HHS Public Access

Author manuscript

Sex Transm Dis. Author manuscript; available in PMC 2022 March 01.

Published in final edited form as:

Sex Transm Dis. 2021 March 01; 48(3): 152–160. doi:10.1097/OLQ.0000000000001284.

Why are Rates of Reported Chlamydia Changing in the United States?: Insights from the National Job Training Program

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Abstract

Background: During 2010–2017, rates of reported chlamydia decreased among young Black women but increased for White women and all men. Since chlamydia case rates can be influenced by changes in prevalence, screening, and other factors, we compared chlamydia prevalence trends in a sentinel population to national case rate trends to understand potential drivers of case rate trends.

Methods: Chlamydia prevalence was calculated annually among 16–24 year old entrants to the National Job Training Program (NJTP) during 2010–2017. An expectation-maximization-based maximum likelihood approach was used to adjust for misclassification due to imperfect test sensitivity and specificity. Models were stratified by sex, age, and race/ethnicity. A statistically significant trend in prevalence was defined as non-overlapping 95% confidence intervals comparing 2010 and 2017. Trends in chlamydia prevalence were compared to trends in case rates using percentage change over time; relative changes ≥10% were considered meaningful.

Results: Among NJTP entrants during 2010–2017, chlamydia prevalence was stable for all Black women, while case rates decreased for adolescents (−12%) and were stable for 20–24 year-olds (−4%). Among adolescent White women, prevalence was stable while case rates increased (+30%). For White women aged 20–24 years, prevalence increased +62% and case rates increased +43%. Trends in prevalence differed from trends in case rates for all subgroups of men.

Conclusions: Prevalence trends in this sentinel population differed from national case rate trends for Black women, White women, and men, suggesting potential decreased screening among Black women 16–19, increased prevalence among White women 20–24, and increased screening among men.

Short Summary:

Trends in chlamydia case rates were compared to prevalence in a sentinel population by sex, age, race/ethnicity to understand drivers of case rates. Discrepancies suggest changes in screening.

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Keywords

chlamydia; surveillance; prevalence; trend; race

Introduction

Overall rates of reported chlamydia (case rates) have increased in the United States nearly every year since 2000 [1]; however, trends differ by sex, age group, and race/ethnicity. In 2009, the rate of chlamydia among Black non-Hispanic ("Black") women (2095.5 cases per 100,000 women) was seven times higher than the rate among White non-Hispanic ("White") women (270.2 cases per 100,000 women) in the United States [1]. While chlamydia case rates have been consistently highest among 15–19 year-old Black women compared to all other sex, age, and racial/ethnic subgroups, they fell by 12% during 2010–2018, from 7,719.1 to 6,817.3 per 100,000 women [1]. However, among 15–19 year-old White women, chlamydia case rates increased by 30% during this period. Among men in this age group, case rates increased by 14% for Blacks and 64% for Whites. These changes caused a decrease in the Black:White ratio of case rates over this period for women and men aged 15–19 years. Similar trends have been observed for 20–24 year-olds in each of these sex and racial/ethnic subgroups.

Differential changes in case rates over time by race suggest a narrowing in the racial disparity of chlamydia; however, changes in chlamydia case rates are challenging to interpret because they can be explained by changes in various factors, such as screening coverage, prevalence, or both. Robust population-based data to evaluate trends in screening coverage by race are lacking, but recent data suggest that screening among women overall may have decreased following the 2009 change to cervical cancer screening recommendations [2,3]. Screening among men likely increased, leading up to and following the 2019 FDA approval of extragenital nucleic acid amplification tests (NAATs) which allows testing of men who have sex with men (MSM) [4]. Furthermore, changes in healthcare access or clinic funding may have influenced screening. The ability to monitor prevalence by race in nationally-representative population-based surveys such as the National Health and Nutrition Examination Survey (NHANES) is limited due to small samples [5,1].

An alternative to assess race-specific disease trends in the general population is to assess trends using prevalence data from sentinel populations, which are well-defined subsets of the general population screened consistently so that trends over time can be expected to reflect trends in the general population. The National Job Training Program (NJTP) has been used to evaluate trends in chlamydia in the United States [6,7,8,1]. The NJTP is an vocational education program for socioeconomically disadvantaged young people in the United States in which all enrollees are screened for chlamydia within two days upon entering the program as part of their medical care [9]. The NJTP has high and consistent screening coverage, making it suitable for monitoring trends in chlamydia prevalence. Using NJTP as a sentinel population, we can compare national case rate trends to NJTP prevalence trends to understand the relationship between case rates, screening, and prevalence. A previous study suggested screening had increased because reported case rates among US women increased

while prevalence among women entering the NJTP decreased from 1990–2002 and was then stable through 2012 while reported case rates among US women increased [8]. Additional years of NJTP data are now available to inform our understanding of recent trends.

We examined trends in the prevalence of chlamydia during 2010–2017 among women and men entering the NJTP, by age and race/ethnicity, to determine whether trends in chlamydia prevalence in this sentinel population correspond to national trends in chlamydia case rates.

Materials and Methods

NJTP Study Population

The NJTP is a residential vocation training program for low income and otherwise disadvantaged 16–24 year-olds in the United States [9] with 124 sites across 48 states [10]. Entrants are screened for chlamydia within two days of entry to the program and remain enrolled for an average of 8 months. All tests are conducted by a single national contract laboratory. During 2000–2017, chlamydia screening tests were conducted using a NAAT (BD ProbeTec ET SDA (Becton Dickinson, Sparks, Maryland, USA)) for which women provided either a urine sample or vaginal or cervical swab and men provided a urine sample.

We included women and men who were tested upon entrance to NJTP during 2007–2017 with a recorded, positive or negative chlamydia test result. Tests after the entrance period were excluded. Our primary period of interest was 2010 through 2017, during which chlamydia case rates decreased among adolescent Black females; however, we also examined data from 2007–2009 to determine if the trends we observed during the study period were present prior to 2010.

Prevalence Trends

We calculated the annual unadjusted prevalence of chlamydia as the number of positive chlamydia tests divided by the total number of NJTP entrants tested each year during 2007–2017. We used a Wilcoxon-type non-parametric test for trend to assess the statistical significance of a trend over time in unadjusted chlamydia prevalence [11]. The prevalence of chlamydia was estimated adjusting for misclassification due to imperfect screening test sensitivity and specificity, modeled using an expectation-maximization (EM) algorithm incorporated into logit regression [12]. Previous studies estimated that the BD ProbeTec ET SDA was 88% sensitive and 99% specific when testing vaginal or cervical swabs and urine from women, and 94% sensitive and a 98% specific when testing urine specimens from men [8]. All models used the chlamydia test result as the dependent variable and continuous year of test as the independent variable. To allow a non-linear relationship between the prevalence of chlamydia and year of test, we used restricted cubic splines with three knots based on Akaike Information Criteria. Model parameters were used to estimate annual predicted prevalence. To calculate 95% confidence intervals (CIs), we used bootstrapping techniques (n=200). Models were stratified by sex, age, and race/ethnicity.

To determine whether there was a significant change in the adjusted chlamydia prevalence trend over the 2010– 2017 study period for a given subgroup, we examined the confidence

intervals for 2010 and 2017; statistically significant trends were defined as those with confidence bounds in 2010 and 2017 that did not overlap.

Finally, we assessed for potential bias in NJTP trends due to shifts in "case mix" (risk status of people entering the NJTP). A shift in case mix may bias prevalence to be artificially higher if a greater proportion of people at high risk for chlamydial infection enter the NJTP and are screened, or artificially lower if a greater proportion of people at low risk for chlamydia enter the NJTP and are screened. Sexual behavior data are not available in the NJTP data. Therefore, to assess shifts in the relative proportions of people who are high risk and low risk among those who are being screened in the population, we examined the racial/ethnic and geographical distribution as proxies of risk.

Case Rate Trends

Chlamydia is a reportable condition in all 50 states and the District of Columbia. Cases of chlamydia are voluntarily reported to the National Notifiable Diseases Surveillance System (NNDSS) at the Centers for Disease Control and Prevention (CDC) [13]. We abstracted data from CDC STD Surveillance Reports [1] to assess the annual rates of reported chlamydia per 100,000 population from 2007–2017 among Black and White women and men aged 15–19 and 20–24 years.

To determine whether there was a change within chlamydia case rates over the 2010–2017 study period, we calculated the relative percentage change from 2010–2017 for each sex, age, and race subgroup. Percentage change was calculated as the estimate in 2017 subtracted from the estimate in 2010, divided by the estimate in 2010. We considered a relative percentage change meaningful when it met or exceeded a change of 10%, and changes <10% to reflect stable trends. The choice of 10% was arbitrary and was a general attempt to acknowledge minor variation as acceptable for a stable trend.

Comparison of Trends in NJTP to Chlamydia Case Rates

We compared trends in chlamydia case rates with trends in prevalence in the NJTP using the relative percentage change from 2010–2017. For each subgroup, we compared the magnitude and direction of percentage change in case rates and NJTP prevalence; subgroups with similar trends suggested that screening was stable while differing trends suggested screening had changed. If case rates increased more than an increase in prevalence, we interpreted this as increased screening, and case rates increased less than an increase in prevalence, we interpreted this decreased screening.

To illustrate the change in chlamydia case rates and the change within NJTP prevalence through 2017 relative to 2010, we plotted the ratio of the value for each year relative to the value for 2010, for each race and age subgroup. Compared to the 2010 value, ratios of 1.0 indicated no change, while ratios <1.0 indicated decreases and ratios >1.0 indicated increases.

All analyses were conducted using Stata SE version 15.1 (College Station, TX, 2017).

Sensitivity Analyses

We tested the influence of preexisting trends in the three years preceding the study period (2007 to 2009) by removing these years of data from the models. Additionally, for each year of data, we reviewed the proportion of entrants tested that met our inclusion criteria and conducted an additional sensitivity analysis removing a year (2013) that was identified to have a high proportion of missing race/ethnicity data.

Results

NJTP Study Population

During 2007 to 2017 there were 583,851 positive or negative chlamydia test results from women and men entering the NJTP. We excluded women and men with unknown race/ethnicity (n=39,346) or test type (n=272), and those residing outside of the 50 states or District of Columbia (n=10,018). Those with unknown race/ethnicity tended to be male, aged 20–24 years, reside in the Western US, and entered NJTP in 2013. Notably, among observations recorded in 2013, approximately 71% were missing race/ethnicity data (n=28,585), resulting in a relatively small sample for that year; missing race/ethnicity was infrequent otherwise (2012: 8.0%; other years <3%). A total of 534,215 observations remained for analysis over the 11-year study period.

NJTP entrants tended to be male (60.0%), aged 16–19 years (63.2%), Black (51.5%), reside in the South (44.7%), and tested using a urine sample (92.5%) (Table 1). From 2007–2017, the number of NJTP entrants decreased for women (−24%) and men (−18%). Overall, 9.6% of all NJTP participants tested positive for chlamydia, with a greater proportion of women testing positive (12.3%) than men (7.7%). Within each sex, unadjusted prevalence was higher across all study years among Black women (14.9%) and men (11.6%) than other racial/ethnic groups and was higher for persons living in the South (women: 14.8%, men: 9.5%) than other regions. By age, unadjusted chlamydia prevalence was highest for women 16–19 years old (13.8%, compared to 9.6% in 20–24 year-olds) and for men aged 20–24 years old (8.1%, compared to 7.5% in 16–19 year-olds).

Prevalence Trends by Sex, Age, and Race/Ethnicity

Over the 11-year study period, unadjusted annual chlamydia prevalence in the NJTP was highest for Black women aged 16–19 years (17.1%) and was similar among Black women aged 20–24 years (11.2%) and all Black men (16–19 years: 11.6%; 20–24 years: 11.7%) (Table 2). Among White women, unadjusted prevalence was approximately half that of Black women the same age; prevalence among White men was low (<5%). No significant trend was observed in unadjusted prevalence from 2010–2017 for any group except White women aged 20–24 years, for whom there was an increase (4.7% to 9.0%; p for trend: <0.001) and Black men, for whom there were decreases (ages 16–19 years [12.1% to 11.2%]; p for trend: <0.01; and ages 20–24 years [12.0% to 10.6%]; p for trend: <0.001).

After adjusting for imperfect test sensitivity and specificity, chlamydia prevalence was higher for Black women and lower for White women and all men (Table 2). Adjusted chlamydia prevalence was stable from 2010 through 2017 for Black women aged 16–19

(approximately 18.2%) (Figure 1a) and 20–24 years (approximately 11.7%) (Figure 1b). For White women aged 16–19 years, adjusted prevalence estimates were stable at approximately 8%; however, there was a significant increase for 20–24 year-old White women, from 5.2% in 2010 (95% CI: 4.7%, 5.7%) to 8.4% in 2017 (95% CI: 7.1%, 9.5%) (Figure 1b). Among Black men, adjusted prevalence was stable for 16–19 year-olds (Figure 1c) but decreased for 20–24 year-olds from 11.1% in 2010 (95% CI: 10.7%, 11.5%) to 9.3% in 2017 (95% CI: 8.6%, 10.0%) (Figure 1d). Prevalence among White men remained low and stable at under 5% for both age groups (Figures 1c, 1d).

We found stable proportions in the racial/ethnic and geographical distributions of NJTP enrollees over time and thus concluded that a meaningful shift in the risk status of the populations studied, or “case mix” was unlikely.

Case Rate Trends by Sex, Age, and Race/Ethnicity

The annual chlamydia case rates decreased from 2010–2017 among Black women aged 15–19 years (−12%; Table 3) and was stable among Black women aged 20–24 years (−4%). For White women, case rates increased for 15–19 year-olds (+30%) and 20–24 year-olds (+43%). Among men, case rates increased for Blacks (15–19 years: +10%; 20–24 years: +10%) and Whites (15–19 years: +63%; 20–24 years: +75%).

Comparison of Trends in NJTP to Chlamydia Case Rates

Trends in national case rates were compared to trends in prevalence in the NJTP to see if they were similar (stable screening) or different (changing screening).

Trends in chlamydia case rates differed from prevalence trends in NJTP. Using percentage change to directly quantify and compare trends, we found that for Black women, the annual chlamydia case rates decreased from 2010–2017 for 15–19 year-olds (−12%; Figure 2a) and was stable for 20–24 year-olds (−4%; Figure 2b), while adjusted prevalence in NJTP was stable. This suggests a potential decrease in screening among adolescent Black women and stable screening for 20–24 year old Black women. For White women, chlamydia case rates and prevalence increased for both age groups, but by different amounts that suggest potential increased screening for young women and decreased screening for older women. For all men, case rates increased while for Black men prevalence in NJTP was stable or decreasing and for White men prevalence was stable or modestly increasing, implying for all men a potential increase in screening (Figures 2c, 2d).

Sensitivity Analyses

When we removed the data for the three years preceding the study period (2007 to 2009) or removed the 2013 study year due to the small sample that year, trend estimates did not meaningfully differ (results not shown).

Discussion

Our goal was to compare national chlamydia case rates in young adults to prevalence rates in a sentinel population to determine whether changes in case rates may be driven by changes

in prevalence or an artifact of altered screening practices. Trends in national case rates differed from trends in the NJTP for most sex, age, and racial/ethnic subgroups suggesting potential changes in screening. Both data sources showed consistently narrowing trends in racial disparities among women and men in both age groups.

Chlamydia case rates are influenced by several factors, and because test characteristics and reporting remained relatively stable during the study period, shifts in case report trends may reflect changes in the proportion of persons screened, changes in the risk composition of persons screened, changes in prevalence, or a combination of these factors. For Black women 16–19 years old, prevalence in the NJTP was stable, whereas case rates decreased, potentially signaling a decrease in screening. This is consistent with reported decreases in the number of young women being screened for chlamydia in federally-funded family planning clinics [14] and overall decreases in chlamydia screening following the updated cervical cancer screening guidelines resulting in fewer healthcare visit opportunities for screening [2,3]. This decrease may also reflect reductions in funding for low cost clinics [15]. Yet Black women 20–24 had stable prevalence and case rates, suggesting stable screening. In contrast, all White women had increases in both prevalence and case rates. These increases differed by age: for 16–19 year-olds increases in case rates slightly outpaced increases in prevalence, suggesting increased screening, but for 20–24 year-olds increases in prevalence outpaced case rates, suggesting decreased screening. It is unclear why screening may have decreased for young Black women and not young White women. Barriers to screening, such as health care access, misperceiving a patient as low risk, or insufficient provider knowledge, may have influenced screening, but we did not identify evidence suggesting that these factors changed substantially over this period. Chlamydia screening is difficult to measure because population-based screening datasets are lacking and those available use metrics such as the Healthcare Effectiveness Data Information Set (HEDIS), which are designed to evaluate provider performance rather than population health [14], they do not include women who do not visit providers, and only include those covered by Medicaid or commercial insurance.

For men, prevalence in NJTP decreased for Blacks aged 20–24 years and increased for Whites aged 16–19 years and was stable for others, while case rates increased for all men, suggesting increased screening. Extragenital infections are prevalent among MSM [17,18] and NJTP included only urogenital testing. Extragenital testing for MSM has thus been encouraged [19] and while NAATs have only recently been approved for screening for chlamydia and gonorrhea at extragenital sites [4], many clinics have been using NAATs to screen for extragenital infection for years [20]. Thus, it is possible that increasing case rates among men are explained in part by increased screening among MSM.

Our findings were consistent with the overall change among women in the U.S. military [21] from 2010–2017. Among young (<25 years) Black women, the rate of chlamydia in 2017 was approximately the same value in 2010, suggesting stability overall, while among young White women the rate of chlamydia increased by approximately 20%. Chlamydia positivity during our study period was also reported in other U.S. datasets, such as NHANES, but did not allow assessment of trends after stratification by sex, age, and race/ethnicity because the

small sample sizes in those datasets do not allow stratification by sex, age, and race/ethnicity [22,5,23,24].

Our study has several limitations. First, we did not use a random sample of the population to evaluate trends in prevalence, rather, we used NJTP as a sentinel population to reflect trends in the broader population, as has been done in the past [6, 7, 8, 1]. NJTP is a program for socioeconomically disadvantaged youths and prevalence is higher than in the general US population [5]; however, we assume that trends over time in well-defined sentinel populations such as NJTP are similar to trends in the general population [25]. Second, recent increases in extragenital testing among MSM may contribute to discrepancies between NJTP and case rates among men, and possibly part of the discrepancies among women, because the NJTP data included only results from urogenital screening while case report data includes diagnosed urogenital, pharyngeal, and rectal infections. Third, NJTP data are based on near universal screening of its participants at entry and thus reflect asymptomatic infections, whereas case rates also include persons seeking treatment for symptomatic infections. However, an estimated 77% to 90% of all chlamydial infections are asymptomatic [26,27], suggesting symptomatic care-seeking may have minimal impact on trends. Fourth, case rates may be influenced by other factors, such as changes in test type or provider reporting. Test sensitivity and specificity have been fairly consistent in recent years according to a survey of clinical laboratories in 2013 that showed nearly all (96.8%) reported use of NAATs as their primary method for identifying chlamydia [28]. Alternatively, a shift in reporting practices may influence reported chlamydia, though chlamydia has been a reportable condition for two decades and laboratory-based reporting has been used throughout that period, so reporting is likely to have remained relatively high and stable. Fifth, in 2013, the majority of laboratory test results for NJTP had incomplete race/ethnicity and were excluded from our analyses, but the removal of the 2013 year did not impact our findings. Finally, we evaluated longitudinal changes in the risk profile of the NJTP study population using race/ethnicity and geographic region as proxies of risk over time and we found no evidence that meaningful case mix shifts occurred in NJTP during our study period, consistent with previous findings [9]. It is unknown whether the risk profile of those screened in the general population has shifted over time so it is also unclear whether or how case rate trends may be influenced and how such changes compare relative to NJTP. It is possible that unmeasured changes in NJTP participants may influence chlamydia prevalence trends, and that unmeasured changes in the general population being tested may influence case rates.

This analysis comparing prevalence trends in a sentinel population to national case report trends suggests that chlamydia screening may have decreased among young Black women and that chlamydia prevalence may be increasing among White women aged 20–24 years and decreasing in Black men aged 20–24 years. Rich data on screening coverage, including race/ethnicity and covering a broad segment of the population, are needed to confirm our findings.

Acknowledgments

Conflicts of Interest and Source of Funding: The authors report no known conflicts of interest or relevant financial disclosures.

Reference

[1]. Division of STD Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Centers for Disease Control and Prevention. STD Surveillance Reports. (CDC Web site). Available at: https://www.cdc.gov/std/stats/archive.htm. Accessed January 30, 2020.

[2]. Hsieh HL, Huppert J, Patel CG, et al. The Impact of the American College of Obstetricians and Gynecologists Guideline Changes in Pap Tests on Annual Chlamydia Test Rates. Journal of Adolescent Health 2017;61(4):440–445.

[3]. Naimer MS, Kwong JC, Bhatia D, et al. The Effect of Changes in Cervical Cancer Screening Guidelines on Chlamydia Testing. Annals of Family Medicine 2017;15(4):329–334. [PubMed: 28694268]

[4]. US Food and Drug Administration. FDA News Release: FDA clears first diagnostic tests for extragenital testing for chlamydia and gonorrhea. (FDA Web site). Available at: https://www.fda.gov/news-events/press-announcements/fda-clears-first-diagnostic-tests-extragenital-testing-chlamydia-and-gonorrhea. Accessed March 2, 2020.

[5]. Torrone E, Papp J, Weintock H. Prevalence of Chlamydia trachomatis Genital Infection Among Persons Aged 14–39 Years — United States, 2007–2012. Morbidity and Mortality Weekly Report 2014;63(38):834–838. [PubMed: 25254560]

[6]. Bradley H, Satterwhite CL. Prevalence of Neisseria gonorrhoeae infections among men and women entering the national job training program -- United States, 2004–2009. Sexually Transmitted Diseases 2012;39(1):49–54. [PubMed: 22183847]

[7]. Satterwhite CL, Tian LH, Braxton J, et al. Chlamydia prevalence among women and men entering the national job training program: United States, 2003–2007. Sexually Transmitted Diseases 2010;37(2):63–67. [PubMed: 19801962]

[8]. Learner ER, Torrone EA, Fine JP,et al. Chlamydia Prevalence Trends Among Women and Men Entering the National Job Training Program From 1990 Through 2012. Sexually Transmitted Diseases 2018;45(8):554–559. [PubMed: 29465650]

[9]. U.S. Department of Labor Office of Job Corps. Policy and Requirements Handbook. 2016.

[10]. US Department of Labor. US Department of Labor Job Corps Annual Report 2009.

[11]. Cuzick J. A Wilcoxon-type test for trend.Statistics in Medicine 1985;4:87–90. [PubMed: 3992076]

[12]. Magder LS, Hughes JP. Logistic regression when the outcome is measured with uncertainty. Am J Epidemiology 1997;146:195–203.

[13]. Centers for Disease Control and Prevention, National Notifiable Diseases Surveillance System. Chlamydia Trachomatis Infection 2010 Case Definition. (CDC Web site). Available at: https://wwwn.cdc.gov/nndss/conditions/chlamydia-trachomatis-infection/case-definition/2010/. Accessed April 11, 2019.

[14]. Fowler CI, Gable J, Wang J, et al. (2018, 8). Family Planning Annual Report: 2017 national summary. Research Triangle Park, NC: RTI International.

[15]. Mehtani NJ, Schumacher CM, Johnsen LE, et al. Three Years Post–Affordable Care Act Sexually Transmitted Disease Clinics Remain Critical Among Vulnerable Populations. Am J Prev Med 2018;55(1):111–114. [PubMed: 29776778]

[16]. Patel CG, Tao G. The significant impact of different insurance enrollment criteria on the HEDIS Chlamydia screening measure for young women enrolled in medicaid and commerical insurance plans. Sexually Transmitted Diseases 2015;42(10):575–579. [PubMed: 26372930]

[17]. Johnson Jones ML, Chapin-Bardales J, Bizune D, et al. Extragenital Chlamydia and Gonorrhea Among Community Venue–Attending Men Who Have Sex with Men — Five Cities, United States, 2017. Morbidity and Mortality Weekly Report 2019;68(14):321–325. [PubMed: 30973847]

[18]. Chan PA, Robinette A, Montgomery M, et al. Extragenital Infections Caused by Chlamydia trachomatis and Neisseria gonorrhoeae: A Review of the Literature. Infectious Diseases in Obstetrics and Gynecology 2016;2016(5758387).

[19]. Gay Men's Health Equity Work Group. Prioritizing The Health Of MSM: Extragenital STD Screening Call-to-Action. (NCSD Web Site). Available at: https://www.ncsddc.org/resource/extragenital-call-action/. Accessed April 3, 2020.

[20]. Sexually Transmitted Diseases Treatment Guidelines, 2015. MMWR Recomm Rep. 2015 6 5; 64(RR-03):1–137.

[21]. Stahlman S, Oetting AA. Sexually transmitted infections, active component, U.S. Armed Forces, 2010–2018. Medical Surveillance Monthly Report 2019;26(3):2–10.

[22]. Park JY, Zimmerman L, Stempinski K, et al. Prevalence of Chlamydia trachomatis and Neisseria gonorrhoeae in an urban public hospital pregnancy termination clinic. International Journal of STD & AIDS 2017;28(12):1164–1168. [PubMed: 28114879]

[23]. Burghardt NO, Chow JM, Steiner A, et al. Trends in Chlamydia Screening, Test Positivity, and Treatment Among Females in California Juvenile Detention Facilities, 2003–2014. Sexually Transmitted Diseases 2016;43(1):12–17. [PubMed: 26650990]

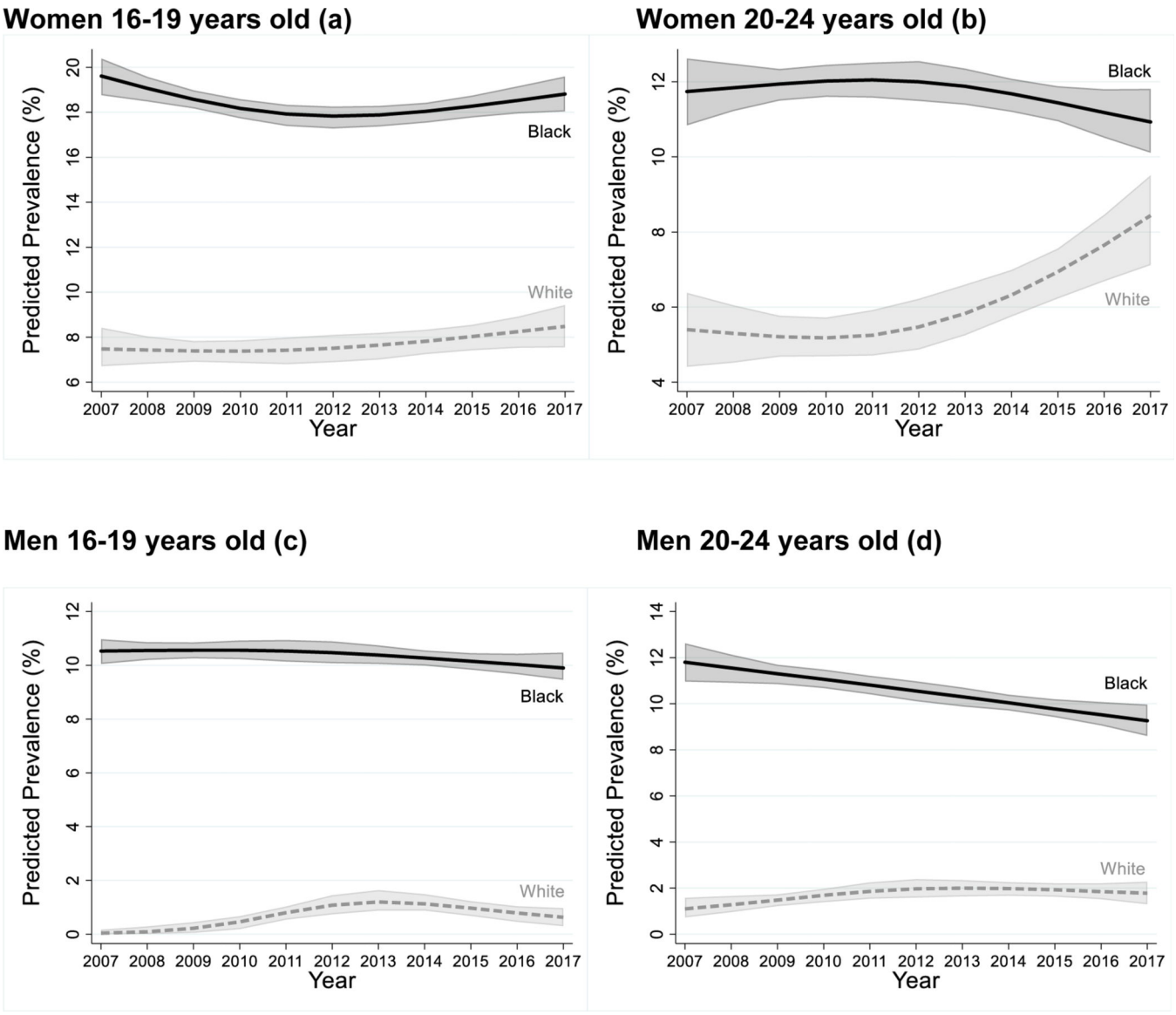
[24]. Owings AJ, Clark LL, Rohrbeck P. Incident and Recurrent Chlamydia trachomatis and Neisseria gonorrhoeae. Medical Surveillance Monthly Report 2016; 23(2) 20–28.

[25]. Nsubuga P, White ME, Thacker SB, et al., Public Health Surveillance: A Tool for Targeting and Monitoring Interventions In: Jamison DT, Breman JG, Measham AR, et al., editors. Disease Control Priorities in Developing Countries. 2nd edition Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2006;997–1015. Chapter 53. Available from: https://www.ncbi.nlm.nih.gov/books/NBK11770/ Co-published by Oxford University Press, New York.

[26]. Farley TA, Cohen DA, Elkins W. Asymptomatic sexually transmitted diseases: the case for screening. Preventive Medicine 2003;36:502–509. [PubMed: 12649059]

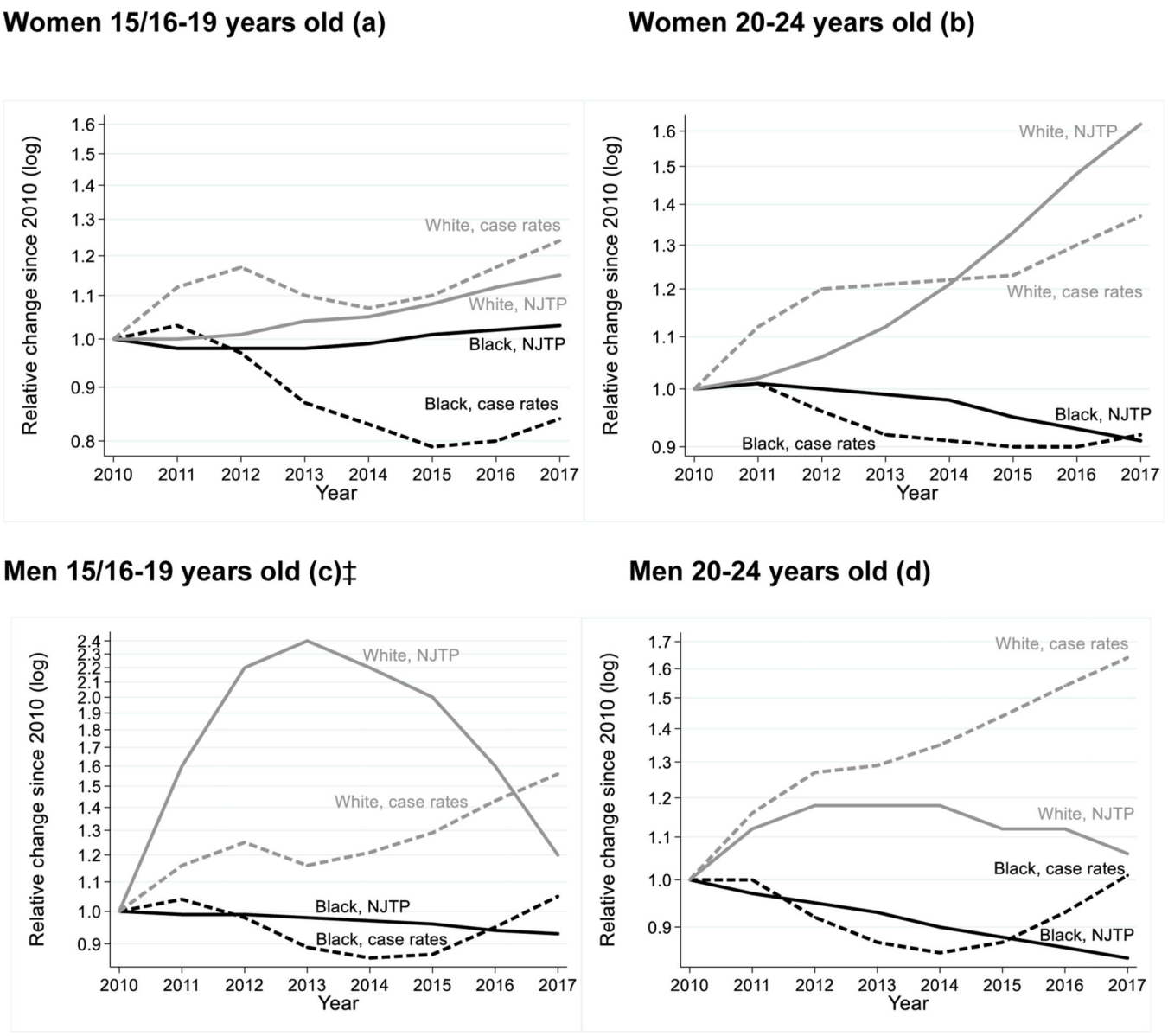
[27]. Korenromp EL, Sudaryo MK, de Vlas SJ, et al. What proportion of episodes of gonorrhea and chlamydia becomes symptomatic? International Journal of STD & AIDS 2002;13:91–101. [PubMed: 11839163]

[28]. Association of Public Health Laboratories. 2013 Chlamydia and Gonorrhea Clinical Laboratory Practices Survey: Summary Data Report. (Association of Public Health Laboratories Web site). Available at: https://www.aphl.org/aboutAPHL/publications/. Accessed January 23, 2020.



Figures 1a-d.

Adjusted chlamydia prevalence estimates and 95% Confidence Intervals, adjusted for misclassification due to imperfect test sensitivity and specificity, among entrants to the National Job Training Program, by sex, age group, and race/ethnicity (2007 to 2017).



Figures 2a-2d.

Trends in chlamydia prevalence in the National Job Training Program (NJTP) and chlamydia case rates per 100,000 population (case rates), by sex, age group, and race/ethnicity, United States, (2010–2017) (log scale). All years were compared to 2010.

† STD Surveillance Report includes age groups 15–19 years old and 20–24 years old; NJTP includes age groups 16–19 years old and 20–24 years old.

‡ NJTP adjusted prevalence estimates were widely variable for White men 16–19 years old due to the small number of cases for this subgroup.

α Relative change in chlamydia prevalence in NJTP as compared to 2010 shown with solid lines.

β Relative change in chlamydia case rates according to STD Surveillance Reports as compared to 2010 shown with dashed lines.

Table 1.

Population tested for chlamydia and the proportion with a positive test result by sex, National Job Training Program, N=534,215 (2007 to 2017).

Characteristic	Women		Men	
	Tested, N	Positive, (%)	Tested, N	Positive, (%)
Total	213,546	(12.3)	320,669	(7.7)
Year of entry				
2007	21,750	(13.5)	34,385	(8.0)
2008	22,573	(12.7)	34,437	(7.9)
2009	22,544	(11.8)	32,905	(7.6)
2010	23,082	(12.0)	31,935	(7.6)
2011	23,389	(11.8)	33,200	(8.1)
2012	21,045	(11.9)	30,064	(7.9)
†2013	4,617	(10.9)	6,457	(7.1)
2014	20,115	(12.2)	29,595	(7.6)
2015	19,306	(12.8)	30,192	(7.7)
2016	18,455	(12.7)	29,465	(7.7)
2017	16,670	(12.1)	28,084	(7.3)
Age (years) at entry				
16 to 19	134,784	(13.8)	202,601	(7.5)
20 to 24	78,762	(9.6)	134,784	(8.1)
Race/Ethnicity				
White, non-Hispanic	42,462	(7.1)	92,907	(2.9)
Black, non-Hispanic	119,240	(14.9)	155,742	(11.6)
Hispanic	36,551	(10.1)	50,581	(5.3)
Asian/Pacific Islander	5,138	(9.9)	7,228	(5.0)
American Indian/Alaska Native	5,555	(12.9)	7,958	(6.9)
Other	4,600	(11.3)	6,253	(7.3)
Region				
Midwest	38,423	(12.9)	53,430	(8.4)
Northeast	39,799	(10.0)	51,959	(6.5)
South	91,519	(14.8)	147,463	(9.5)
West	43,805	(8.7)	67,817	(4.3)
Specimen type				
Urine	173,857	(12.0)	320,669	(7.7)
Cervical or Vaginal Swab	39,689	(13.8)	--	--

†In 2013, 71% of the sample was missing race/ethnicity data and were thus excluded from further analysis.

Table 2.

Number tested for chlamydia, unadjusted chlamydia prevalence, and adjusted chlamydia prevalence estimates and 95% Confidence Intervals (CI) among entrants to the National Job Training Program, by sex, age group, and race/ethnicity (2007 to 2017).

		16 to 19 years old				20 to 24 years old			
		Tested, N	Unadjusted Prevalence, %‡	Adjusted Prevalence (95% CI) Ω		Tested, N	Unadjusted Prevalence, %‡	Adjusted Prevalence (95% CI) Ω	
Black Women	**Total**	**74,850**	**17.1**			**44,390**	**11.2**		
	2007	8,774	18.4	19.6	(18.8, 20.4)	3,328	11.5	11.7	(10.8, 12.6)
	2008	9,029	17.4	19.1	(18.5, 19.6)	3,637	11.4	11.8	(11.2, 12.5)
	2009	8,245	16.8	18.6	(18.2, 19.0)	4,329	11.0	11.9	(11.5, 12.3)
	2010	8,247	17.2	18.2	(17.7, 18.6)	4,830	10.7	12.0	(11.6, 12.5)
	2011	7,851	16.6	17.9	(17.4, 18.3)	5,198	11.0	12.1	(11.6, 12.5)
	2012	6,608	16.0	17.8	(17.3, 18.3)	5,004	11.7	12.0	(11.5, 12.6)
	†2013	828	15.8	17.9	(17.4, 18.3)	736	11.3	11.9	(11.4, 12.4)
	2014	6,726	16.9	18.0	(17.5, 18.4)	5,128	11.2	11.7	(11.0, 12.1)
	2015	6,622	17.6	18.3	(17.8, 18.7)	4,567	11.4	11.4	(11.0, 11.9)
	2016	6,268	17.5	18.5	(18.0, 19.2)	4,143	11.0	11.2	(10.5, 11.8)
	2017	5,652	16.5	18.8	(18.0, 19.6)	3,490	9.8	10.9	(10.1, 11.8)
	Percent change€			+3%				−9%	
White Women	**Total**	**27,145**	**7.7**			**15,317**	**6.2**		
	2007	3,304	7.9	7.5	(6.7, 8.4)	1,337	6.5	5.4	(4.4, 6.4)
	2008	3,094	7.5	7.4	(6.8, 8.0)	1,424	5.6	5.3	(4.5, 6.1)
	2009	3,019	6.5	7.4	(6.9, 7.8)	1,561	4.7	5.2	(4.7, 5.8)
	2010	3,055	7.4	7.4	(6.9, 7.9)	1,844	4.7 α	5.2	(4.7, 5.7) β
	2011	2,985	7.5	7.4	(6.8, 8.0)	1,968	6.0	5.3	(4.7, 5.9)
	2012	2,543	8.0	7.5	(6.9, 8.1)	1,807	6.1	5.5	(4.9, 6.2)
	†2013	216	3.7	7.7	(7.0, 8.2)	171	6.4	5.8	(5.3, 6.6)
	2014	2,248	8.5	7.8	(7.3, 8.3)	1,524	7.1	6.3	(5.8, 7.0)
	2015	2,289	8.0	8.0	(7.4, 8.6)	1,344	7.7	6.9	(6.2, 7.6)

		16 to 19 years old				20 to 24 years old			
		Tested, N	Unadjusted Prevalence, %‡	Adjusted Prevalence (95% CI) Ω		Tested, N	Unadjusted Prevalence, %‡	Adjusted Prevalence (95% CI) Ω	
	2016	2,215	8.4	8.3	(7.5, 8.9)	1,243	5.9	7.7	(6.7, 8.5)
	2017	2,177	7.9	8.5	(7.6, 9.4)	1,094	9.0	8.4	(7.1, 9.5)
	Percent change €			+15%				+62%	
Black Men	**Total**	**98,865**	**11.6**			**56,877**	**11.7**		
	2007	13,206	11.9	10.5	(10.3, 11.0)	4,344	13.2	11.8	(11.0, 12.6)
	2008	12,976	11.6	10.6	(10.3, 10.9)	4,665	11.9	11.6	(10.9, 12.1)
	2009	10,533	11.0	10.6	(10.2, 10.8)	5,496	12.9	11.3	(10.9, 11.7)
	2010	9,513	12.1 α	10.6	(10.2, 10.7)	5,666	12.0 α	11.1	(10.7, 11.5) β
	2011	9,299	12.2	10.5	(10.2, 10.6)	6,360	12.3	10.8	(10.4, 11.2)
	2012	8,307	11.8	10.5	(10.1, 10.6)	6,219	11.5	10.6	(10.1, 11.0)
	†2013	1,078	10.8	10.4	(10.1, 10.5)	882	11.9	10.3	(9.9, 10.7)
	2014	8,190	11.0	10.3	(10.0, 10.5)	6,528	11.0	10.0	(9.7, 10.4)
	2015	8,588	11.3	10.2	(9.8, 10.5)	6,315	11.1	9.8	(9.4, 10.2)
	2016	8,698	11.4	10.0	(9.8, 10.4)	5,410	10.7	9.5	(9.1, 10.1)
	2017	8,477	11.2	9.9	(9.7, 10.4)	4,992	10.6	9.3	(8.6, 10.0)
	Percent change €			−7%				−16%	
White Men	**Total**	**58,077**	**2.5**			**34,830**	**3.6**		
	2007	7,028	1.7	0.0	(0.0, 0.2)	2,785	2.9	1.1	(0.7, 1.6)
	2008	6,724	2.3	0.1	(0.0, 0.3)	2,955	3.8	1.3	(1.0, 1.7)
	2009	6,386	2.5	0.2	(0.1, 0.5)	3,612	3.1	1.5	(1.2, 1.7)
	2010	6,089	2.1	0.5	(0.2, 0.7)	4,011	3.4	1.7	(1.4, 2.0)
	2011	5,980	2.7	0.8	(0.5, 1.0)	4,481	3.6	1.9	(1.5, 2.3)
	2012	4,997	3.2	1.1	(0.7, 1.5)	3,972	3.8	2.0	(1.6, 2.4)
	†2013	470	3.0	1.2	(0.9, 1.6)	380	3.7	2.0	(1.6, 2.4)
	2014	4,872	2.9	1.1	(0.9, 1.5)	3,601	4.1	2.0	(1.7, 2.3)

	16 to 19 years old				20 to 24 years old			
	Tested, N	Unadjusted Prevalence, %‡	Adjusted Prevalence (95% CI) Ω		Tested, N	Unadjusted Prevalence, %‡	Adjusted Prevalence (95% CI) Ω	
2015	5,169	2.8	1.0	(0.7, 1.2)	3,301	4.0	1.9	(1.6, 2.2)
2016	5,232	3.1	0.8	(0.5, 1.0)	3,031	3.6	1.9	(1.5, 2.2)
2017	5,130	2.4	0.6	(0.3, 1.0)	2,701	3.4	1.8	(1.3, 2.3)
Percent change€			+20%				+6%	

†In 2013, 71% of the sample was missing race/ethnicity and were thus excluded from further analysis.

‡Unadjusted prevalence based on the proportion of tests positive among all those tested.

ΩAdjusted prevalence based on models adjusted for misclassification due to imperfect test sensitivity and specificity.

αWilcoxon-type non-parametric test for trend [11] in unadjusted prevalence in NJTP from 2010–2017, $p<0.05$.

βNon-overlapping 95% Confidence Intervals (CI) in adjusted prevalence in NJTP from 2010 as compared to 2017.

€Percentage change in the rate of reported chlamydia cases (per 100,000 population) comparing 2010 to 2017.

Table 3.

Number of chlamydia case reports (N) and case rates per 100,000 population, by sex, age group, and race/ethnicity, United States, 2007 to 2017.

	15 to 19 years old		20 to 24 years old	
	Cases, N	**Case rates per 100,000 population**	**Cases, N**	**Case rates per 100,000 population**
Black Women				
2007	157,037	9,646.7	129,480	8,671.5
2008	173,987	10,513.4	140,609	9,373.9
2009	177,487	10,629.7	146,159	9,603.9
2010	130,068	7,719.1	114,782	7,262.8
2011	129,976	7,507.1	121,948	7,680.2
2012	108,564	7,719.1	110,974	7,836.3
2013	90,577	6,907.6	103,170	7,342.7
2014	93,695	6,371.5	112,497	7,122.5
2015	93,081	6,340.3	114,437	6,782.5
2016	95,551	6,485.2	112,858	6,747.6
2017	99,492	6,771.6	113,046	6,971.7
Percent change€		−12%		−4%
White Women				
2007	90,721	1,432.7	99,128	1,581.4
2008	96,951	1,534.5	104,514	1,669.3
2009	98,442	1,569.9	108,326	1,727.8
2010	73,723	1,172.1	87,560	1,357.9
2011	80,372	1,301.5	99,732	1,595.5
2012	78,939	1,458.3	102,091	1,778.4
2013	70,185	1,383.3	98,148	1,774.2
2014	70,995	1,291.6	103,275	1,728.2
2015	75,106	1,339.1	106,961	1,737.8
2016	79,975	1,433.3	110,984	1,836.2
2017	84,129	1,518.5	114,290	1,936.0
Percent change€		+30%		+43%
Black Men				
2007	42,631	2,550.8	52,167	3,420.5
2008	49,101	2,889.5	58,689	3,825.4
2009	51,652	3,007.5	62,987	4,055.7
2010	40,666	2,344.9	53,317	3,292.5
2011	41,117	2,301.6	56,770	3,662.0
2012	34,129	2,333.5	50,036	3,556.0

	15 to 19 years old		20 to 24 years old	
	Cases, N	**Case rates per 100,000 population**	**Cases, N**	**Case rates per 100,000 population**
2013	28,712	2,109.6	46,479	3,282.5
2014	30,538	2,003.6	51,501	3,241.2
2015	32,090	2,119.6	54,126	3,128.8
2016	35,461	2,337.7	57,223	3,316.9
2017	39,191	2,589.3	60,833	3,627.4
Percent change€		+10%		+10%
White Men				
2007	11,770	176.2	27,906	423.9
2008	13,270	199.3	30,684	465.9
2009	14,452	218.6	32,450	491.9
2010	11,855	178.6	28,197	415.4
2011	13,454	207.1	33,231	516.4
2012	13,558	236.4	35,035	590.6
2013	11,894	221.3	34,140	594.0
2014	12,892	221.5	37,474	603.5
2015	14,240	240.3	41,176	637.2
2016	15,715	266.9	43,536	682.5
2017	17,027	291.5	45,452	726.8
Percent change€		+63%		+75%

†Number of chlamydia case reports and case rates per 100,000 population based on the 2007–2017 STD Surveillance Reports [1].

€Percentage change in chlamydia case rates (per 100,000 population) comparing 2010 to 2017.