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Human Papillomavirus Vaccination Among Young Men Who Have Sex With Men and Transgender Women in 2 US Cities, 2012–2014

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Abstract

Background—Since 2011, in the United States, quadrivalent human papillomavirus (HPV) vaccine has been recommended for boys aged 11 to 12 years, men through age 21, and men who have sex with men (MSM) through age 26. We assessed HPV vaccination coverage and factors associated with vaccination among young MSM (YMSM) and transgender women (TGW) in 2 cities.

Methods—During 2012–2014, 808 YMSM and TGWaged 18 to 26 years reported vaccination status in a self-administered computerized questionnaire at 3 sexually transmitted disease (STD) clinics in Los Angeles and Chicago. Associations with HPV vaccination were assessed using bivariate and multivariable models to calculate adjusted odds ratios (aORs) and 95% confidence intervals (CIs).

Results—Few of the diverse participants (Hispanic/Latino, 38.0%; white, 27.0%; and black/African American, 17.9%) reported receiving 1 or more HPV vaccine doses (n = 111 [13.7%]) and even fewer reported 3 doses (n = 37 [4.6%]). A multivariable model found associations between vaccination and having a 4-year college degree or higher (aOR, 2.83; CI, 1.55–5.17) and self-reported STDs (aOR, 1.21; CI, 1.03–1.42). In a model including recommendation variables, the strongest predictor of vaccination was a health care provider recommendation (aOR, 11.85; CI, 6.70–20.98).

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Conclusions—Human papillomavirus vaccination coverage was low among YMSM and TGW in this 2–US city study. Our findings suggest further efforts are needed to reach YMSM seeking care in STD clinics, increase strong recommendations from health care providers, and integrate HPV vaccination with other clinical services such as STD testing.

Human papillomavirus (HPV) is the most common sexually transmitted infection (STI) worldwide and in the United States; certain high-risk subtypes are causally linked to male cancers including 91% of anal cancers, 70% of oropharyngeal cancers, and 63% of penile cancers.[1] An average of 15,793 HPV-associated cancers are diagnosed among US men each year,[2] with most of these among men who have sex with men (MSM) and those with human immunodeficiency virus (HIV) infection.[3]

Men who have sex with men are at high risk for HPV infection and associated disease. A meta-analysis of 53 studies found that the pooled prevalence of any anogenital HPV was 37% among HIV-negative MSM and 73.5% among those living with HIV.[3] Rates are approximately 4 times higher among MSM compared to men who have sex with exclusively women (MSW): a study of 1305 MSW found that approximately 12% harbored HPV in the anal canal compared with 47% of 176 MSM.[4] Accordingly, men reporting contact with other men (not exclusively heterosexual) are significantly more likely to develop HPV-associated anal cancer than those who exclusively have sex with women (odds ratio [OR], 17.3; 95% confidence interval [CI], 8.2–36.1).[5] In addition, HIV infection synergistically increases the risk of HPV-associated cancer, such that a meta-analysis of 13 studies found that the incidence rate of anal cancer was 80 times higher among HIV-infected MSM compared to HIV-negative men.[6] Prevalence estimates of oral HPV in MSM range from approximately 10% to 20%[7–9] and are higher among those with HIV infection.[10] In addition, men with a history of same-sex sexual contact have a higher incidence of oropharyngeal cancer.[11]

Since 2011, HPV vaccination has been recommended routinely for US girls and boys at age 11 or 12 years (or starting at age 9 years), as well as men through age 21 years, and MSM and immunocompromised men through age 26 years.[12,13] The proportion of male adolescents 13 to 17 years of age in the United States who have received 1 or more doses of HPV vaccine was 49.8% in 2015, and coverage lags other adolescent vaccines.[14] Among young MSM (YMSM) aged 18 to 26 years, coverage with 1 or more doses of HPV vaccine was 4.9% in 2011 soon after the national recommendation was issued[15]; more recent studies of YMSM have identified coverage ranging from 6.8% to 20.8%.[16–18] Increasing HPV vaccine coverage is expected to reduce the burden of HPV infections and HPV-associated disease among MSM.[19]

A number of studies have examined HPV vaccine awareness, knowledge, and acceptability among MSM. Generally, awareness of HPV vaccine and knowledge about HPV have been low.[20–23] Vaccine acceptability varies based on the population surveyed, but is generally moderate to high,[24,25] and positively influenced by physicians' recommendations,[16] low or no cost,[20,26] and increased perceived seriousness of HPV infection and benefits of vaccination.[20,26,27] However, vaccine acceptability may not necessarily correlate with uptake, and there is a lack of research identifying facilitators and barriers to HPV vaccine uptake among MSM.[26,28] In addition, much of the research on HPV awareness and

knowledge, and acceptability thus far has been on MSM who are older than the upper limit for vaccination,[22] and few studies have addressed younger MSM within the recommended target age range for vaccination.[29]

This analysis examined demographics, sexual behaviors, health care use, and correlates of HPV vaccination among MSM aged 18 to 26 years during 2012–2014. We hypothesized that HPV vaccination uptake would be associated with more health care use, health care provider or peer vaccination recommendations, and sexual risk behaviors.

METHODS

Study Design and Procedures

The Young Men's HPV (YMHPV) study enrolled 1,033 consenting gay, bisexual, and other MSM and transgender women, aged 18 to 26 years. Detailed methods have been reported previously.[30] Enrollment occurred at 3 clinical facilities providing sexually transmitted disease (STD), HIV, and other clinical care to lesbian, gay, bisexual, and transgender (LGBT) populations in 2 US cities: Chicago, IL (n = 328 [32%]) and Los Angeles, CA (n = 705 [68%]) during July 2012 to August 2014. In Chicago, 7.5% (29/384) of those invited and age eligible refused; and in Los Angeles, 4.4% (35/791) of those invited and age eligible refused. The study protocol was reviewed and approved by institutional review boards at the participating institutions and the Centers of Disease Control and Prevention.

Participants were eligible if they provided written informed consent and met the following criteria at the time of enrollment: (*a*) age 18 to 26 years; (*b*) assigned male sex at birth; and (*c*) identify as gay, homosexual, or bisexual, or ever engaged in oral or anal sex with a male partner. Each received a gift card incentive of nominal value. Most were enrolled and completed all study elements on the day of a clinic visit, without interruption of their scheduled appointment. Vaccine was not provided as part of the study.

Participants completed a confidential 30-minute standardized computer-assisted interview in English regarding participants' demographic characteristics, health care use, HIV/STD testing and diagnosis history, lifetime sexual risk behaviors, knowledge and attitudes regarding HPV, and HPV vaccination status. Survey data were collected in Web-based Qualtrics (Qualtrics, Provo, UT). Each participant was assigned a unique study ID code, and no personally identifying information was collected. Each participant provided 3 types of biologic specimens: a self-collected anal swab, a self-collected oral rinse, and a blood/serum specimen collected by a phlebotomist. Upon request, participants received a verbal summary of their high-risk HPV DNA test results confidentially, along with telephone counseling about the interpretation of such results.

Statistical Analyses

The main outcome variable for these analyses was HPV vaccination status, self-reported by participants with 2 questionnaire items, the first assessing whether any HPV vaccine was received, and the second assessing the number of doses. Of 1,033 participants completing the survey, 225 (21.8%) were unsure of their vaccination status or did not answer and were excluded from the analytic sample to avoid misclassification. For comparisons, participants

were dichotomized into those reporting any doses of HPV vaccine (n = 111 [13.7%]) and those reporting none (n = 697 [86.3%]) for a total analyzed sample of 808. Participants were included regardless of current gender identity or expression, including transgender women. Descriptive analyses included univariate statistics such as frequencies, means, and standard deviations (SDs). Bivariate analyses used *t* tests, Wilcoxon-Mann-Whitney tests, and χ^2 tests to compare participants' characteristics and behaviors. A multivariable logistic regression was conducted to assess factors predictive of HPV vaccination status, controlling for study site; results are presented as adjusted odds ratios and 95% CIs. As this was a cross-sectional study, covariates were only included in the model if they could reasonably be expected to precede vaccination (e.g., demographics and lifetime sexual risk behaviors). After specification of the main effects model, 2-way interactions were tested where theoretically relevant and presented if significant. All analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC).

RESULTS

Study Population

Among 808 participants aged 18 to 26 years (mean [SD], 23.1 [2.3] years); 307 (38.0%) were Hispanic/Latino, 218 (27.0%) were white, and 145 (17.9%) were black/African American (Table 1). Most participants were attending or had completed some postsecondary education, or had earned a postsecondary degree (n = 456 [56.4%]), and median household income was $35,000. Most participants (n = 749 [92.7%]) identified as male, with 39 (4.8%) identifying as transgender women and 13 (1%) identifying as either queer or "other". Regarding sexual orientation, most (n = 579 [71.7%]) identified as homosexual or gay, 167 (20.7%) identified as bisexual, and 62 (7.7%) identified as other orientation. Most (n = 582 [72.0%]) described their relationship status as single. Finally, 79 (9.8%) reported being HIV positive, 654 (80.9%) reported being HIV negative, and 75 (9.3%) indicated that they did not know their HIV status or did not answer the question.

Lifetime number of sex partners skewed to the right (mean [SD] 26.9 [30.4]; median, 16), with 307 (38.0%) YMSM reporting more than 20 lifetime partners. Number of sex partners in the past 3 months was approximately 1 per month (mean [SD], 4.7 [6.8]; median, 3). There was no significant difference in the number of insertive versus receptive anal sex acts in the past 3 months, or condom use (approximately 40% reporting condom use by act—data not shown). Overall, 401 (49.6%) reported any condomless anal intercourse in the past 3 months.

Factors Associated with HPV Vaccination

In total, 111 participants (13.7%) reported receiving any doses of HPV vaccine (Table 1). Thirty-seven (4.6%) reported receiving 3 doses, 31 (3.8%) reported 2 doses, 31 (3.8%) reported 1 dose, and 12 (1.5%) were unsure of the number of doses. Among 79 HIV-positive participants, 22 (27.8%) reported vaccination, whereas among 654 HIV-negative participants, 86 (13.1%) reported vaccination. Among all participants reporting vaccination, 40 (36.0%) were white, 35 (31.5%) were Hispanic, and 18 (16.2%) were black. More white participants reported being vaccinated (19%) than black (12%), Hispanic (12%), or mixed

race (16%) participants, resulting in a significant association between race/ethnicity and vaccination status (Table 1).

Human papillomavirus vaccination was significantly associated with greater health care use (Table 2). Among vaccinated participants, 105 (94.6%) visited a health care provider in the past 12 months, and 85 (76.6%) had discussed their sexual behavior or sexual orientation with a health care provider, compared to 547 (78.5%) and 373 (53.5%) unvaccinated participants, respectively. The mean number of self-reported lifetime HIV tests was significantly higher among vaccinated participants (mean, 9.1; range, 1–50 for vaccinated; mean, 8.2; range, 0–300 for unvaccinated). In addition, STD testing in the past 6 months was significantly more common among vaccinated participants (71.2%) compared with unvaccinated participants (56.4%). Lifetime STD diagnoses were also significantly more common among vaccinated participants (mean, 1.4; range, 0–7) compared with unvaccinated participants (mean, 1.1; range, 0–10). Participants reporting HPV vaccination were significantly more likely to report receiving additional vaccinations recommended for MSM, including hepatitis A and B.[31]

Vaccinated participants were significantly more likely to indicate that the vaccine had been recommended to them by a health care provider, friend, family member, or sex partner (Fig. 1).

There were no significant differences in sexual behavior identified between vaccinated and unvaccinated participants. Furthermore, there were no significant differences in vaccination status noted by reported income, living arrangement, relationship status, or gender identity (data not shown).

Reported barriers to HPV vaccination among all participants included cost (37.9%), insurance not covering vaccination (33.2%), physician not recommending vaccination (26.9%), not knowing where to get vaccinated (26.8%), and safety questions (19.8%). Among vaccinated participants, more reported that the last clinic they attended in the past year was private (47.7%) rather than an LGBT clinic (29.7%) or a public clinic (14.4%). More participants were vaccinated who had visited private clinics than these other settings (19.3% vs 12.7% or 5.4%, respectively; overall $P = 0.01$).

Logistic Regression Analysis

Two multivariable logistic regression models assessed factors predictive of HPV vaccination (Fig. 2). Variables were included in the model if they were significantly associated with vaccination in bivariate analysis. Models were analyzed with and without indicators of vaccine recommendations from family, friends, and health care providers, given potential endogeneity of these variables. The strongest predictor of vaccination was a recommendation for vaccination from a health care provider (aOR, 11.85; CI, 6.70–20.98 including recommendations). In addition, in both models, having a 4-year college degree or higher education was associated with vaccination (aOR, 2.83; CI, 1.55–5.17 excluding recommendations; aOR, 2.37; CI, 1.24–4.53 including recommendations). History of self-reported STDs was associated with vaccination in 1 model (aOR, 1.21; CI, 1.03–1.42

excluding recommendations) but not the other. None of the 2-way interaction terms tested (e.g., age and health care use variables) were statistically significant in adjusted models.

DISCUSSION

Findings from this large study of HPV vaccination and correlates among young, racially diverse, gay, bisexual, and other MSM and transgender women in 2 US cities provide information on HPV vaccination coverage in this population shortly after a 2011 national recommendation for male vaccination. Human papillomavirus vaccine coverage was low overall, as 14% of participants reported receiving any doses of HPV vaccine, and fewer than 5% reported 3 doses.

Human papillomavirus vaccine coverage in our study was higher than in a 2011 baseline study of MSM[15] and in line with other recent studies of Internet-using YMSM, suggesting a trend of slowly rising HPV vaccination coverage in this population after the national recommendation.[16–18] Vaccination among gay, bisexual, and other MSM and transgender women in this age group can be expected to increase in future years as programs are implemented and as routinely vaccinated adolescents age into older cohorts. However, we note that in our study, coverage was lower among racial/ethnic minority MSM, those with less education, and those attending public clinics, suggesting that disparities in health care access and use could continue to affect HPV vaccination rates.

Our findings provide supportive evidence for the vital role health care providers play in influencing vaccination uptake among YMSM. The importance of a provider recommendation for HPV vaccination has been found in multiple populations, including MSM.[16,18] We also found that many YMSM do not disclose same-sex sexual behavior to health care providers until well into their sexual lives, at a mean age of 19 years, compared to a mean age of 17.2 years at first sex with a man. More integrated vaccination programs might increase coverage, as almost twice as many participants reported other recommended vaccinations (i.e., hepatitis A and B) than HPV vaccination, and also received more other sexual health services (e.g., HIV testing) than HPV vaccination. Other studies have suggested that offering vaccination for both HPV and hepatitis B may increase vaccination coverage for both,[22] and our findings support this conclusion. Although more than 40% of participants in our study were vaccinated for either hepatitis A or B, almost 60% were tested for STIs in the past 6 months, suggesting HPV vaccination rates could be increased among YMSM if offered at the time of STI testing. Our findings suggest this population is highly responsive to discussions with health care providers about HPV vaccine, irrespective of lifetime sexual behaviors.

This analysis is subject to several limitations. Our findings are not necessarily representative of HPV vaccination coverage in other populations or areas. Our study had the advantage of being a biobehavioral study that included HPV testing (reported elsewhere) compared to other studies that were based solely on self-reported behavioral data. Nevertheless, vaccination and health care behaviors were also self-reported, not verified from medical records, and there could have been over- or under-reporting. Finally, because these are cross-

sectional data, we could not verify temporal relationships, for example, between provider discussions and HPV vaccination.

Although HPV vaccination coverage among adolescents in general may be expected to increase in future years,[14] at LGBT clinics and other clinical settings such as public clinics where at-risk populations receive recommended health care, health care providers should continue to make concentrated efforts to promote HPV vaccination for age-eligible YMSM and transgender women. Further efforts are needed to reach males seeking care in STD, LGBT, and public clinics, to increase strong recommendations from health care providers, and to integrate vaccination with other services such as STD testing. In a qualitative study of YMSM, a theme among men interviewed was a desire for HPV vaccination to be a co-occurring part of other health-related services (e.g., HIV testing).[32] Additionally, findings suggest that limited access to health care may especially affect HPV vaccine coverage among black and Hispanic YMSM and those without a college degree for whom coverage lags. Broad public health efforts are needed to increase acceptance and access to health care services for YMSM and transgender women.

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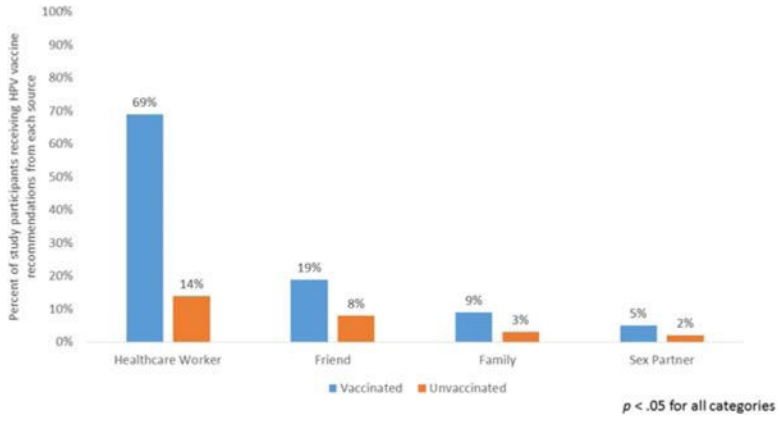

Figure 1.

Source of HPV vaccine recommendation, by vaccination status, among participants in the YMHPV study in community LGBT clinics in Chicago and Los Angeles, 2012–2014.

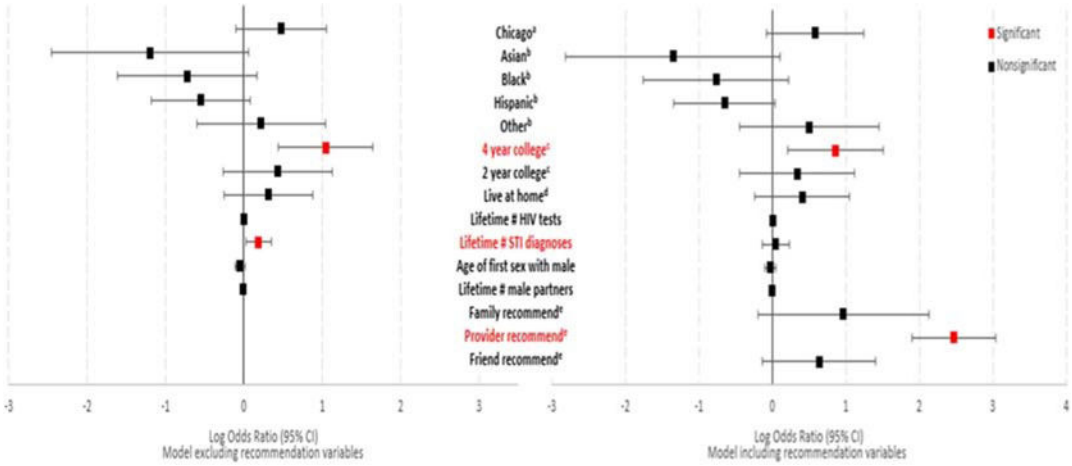

Figure 2.

Adjusted log ORs and 95% CIs for variables included in multivariable models predicting HPV vaccination excluding recommendation variables and including recommendation variables, among 18- to 26-year-old participants in the YMHPV Study in community LGBT clinics in Chicago and Los Angeles, 2012–2014.

TABLE 1

Demographic and Behavioral Characteristics by Self-Reported HPV Vaccination Status Among Participants in the Young Men's HPV Study in Community LGBT Clinics in Chicago and Los Angeles, 2012–2014

	All Participants	Participants Reporting ≥1 Dose of HPV Vaccine	Participants Reporting No HPV Vaccine
Characteristic	**n (%)**	**n (%)**	**n (%)**
Total	808 (100%)	111 (100%)	697 (100%)
City *			
Chicago, IL	255 (31.6%)	45 (40.5%)	210 (30.1%)
Los Angeles, CA	553 (68.4)	66 (59.5%)	487 (69.9%)
Age, years			
18–21	209 (25.9%)	30 (27.0%)	179 (25.7%)
22–26	599 (74.1%)	81 (73.0%)	518 (74.3%)
Race/Ethnicity *			
Hispanic	307 (38.0%)	35 (31.5%)	272 (39.0%)
White	218 (27.0%)	40 (36.0%)	178 (25.5%)
Black	145 (17.9%)	18 (16.2%)	127 (18.2%)
Asian	59 (7.2%)	3 (2.7%)	56 (8.0%)
Other/Multiracial	79 (9.8%)	15 (13.5%)	64 (9.2%)
Education *			
High school or below	342 (42.3%)	37 (33.3%)	305 (43.8%)
Some college, 2-year or technical degree	184 (22.8%)	23 (20.7%)	161 (23.1%)
4-year degree or equivalent	272 (33.7%)	51 (45.9%)	221 (31.7%)
Other	10 (1.2%)	0 (0%)	10 (1.4%)
Self-reported HIV status *			
HIV-positive	79 (9.8%)	22 (19.8%)	57 (8.2%)
HIV-negative	654 (80.9%)	86 (77.5%)	568 (81.5%)
Unknown	30 (3.7%)	2 (1.8%)	28 (4.0%)
No answer	45 (5.6%)	1 (0.9%)	44 (6.3%)
Age at first sex with a man	Mean (SD), 17.2 (3.9)	Mean (SD), 16.8 (3.8)	Mean (SD), 17.3 (3.9)
Number of lifetime male sex partners †	Mean (SD), 26.9 (30.4)	Mean (SD), 27.0 (28.1)	Mean (SD), 26.9 (30.8)
Number of male sex partners in past 3 months †	Mean (SD), 4.7 (6.8)	Mean (SD), 4.9 (7.7)	Mean (SD), 6 (6.6)
Total number of anal sex acts in past 3 months	Mean (SD), 9.8 (19.2)	Mean (SD), 9.2 (12.8)	Mean (SD), 9.9 (20.0)

N may vary due to missing survey responses.

* $P < 0.05$

† Difference between vaccinated and unvaccinated participants tested using the Wilcoxon test.

TABLE 2

Health Care Use by Self-Reported HPV Vaccination Status Among Participants in the Young Men's HPV Study in Community LGBT Clinics in Chicago and Los Angeles, 2012–2014

Characteristic	All Participants	Participants Reporting ≥1 Dose of HPV Vaccine	Participants Reporting No HPV Vaccine
	n (%)	n (%)	n (%)
Total	808 (100%)	111 (100%)	697 (100%)
Ever discussed sexual behavior with health care provider [*]			
Yes	458 (56.7%)	85 (76.6%)	373 (53.5%)
No	305 (37.7%)	23 (20.7%)	282 (40.5%)
No answer	45 (5.6%)	3 (2.7%)	42 (6.0%)
Age first discussed sexual behavior with health care provider (n = 458 ever discussed) [*]	Mean (SD), 19.0 (3.2)	Mean (SD), 18.4 (3.5)	Mean (SD), 19.2 (3.1)
Number of times tested for HIV in lifetime [†*] (n = 771 ever tested)	Mean (SD), 8.6 (17.0)	Mean (SD), 9.11 (8.5)	Mean (SD), 18 (17.8)
HIV test in past 6 months			
Yes	527 (65.2%)	79 (71.2%)	448 (64.3%)
No	202 (25.0%)	27 (24.3%)	175 (25.1%)
Do not know/No answer	34 (4.2%)	4 (3.6%)	30 (4.3%)
Number of times tested for STIs in lifetime [†*]	Mean (SD), 5.3 (7.6)	Mean (SD), 6.60 (7.1)	Mean (SD), 5.10 (7.70)
Had STD/STI test in past 6 months [*]			
Yes	472 (58.4%)	79 (71.2%)	393 (56.4%)
No	230 (28.5%)	27 (24.3%)	203 (29.1%)
Do not know/No answer	106 (13.1%)	5 (4.5%)	101 (14.5%)
Lifetime number of STIs [†*]	Mean (SD), 1.11 (1.5)	Mean (SD), 1.43 (1.7)	Mean (SD), 1.06 (1.5)
Vaccinated against hepatitis A [*]			
Yes	337 (41.7%)	82 (73.9%)	255 (36.6%)
No	167 (20.7%)	10 (9.0%)	157 (22.5%)
Do not know/No answer	304 (37.6%)	19 (17.1%)	285 (40.9%)
Vaccinated against hepatitis B [*]			
Yes	378 (46.8%)	89 (80.2%)	289 (41.5%)
No	150 (18.6%)	6 (5.4%)	144 (20.7%)
Do not know/No answer	280 (34.7%)	16 (14.4%)	264 (37.9%)
Ever used PEP or PrEP			
Yes	79 (9.8%)	16 (14.4%)	63 (9.0%)
No	708 (87.6%)	91 (82.0%)	617 (88.5%)
Do not know/No answer	21 (2.6%)	4 (3.6%)	17 (2.4%)

N may vary due to missing survey responses.

[*] $P < 0.05$

[†] Difference between vaccinated and unvaccinated participants tested using the Wilcoxon test.

PEP, postexposure prophylaxis for HIV; PrEP, pre-exposure prophylaxis for HIV.