years. Chlamydia prevalence was low overall but varied by sociodemographics and sexual behaviors. Findings support current recommendations that women older than 25 years should not be routinely screened for chlamydial infection.

Because most chlamydial infections and complications in women are asymptomatic, screening is necessary to detect and treat infections. However, routine screening is likely only cost-effective in populations with a prevalence above a minimum threshold (e.g., 3%),[1] and screening criteria are needed to identify populations most at risk. Chlamydia burden is highest in young women,[2,3] and the Centers for Disease Control and Prevention (CDC) recommends that all sexually active women 25 years or younger receive annual chlamydia screening.[4] For women older than 25 years, the CDC recommends screening those with "risk factors" for chlamydia[4]; however, these risk factors have not been fully elucidated.

Data collected on sexually active women enrolled in commercial and Medicaid health plans suggest that chlamydia screening coverage for women 25 years or younger remains low, with less than 60% of sexually active women screened annually.[5] Overscreening female older than 25 years, a population with lower chlamydia prevalence, is common. For example, in Title X family planning clinics, 42% of female clients 25 years or older were screened for chlamydia, accounting for nearly 40% of all chlamydia tests conducted in Title X clinics in 2010.[6] Overscreening older women strains the already limited resources needed to ensure adequate chlamydia screening coverage for younger women.[7] Hence, there is a need for better (evidence-based) chlamydia screening criteria for older women.

Correspondence: Elizabeth A. Torrone, MSPH, PhD, Centers for Disease Control and Prevention, 1600 Clifton Rd NE, M/S E-02 Atlanta, GA 30333. ETorrone@cdc.gov.

Potential conflicts of interest: None.

Screening criteria are often created by retrospectively looking at characteristics of women tested in clinics to identify predictors of chlamydial infection.[8] One of the limitations of using clinic-based chlamydia positivity data to identify screening recommendations is the representativeness of the patient population. Women seeking care in clinics may have a higher chlamydia prevalence than the general population (i.e., women may seek care for reasons related to chlamydial infections). In addition, screening coverage is rarely 100% in clinical settings. Consequently, positivity in clinical settings may not reliably estimate population prevalence because women seeking care who are screened for chlamydia may differ from women seeking care who are not screened and women not seeking care. Therefore, population-based surveys with chlamydia prevalence estimates are more useful to inform national screening recommendations for the general population.

The objective of our study was to determine factors associated with prevalent chlamydial infection in a nationally representative sample of women aged 26 to 39 years participating in the National Health and Nutrition Examination Survey (NHANES).

The National Health and Nutrition Examination Survey is a series of cross-sectional, household surveys. Using a complex, multistage, probability sampling frame, NHANES is designed to be representative of the US civilian, noninstitutionalized population.[9] After providing written informed consent, women participating in NHANES were interviewed and examined. Urine specimens collected from women aged 14 to 39 years were tested for *Chlamydia trachomatis* by nucleic acid amplification tests (NAATs), according to the manufacturers' instructions.[10] From 1999 to 2002, a ligase chain reaction assay (LCx; Abbott Laboratories, Abbott Park, IL) was used, and for the remaining cycles, the Becton Dickinson Probe Tec (Becton Dickinson, Franklin Lakes, NJ) was used. The study protocol was reviewed and approved by an institutional review board at the CDC.

For our analyses, data from women aged 26 to 39 years that were collected during six 2-year NHANES cycles (1999–2010) were aggregated and analyzed. We report prevalence of chlamydial infection by self-reported demographics and sexual behaviors. Estimates were weighted to be nationally representative and to account for oversampling and nonresponse.[11] We did not conduct statistical tests of significance but, instead, provide 95% confidence intervals (CIs) as measures of precision of estimates.[12] Prevalence estimates with relative standard errors (RSEs) greater than 30%, but less than 40% are noted and are considered unstable and should be interpreted with caution.[13] Exploratory analyses conducted with other variables collected in NHANES that had RSEs greater than 40% are not reported. Analyses were conducted in SAS v9.13 (SAS Institute Inc, Cary, NC) accounting for the complex survey design.

From 1999 to 2010, 3875 women aged 26 to 39 years participated in NHANES and were interviewed, examined, and tested for chlamydia. Overall chlamydia prevalence was 1.2% (95% CI, 0.8%–1.7%) (Table 1). Prevalence varied by race/ethnicity, with highest prevalence among black, non-Hispanic women (2.5%; 95% CI, 1.7%–3.6%), and by marital status, with highest prevalence among women who reported being widowed, divorced, or separated (2.7%; 95% CI, 1.4%–5.4%). Women who reported having less than a high school education or general education development (GED) had a higher prevalence than did women with

more education. Prevalence among women with health insurance was 1.0% (95% CI, 0.7%–1.6%) and was 1.8% (95% CI, 0.9%–3.6%) among women without health insurance. Prevalence was highest among women who reported 2 or more sex partners in the last 12 months (2.9%; 95% CI, 1.4%–5.7%) and among women who never used oral contraceptives or Depo-provera/injectables (3.4%; 95% CI, 2.0%–6.0%).

This is the first report to identify predictors of chlamydial infection in older women in a nationally representative sample using prevalence estimates from urine-based chlamydia screening. We document a low overall prevalence of chlamydial infection in this age group, as well as differences in prevalence by sociodemographics including race/ethnicity and educational attainment and self-reported sexual behaviors. These findings do not suffer from the limitations of studies identifying predictors of chlamydial infection diagnosed in clinical settings because the study population was nationally representative and not limited to a health care seeking population.

Lower educational attainment is a marker of current socioeconomic status.[14] Our finding of a higher chlamydia prevalence in women with less than a high school education supports the notion that socioeconomic status may be an indirect determinant of sexually transmitted diseases.[15] The racial/ethnic disparities in the NHANES prevalence estimates are less pronounced than those in chlamydia case-report data.[16] This finding is not surprising because case-report data are likely influenced by differential screening[17] and reporting practices, as well as missing race/ethnicity data, which may magnify disparities.[16] Still, the racial/ethnic disparities in the NHANES data are noteworthy. It is likely that race/ethnicity and socioeconomic status are markers of other predictors of chlamydial infection, such as decreased access to routine health care and involvement in sexual networks with higher prevalence of disease.[11] Access to routine health care is also likely influenced by health insurance coverage. Observed differences in prevalence by current insurance coverage are similar to findings from another nationally representative survey of young adults, which found that chlamydia prevalence was higher in men and women without continuous health insurance coverage.[18]

Differences in prevalence by self-reported sexual behaviors suggest that sexual history may be useful in identifying older women at higher-risk for chlamydial infection. Having multiple sexual partners in the last 12 months increases a woman's opportunity for exposure to chlamydia. A clinic-based study in California also found sexual risk factors to be predictive of chlamydial infection in older women.[19] In addition to new and multiple sex partners, the California study identified "possible concurrency" (measured by the question "At any time within the past 12 months, did any of your male partners have sex (of any type) with someone else while they were still in a sexual relationship with you?") as a predictor of chlamydial infection in older women. Previous research has suggested that hormonal contraceptives may increase chlamydia risk[20] perhaps through physiological mechanisms (e.g., increased susceptibility) and behavior change (e.g., decreased condom use). In our data, we found a higher prevalence among women reporting that they have never used oral contraceptives or longer-acting birth control methods such as Depo-provera/injectables. It is possible that women using hormonal contraceptives may have increased risk of infection but were less likely to have a prevalent infection because they have access to or use routine

reproductive health care, increasing their opportunities for routine sexually transmitted disease testing and treatment.

Although population-based survey data are better than clinic-based data for identifying predictors of chlamydial infection in the general population, our analysis has several limitations. Even after aggregating multiple survey cycles, small sample sizes limited our ability to examine prevalence by all possible relevant characteristics measured in NHANES (e.g., prior chlamydial infection and type of health insurance) and to cross-stratify variables to identify independent predictors or to develop weighted risk scores. We were limited to data collected consistently in all 6 survey cycles, and some important predictors of chlamydial infection in older women may not be included (e.g., concurrency and condom use). Chlamydia diagnosis was made using urine-based NAATs, which, at the time of the surveys, were the preferred specimen for chlamydia screening in women not undergoing a pelvic examination.[21] Studies suggest that NAATs based on vaginal specimens may have higher sensitivity than urine specimens, which could lead to misclassification bias in our study.[22] Finally, to increase the stability of our estimates, we combined all survey cycles and did not account for any changes in prevalence over time.

These findings support the current CDC recommendation that women older than 25 years should not be routinely screened for chlamydia, given the low prevalence of disease in this population. Although we identified predictors of chlamydial infection in older women, most subgroups had a prevalence of less than 3%, a cut-point often used in determining cost-effectiveness of routine screening.[1] Although some studies have shown that chlamydia screening in women can be cost-effective from a societal perspective at lower prevalence, few have evaluated screening in prevalence below 2%.[23,24] Thus, these data did not identify national criteria for screening women older than 25 years. The National Health and Nutrition Examination Survey is currently the only nationally representative survey that includes *C. trachomatis* testing of older women, so it is unlikely that any other surveys will provide national, population-based prevalence estimates of women older than 25 years in the near future. However, it is likely that there are subpopulations of older women in which routine screening is indicated, particularly among women seeking clinical care in high-prevalence settings. Guided by the existing national screening recommendations, STD programs should consider conducting targeted prevalence studies (e.g., for a defined period, screen all women accessing care in a clinical setting and identify predictors of infection in asymptomatic women) to determine appropriate screening criteria for women older than 25 years accessing clinical care. However, criteria to identify and screen high-risk populations of older women should not take away from resources needed to provide screening coverage in younger women, the population at highest risk.

REFERENCES

1. Honey E, Augood C, Templeton A, et al. Cost effectiveness of screening for *Chlamydia trachomatis*: A review of published studies. Sex Transm Infect 2002; 78:406–412. Review. [PubMed: 12473799]
2. Datta SD, Torrone E, Kruszon-Moran D, et al. *Chlamydia trachomatis* trends in the United States among persons 14 to 39 years of age, 1999–2008. Sex Transm Dis 2012; 39:92–96. [PubMed: 22249296]

3. Centers for Disease Control and Prevention (CDC). CDC grand rounds: Chlamydia prevention: Challenges and strategies for reducing disease burden and sequelae. MMWR Morb Mortal Wkly Rep 2011; 60:370–373. [PubMed: 21451447]
4. Centers for Disease Control and Prevention. Sexually transmitted diseases treatment guidelines, 2010. MMWR Morb Mortal Wkly Rep 2010; 59:44–7. [PubMed: 20094027]
5. National Committee for Quality Assurance. The State of Healthcare Quality 2011 Washington, DC: National Committee for Quality Assurance, 2011:82–83.
6. Fowler CI, Lloyd SW, Gable J, Wang J, and Krieger K. Family Planning Annual Report: 2010 National Summary. Research Triangle Park, NC: RTI International 9 2011 Available at: http://www.hhs.gov/opa/pdfs/fpar-2010-national-summary.pdf. Accessed August 8, 2012.
7. Berman SM, Satterwhite CL. A paradox: Overscreening of older women for chlamydia while too few younger women are being tested. Sex Transm Dis 2011; 38:130–132. [PubMed: 21173722]
8. Marrazzo JM, Celum CL, Hillis SD, et al. Performance and cost-effectiveness of selective screening criteria for *Chlamydia trachomatis* infection in women. Implications for a national chlamydia control strategy. Sex Transm Dis 1997; 24:131–141. [PubMed: 9132979]
9. Centers for Disease Control and Prevention (CDC). National Center for Health Statistics (NCHS). National Health and Nutrition Examination Survey Data. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 1999–2010 Available at: http://www.cdc.gov/nchs/nhanes/http://www.cdc.gov/nchs/nhanes/nhanes_questionnaires.htm. Accessed October 24, 2011.
10. National Center for Health Statistics. Laboratory Procedures Manual. Hyattsville, MD: The National Center for Health Statistics, Centers for Disease Control and Prevention; 1999–2010 Available at: http://www.cdc.gov/nchs/nhanes/nhanes_questionnaires.htm. Accessed October 24, 2011.
11. Curtin LR, Mohadjer L, Dohrmann S, et al. The National Health and Nutrition Examination Survey: Sample design, 1999–2006. National Center for Health Statistics. Vital Health Stat 2012; 2(155):1–36.
12. Rothman KJ. A show of confidence. N Engl J Med 1978; 299: 1362–1363. [PubMed: 362205]
13. National Health and Nutrition Examination Survey Analytic Guidelines, Available at: http://www.cdc.gov/nchs/data/nhanes/nhanes_03_04/nhanes_analytic_guidelines_dec_2005.pdf Accessed October 24, 2011.
14. Shavers VL. Measurement of socioeconomic status in health disparities research. J Natl Med Assoc 2007; 99:1013–1023. [PubMed: 17913111]
15. Hogben M, Leichliter JS. Social determinants and sexually transmitted disease disparities. Sex Transm Dis 2008; 35(12 suppl):S13–S18. [PubMed: 18936725]
16. Centers for Disease Control and Prevention. Sexually Transmitted Disease Surveillance 2010. Atlanta: U.S. Department of Health and Human Services, 2011.
17. Christiansen-Lindquist L, Tao G, Hoover K, et al. Chlamydia screening of young sexually active, Medicaid-insured women by race and ethnicity, 2002–2005. Sex Transm Dis 2009; 36:642–646. [PubMed: 19652631]
18. Geisler WM, Chyu L, Kusunoki Y, et al. Health insurance coverage, health care-seeking behaviors, and genital chlamydial infection prevalence in sexually active young adults. Sex Transm Dis 2006; 33: 389–396. [PubMed: 16505745]
19. Howard H, Chow J, Deal M, Bauer H and Bolan G. Developing chlamydia screening guidelines for women over age 25. Presented at the 2008 National STD Prevention Conference, Chicago Illinois Available at:https://cdc.confex.com/cdc/std2008/webprogram/Paper14355.html, Accessed May 5, 2012.
20. Morrison CS, Bright P, Wong EL, et al. Hormonal contraceptive use, cervical ectopy, and the acquisition of cervical infections. Sex Transm Dis 2004; 31:561–567. [PubMed: 15480119]
21. Johnson RE, Newhall WJ, Papp JR, et al. Screening tests to detect *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections—2002. MMWR Recomm Rep 2002; 51:1–38; quiz CE1–4.
22. Schachter J, Chernesky MA, Willis DE, et al. Vaginal swabs are the specimens of choice when screening for *Chlamydia trachomatis* and *Neisseria gonorrhoeae*: Results from a multicenter

evaluation of the APTIMA assays for both infections. Sex Transm Dis 2005; 32:725–728. [PubMed: 16314767]

23. Gift TL, Gaydos CA, Kent CK, et al. The program cost and cost-effectiveness of screening men for chlamydia to prevent pelvic inflammatory disease in women. Sex Transm Dis 2008; 35(11 suppl): S66–S75. [PubMed: 18830137]
24. Roberts TE, Robinson S, Barton P, et al. Screening for *Chlamydia trachomatis*: A systematic review of the economic evaluations and modeling. Sex Transm Infect 2006; 82:193–200. [PubMed: 16731666]

TABLE 1.

Estimated Chlamydia Prevalence Among Women Aged 26 to 39 Years, NHANES, 1999 to 2010

	n/N	Weighted Percent	95% CI, %
Overall	51/3875	1.2	0.8–1.7
Demographics			
Age, y			
26–30	21/1459	1.4	0.8–2.5
31–39	30/2416	1.1	0.7–1.8
Race/Ethnicity			
Black, non-Hispanic	19/767	2.5	1.7–3.6
Mexican American	13/869	1.5	0.9–2.5
White, non-Hispanic	12/1741	0.7	0.4–1.5*
Marital status			
Married/Living with partner	23/2617	0.8	0.4–1.3
Widowed/Divorced/Separated	12/462	2.7	1.4–5.4*
Never married	16/722	1.9	1.1–3.3
Education			
HS/GED or less	32/1711	2.0	1.2–3.2
>HS/GED	19/2163	0.7	0.4–1.2
Currently has health insurance			
Yes	34/2913	1.0	0.7–1.6
No	17/944	1.8	0.9–3.6*
Sexual behaviors			
Age at first sex, y			
<16	13/915	1.1	0.6–2.1*
≥16 years†	29/2354	1.2	0.7–1.9
No. sex partners in the last 12 mo			
0–1	27/2893	0.8	0.5–1.3
2+	15/464	2.9	1.4–5.7
Ever used oral contraceptives or Depo-provera/injectables			
Yes	25/2851	0.7	0.4–1.2
No	18/566	3.4	2.0–6.0

*Estimate has an RSE greater than 30% but less than 40% and should be interpreted with caution.

†Includes women who reported never having sex.

HS indicates high school.