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## Acceptability of a Gonococcal Vaccine Among Sexually Active Men Who Have Sex With Men

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### Abstract

**Background:** Prospects for a gonococcal vaccine have advanced. Vaccine acceptability is crucial to maximizing population-level protection among key groups, such as men who have sex with men (MSM). We assessed the prevalence of gonococcal vaccine acceptability among sexually active MSM in the United States.

**Methods:** We used data from the American Men's Internet Study conducted from August 2019 to December 2019. We calculated frequencies of sociodemographic characteristics, vaccine acceptability, and preferred location for vaccine receipt. Using log-binomial regression analyses, we calculated unadjusted prevalence rates (PRs) and 95% confidence intervals (CIs) to evaluate factors associated with vaccine acceptability.

**Results:** Of 4951 MSM, 83.5% were willing to accept a vaccine and 16.5% were unwilling. Preferred vaccination locations were primary care provider's clinics (83.5%) and sexually transmitted disease (STD) clinics (64.6%). Vaccine acceptability was greater among young MSM (15–24 years [PR, 1.09; 95% CI, 1.05–1.12], 25–29 years [PR, 1.13; 95% CI, 1.09–1.17], and 30–39 years [PR, 1.10; 95% CI, 1.05–1.14] compared with MSM ≥40 years), MSM living with HIV (PR, 1.05; 95% CI, 1.02–1.09), and MSM who reported (in the past 12 months) condomless anal sex (PR, 1.09; 95% CI, 1.06–1.12), a bacterial STD test (PR, 1.18; 95% CI, 1.15–1.21), HIV preexposure prophylaxis use (PR, 1.17; 95% CI, 1.14–1.19), a bacterial STD diagnosis (PR, 1.04; 95% CI, 1.02–1.07), or a health care provider visit (PR, 1.11; 95% CI, 1.06–1.16). Men who have sex with men who reported high school education (PR, 0.93; 95% CI, 0.91–0.97) were less willing to accept a vaccine compared with those with >high school education.

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**Conclusions:** Most respondents were willing to accept a gonococcal vaccine. These findings can inform the planning and implementation of a future gonococcal vaccination program that focuses on MSM.

Approximately 583,000 cases of gonorrhea were reported to the Centers for Disease Control and Prevention (CDC) in 2018.<sup>1</sup> After historically low gonorrhea case rates in 2009, the rate of reported gonorrhea cases increased by 82%, from 98.1/100,000 in 2009 to 179.1/100,000 in 2018, with stark increases among men.<sup>1,2</sup> These increases in gonorrhea rates among men are likely attributable to increasing case rates among gay, bisexual, and other men who have sex with men (hereafter referred to as MSM).<sup>3</sup> Increasing rates among MSM may reflect increases in incident infections and greater detection of prevalent infections through increases in gonorrhea screening (as gonorrhea can often be asymptomatic).<sup>3</sup>

Effective antimicrobial treatment is essential to the prevention and control of gonorrhea.<sup>4</sup> Untreated gonorrhea facilitates gonococcal and HIV transmission within sexual networks and can cause severe reproductive complications and systemic illness.<sup>1,5</sup> The CDC currently recommends a single 500-mg intramuscular dose of ceftriaxone for the treatment of uncomplicated gonorrhea in persons weighing <150 kg (and 1 g for persons weighing ≥ 150 kg).<sup>4</sup> However, declining gonococcal cephalosporin susceptibility and reports of unsuccessful treatment with ceftriaxone have been documented.<sup>6-8</sup> Emergence of ceftriaxone-resistant gonorrhea would substantially hinder an effective treatment of gonorrhea and undermine prevention and control efforts.

New approaches, such as vaccination, are needed as long-term strategies for gonorrhea prevention and control.<sup>9</sup> There is currently no licensed vaccine against gonorrhea. However, outer-membrane vesicle (OMV) meningococcal serogroup B (MenB) vaccines have demonstrated some protection against *Neisseria gonorrhoeae*.<sup>10-14</sup> Findings from ecological studies from Cuba, Norway, and Quebec all demonstrated substantial decreases in gonorrhea rates after mass OMV MenB vaccination campaigns to address epidemics of invasive meningococcal disease.<sup>11-13</sup> A case-control study from New Zealand showed that persons vaccinated with a local epidemic strain-specific OMV MenB vaccine were less likely than unvaccinated persons to be diagnosed with gonorrhea than diagnosed with chlamydia.<sup>10</sup> The estimated vaccine effectiveness was 31%.<sup>10</sup> Another study that used data from New York City and Philadelphia showed that persons aged 16 to 23 years who were vaccinated with MenB-4C, a currently licensed OMV MenB vaccine, were less likely to be diagnosed with gonorrhea than with chlamydia with an estimated MenB-4C effectiveness of 40% at 6 months after vaccination.<sup>14</sup> These findings suggest that developing an effective vaccine against *N. gonorrhoeae* is feasible.

Although the timeline for the availability of a licensed gonococcal vaccine is uncertain, examination of social and behavioral factors that influence acceptability of a gonococcal vaccine is a critical component of vaccine planning.<sup>15</sup> Acceptability of an effective gonococcal vaccine will influence its uptake, which in turn will impact the population-level protective effect of the vaccine.<sup>9,15</sup> Although prior studies examined the acceptability of a possible gonococcal vaccine among various populations including adolescents and their parents, incarcerated women, and sexually transmitted disease (STD) clinic

attendees,<sup>16-18</sup> no study has examined vaccine acceptability among MSM, a population with persistently high rates of gonorrhea. Understanding factors that influence the acceptability of a gonorrhea vaccine among MSM is essential to informing public health gonorrhea vaccination messaging and implementation efforts in this population. The objective of this exploratory analysis was to assess the acceptability of a gonococcal vaccine among an Internet-recruited sample of sexually active MSM.

## METHODS

We used data from the 2019 cycle of the American Men's Internet Study (AMIS) conducted from August 2019 to December 2019. AMIS is an annual cross-sectional behavioral Internet survey of MSM in the United States.<sup>19</sup> Participants are recruited through convenience sampling from a variety of web sites or social networking applications using banner advertisements or e-mail blasts. Men who are 15 years or older, self-identify as male, live in the United States, and report ever having sex with a male partner are eligible to participate in AMIS. We restricted our analytical sample to men who reported sex with another man in the past 12 months (sexually active), were not duplicate respondents, and responded to the question about willingness to accept a vaccine that would be protective against gonorrhea. Fifty percent of AMIS participants were randomized to receive the question about willingness to accept a vaccine that would be protective against gonorrhea to reduce overall respondent burden.

We obtained data about sociodemographic characteristics, and condomless anal sex (CAS), HIV preexposure prophylaxis (PrEP) use, self-reported bacterial STD (syphilis, gonorrhea, or chlamydia) testing and diagnosis, and visiting a health care provider (HCP) in the past 12 months. We also obtained data about whether respondents are living with HIV and disclosed same-sex sexual behavior to an HCP. We defined CAS as insertive or receptive anal sex without a condom with a male partner in the past 12 months. Respondents who reported using PrEP at any period or for any duration in the past 12 months were considered to have used PrEP. Among persons who reported having been tested for HIV, those who self-reported a previous positive HIV test result were classified as living with HIV; respondents who tested negative for HIV and never tested positive for HIV were classified as not living with HIV. Among respondents who reported having been tested for a bacterial STD, those who reported that an HCP informed them of a diagnosis of syphilis, gonorrhea, or chlamydia were categorized as having received a bacterial STD diagnosis.

We obtained data on acceptability of a gonococcal vaccine by asking respondents the following question: "If a gonorrhea vaccine is available, how willing would you be to get a vaccine that would protect you against gonorrhea?" Response options were "very willing," "somewhat willing," "neither willing nor unwilling," "somewhat unwilling," "very unwilling," or "do not know." We also asked respondents to select all the preferred types of health care settings where they would feel comfortable receiving a gonorrhea vaccine from a list provided in the survey. We calculated descriptive statistics of the sociodemographic characteristics of eligible respondents, CAS, PrEP use, living with HIV status, bacterial STD testing and diagnosis, HCP visit, disclosure of same-sex sexual behavior to an

HCP, willingness to accept a vaccine, and preferred types of health care settings where respondents would feel comfortable receiving a gonococcal vaccine.

Unadjusted prevalence rates (PRs) and 95% confidence intervals (CIs) were estimated from bivariate log-binomial regression analyses to determine factors associated with acceptability of a gonococcal vaccine. For the regression analyses, gonococcal vaccine acceptability response options were combined into 2 categories: willing (combining response options “very willing” and “somewhat willing”) and unwilling (combining response options “very unwilling,” “somewhat unwilling,” “neither willing nor unwilling,” and “do not know”). The reference level for acceptability of a gonococcal vaccine in the regression analyses was “unwilling.” All analyses were conducted using SAS 9.4. Statistical significance was set at  $P < 0.05$ . The institutional review board of Emory University approved all procedures that were conducted and performed as part of AMIS. Each participant provided informed consent to participate in AMIS. No incentives or compensation were provided to participants.

## RESULTS

The analytical sample included 4951 sexually active MSM (Table 1). Among sample respondents, 59.9% were non-Hispanic White, 42.0% were aged 15 to 24 years, and 77.6% had more than a high school level of education. Respondents reported CAS in the past 12 months (69.4%) and having visited an HCP in the past 12 months (86.8%). Of all respondents who provided a response to whether they had ever disclosed their same-sex behavior or attraction to an HCP, 44.0% reported that they had ever disclosed their same-sex behavior or attraction to an HCP, 50.6% did not respond to this question, and 0.4% reported that they had never disclosed their same-sex behavior or attraction to an HCP. Among 3663 respondents with HIV test results, 456 (12.5%) were living with HIV. Among 3207 MSM who are not living with HIV, 20.3% reported PrEP use in the past 12 months. Fewer than half of the sexually active MSM in this sample (47.5%) reported having been tested for a bacterial STD in the past 12 months; of those tested, 27.9% reported at least one bacterial STD.

Of 4951 respondents, 3148 (63.6%) were very willing to accept a vaccine, 985 (19.9%) were somewhat willing, 372 (7.5%) were neither willing nor unwilling, 250 (5.1%) did not know if they would be willing, 76 (1.5%) were somewhat unwilling, and 120 (2.4%) were very unwilling (Table 2). The 2 most commonly preferred types of health care settings to receive a gonococcal vaccine were their primary care provider's office (83.5%) and an STD clinic (64.6%; Table 2). The majority of respondents living with HIV (58.7%) reported that they would prefer to receive a gonococcal vaccine from their HIV care provider. Among respondents who were not living with HIV and reported PrEP use in the past 12 months, 56.8% reported that they would prefer to receive a gonococcal vaccine in the PrEP clinic.

In unadjusted regression analyses, there were no racial differences in acceptability of a gonococcal vaccine. However, age, level of education, CAS, PrEP use, living with HIV, bacterial STD testing and diagnoses, and visiting an HCP were significantly associated with acceptability of a gonococcal vaccine (Table 3). Compared with MSM who were 40 years or older, MSM who were 15 to 24 years old (PR, 1.09; 95% CI, 1.05–1.12), 25 to 29 years

old (PR, 1.13; 95% CI, 1.09–1.17), and 30 to 39 years old (PR, 1.10; 95% CI, 1.05–1.14) were more likely to accept a gonococcal vaccine. Men who have sex with men who had a high school diploma/General Education Diploma or less (PR, 0.94; 95% CI, 0.91–0.97) were less likely to accept a vaccine compared with MSM with at least a college degree. Men who have sex with men who reported CAS (PR, 1.09; 95% CI, 1.06–1.12), PrEP use (PR, 1.17; 95% CI, 1.14–1.19), living with HIV (PR, 1.05; 95% CI, 1.02–1.09), having been tested for a bacterial STD (PR, 1.18; 95% CI, 1.15–1.21), or a bacterial STD (PR, 1.04; 95% CI, 1.02–1.07) were more likely to accept a gonococcal vaccine than other men.

## DISCUSSION

Approximately 83% of sexually active MSM in this analytical sample were willing to accept a gonorrhea vaccine. The prevalence of vaccine acceptability in this exploratory study is comparable to the prevalence of gonococcal vaccine acceptability observed in studies of other populations.<sup>16-18</sup> One study of predominantly White incarcerated women showed that 79% of respondents were willing to accept a gonorrhea vaccine.<sup>17</sup> Another study of predominantly White parents and adolescents showed that 85% of parents and adolescents were willing to accept a gonorrhea vaccine.<sup>16</sup> Lastly, a recent study of predominantly White attendees of an STD clinic showed that 76% were interested in accepting a gonorrhea vaccine.<sup>18</sup> The high prevalence of vaccine acceptability in our sample of sexually active MSM might be attributable to perceived susceptibility to gonorrhea and possible awareness of the increased HIV transmission risk associated with gonorrhea.<sup>1,5</sup> Awareness of the emerging threat of antimicrobial-resistant gonorrhea might also explain the high vaccine acceptability in this sample.<sup>20</sup>

Primary care provider clinics and STD clinics were preferred locations to receive a gonococcal vaccine. Primary care providers are involved in the general health care of their patients, often including sexual health.<sup>21</sup> Many patients, including MSM, receive routine STD care and treatment such as recommended bacterial STD testing, PrEP, and human papillomavirus (HPV) vaccination from their primary care providers.<sup>21</sup> Sexually transmitted disease clinics traditionally focus on sexual health and provide comprehensive STD care, partner services, and other ancillary sexual health care services in a confidential and culturally sensitive manner.<sup>21</sup> They are also often convenient to access, provide walk-in services, cater to uninsured or underinsured patients, and are more likely to provide recommended STD care and treatment compared with other clinical settings.<sup>21-24</sup> These factors may explain the selection of primary care provider clinics and STD clinics as a preferred location to receive a gonococcal vaccine. Notably, almost 60% of MSM living with HIV or MSM who used PrEP in the past year identified their HIV care provider or PrEP clinic, respectively, as a preferred location to receive a vaccine. Men who have sex with men living with HIV and MSM who use PrEP may prefer to receive all STD care from the same location and might be more comfortable with receiving a gonococcal vaccine from HCPs who are aware of their clinical and STD history, from whom they already receive sexual health care, and with whom they may already have an established relationship. For example, HPV vaccination uptake is higher among MSM who are not living with HIV and attend a PrEP clinic compared with MSM who are not living with HIV and do not attend a PrEP clinic.<sup>25</sup> Human papillomavirus vaccination uptake is also higher among MSM living

with HIV who attend an HIV clinic compared with MSM living with HIV and who do not attend an HIV clinic.<sup>26</sup> Primary care provider offices, STD clinics, PrEP clinics, and HIV clinics may be good health care settings to initiate vaccine rollout to MSM, and the different settings described may be able to reach different populations of MSM.

Younger MSM (15–24, 25–29, and 30–39 years) were more likely to accept a gonococcal vaccine compared with MSM 40 years or older. Greater acceptability among younger MSM in this study may be attributable to the elevated risk of gonorrhea in this population and greater engagement in CAS and sex with multiple casual partners, compared with older men.<sup>1,27,28</sup> Men who have sex with men who reported CAS, PrEP use, or living with HIV were also more likely to accept a gonococcal vaccine. Men who have sex with who report CAS or PrEP use may perceive themselves to be at risk of gonorrhea and may be more willing to accept a gonococcal vaccine. Furthermore, persons who use PrEP implicitly acknowledge their risk of HIV and other STIs and have taken PrEP to reduce this risk. Thus, MSM who use PrEP may be more proactive about their sexual health, reflected in greater acceptability of a vaccine. Men who have sex with living with HIV may be more willing to accept a gonococcal vaccine because they are more likely to visit their HCP than MSM who are not living with HIV<sup>29</sup> and gonorrhea can complicate HIV infection.<sup>30</sup>

Men who have sex with men who reported a visit to an HCP or bacterial STD testing or diagnoses in the past 12 months were more willing to accept a vaccine. These MSM might be more concerned about their health and adopt health seeking behaviors, have the resources to seek health care, or consider themselves at greater risk of gonorrhea<sup>3,31s,32s</sup> than other MSM. Although the racial differences in acceptability of HPV vaccination have been described,<sup>33s</sup> we did not observe any differences by race/ethnicity in gonorrhea vaccine acceptability in this study. The relatively small sample size of minority populations in this sample may have reduced the statistical power required to detect any racial differences. Future studies should explore racial differences in gonorrhea vaccine acceptability, particularly given the racial disparities in gonorrhea among MSM.<sup>34s</sup> Men who have sex with men with high school education/general education diploma were less likely to be willing to accept a gonococcal vaccine. These MSM may be less likely to acknowledge their susceptibility to or risk of gonorrhea, or may not recognize the severity of gonorrhea compared with those with a higher level of education.

There are limitations to this study. Data were obtained from a convenience sample of Internet-recruited, sexually active MSM; racial/ethnic minorities, especially African American men, were underrepresented relative to their disparate burden of STIs. The generalizability of these findings may be limited. We recruited MSM using the Internet. This recruitment method may inherently bias the sample toward MSM with easy Internet access and may not capture MSM who are at greatest risk for gonorrhea or MSM with lower vaccine literacy. Data were self-reported and might be subject to social desirability bias, which can lead to over-estimation of vaccine acceptability. Data were obtained before COVID-19. Given the effectiveness of COVID-19 vaccines against SARS-CoV-2<sup>35s</sup> and COVID-19 vaccine hesitancy,<sup>36s</sup> it is possible that the estimates of vaccine acceptability may differ if the data were obtained during or after the COVID-19 pandemic. Respondents were asked to report their willingness to accept a vaccine before licensure and for which product

characteristics such as efficacy, duration of protection, number of doses, side effects, cost, and safety profile are unknown. It is possible that vaccine acceptability will vary with these product characteristics. Lessons learned from HPV vaccination such as making a gonococcal vaccine widely available at no cost or reduced cost, public health campaigns that inform MSM and HCPs about gonorrhea risk and prevention, vaccine efficacy and safety, and immunization recommendations from the Advisory Committee on Immunization Practices, the CDC, or other professional organizations may increase vaccine acceptability and uptake among MSM.<sup>9,37s</sup>

In this sample, sexually active MSM seem highly willing to receive a gonorrhea vaccine. The study describes the characteristics of MSM who would be more likely to accept one and highlighted preferred health care settings where MSM would prefer to receive a gonorrhea vaccine. These findings can inform the planning and implementation of a future gonococcal vaccination program that focuses on MSM.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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**TABLE 1.**

Characteristics of Sexually Active Men Who Have Sex With Men, American Men's Internet Survey, 2019 (n = 4951)

| Variable  | n*   | %     |
|---|------|-------|
| Race  |      |       |
| Non-Hispanic White  | 2966 | 59.9  |
| Black   | 734  | 14.8  |
| Hispanic  | 764  | 15.4  |
| Other <sup>†</sup>  | 382  | 7.7   |
| Missing   | 105  | 2.1   |
| Age, y  |      |       |
| 15–24   | 2077 | 42.0  |
| 25–29   | 862  | 17.4  |
| 30–39   | 713  | 14.4  |
| 40  | 1299 | 26.2  |
| Highest level of education  |      |       |
| High school diploma/General Education Diploma                     | 1102 | 22.3  |
| >High school  | 3821 | 77.6  |
| Missing   | 28   | <0.01 |
| Condomless anal sex in past 12 mo                                 |      |       |
| Yes   | 3437 | 69.4  |
| No  | 1514 | 30.6  |
| Visited a health care provider in past 12 mo                      |      |       |
| Yes   | 4296 | 86.8  |
| No  | 619  | 12.5  |
| Missing   | 36   | <0.01 |
| Disclosed same-sex behavior to a health care provider             |      |       |
| Yes   | 2180 | 44.0  |
| No  | 266  | 5.4   |
| Missing   | 2505 | 50.6  |
| Living with HIV <sup>‡</sup> (n = 3663)                           |      |       |
| MSM living with HIV   | 456  | 12.5  |
| MSM who are not living with HIV                                   | 3207 | 87.5  |
| HIV preexposure prophylaxis use in the past 12 mo (n = 3207)      |      |       |
| Yes   | 651  | 20.3  |
| No  | 2556 | 79.7  |
| Tested for a bacterial STD in the past 12 mo <sup>§</sup>         |      |       |
| Yes   | 2351 | 47.5  |
| No  | 2600 | 52.5  |
| Bacterial STD diagnoses in the past 12 mo <sup>¶</sup> (n = 2351) |      |       |
| Yes   | 656  | 27.9  |

| Variable | n <sup>*</sup> | %    |
|----------|----------------|------|
| No       | 1695           | 72.1 |

\* May not sum to 4951 because of missing responses.

† American Indian, Alaska Native, Native Hawaiian, Pacific Islander, multiple race/ethnicity, or unknown.

‡ Among persons who self-reported ever taking an HIV test and receiving a positive or negative result.

§ Tested for gonorrhea, chlamydia, or syphilis in the past 12 months.

¶ Among MSM tested for bacterial STD in the past 12 months and informed by a health care provider of a diagnosis of gonorrhea, chlamydia, or syphilis.

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**TABLE 2.**

Willingness and Preferred Types of Health Care Settings to Accept a Gonorrhea Vaccine Among Sexually Active Men Who Have Sex With Men American Men's Internet Survey 2019

| Variable   | n    | %    |
|--|------|------|
| Willing to accept a gonococcal vaccine (n = 4951)            |      |      |
| Very willing   | 3148 | 63.6 |
| Somewhat willing   | 985  | 19.9 |
| Neither willing nor unwilling                                | 372  | 7.5  |
| Do not know  | 250  | 5.1  |
| Somewhat unwilling   | 76   | 1.5  |
| Very unwilling   | 120  | 2.4  |
| Preferred location to receive a gonorrhea vaccine (n = 4581) |      |      |
| Primary care provider  | 3824 | 83.5 |
| Sexual health clinic/STD clinic                              | 2960 | 64.6 |
| Health department public health clinic                       | 2224 | 48.6 |
| HIV testing site   | 2091 | 45.7 |
| Preexposure prophylaxis clinic (n = 665) *                   | 378  | 56.8 |
| Urgent care clinic   | 1906 | 41.6 |
| AIDS service organization                                    | 1792 | 39.1 |
| HIV care provider (n = 436) †                                | 256  | 58.7 |
| Pharmacy   | 1972 | 43.1 |
| High school or university-based health center                | 1462 | 31.9 |

\* Restricted to persons who reported preexposure prophylaxis use in the past 12 months.

† Restricted to MSM living with HIV.

Factors Associated With Gonorrhea Vaccine Acceptability Among Sexually Active MSM, American Men's Internet Survey, 2019 Cycle (n = 4951)

TABLE 3.

| Variable  | Total, N | Willingness to Accept a Gonorrhea Vaccine, n (Row %) | Unadjusted Prevalence Ratio | 95% Confidence Interval |
|---|----------|--|-----------------------------|-------------------------|
| Race  |          |  |                             |                         |
| Black   | 734      | 609 (83.0)   | 1.01                        | 0.96–1.04               |
| Hispanic  | 764      | 658 (86.1)   | 1.04                        | 0.99–1.07               |
| Other*  | 382      | 330 (86.4)   | 1.05                        | 0.99–1.09               |
| Non-Hispanic White  | 2966     | 2446 (82.5)  | 1.00                        |                         |
| Age, y  |          |  |                             |                         |
| 15–24   | 2077     | 1756 (84.6)  | 1.09                        | 1.05–1.12               |
| 25–29   | 862      | 757 (87.8)   | 1.13                        | 1.09–1.17               |
| 30–29   | 713      | 608 (85.3)   | 1.10                        | 1.05–1.14               |
| 40  | 1299     | 1012 (77.9)  | 1.00                        |                         |
| Highest level of education                                |          |  |                             |                         |
| High school/General Education Diploma                     | 1102     | 879 (79.8)   | 0.94                        | 0.91–0.97               |
| >High school  | 3821     | 3234 (84.6)  | 1.00                        |                         |
| Condomless anal sex in the past 12 mo                     |          |  |                             |                         |
| Yes   | 3437     | 2941 (85.6)  | 1.09                        | 1.06–1.12               |
| No  | 1514     | 1192 (78.7)  | 1.00                        |                         |
| HIV preexposure prophylaxis use in the past 12 mo         |          |  |                             |                         |
| Yes   | 651      | 620 (95.2)   | 1.17                        | 1.14–1.19               |
| No  | 2556     | 2103 (82.3)  | 1.00                        |                         |
| Living With HIV <sup>‡</sup>                              |          |  |                             |                         |
| MSM living with HIV                                       | 456      | 408 (89.5)   | 1.05                        | 1.02–1.09               |
| MSM who are not living with HIV                           | 3207     | 2723 (84.9)  | 1.00                        |                         |
| Tested for a bacterial STD in the past 12 mo <sup>‡</sup> |          |  |                             |                         |
| Yes   | 2351     | 2131 (90.6)  | 1.18                        | 1.15–1.21               |
| No  | 2600     | 2002 (77.0)  | 1.00                        |                         |
| Bacterial STD in the past 12 mo <sup>§</sup>              |          |  |                             |                         |
| Yes   | 656      | 613 (93.5)   | 1.04                        | 1.02–1.07               |

| Variable  | Total, N | Willingness to Accept a Gonorrhea Vaccine, n (Row %) | Unadjusted Prevalence Ratio | 95% Confidence Interval |
|---|----------|--|-----------------------------|-------------------------|
| No  | 1695     | 1518 (89.6)  | 1.00                        |                         |
| Visited a health care provider in the past 12 mo      |          |  |                             |                         |
| Yes   | 4296     | 3636 (84.6)  | 1.11                        | 1.06–1.16               |
| No  | 619      | 474 (76.6)   | 1.00                        |                         |
| Disclosed same-sex behavior to a health care provider |          |  |                             |                         |
| Yes   | 2180     | 1899 (87.1)  | 1.05                        | 0.99–1.12               |
| No  | 266      | 220 (82.7)   | 1.00                        |                         |

\* American Indian, Alaska Native, Native Hawaiian, Pacific Islander, multiple race/ethnicity, or unknown.

<sup>†</sup> Among persons who self-reported ever taking an HIV test and receiving a positive or negative result.

<sup>‡</sup> Tested for gonorrhea, chlamydia, or syphilis in the past 12 months.

<sup>§</sup> Among MSM tested for bacterial STD in the past 12 months and informed by a health care provider of a diagnosis of gonorrhea, chlamydia, or syphilis.