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Predictors of Human Papillomavirus Vaccination among Young Men who Have Sex with Men

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Abstract

Background—Human papillomavirus (HPV) is a common sexually transmitted infection that causes anal, penile, and oropharyngeal cancers in men. Men who have sex with men (MSM) are at particularly high risk for HPV infection and HPV-related disease. HPV vaccination is currently recommended for all MSM in the U.S. through age 26 years, yet little is known about HPV vaccine uptake in this population. The purpose of this study was to identify predictors of HPV vaccine uptake and barriers and facilitators to HPV vaccination that may be unique to young MSM.

Methods—Men aged 18–26 years (N=336) were recruited via advertisements placed on a geospatial smartphone dating application designed for MSM. Participants completed an online survey. Correlates of vaccine uptake and provider recommendation for HPV vaccine were identified using logistic regression.

Results—In total, 21% of participants had received ≥1 dose of HPV vaccine. Provider recommendation was the strongest predictor of uptake such that MSM with a recommendation were over 40 times more likely to have been vaccinated. Additional predictors of uptake included age and HPV vaccine attitudes. Predictors of provider recommendation included sexual identity, race/ethnicity, condomless anal sex, and HIV status. Psychosocial correlates and barriers and facilitators to HPV vaccination among unvaccinated men were also identified.

Conclusions—Findings highlight potential disparities in HPV vaccine uptake, as well as disparities in provider recommendation practices for HPV vaccination. Future interventions should aim to clarify misconceptions, modify psychosocial beliefs, and address barriers and facilitators to HPV vaccine uptake specific to young MSM.

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Keywords

Papillomavirus vaccines; Neoplasms; Homosexuality; Male; Physician-Patient Relations; Behavior and Behavior Mechanisms

INTRODUCTION

HPV (human papillomavirus) is a common sexually transmitted infection that causes anal, penile, and oropharyngeal cancers in men.[1] Due to their sexual practices (e.g., receptive anal intercourse), men who have sex with men (MSM) are at especially high risk for HPV infection and associated disease outcomes. Over the course of a 1-year study, for example, oncogenic HPV types 16 and/or 18 were detected in 37% of MSM 16–30 years old.[2] Rates of anal cancer are over 17 times higher among MSM relative to heterosexual men [3] and the burden of anal cancer is exceptionally high among HIV-positive MSM.[4] Data also suggest an increasing role of HPV in oropharyngeal cancers, rates of which are growing rapidly among men in the United States.[5] Beyond cancer, HPV causes genital warts, which negatively affect quality of life and are expensive to treat.[6]

A safe and effective quadrivalent vaccine targeting two oncogenic HPV types responsible for the large majority of HPV-related cancers and two non-oncogenic types responsible for most cases of genital warts was introduced in the United States in 2006.[1] Vaccination is achieved with three doses administered over six months. The HPV vaccine was initially approved only for females, primarily for cervical cancer prevention. Approval was subsequently extended to males, initially for prevention of genital warts and later for anal cancer.[7] Although the Advisory Committee on Immunization Practices (ACIP) recommendation for females was made in 2006, recommendation for males did not occur until 2009 and was permissive (i.e., not the standard of care) until 2011.[7] ACIP currently recommends *routine* quadrivalent HPV vaccination for females and males aged 11 or 12 years and catch-up vaccination for females aged 13–26 and males aged 13–21, although males aged 22–26 may also be vaccinated.[1] Of note for the present paper, ACIP recommends HPV vaccination for *all* MSM through 26 years of age.[1] Nevertheless, recent data suggest that only 35% of adolescent males have initiated the HPV vaccine.[8] Few data are available on sexual minority men, but a recent study with a national sample of gay and bisexual men aged 18–26 found that only 13% had initiated the HPV vaccine series.[9]

Despite the fact that MSM are disproportionately affected by HPV-related cancers, little research has been conducted with this population since ACIP's guidelines were updated. Existing research suggests relatively high acceptance of HPV vaccine among MSM,[10–20] nevertheless many of these studies have significant limitations in that they 1) were conducted prior to ACIP's 2011 recommendation for *routine* HPV vaccination among boys and men and thus were hypothetical in nature, 2) involved MSM who were older than age 26, and 3) lacked a strong theoretical framework. Previous research suggests that despite relatively limited knowledge about HPV, many MSM are willing to get vaccinated.[21] To our knowledge only one study has been conducted with young adult gay and bisexual men since HPV vaccination became routine for males.[9] This study found that men who had

initiated (vs. not initiated) the HPV vaccine reported more worry about getting an HPV-related disease and more favorable norms toward HPV vaccination. Further, provider recommendation for HPV vaccination emerged as a key correlate of vaccine uptake.

The current study addresses the limitations of previous work by using a theory-driven approach to identify predictors of HPV vaccine uptake among a sample of MSM aged 18–26 living in the United States. Another objective was to identify barriers and facilitators to HPV vaccination that may be unique to young MSM. This work was guided by the HPV vaccination framework, which identifies behavioral and environmental factors central to HPV vaccine uptake [22], as well as important beliefs (drawn largely from the Health Belief Model (HBM)[23] and the Theory of Planned Behavior (TPB)[24]) that are proposed to influence people's intentions to get vaccinated.

MATERIALS AND METHODS

Procedure and Participants

We recruited participants via advertisements placed on a popular geospatial smartphone dating application designed for MSM. The application tracks the locations of users' mobile devices such that men can see the profiles of other app users in their immediate vicinity and initiate contact. The campaign served the dual purpose of recruiting participants for a randomized clinical trial (RCT; not reported here) and collecting survey data from MSM who were either ineligible for the RCT or eligible but not interested in enrolling in the RCT. Advertisements ran from November 2014 through February 2015 and described an opportunity to provide input to better understand the health needs of the LGBTQ community. Advertisements appeared throughout the U.S., with pop-up ads shown 5 times —each time shown the first time a user logged onto the application within the scheduled 24-hour advertising period. Banner advertisements ran continuously during the period. No incentives for participation were provided. This study was approved by the Institutional Review Board as an anonymous, exempt study.

Potential participants were taken to an online eligibility screener. A total of 4,783 individuals clicked the advertisements and 2,932 (61%) consented and started the screener. Of those, 801 (27%) were ineligible because of demographic characteristics (female or under 18 years of age), provisional eligibility for the RCT (age 18–29 years, male sex assigned at birth and male gender identity, not in a serious monogamous relationship lasting more than 6 months, had sex with a male, had condomless anal sex (CAS) in prior 6 months, and HIV negative or unknown status), failure to complete the screener, or duplicate responses. The remaining participants were routed to various surveys, including 342 who completed the survey associated with the current study. Eligibility criteria for the present study included being aged 18–26 years, male sex assigned at birth, currently identify as male, and identify as gay, bisexual, queer, or questioning/unsure *or* ever had anal sex with a man. Six participants were subsequently excluded for being older than age 26 (n=2), heterosexual (n=1), not assigned male sex at birth (n=1), not identifying as male (n=1), and unknown sexual identity (n=1) resulting in a final sample size of 336. For the sake of brevity, we refer to participants as MSM throughout the paper, although some participants had never had sex with a man.

Measures

We assessed demographic characteristics, sexual behavior, and health history (Table 1). HPV-related survey questions were adapted from previous research.[15, 19, 25] We asked participants if they ever heard of HPV, and if yes, assessed their knowledge about HPV with 8 items (e.g., "Do you think you can get HPV from oral sex?"). Participants received 1 point for each correct response and points were summed. Before answering additional questions, participants were given information about HPV and the HPV vaccine and informed that the vaccine is now recommended for men up to age 26. Next we assessed provider recommendation for HPV vaccine, whether they had received any doses of HPV vaccine, and if so, how many. Perceived norms (α=.73) and attitudes toward HPV vaccination (α=.85) were assessed using two and three items, respectively.

We assessed behavioral intentions to receive HPV vaccine among unvaccinated participants as follows: "Based on what you know right now about the HPV vaccine, how likely is it that you will receive the HPV vaccine within the next 12 months? (1=*very unlikely*; 2=*unlikely*; 3=*neither likely nor unlikely*; 4=*likely*; 5=*very likely*). Depending on their response (unlikely, undecided, or likely), participants were then asked to select the reason(s) and primary reason underlying their rating from a list of options adapted from Liddon et al. [26] or to specify some other reason. Several additional psychosocial constructs were assessed among unvaccinated participants, most of which used one item unless specified otherwise. TPB constructs included attitudes, subjective norms, perceived behavioral control, and behavioral intentions. HBM constructs included perceived susceptibility to HPV, perceived severity (2 items), perceived benefits (2 items; α=.82), perceived barriers, and self-efficacy. We also measured anticipated regret as it has been identified as an important correlate of HPV vaccination [15]. Mean scores were computed for constructs with multiple items, with higher values representing greater levels. Perceived severity items were not combined, as items captured distinct beliefs.

Data Analysis

We used univariable logistic regression to identify correlates of HPV vaccine uptake (defined as receipt of ≥1 dose of HPV vaccine). All variables associated with uptake at $p \leq .10$ were subsequently entered into a multivariable logistic regression analysis. We used the same procedure (univariable followed by multivariable logistic regression) to identify predictors of provider recommendation for HPV vaccine. Univariable and multivariable linear regression were used to identify correlates of intentions to receive the HPV vaccine among unvaccinated men. Frequencies were computed to identify facilitators and barriers to HPV vaccination among unvaccinated men.

RESULTS

Twenty-one percent (*n*=70) reported receipt of at least 1 dose of HPV vaccine and 9% (n=31) did not know their HPV vaccination status. Among vaccinated men, 30% received one dose, 19% received two doses, 41% completed the 3-dose series, and 10% were unsure how many doses they had received. In all, 81 participants (24%) reported that a provider had recommended they should receive the HPV vaccine.

Correlates of HPV Vaccine Uptake

Correlates of HPV vaccine uptake are reported in Table 1. Provider recommendation was the strongest correlate of uptake. Vaccination was 54% less likely among men aged 21–23 years relative to men aged 18–20 years and Latino men were 65% less likely to have been vaccinated than White men. Men who self-identified as "other" for sexual identity (e.g., queer, questioning/unsure) were over three times more likely to have been vaccinated than were gay men and HIV-positive men were over two times more likely to be vaccinated relative to HIV-negative men. Participants with higher HPV knowledge, more favorable attitudes, and higher perceived norms were more likely to have been vaccinated than participants with lower scores on these constructs. In the multivariable analysis, age, provider recommendation, and HPV vaccine attitudes independently predicted uptake. Participants who received a recommendation for HPV vaccine were over 40 times more likely to have been vaccinated than participants without a recommendation.

Correlates of Provider Recommendation for HPV Vaccine

Because provider recommendation was such a strong predictor of vaccine uptake, we also examined correlates of provider recommendation for HPV vaccine (Table 2). Men who self-identified as "other" for sexual identity were almost three times more likely to have reported receiving a recommendation compared to gay men. Relative to White men, Latino men were 57% less likely and men identifying as "other" race/ethnicity (including American Indian or Alaska Native, Asian, and other) were two times more likely to report a provider recommendation. Men who engaged in CAS were more likely to report receiving a recommendation, as were men with a history of HPV infection. HIV-positive men were over two times more likely to receive a recommendation for HPV vaccine relative to HIV-negative men. Independent predictors included sexual identity, race/ethnicity, CAS, and HIV status.

Psychosocial Correlates of HPV Vaccination Intentions among Unvaccinated Men

Univariable correlates of HPV vaccination intentions included attitudes, subjective norms, perceived benefits of HPV vaccination, perceived susceptibility to HPV infection, self-efficacy, and anticipated regret (Table 3). Although attitudes, perceived benefits, and perceived susceptibility were marginally statistically significant in the multivariable model, only self-efficacy independently predicted intentions such that participants with higher self-efficacy to get vaccinated reported higher HPV vaccination intentions.

Facilitators and Barriers to HPV Vaccination among Unvaccinated Men

Factors endorsed as facilitators and barriers to HPV vaccination are reported in Table 4. Among men not planning to get vaccinated, the most commonly endorsed barriers included lack of a provider recommendation, lack of knowledge about HPV or the vaccine, that their health care provider was unaware of their sexual identity, not feeling at risk for HPV, and having concerns about vaccine safety. Additionally, several participants entered "already infected with HPV" or "not sexually active" as deterrents to getting vaccinated. When prompted to indicate the primary barrier, the top three primary barriers endorsed by this

group included lack of a provider recommendation, not feeling at risk for HPV, and vaccine cost.

Among undecided men, the most commonly endorsed barriers included not having enough information, lack of a provider recommendation, and the fact that they had not shared their sexual identity with their provider. Vaccine cost was also frequently endorsed by this group. Common facilitating factors included worry about HPV infection, cancer, and genital warts. The top three primary barriers endorsed by this group included lack of information, lack of provider recommendation, not having disclosed their sexual identity to their physician, and vaccine cost (the last two were tied for third).

Among men planning to get vaccinated, the most commonly endorsed facilitators included worry about becoming infected with HPV, developing an HPV-related cancer, and contracting genital warts. Additionally, approximately 10% of men in this group cited "general prevention" or "precaution" as the reason they were planning to get vaccinated. The top three primary facilitators endorsed by this group included worry about HPV and cancer and "general prevention."

DISCUSSION

The present study is one of the first to examine predictors of HPV vaccine uptake among young MSM since ACIP's updated recommendations for males. Although MSM are at high risk for HPV infection, only 21% of participants had initiated the HPV vaccine. This percentage is slightly higher than the 13% estimate reported by a similar study [9] conducted one year earlier. It is unclear whether this difference represents a real increase in uptake or simply reflects differences in the timing of data collection or participant characteristics across the two studies. Although the samples were quite similar on many demographic characteristics, our sample contained more men who self-identified as gay (vs. bisexual) and a lower percentage of men earning more than $50,000 per year. Regardless of the reason(s) underlying the different rates of uptake, that the overall rate of uptake remains low suggests a crucial need for interventions designed to increase HPV vaccination among young MSM.

Consistent with previous research,[9, 27, 28] findings underscore the critical role of the health care provider in promoting HPV vaccination. Most men who had received a provider recommendation for HPV vaccine had been vaccinated and provider recommendation was the single largest predictor of uptake. Disparities in provider recommendation practices were observed for some subgroups of MSM. For example, participants who had recently engaged in CAS or were HIV-positive were more likely to report that a provider had recommended the vaccine. Additionally we found differences in provider recommendation practices by participant race/ethnicity, similar to previous research.[29] These findings call for a more in-depth examination of provider recommendation practices around HPV vaccine and speak to the importance of integrating providers into future HPV vaccination interventions with young MSM.

Disparities in HPV vaccine uptake were observed by age, race/ethnicity, and HIV status. That the youngest men (18–20 years old) were more likely to have been vaccinated is

consistent with national data.[8] This finding could reflect routine efforts to vaccinate boys and young men per updated ACIP recommendations, efforts that may not necessarily be related to participants' sexual behavior or identity. As ACIP recommends HPV vaccination for *all* MSM through age 26, it will be important for intervention efforts to target MSM in their early to mid-20s. That Latino men were less likely to have been vaccinated than White men is concerning. Additional research is needed to establish whether this is an emerging trend or limited to the present sample. Finally, although the proportion of HIV-positive men sampled was relatively small (~9%), we observed higher rates of uptake among this subgroup. Given the high rates of anal cancer among HIV-positive MSM,[4] vaccination is particularly important for these men.

Consistent with previous studies,[9, 15, 19] findings point to several modifiable factors that could be integrated into future HPV vaccination interventions with MSM. Vaccine uptake was associated with HPV knowledge, attitudes, and perceived norms. Moreover, men with higher self-efficacy to get vaccinated reported stronger intentions to receive HPV vaccine. Increasing HPV knowledge (e.g., how HPV is transmitted, its associated health consequences) while modifying relevant psychosocial beliefs could be a promising strategy for increasing uptake. Social marketing campaigns designed specifically for young MSM could be helpful in achieving this goal.[30]

Another objective was to identify barriers and facilitators to HPV vaccination that may be unique to young MSM. Although many of these barriers/facilitators (e.g., lack of information or provider recommendation; cost; desire to prevent cancer) have been observed in other populations,[26, 27] some new factors were identified. First, worry about getting an HPV-related cancer and genital warts were frequently endorsed facilitating factors in this sample of MSM. This finding is consistent with previous research demonstrating that relative to heterosexual men, gay and bisexual men report greater worry about and perceived vulnerability to HPV-related diseases.[12] Emphasizing the multiple disease prevention benefits of HPV vaccination should be a priority in future interventions with young MSM. Second, not having disclosed their sexual identity to their health care provider was a common barrier to vaccination. Reiter and colleagues [9] found higher rates of HPV vaccination among gay and bisexual men who had disclosed (vs. not disclosed) their sexual orientation to their health care provider. Given the crucial role providers play in HPV vaccine uptake, sexual identity disclosure could represent an important obstacle to HPV vaccination for some young MSM.

Strengths of this study include its recruitment of a relatively large sample, use of a strong theoretical framework, and focus on barriers and facilitators specific to young MSM. Limitations include the use of single items to assess many theoretical constructs and use of participant-reported vaccination status and provider recommendation. Further, findings may be of limited generalizability given the recruitment strategy and the fact that MSM under age 18 years were not included. Additional research is needed to replicate and extend these findings.

Conclusions

About one fifth of young adult MSM in this convenience sample had initiated the HPV vaccine series. Findings highlight potential disparities in HPV vaccine uptake, as well as disparities in provider recommendation practices for HPV vaccination. Results point to important targets for intervention such as clarifying misconceptions about HPV, modifying psychosocial beliefs associated with HPV vaccination, and addressing barriers and facilitators to HPV vaccination specific to young MSM.

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Table 1

Participant characteristics and univariable and multivariable correlates of HPV vaccine uptake (n = 305)

Categorical variables	No. Initiated HPV Vaccine/Total No. in Category (%)	Univariable OR (95% CI)	Multivariable OR (95% CI)
Age (Mean = 22.5; SD = 2.5)			
18–20 years	23/73 (32)	1.00 (Ref)	1.00 (Ref)
21–23 years	19/108 (18)	0.46* (0.23, 0.93)	0.19* (0.05, 0.74)
24–26 years	28/124 (23)	0.63 (0.33, 1.21)	0.24* (0.06, 1.00)
Sexual identity			
Gay	56/254 (22)	1.00 (Ref)	1.00 (Ref)
Bisexual	7/37 (19)	0.83 (0.34, 1.98)	0.47 (0.10, 2.16)
Other [a]	7/14 (50)	3.54* (1.19, 10.50)	1.43 (0.20, 10.27)
Race/ethnicity			
White	43/175 (25)	1.00 (Ref)	1.00 (Ref)
Black	7/21 (33)	1.54 (0.58, 4.05)	3.34 (0.60, 18.48)
Latino	7/69 (10)	0.35* (0.15, 0.81)	0.28 (0.07, 1.10)
Other [b]	13/40 (33)	1.48 (0.70, 3.12)	1.00 (0.26, 3.80)
Education			
High school grad or less	8/39 (21)	1.00 (Ref)	--
Some college	30/131 (23)	1.15 (0.48, 2.77)	
College grad or more	32/135 (24)	1.20 (0.50, 2.88)	
Annual income			
Less than $25,000	39/169 (23)	1.00 (Ref)	--
$25,000-$49,000	20/83 (24)	1.06 (0.57, 1.96)	
$50,000 or more	5/24 (21)	0.88 (0.31, 2.50)	
Relationship status			
Not in a relationship	59/243 (24)	1.00 (Ref)	--
Monogamous relationship >6 mo	4/31 (13)	0.46 (0.16, 1.38)	
Open relationship >6 mo	3/13 (23)	0.94 (0.25, 3.51)	
Any relationship <6 mo	4/18 (22)	0.89 (0.28, 2.81)	
Location			
Urban	27/137 (20)	1.00 (Ref)	--

Categorical variables	No. Initiated HPV Vaccine/Total No. in Category (%)	Univariable OR (95% CI)	Multivariable OR (95% CI)
Suburban	35/127 (28)	1.55 (0.87, 2.75)	
Rural	4/33 (12)	0.56 (0.18, 1.73)	
Anal sex with a man			
No	9/46 (20)	1.00 (Ref)	--
Yes	59/254 (23)	1.24 (0.57, 2.73)	
Condomless anal sex past 6 mo			
No	53/245 (22)	1.00 (Ref)	--
Yes	17/60 (28)	1.43 (0.76, 2.71)	
HPV infection			
No	64/285 (23)	1.00 (Ref)	--
Yes	6/19 (32)	1.59 (0.58, 4.36)	
HIV status			
HIV negative	45/197 (23)	1.00 (Ref)	1.00 (Ref)
HIV positive	10/24 (42)	2.41* (1.00, 5.80)	1.98 (0.36, 10.99)
Never tested	15/82 (18)	0.76 (0.39, 1.45)	0.51 (0.15, 1.76)
Provider recommendation			
No	11/225 (5)	1.00 (Ref)	1.00 (Ref)
Yes	58/78 (74)	56.42** (25.58, 124.42)	42.23** (14.90, 119.68)

Continuous variables	Unvaccinated (*n* = 235) Mean (SD)	Vaccinated (*n* = 70) Mean (SD)	Univariable OR (95% CI)	Multivariable OR (95% CI)
HPV knowledge [c]	4.71 (2.33)	5.77 (1.82)	1.27** (1.10, 1.46)	1.11 (0.87, 1.43)
HPV vaccine attitudes [d]	4.10 (0.91)	4.78 (0.51)	4.62** (2.58, 8.28)	6.22** (2.30, 16.82)
Perceived norms [e]	1.93 (0.86)	2.40 (0.94)	1.79** (1.32, 2.42)	1.08 (0.64, 1.81)

Note: SD = standard deviation; OR = odds ratio; CI = confidence interval. Thirty-one participants did not know their HPV vaccination status and were excluded from this analysis.

[a] Queer, questioning/unsure, or other (e.g., pansexual)

[b] American Indian or Alaska Native, Asian, or other (e.g., multi-racial)

[c] 8-item summed scale; participants received 1 point for each correct item

[d] 3-item mean scale; e.g., I think that getting the HPV vaccine is: 1 = *harmful* to 5 = *beneficial*

[e] 2-item mean scale; e.g., Most people my age and gender have received the HPV vaccine; 1 = *strongly disagree* to 5 = *strongly agree*

* $p \leq .05$

** $p \leq .001$.

Table 2

Univariable and multivariable correlates of provider recommendation for HPV vaccine (n = 324)

Variable	Univariable OR (95% CI)	Multivariable OR (95% CI)
Age		
18–20 years	1.00 (Ref)	--
21–23 years	0.62 (0.33, 1.19)	
24–26 years	0.60 (0.32, 1.12)	
Sexual identity		
Gay	1.00 (Ref)	1.00 (Ref)
Bisexual	1.56 (0.74, 3.26)	1.79 (0.79, 4.05)
Other [a]	2.95* (1.03, 8.46)	3.81* (1.27, 11.45)
Race/ethnicity		
White	1.00 (Ref)	1.00 (Ref)
Black	1.13 (0.45, 2.88)	1.17 (0.42, 3.23)
Latino	0.43* (0.20, 0.93)	0.42* (0.19, 0.94)
Other [b]	2.07* (1.02, 4.17)	2.46* (1.18, 5.14)
Education		
High school grad or less	1.00 (Ref)	--
Some college	1.43 (0.65, 3.15)	
College grad or more	0.91 (0.40, 2.04)	
Annual income		
Less than $25,000	1.00 (Ref)	--
$25,000–$49,000	0.76 (0.42, 1.39)	
$50,000 or more	0.61 (0.22, 1.72)	
Relationship status		
Not in a relationship	1.00 (Ref)	--
Monogamous relationship >6 mo	1.21 (0.53, 2.75)	
Open relationship >6 mo	0.84 (0.23, 3.12)	
Any relationship <6 mo	1.33 (0.49, 3.60	
Location		
Urban	1.00 (Ref)	--
Suburban	1.04 (0.61, 1.78)	
Rural	0.53 (0.19, 1.48)	
Anal sex with a man		
No	1.00 (Ref)	--
Yes	1.15 (0.56, 2.38)	
Condomless anal sex past 6 mo		
No	1.00 (Ref)	1.00 (Ref)
Yes	1.89* (1.04, 3.43)	1.93* (1.00, 3.73)
HPV infection		
No	1.00 (Ref)	1.00 (Ref)

Variable	Univariable OR (95% CI)	Multivariable OR (95% CI)
Yes	2.88* (1.13, 7.35)	2.14 (0.74, 6.19)
HIV status		
HIV negative	1.00 (Ref)	1.00 (Ref)
HIV positive	2.37* (1.05, 5.36)	3.34** (1.30, 8.56)
Never tested	0.90 (0.50, 1.63)	1.06 (0.56, 2.02)

Note: OR = odds ratio; CI = confidence interval. Twelve participants did not know whether they had received a provider recommendation for HPV vaccine and were excluded from this analysis.

[a] Queer, questioning/unsure, or other (e.g., pansexual)

[b] American Indian or Alaska Native, Asian, or other (e.g., multi-racial)

* $p \leq .05$.

** $p \leq .01$.

Table 3

Psychosocial correlates of intentions to receive the HPV vaccine in the next 12 months among unvaccinated men (n = 235)

Variable	Univariable Model Standardized Beta Coefficient	Multivariable Model Standardized Beta Coefficient (partial eta squared)
HPV knowledge [a]	.06	--
HPV vaccine attitudes [b]	.40**	.15 (.13)
Subjective norms [c]	.30**	.01 (.01)
Perceived norms [d]	.03	--
Perceived behavioral control [e]	.01	--
Perceived benefits [f]	.42**	.17 (.12)
Perceived susceptibility to HPV [g]	.24**	.12 (.13)
Perceived severity of HPV [h]	.04	--
Perceived severity of anal cancer [i]	.00	--
Self-efficacy [j]	.37**	.19** (.18)
Anticipated regret [k]	.21**	.03 (.03)

[a] 8-item summed scale; participants received 1 point for each correct item

[b] 3-item mean scale; e.g., I think that getting the HPV vaccine is: 1 = *harmful* to 5 = *beneficial*

[c] Most people who are important to me would want me to receive the HPV vaccine; 1=*strongly disagree* to 5=*strongly agree*

[d] 2-item mean scale; e.g., Most people my age and gender have received the HPV vaccine; 1 = *strongly disagree* to 5 = *strongly agree*

[e] There are factors beyond my control that would prevent me from getting the HPV vaccine; 1=*strongly disagree* to 5=*strongly agree*

[f] 2-item mean scale; Getting the HPV vaccine a) is a good thing for me to do for my overall health and b) would give me peace of mind about my overall health; 1=*strongly disagree* to 5=*strongly agree*

[g] If you don't get vaccinated for HPV, how likely is it that you will become infected with HPV at some point in your life? 1=*very unlikely* to 5=*very likely*)

[h] How serious would it be for you if you became infected with HPV? 1=*not at all serious* to 5=*extremely serious*

[i] How serious would it be for you if you developed anal cancer?" 1=*not at all serious* to 5=*extremely serious*

[j] I feel confident in my ability to receive the HPV vaccine; 1=*strongly disagree* to 5=*strongly disagree*

[k] If you don't get vaccinated for HPV, how much would you regret it if you developed an HPV-related disease (anal cancer, oral cancer, genital warts) at some point in your life? 1=*not at all* to 5=*a lot*

* $p \leq .05$.

** $p \leq .01$.

Table 4

Barriers and facilitators to HPV vaccination among unvaccinated men (*n* = 235)

Reason	Not planning to get vaccinated (*n* = 97) n (%)	Undecided (*n* = 71) n (%)	Planning to get vaccinated (*n* = 67) n (%)
Barriers			
I don't know enough about HPV or the HPV vaccine	33 (34)	**41 (58)**	--
My doctor has not recommended it	**45 (46)**	**44 (62)**	--
My provider doesn't know my sexual identity	28 (29)	**29 (41)**	--
I'm not at risk for HPV and don't need the vaccine	**30 (31)**	10 (14)	--
I don't like getting shots	12 (12)	4 (6)	--
I'm concerned about vaccine safety or side effects	22 (23)	12 (17)	--
Vaccine costs too much/Not covered by insurance	**16 (17)**	**22 (31)**	--
I'm in a monogamous/committed relationship	11 (11)	7 (10)	--
Facilitators			
My doctor recommended it	--	4 (6)	4 (6)
I'm worried I might get HPV	--	15 (21)	**52 (78)**
I'm worried I might get an HPV-related cancer	--	14 (20)	**43 (64)**
I'm worried I might get genital warts	--	16 (23)	34 (51)
Someone close to me had an HPV-related disease	--	2 (3)	2 (3)
Other	22 (23)	7 (10)	**13 (19)**

Note: Each column reports the number (percentage) of participants who selected each factor as a reason underlying their intention to get vaccinated for HPV in the next 12 months. Participants were divided into three groups: those who were not planning to get vaccinated (responded *very unlikely* or *unlikely*), undecided (*neither likely nor unlikely*), and planning to get vaccinated (*likely* or *very likely*). Participants were instructed to check all that apply and/or specify some other reason and then select the primary reason underlying their rating. Bold-faced values in each column represent the three most frequently selected primary reasons underlying vaccination intentions for a given group. Columns with more than three bold-faced values indicate a tie.