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Three-Dose HPV Vaccine Completion among Sexual and Gender Minority Young Adults at a Boston Community Health Center

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Abstract

Background: Disparities in human papillomavirus (HPV) vaccination completion have been noted among sexual and gender minority (SGM) people. Little is known about factors associated with HPV vaccination among SGM people. This study examines factors linked with completion of HPV vaccination among SGM patients.

Methods: We collected cross-sectional data from electronic health records (EHRs) of SGM patients receiving primary care at a Boston community health center specialized in SGM health. We employed a binomial logistic regression model to identify factors associated with 3-dose HPV vaccine completion.

Results: Patients were 70.3% white, with mean age of 26.3 years (SD=2.48), 26.9% identifying as gender minorities and 79% as sexual minorities, 48.9% with 4-year college or graduate degrees, 59.4% employed, 65.9% with private insurance, 39.1% living at or below the federal poverty level,

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Conflict of Interest

The authors have no conflicts of interest to report.

and 8.3% living with HIV. Seventy-seven percent of patients who were offered HPV vaccination had completed the series. Factors significantly associated with HPV vaccine completion included: 4-year college or graduate degree (OR: 2.87; 95% CI=1.26-6.53), completion of primary care appointments (OR: 1.03; 95% CI: 1.01-1.05), Hepatitis A or B vaccine completion (OR: 2.59; 95% CI: 1.2-5.59), and visits for a sexually transmitted infection(STI) screen (OR: 1.22; 95% CI: 1.03-1.43).

conclusion: Vaccine completion was higher among SGM with higher levels of education, Hepatitis A or B vaccination, and completed health visits. These findings highlight potential ways to increase HPV vaccination, such as offering tailored HPV vaccine education, bundling with other vaccines, and incorporating HPV vaccination with STI screenings.

Keywords

Human papillomavirus; HPV; Vaccine; HPV-related Cancers; Sexual and Gender Minority; Transgender

1. Introduction

Human papillomavirus (HPV), the most common sexually transmitted infection [1], may cause genital warts and cancers of the cervix, vulva, vagina, anus, penis, head and neck [2]. The primary preventative measure to reduce HPV-related disease is vaccination. The Centers for Disease Control (CDC) recommend HPV vaccination for all children at age 11-12 years, with a catch-up vaccination up to age 21 years for males and up to age 26 years for females if not previously vaccinated [3]. HPV vaccination is also recommended for HIV-infected men and men who have sex with men (MSM) up through 26 years of age.

Despite these vaccine recommendations, both initiation and completion of the HPV vaccine have fallen short of national goals [4]. While vaccine initiation persists as a problem, this study focuses on factors associated with vaccine completion. Initial immune response with less than 3-doses is robust; among adolescents aged 15 years and older, however, all 3 doses are needed to achieve the highest levels of sustained immunity [5,6].

In a recent national study of adolescents up to age 17 years, only 43% of female and 38% of male youth had completed the 3-dose vaccine series in 2016 [7]. Data on vaccination patterns specifically among SGM youth are limited, and existing data suggest particularly low vaccine completion rates [8–12]. SGM youth have elevated risk for HPV-related disease due to factors such as higher HPV prevalence [13,14], number of sexual partners [15], HIV-infection [14], and receptive anal intercourse [16]. In 2014, one study documented that only 32% of lesbian and bisexual women (ages 18-26 years) who initiated the series completed all 3 doses [12]. Data available for MSM and transgender women document vaccine completion for those who initiate the series ranging from 40-54% for MSM [8,10] to 37% for young MSM and transgender women ages 18-26 years [11].

SGM face different challenges in health care uptake compared to their non-SGM peers [17–20]. Special attentiveness to the unique health care needs [21,22] of this population is necessary for addressing health disparities and determining care delivery methods to provide

optimal vaccine and preventive services. Some studies have investigated predictors and rates of HPV vaccination separately among lesbian/bisexual women, gay/bisexual men, or MSM and transgender women. We recently conducted a qualitative study of perspectives on barriers to and facilitators of HPV vaccination among SGM patients [23]. To our knowledge, no studies to date have investigated factors associated specifically with HPV vaccine completion in a broadly inclusive sample of SGM patients. This study is the first to comprehensively explore associations of sociodemographics, mental health factors, and engagement in care with 3-dose HPV vaccine completion in a broad sample of SGM young adults. We conducted this investigation via systematic electronic health record (EHR) audit at an SGM-focused health center.

2. Methods

2.1. Study Design

All data were drawn retrospectively from existing EHRs of eligible patients at Fenway Health, an urban Federally Qualified Health Center in Boston, MA. This health center focuses on care needs of SGM patients [21]. Eligible records were from patients ages 18-26, self-identified as SGM, with EHR documentation of being offered the HPV vaccine during the study period, which was between April 1, 2011 and March 31, 2016 (inclusive). Data collection occurred over 3 months (September to December of 2016).

We used an automated simple random sampling algorithm [24] to select 358 records from the overall pool of 1,933 SGM patient records who fit the eligibility criteria. We sought to examine characteristics of patients who had the opportunity to complete vaccination within the study period, therefore we excluded those who had fewer than 3 appointments within the study period (57 total) or received their 1st or 2nd HPV vaccine dose after October 1st, 2015 (25 total) and did not have at least 6 months to complete their 3-dose HPV vaccine regimen. Thus, the final cohort for analyses included 276 patients, of whom only one individual had declined vaccine initiation.

2.2. Measures

Data were retrieved from the EHR through a combination of automated Structured Query Language (SQL) queries by S.U. and manual audit by A.S.K and K.Z.A. from September to December 2016. Automated SQL queries retrieved partial or complete data, from patients' EHRs into a Microsoft Access Database, on variables related to sociodemographics (e.g. race/ethnicity, sex at birth, current gender identity, sexual orientation, highest education level), mental health (e.g. psychiatric disorders, substance use/misuse), engagement in care (e.g. primary care appointments, STI screening visits) and HPV vaccination (i.e. vaccination date and number). These variables are located in patient registration forms, problem lists, flowsheets, or the appointments fields in the EHR. We systematically performed manual audits of these forms and fields to complete and confirm the dataset initially collected via automated SQL queries. Variables were carefully defined with specific parameters and retrieved via pre-determined systematic guidelines to eliminate potential bias during data extraction from EHR [25,26].

All EHR data at Fenway Health are recorded by trained health center providers and/or staff. Sociodemographic information is recorded in the EHR at registration and/or during provider visits based on patient report. The remaining data included in our analysis (i.e., mental health, engagement in care, and vaccine data) are recorded in the EHR by providers and staff during points of patient engagement, within chart notes (i.e., office visits, phone calls, or secure messaging), problem lists, flowsheets, and appointment records. The data related to mental health variables were manually retrieved from health records by reading patients' problem lists, which include diagnoses for psychiatric disorders with ICD-10 codes, and by reading patients' visit notes to determine whether their providers documented that they met diagnostic criteria for these disorders based on DSM-5.

Predictor variables collected from the EHR pertained to: 1) sociodemographics, 2) mental health, and 3) engagement in care. Details of these variables are included in Table 1. The outcome variable was completion of the 3-dose HPV vaccine series. The patients who obtained all 3 doses of the vaccine were included in the "Complete" category, whereas patients who obtained fewer than 3 doses were included in the "Incomplete" category.

The term "current" refers to characteristics present or absent during the study period from April 1, 2011 to March 31, 2016, and the term "lifetime" refers to the presence or absence of characteristics at any time. We examined possible associations of these factors with 3-dose vaccine completion. The study received Institutional Review Board approval prior to data collection.

2.3. Data Analysis

Data analysis was conducted in 2017-2018. We used descriptive statistics to analyze the distribution of all variables (mean, standard deviation, and frequency) and stratified patients based on completion of the 3-dose HPV vaccine series ('complete' vs. 'incomplete').

We used bivariate tests to compare patients with complete vs. incomplete vaccination. We used Pearson correlations for continuous variables (e.g. age, percentage of primary care appointments completed, and number of STI screening visits). For categorical variables, we used Pearson's Chi-Square (X^2) tests to evaluate differences in observed and expected distributions by 3-dose completion. Fisher's exact tests were used for categorical variables when counts in distributions were <5 , to determine p -values in X^2 tests. To compare sample characteristics of these 276 patients with the overall pool of 1,933 eligible patients at the health center, we conducted a X^2 analysis on race/ethnicity [27–29]. We did not find any statistically significant difference at the $p<0.05$ level between our sample and the overall pool of eligible patients in the proportion who identified as "White," "Black/African/American," "Latino/Hispanic," "Alaskan/Native American," "Asian/Pacific Islander," "Hawaiian Islander," "Multiracial," "Other," or "Not Identified."

We generated a binary logistic regression model with variables that: 1) had a p -value of <0.05 in bivariate analysis (i.e. highest education level; tobacco use during the study period; amphetamine, crack/cocaine, opioid, benzodiazepine, IV drug, or other substance use disorder during study period and lifetime; percentage of primary care appointments completed; number of STI screening visits for HIV, chlamydia, gonorrhea, or syphilis during

the study period), 2) were identified in the existing literature as potentially important for 3-dose completion (i.e., transgender status, sexual orientation, race/ethnicity) [10,12,30,31], or 3) were hypothesized to influence the model based on prevailing practices, such as having HIV diagnosis, given that it is common practice to vaccinate eligible patients following an HIV diagnosis [32]. Within the sample of 276 patients, 59 individuals (21.4%) did not have EHRs with complete data for all desired variables and thus were excluded from the binary logistic regression model, which was therefore run with data from 217 patients (78.6%).

Both sexual and gender minority people have lower vaccination rates compared to the general population [8–12], in the context of sexual minority stress and gender minority stress that exert a similar mechanism on health behaviors [33–35]. The health center's combined mission is focused on both sexual and gender minorities [21]. Combining sexual and gender minority patients into a single variable provided an adequate sample size to conduct the analyses.

All statistical analyses were conducted in IBS SPSS Statistics version 22 (IBM, Armonk, NY).

3. Results

3.1. Descriptive and Bivariate Analyses

Study sample characteristics are shown in Table 1. The *p*-values for bivariate statistics comparing patients with complete vs. incomplete vaccination are also included in the table.

Overall, 77% (n=276) of patients offered HPV vaccination completed the 3-dose series. The average age of patients in the sample was 26.3 (SD=2.48) at the end of the study period. Most identified their race as White (70.3%). Among these patients, 69.2% identified their sex at birth as male, 62.7% identified their current gender identity as male, 73.2% identified their gender identity as cisgender, and 79% identified their sexual orientation as bisexual, or lesbian, gay or homosexual.

Significant heterogeneity in the distribution of highest education level was found based on 3-dose completion ($p=0.008$), with a higher proportion of patients with 3-dose completion having 4-year college or graduate degrees (53.7% vs 32.3%), and a higher proportion of patients with incomplete vaccination having some college/post-secondary education or less (40.3% vs. 27.6%). The majority of patients reported full- or part-time employment (59.4%) and had private insurance (65.9%); neither of these factors was associated with vaccine completion. Thirty-nine percent of patients reported living at or below the federal poverty level.

More than half of patients (65.2%) had at least one or more of the following diagnostic categories of psychiatric disorders: PTSD, anxiety disorder, mood disorder, or personality disorder. Despite the high proportion of anxiety disorders (48.2%) and mood disorders (48.2%) diagnoses, psychiatric disorders were not significantly associated with 3-dose vaccine completion at the bivariate level. Additionally, a high proportion of patients had substance use disorders documented during the study period (43.8%) or during their lifetime

(45.7%) (Table 1). Patients with incomplete vaccination were more likely to report tobacco use during the study period ($p=0.16$), and have documentation of amphetamine, crack/cocaine, opioid, benzodiazepine, IV drug, or other substance use disorder (i.e., poppers, GHB, mushrooms, LSD, acid, ketamine, Adderall, Tylenol, cough syrup) use during the study period ($p=0.03$) and during their lifetime ($p=0.049$).

With regard to engagement in care, patients with 3-dose completion had a higher percentage of completed primary care appointments during the study period (77.36% vs. 70.3%, $p=0.002$), a higher number of STI screening visits during the study period (3.9% vs 2.55%, $p=0.005$) and higher completion of Hepatitis A or B vaccination (63.1% vs 35.5%, $p<0.001$) (Table 1).

3.2. Binary Logistic Regression of 3-Dose HPV Vaccine Completion

Table 2 presents a binary logistic regression model with 3-dose HPV vaccine completion as the primary outcome. All variables included in the model are listed in Table 2.

Transgender status, sexual orientation, and race/ethnicity were not significantly associated with 3-dose HPV vaccine completion. The only sociodemographic characteristic significantly associated with completion was level of education. Having a 4-year college or graduate degree was associated with increased odds of 3-dose completion (OR: 2.87; 95% CI: 1.26-6.53, $p=0.012$) as compared to patients with some college/post-secondary education or less.

None of the mental health variables were significantly associated with vaccine completion; however, several engagement in care variables were. The percentage of completed primary care appointments (OR: 1.03; 95% CI: 1.01-1.05, $p=0.018$) and Hepatitis A or B vaccine completion (OR: 2.59; 95% CI: 1.2-5.59, $p=0.016$) were both associated with increased odds of 3-dose completion as compared to those who did not have these behaviors. Lastly, the number of STI screening visits was also associated with increased odds of 3-dose completion (OR: 1.22; 95% CI: 1.03-1.43, $p=0.018$) as compared to young adult SGM who lacked STI screening visits.

4. Discussion

Previous research has explored factors associated with vaccine uptake, rather than completion, exclusively within certain select subgroups of SGM (e.g., MSM, lesbian women) [8,11,12] but not others (e.g., genderqueer people, transgender men). Even though receiving less than 3-doses provides a robust immune response and many other studies focused on HPV vaccine initiation rather than completion, all 3 doses are needed to achieve the highest level of sustained immunity [5,6]. Our study is novel in its exploration of variables associated with 3-dose HPV vaccine completion, in a broadly inclusive sample of young adult SGM patients

Vaccine completion was higher among SGM with higher levels of education, complete Hepatitis A or B vaccination, or visits to the health center for primary care or STI screening. The relatively high HPV vaccine completion at this health center among young SGM who

were offered the vaccine, a population previously found to experience disproportionately low HPV vaccination, also suggests a potential benefit of SGM-affirming health care providers and settings [21,36,37] in facilitating HPV vaccine completion among SGM. SGM-affirming health care delivery may facilitate visits to health care providers for STI screening and completion of Hepatitis A or B vaccines [31,38], thus increasing opportunities for completion of the 3-dose HPV vaccination.

We found that vaccine completion was associated with higher education levels among SGM patients. Patients with higher levels of education may have greater health literacy, thereby increasing their likelihood of HPV vaccine completion [39,40]. In alignment with our results, recent studies have also found increased likelihood of HPV vaccination among lesbian and bisexual women [12] as well as MSM and transgender women who had a college degree or more [11]. Therefore, it is important for health care providers to consider many intersecting sociodemographic identities of their SGM patients, including their education level, and to produce public health campaigns and patient education materials about HPV and the importance of HPV vaccine completion tailored for any level of health literacy.

SGM youth are at an increased risk for adverse mental health outcomes (e.g., depression, anxiety) [41,42] and substance use disorders [43] compared to their heterosexual and cisgender counterparts. Even though none of the mental health and substance use variables were significantly associated with 3-dose vaccine completion, 65% of our cohort had documentation of a diagnosis for at least one of 4 categories of psychiatric disorders assessed (i.e., anxiety disorder, mood disorder, personality disorder, and PTSD) and 46% of the cohort also had documentation of at least one of the substance use disorders assessed (i.e., alcohol, amphetamine, cannabis, crack/cocaine, opioid, tobacco). We have previously shown that primary care providers view psychiatric disorders and substance use disorders as potential barriers to HPV vaccination [44].

Our findings underscore the importance of patient engagement in primary and sexual health care in order to facilitate HPV vaccine completion [45]. Some studies among only MSM have suggested bundling HPV, Hepatitis, and other vaccinations to increase vaccination rates, plus offering HPV vaccination during STI screening visits [10,31]; our findings support these suggestions to increase vaccine completion for SGM populations as a whole.

Limitations

This study is not without limitations. In order to explore completion rates, we focused our sample on SGM patients with EHR documentation of being offered HPV vaccination, as opposed to all vaccine-eligible SGM patients whether they were offered vaccination or not. The cross-sectional design of this study prevented deduction of causal relationships between independent variables and 3-dose HPV vaccine completion, and our data were derived from a predominantly White patient sample at one SGM-focused urban community health center, which may reduce our ability to generalize findings to a broader SGM population. Another limitation is due to the nature of retrospective chart review, which may introduce unintended bias related to incomplete data, or data with reduced integrity due to differences in practice across various care teams while entering information into the EHR fields [25,26,46].

Despite these limitations, our findings offer directions for future research. Investigators should continue to explore vaccine uptake for SGM youth at non-SGM specialized health centers, as well as uptake for both initial vaccine recommendation as well as repetitive (after initial refusal) vaccine recommendation to SGM youth in catch-up populations. Future studies ought to conduct analyses with greater power to assess sexual and gender minority patients separately, who have unique experiences in health care and potentially different factors impacting vaccine completion, as well as focusing on comparison of SGM and cisgender or straight-identified populations to further determine factors specific to SGM people. Lastly, research should examine differences across geographic regions of the United States and between urban vs. rural settings to determine novel steps for increasing HPV vaccine completion nationally among SGM young adults.

5. Conclusion

This study comprehensively highlights factors related to sociodemographics, mental health, and engagement in care that are associated with 3-dose HPV vaccine completion in diverse sample of young SGM adults. Our findings may inform development of new HPV vaccination strategies for the larger SGM community. Providing SGM-affirming and patient-centered education about and recommendations for HPV vaccination, bundling HPV vaccination with other vaccinations, and offering catch-up vaccination during STI screening visits may serve as effective methods for increasing HPV vaccine completion among young SGM people.

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Highlights

- Health literacy of SGM may influence their HPV vaccine completion.
- Greater engagement in health care services may facilitate completion of HPV vaccination.
- Bundling HPV vaccine with other vaccines may enable completion.

Table 1.

Sample Characteristics by HPV Vaccine Completion among Sexual and Gender Minorities (N=301)

<i>Variables</i>	Incomplete (n=62)	Complete (n=214)	Overall (N=276)	<i>p-value</i>
<i>Sociodemographics</i>				
Age in years, M (SD)	26.26 (2.50)	26.32 (2.48)	26.30 (2.48)	0.868
Race/Ethnicity ^a	n (%)	n (%)	N (%)	0.369
White	46 (74.2)	148 (69.2)	194 (70.3)	
Non-White	15 (24.2)	65 (30.4)	80 (29)	
Not Identified	1 (1.6)	1 (0.5)	2 (0.7)	
Sex at Birth				0.552
Female	21 (33.9)	64 (29.9)	85 (30.8)	
Male	41 (66.1)	150 (70.1)	191 (69.2)	
Current Gender Identity ^a				0.147
Female	17 (27.4)	42 (19.6)	59 (21.4)	
Male	41 (66.1)	132 (61.7)	173 (62.7)	
Genderqueer or Not Exclusively Male or Female	1 (1.6)	16 (7.5)	17 (6.2)	
Not Identified	3 (4.8)	24 (11.2)	27 (9.8)	
Transgender Status				0.716
Cisgender	43 (69.4)	159 (74.3)	202 (73.2)	
Transmasculine/Transman	11 (17.7)	30 (14)	41 (14.9)	
Transfeminine/Transwoman	8 (12.9)	25 (11.7)	33 (12)	
Sexual Orientation				0.095
Straight or Heterosexual	9 (14.5)	14 (6.5)	23 (8.3)	
Bisexual	10 (16.1)	22 (10.3)	32 (11.6)	
Lesbian, Gay, or Homosexual	37 (59.7)	149 (69.6)	186 (67.4)	
Something Else/Don't Know/Not Reported	6 (9.7)	29 (13.6)	35 (12.7)	
Highest Education Level ^a	6 (9.7)	29 (13.6)	35 (12.7)	0.008 **
Some College/Post-Secondary or Less	25 (40.3)	59 (27.6)	84 (30.4)	
4-Year College or Graduate Degree	20 (32.3)	115 (53.7)	135 (48.9)	
Not Identified	17 (27.4)	40 (18.7)	57 (20.7)	
Employment Status ^a				0.564
Working (Full- or Part-Time)	32 (51.6)	132 (61.7)	164 (59.4)	
Not Working (Retired, Disabled or Unemployed)	12 (19.4)	35 (16.4)	47 (17)	
Student	14 (22.6)	43 (20.1)	57 (20.7)	
Not Identified	4 (6.5)	4 (1.9)	8 (2.9)	
Health Insurance Status Using 2014 USD Categories				0.237
Private Insurance	37 (59.7)	145 (67.8)	182 (65.9)	
Other (Medicare/Medicaid/Other Public/Uninsured)	25 (40.3)	69 (32.2)	94 (34.1)	
Income as Percentage of Federal Poverty Level for Individual Using 2014 Levels ^a				0.518
100% and Below	23 (37.1)	85 (39.7)	108 (39.1)	
100% - 200%	11 (17.7)	33 (15.4)	44 (15.9)	

<i>Variables</i>	Incomplete (n=62)	Complete (n=214)	Overall (N=276)	<i>p-value</i>
200% - 300%	5 (8.1)	33 (15.4)	34 (13.4)	
Over 300%	12 (19.4)	34 (15.9)	46 (16.7)	
Not Identified	11 (17.7)	30 (14.0)	41 (14.9)	
HIV Diagnosis				
Yes	6 (9.7)	17 (7.9)	23 (8.3)	0.611
<i>Mental Health</i>				
Substance Use During Study Period ^b				
Any Substance Use Disorder	33 (53.2)	88 (41.1)	121 (43.8)	0.091
Alcohol Use Disorder	12 (19.4)	40 (18.7)	52 (18.8)	0.906
Tobacco Use	29 (47)	65 (30.4)	94 (34.1)	0.016 *
Tobacco Use Disorder	22 (35.5)	53 (24.8)	75 (27.2)	0.095
Cannabis Use Disorder	12 (19.4)	36 (16.8)	48 (17.4)	0.643
Amphetamine, Crack/Cocaine, Opioid, Benzodiazepine, IV Drug, Other Use Disorder ^c	6 (9.7)	6 (2.8)	12 (4.3)	0.03 *
Substance Use Lifetime				
Any Substance Use Disorder	34 (54.8)	92 (43.0)	126 (45.7)	0.099
Alcohol Use Disorder	13 (21)	40 (18.7)	53 (19.2)	0.689
Tobacco Use Disorder	24 (38.7)	60 (28)	84 (30.4)	0.108
Cannabis Use Disorder	13 (21)	37 (17.3)	50 (18.1)	0.508
Amphetamine, Crack/Cocaine, Opioid, Benzodiazepine, IV Drug, Other Substance Use Disorder ^c	7 (11.3)	8 (3.7)	15 (5.4)	0.049 *
Any Psychiatric Disorder (Four Diagnostic Categories Assessed):	41 (66.1)	139 (65)	180 (65.2)	0.864
PTSD Diagnosis	5 (8.1)	19 (8.9)	24 (8.7)	0.841
Anxiety Disorder Diagnosis	31 (50)	102 (47.7)	133 (48.2)	0.746
Mood Disorder Diagnosis	35 (56.5)	98 (45.8)	133 (48.2)	0.139
Personality Disorder Diagnosis	3 (4.8)	7 (3.3)	10 (3.6)	0.698
<i>Engagement In Care</i>				
Percentage of Primary Care Appointments Completed (Mean(SD)) ^d	70.30 (17.40)	77.36% (15.21)	75.78% (15.97)	0.002 **
Number of STI Screening Visits (HIV, Chlamydia, Gonorrhea, and Syphilis) During Study Period (Mean (SD)) ^d	2.55 (2.45)	3.90 (3.51)	3.60 (3.35)	0.005 **
Hepatitis A or B Vaccines Completed	22 (35.5)	135 (63.1)	157 (56.9)	0 ***

Note: HPV: human papillomavirus. HIV: human immunodeficiency virus. PTSD: post-traumatic stress disorder. STI: sexually transmitted infection. USD: United States dollar. *p*-values were based on chi-square tests for categorical variables and Pearson correlations for continuous variables. Reported *p*-values are from Fisher's exact tests where cells sizes are <5.

*
p<0.05

**
p<0.01,

p<0.001

^a *p*-values were calculated by excluding "Not Identified." ^b Study period is between 04/01/2011 - 03/31/2016.

^b Study period is between 04/01/2011 - 03/31/2016.

^c Other Substances include poppers, GHB, mushrooms, LSD, acid, ketamine, Adderall, Tylenol OD, cough syrup OD.

^dPercentage of Primary Care Appointments Completed and Number of STI Screening Visits are assessed during the study period.

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Table 2.

Multivariate Predictors of HPV Vaccine Completion among Sexual and Gender Minorities (N=276)

	<u>Multivariate</u>	
OR	(95% CI)	
Transgender Status		
Cisgender	1	[reference]
Transmasculine/Transman	1.64	0.38-7.15
Transfeminine/Transwoman	2.49	0.61-10.13
Sexual Orientation		
Straight or Heterosexual	1	[reference]
Bisexual	3.45	0.61-19.64
Lesbian, Gay, or Homosexual	2.7	0.51-14.45
Something Else/Don't Know/Not Reported	3.6	0.78-16.67
Race/Ethnicity		
White	1	[reference]
Non-White	1.77	0.74-4.23
Highest Education Level		
Some College/Post-Secondary or Less	1	[reference]
4-Year College or Graduate Degree	2.87	1.26-6.53 [*]
Tobacco Use		
No	1	[reference]
Yes	0.65	0.3-1.44
History of Amphetamine, Crack/Cocaine, Opiate, Benzodiazepine, IV Drug or Other Substance Use Disorder ^a		
No	1	[reference]
Yes	0.61	0.14-2.72
Percentage of Primary Care Appointments Completed ^b	1.03	1.01-1.05 [*]
Hepatitis A or B Vaccine Completed		
No/Not Indicated	1	[reference]
Yes	2.59	1.2-5.59 [*]
HIV Diagnosis		
No/Not Indicated	1	[reference]
Yes	0.65	0.13-3.24
Number of Times Patient Came in for an STI Screen (HIV, Chlamydia, Gonorrhea, Syphilis) ^b	1.22	1.03-1.43 [*]

Note: HPV: human papillomavirus. UK: odds ratio. CI: confidence interval. HIV: human immunodeficiency virus. STI: sexually transmitted infection. USD: United States dollar.

* p<0.05

^a Other Substances include poppers, GHB, mushrooms, LSD, acid, ketamine, Adderall, Tylenol OD, cough syrup UD.

^b Percentage of Primary Care Appointments Completed and Number of STI Screening Visits are assessed during the study period, which is defined as the 5-year period between 04/01/2011 - 03/31/2016.