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## Prevalence of Urogenital *Mycoplasma genitalium* Infection, United States, 2017 to 2018

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### Abstract

During the 2017–2018 National Health and Nutrition Examination Survey, urine samples from participants aged 14 to 59 years were tested for *Mycoplasma genitalium* infection. Overall prevalence was 1.7% (95% confidence interval [CI], 1.1%–2.7%). Prevalence was similar between males (1.8% [95% CI, 0.9%–3.1%]) and females (1.7% [95% CI, 0.8%–3.0%]).

In the United States, the current population prevalence of *Mycoplasma genitalium*, a sexually transmitted bacterium that can cause urethritis in men and has been associated in some studies with cervicitis and pelvic inflammatory disease in women, is unknown.<sup>1</sup> *M. genitalium* is difficult to culture, and until recently, nucleic acid amplification tests were only available in research settings limiting the use of routine surveillance activities.<sup>2</sup> A number of clinic-based studies have found substantial burden among persons tested for *M. genitalium*<sup>3,4</sup>; however, because these estimates include symptomatic persons seeking care, clinic-based estimates of sexually transmitted infections (STIs) are likely biased toward populations most likely to be infected, overestimating population prevalence.<sup>5</sup> One nationally representative US prevalence study of *M. genitalium* was conducted in 2001 to 2002; however, in addition to being almost 2 decades old, it was limited to adolescents and young adults.<sup>6</sup> To provide updated national prevalence estimates among adolescents and adults, urine-based testing for *M. genitalium* was added to the 2017–2018 National Health and Nutrition Examination Survey (NHANES). We estimated the population prevalence of

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urogenital *M. genitalium* infection among persons aged 14 to 59 years by demographics and sexual behaviors.

## METHODS

The NHANES is a series of cross-sectional surveys, designed to be nationally representative of the noninstitutionalized US civilian population. Data are collected during household interview followed by a standardized physical examination in mobile examination centers and released in 2-year cycles.<sup>7</sup> During the 2017–2018 cycle, urine samples collected from participants aged 14 to 59 years were tested for *M. genitalium* using nucleic acid amplification testing for the qualitative detection of ribosomal RNA from *M. genitalium* (APTIMA MG Assay; Hologic, Inc., San Diego, CA).<sup>8</sup> Testing urine samples detects urethral infection in males and both urethral and cervical infection in females.

Prevalence of *M. genitalium* was estimated overall and by selected demographic groups, including age, sex, race, and Hispanic origin (based on self-report and classified as non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, Hispanic, and non-Hispanic “other”; non-Hispanic Asian and “other” were not reported separately because of small sample size but were included in totals), education level (for those 20 years and older only), and poverty level (categorized from a poverty index ratio calculated by dividing family income by a poverty threshold specific to family size, using the US Department of Health and Human Services poverty guidelines and categorized as either below (<1.0) or at or above poverty (≥ 1.0), nativity coded as foreign born (not born in the 50 US states or the District of Columbia) or US born, and lifetime number of sex partners.<sup>9</sup> Answers to sensitive questions on ever having had vaginal, anal or oral sex and lifetime number of both male and female sexual partners were collected using an audio and computer self-interview and grouped as 0–4, 5–9, and 10 or more partners. All estimates were weighted using examination weights to be nationally representative of the US population, accounting for unequal probabilities of selection, nonresponse, and noncoverage. Standard errors of the percentages were estimated using Taylor series linearization, a method that incorporates the complex sample design and weights. Exact binomial 95% confidence intervals (95% CIs) were computed using the Korn and Graubard method.<sup>10</sup> Prevalence ratio (PR) and 95% CI were estimated to quantify differences between groups. Reported estimates meet the Centers for Disease Control and Prevention’s National Center for Health Statistics reliability standards unless otherwise noted.<sup>11</sup> Population counts were estimated by multiplying weighted prevalence estimates by the average of the American Community Survey estimates of the civilian, noninstitutionalized population during the 2017–2018 cycle.<sup>12</sup> Data analyses were performed using SAS version 9.4 (SAS Institute, Cary, NC) and SUDAAN version 11.1 (RTI International, Research, Triangle Park, NC).

## RESULTS

During the 2017–2018 cycle, 7754 persons aged 14 to 59 years were sampled for the NHANES survey, 4305 (55.5% of those sampled) were interviewed, 4092 (95.1% of those interviewed) were examined, and 3945 (96.4% of those examined) provided a urine sample that was tested for *M. genitalium*. Overall, the prevalence of *M. genitalium* was 1.7% (95%

CI, 1.1%–2.7%), suggesting that at any point in time, approximately 3.3 million persons aged 14 to 59 years have a prevalent urogenital *M. genitalium* infection (range, 2.0–5.1 million persons; Table 1). Prevalence was similar among males (1.8 [95% CI, 0.9%–3.1%]) and females (1.7% [95% CI, 0.8%–3.0%]; PR, 1.1 [95% CI, 0.5–2.4]).

The prevalence was higher among non-Hispanic Black adolescents and adults (3.6% [95% CI, 2.1%–5.6%]) compared with non-Hispanic White adolescents and adults (1.4% [95% CI, 0.5%–3.2%]; PR, 2.5 [95% CI, 1.0–6.4]). Among non-Hispanic Black adolescents and adults, prevalence was 4.4% (95% CI, 1.9%–8.4%) among males and 2.9% (95% CI, 1.4%–5.2%) among females (Supplemental Figure, <http://links.lww.com/OLQ/A637>). Among non-Hispanic White adolescents and adults, prevalence was 1.4% (95% CI, 0.2%–4.3%) among males and 1.5% (95% CI, 0.4%–3.9%) among females. Among all persons, there were no differences in prevalence by poverty status, educational attainment, or nativity.

The prevalence of *M. genitalium* was higher among persons reporting 10 or more lifetime sexual partners (3.0% [95% CI, 1.8%–4.6%]) compared with persons reporting 0 to 4 lifetime sexual partners (1.0% [95% CI, 0.3%–2.4%]; PR: 3.0 [95% CI, 1.2–7.4]).

## DISCUSSION

We provide the first national prevalence estimates of urogenital *M. genitalium* infection among adolescents and adults in the US noninstitutionalized civilian population. During the 2017–2018 cycle, the overall prevalence among persons aged 14 to 59 years was 1.7%. *M. genitalium* can cause persistent or recurrent urethritis in men and has been associated with cervicitis and pelvic inflammatory disease in women, although data are not consistent.<sup>13,14</sup> Although the evidence base continues to grow, the natural history and long-term consequences of *M. genitalium* infection in women, including the impact on adverse pregnancy outcomes, are not fully understood at this time. High levels of resistance have been documented in multiple studies,<sup>3,15,16</sup> and lack of antibiotics effective against *M. genitalium* led to the addition of this organism to the Centers for Disease Control and Prevention’s Antibiotic Resistance Threats in the United States, 2019 report.<sup>17</sup> Understanding the burden of *M. genitalium* is critical to help inform and direct prevention interventions.

The estimated population prevalence of *M. genitalium* is similar to the prevalence of other curable STIs monitored in the NHANES, including urogenital *Chlamydia trachomatis* (estimated to be 1.7%)<sup>18</sup> and *Trichomonas vaginalis* (estimated to be 2.1%),<sup>19</sup> and is lower than lifelong, viral STIs such as herpes simplex virus type 2 (estimated to be 11.9%).<sup>20</sup> As expected, the estimated population-based prevalence of *M. genitalium* is also lower than clinic-based estimates. For example, in the MAGNUM study of men with urethritis in STD clinics, 28.7% were positive for *M. genitalium*,<sup>3</sup> and in a study of high-risk women in a Seattle STD clinic, 26% were found to be infected.<sup>4</sup>

The estimated population prevalence of urogenital infection based on the NHANES is comparable to the estimated prevalence among persons aged 18 to 27 years (1.0% [95% CI, 0.5%–1.5%]) participating in the National Longitudinal Study of Adolescent to Adult Health

in 2001 to 2002.<sup>6</sup> In both studies, prevalence was similar among males and females and increased with increasing number of reported sexual partners. Although more pronounced in the National Longitudinal Study of Adolescent to Adult Health, the estimated population prevalence of urogenital *M. genitalium* seems higher among non-Hispanic Black adolescents and adults compared with non-Hispanic White adolescents and adults. It is likely that, similar to other STIs, these observed differences are not explained by differential sexual behaviors.<sup>21–23</sup> High prevalence of infection likely reflects differences in prevalence of disease in sexual networks, which results in a higher probability of infection with any given sexual act, as well as differential access to quality sexual health care.

Although these prevalence estimates are nationally representative and based on laboratory documentation of infection, minimizing bias by self-report, there are several important limitations. First, these estimates underestimate the prevalence of *M. genitalium* in the United States, as they only reflect urogenital infections and exclude extragenital (i.e., rectal and pharyngeal) infections. The population-level burden of extragenital infections is unknown; however, a meta-analysis based mostly on clinic-based studies found that among men who have sex with men, rectal *M. genitalium* infection was as common as urogenital infection (6.2% and 5.0%, respectively).<sup>24</sup> Second, these estimates are generalizable to the noninstitutionalized, civilian population; prevalence may be higher or lower in other populations. Third, given small sample sizes, highly stratified estimates (e.g., age by sex by race/ethnicity) were unstable and therefore not reported. Because testing for *M. genitalium* is ongoing in the NHANES, additional cycles could be combined in future analyses to increase stability of estimates. Fourth, analyses were likely underpowered to detect differences between some subpopulations; future analyses with data from combined cycles will be better suited to investigate differences. Fifth, the NHANES does not collect information on gender identity, and we were unable to provide prevalence estimates among transgender populations. Finally, the diagnostic test characteristics likely vary by patient's gender and symptom status.<sup>25,26</sup> Because we did not have information on symptom status, we could not adjust the prevalence estimates presented in this article, and our estimates may be an overestimate or an underestimate of prevalence.

Based on recent national survey data, we estimate that approximately 3 million persons aged 14 to 59 years have a prevalent *M. genitalium* urogenital infection in the United States. Population-based point prevalence estimates are useful to document the burden of disease; however, continued research into the clinical and public health implications of infection, including better understanding sequelae and monitoring antimicrobial resistance, may help inform strategies to prevent adverse outcomes.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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**TABLE 1.** Estimated Prevalence and 95% CIs of Urogenital *Mycoplasma genitalium* Infection, United States, 2017 to 2018

	Sample Size (Unweighted)	Weighted Prevalence, %	95% CI	Prevalence Ratio	95% CI
All	3945	1.7	1.1–2.7	—	
Sex					
Male	1877	1.8	0.9–3.1	1.1	0.5–2.4
Female	2068	1.7	0.8–3.0	Ref	
Age group, y					
14–19	809	0.6	0.2–1.4	0.6	0.1–2.8
20–29	750	3.9	1.8–7.1*	4.1	1.2–14.4
30–39	779	1.7	0.7–3.4	1.8	0.4–7.5
40–59	1607	0.9	0.2–2.8	Ref	
Race/Hispanic ethnicity <sup>†</sup>					
Hispanic	998	2.1	1.2–3.5	1.5	0.6–3.3
Non-Hispanic Black	874	3.6	2.1–5.6	2.5	1.0–6.4
Non-Hispanic White	1193	1.4	0.5–3.2	Ref	
Poverty level					
Below poverty level	763	1.7	0.6–3.8	1.0	0.4–2.6
At or above poverty level	2689	1.6	0.9–2.6	Ref	
Education <sup>‡</sup>					
<High school	546	2.8	0.9–6.6*	2.4	0.8–6.8
High school or GED	734	3.1	0.9–7.7*	2.6	0.7–9.1
>High school	1854	1.2	0.7–1.9	Ref	
Nativity <sup>§</sup>					
Foreign born	1151	1.6	0.8–2.7	0.9	0.5–1.6
US born	2792	1.8	1.0–2.8	Ref	
No. sex partners (lifetime)					
0–4	1852	1.0	0.3–2.4	Ref	
5–9	810	1.7	1.0–2.9	1.8	0.6–5.0
10+	944	3.0	1.8–4.6	3.0	1.2–7.4

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\* Estimates did not meet the National Center for Health Statistics' stability criteria and should be interpreted with caution.  
† Estimates for persons of other race and Hispanic origin were not calculated individually because of small samples sizes, but sample persons were included in overall estimates.  
‡ Among persons 20 years and older.  
§ Nativity was defined as those foreign born (not born within the 50 US states or the District of Columbia) versus born in the United States. CI indicates confidence interval.  
Source: National Health and Nutrition Examination Survey, 2017–2018.