


# Human Papillomavirus Prevalence and Vaccination Rates Among Users of Pre-Exposure Prophylaxis for Human Immunodeficiency Virus Prevention

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Paul Rotert<sup>1</sup>, Christopher Wheldon<sup>2</sup>, Jenn Kownack<sup>1</sup>, Zoe Sullivan-Blum<sup>1</sup>,  
Brendan Cokington<sup>3</sup>, Karishma Khetani<sup>4</sup>, Kavindu Ndeti<sup>1</sup>, Kevin Skyes<sup>1</sup> , and  
Megha Ramaswamy<sup>1</sup> 

## Abstract

**Introduction:** Our study provides data on the prevalence of human papillomavirus (HPV) related disease and vaccination rates among users of pre-exposure prophylaxis (PrEP) in a primary care clinic. Results highlight an opportunity to partner HIV and HPV prevention efforts. **Methods:** This is a retrospective chart review of PrEP patients in an urban Midwestern Family Medicine clinic. We conducted univariate analyses for HPV vaccination status and the prevalence of any HPV-related disease. We then examined bivariate relationships between vaccination status and insurance coverage, provider type, and age. **Results:** Of all 78 PrEP patients identified, 21.8% (n = 17) were vaccinated. Of the 59 patients 45 years or younger, 28.8% (n = 17) were vaccinated. There was no association between insurance or provider type and vaccination status. Patients 26 years or younger were 3 times more likely to be vaccinated than those ages 27 to 45 (56.3% vs 18.6%,  $P = .0011$ ). Three unvaccinated patients had HPV-related disease. **Conclusions:** Despite ongoing risk of HPV infection and frequent interaction with the medical system, this study found most PrEP users continue to be unvaccinated. This is a significant missed opportunity for HPV prevention. With the FDA approval of the HPV vaccine for individuals age 9 to 45, PrEP patients in this age range would benefit from clinicians partnering HPV vaccination with PrEP prescribing.

## Keywords

PrEP, HPV vaccine, HPV prevalence, MSM, retrospective chart review

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## Introduction

PrEP (pre-exposure prophylaxis) is an effective strategy to prevent HIV infection and is indicated for individuals at higher risk of infection from sexual contact or injection drug use. Men who have sex with men (MSM) account for approximately 70% of new HIV infections each year and also have a higher incidence of anal and oropharyngeal cancers.<sup>1,2</sup> Human papillomavirus (HPV) is detected in over 90% of all anal cancers and 70% of oropharyngeal cancers.<sup>1,2</sup> These infections are mostly caused by high risk HPV strains 16 and 18 and can be prevented by the HPV vaccine.<sup>2</sup> The utilization of PrEP has greatly reduced the HIV prevalence rate of MSM, however, the prevalence of HPV in HIV seronegative MSM has continued to increase.<sup>3,4</sup>

PrEP use became widespread through a model that can be applied to HPV vaccination. The HPV vaccine, Gardasil,

was first approved by the U.S. Food and Drug Administration (FDA) in 2006 for females age 9 to 26 as a highly effective strategy to prevent HPV infection. In 2009, males age 9 to 26 were approved to receive the vaccine. Then in 2018, the age range was expanded and now includes all individuals age 9 to 45. In turn, PrEP was FDA approved in 2012 as a highly effective strategy to prevent HIV infection. Behavioral

<sup>1</sup>University of Kansas Medical Center, Kansas City, KS, USA

<sup>2</sup>Temple University, Philadelphia, PA, USA

<sup>3</sup>Cleveland Clinic Foundation, Cleveland, OH, USA

<sup>4</sup>Rutgers New Jersey School of Medicine, Newark, NJ, USA

### Corresponding Author:

Megha Ramaswamy, Department of Population Health, University of Kansas Medical Center School of Medicine, 3901 Rainbow Blvd, Mail Stop 1008, Kansas City, KS 66160, USA.

Email: mramaswamy@kumc.edu



risk factors of HPV and HIV are similar among high-risk populations (eg, receptive anal intercourse) and there is some evidence that PrEP users may be at greater risk for HPV infection given behavioral compensation following PrEP initiation.<sup>5,6</sup> Despite the expansion of PrEP accessibility, HPV vaccination rates appear low among PrEP users.<sup>7</sup> The culture of prevention among PrEP users and their frequent interaction with the healthcare system can be capitalized to administer the HPV vaccine at PrEP appointments.

Although most men across various studies believe that the HPV vaccine is safe and understand its benefit for cervical cancer prevention, there is low awareness of other forms of HPV-related disease and HPV vaccine benefits.<sup>8,9</sup> In a national probability study, less than 20% of MSM were aware that HPV causes anal cancer.<sup>10</sup> School-based vaccination programs have shown to have much higher vaccine rates; however, those who have aged out of school but are now eligible for the HPV vaccine do not have the knowledge of its availability.<sup>11</sup> Countries such as Scotland have adopted vaccine programs through which the HPV vaccine is offered to specific high-risk populations, like MSM, in a sexual health clinics. These programs have led to marked increases in vaccine rates, with first dose uptake between 64% and 77%.<sup>12</sup>

There is a lack of clinical data for HPV vaccine rates among MSM engaged in PrEP care. Thus, in this retrospective study, medical records of current or historical PrEP patients seen in the Family Medicine clinic at the University of Kansas Medical Center (KUMC) were evaluated to determine vaccine status and history of HPV-related disease. We decided to focus specifically on PrEP users because, in addition to being at potential at high risk for HPV, they are already engaged in HIV prevention and are likely to be amenable to HPV prevention as well. This study will help us understand the prevalence of HPV related diseases and the rate of vaccination within this population. The results will help providers and insurance companies recognize the continued need for HPV vaccine promotion in this vulnerable patient population.

## Methods

This study was a retrospective chart review of 78 patients at KUMC clinics who are 18 years of age or older and were either currently taking PrEP or had taken it at least once in the past 5 years. The chart review was conducted in April 2020, less than 1 month after the COVID-19 lockdowns. Thus, we don't expect the pandemic to have had an effect on previous receipt of HPV vaccine. The study was approved by the KUMC IRB (IRB #: STUDY00145228).

Medical charts of men and women were included if they were aged 18 and older who were receiving PrEP through KUMC clinics and (1) were receiving PrEP at the time of

recruitment, regardless of compliance habits or (2) were not receiving PrEP at the time of recruitment but had done so at least once in the past and continued to be followed in-clinic for high-risk behaviors. All participant medical record numbers (MRNs) were provided through a REDCap database of patients receiving PrEP at KUMC clinics. Current or prior PrEP treatment was determined from patient's medication administration records (MARs) or provider clinical note documentation.

Details on how the information was collected can be found in Appendix 1. Project personnel accessed clinical charts using medical record numbers. All relevant data was cataloged in a secure REDCap database. All protected health information (PHI) was entered directly into REDCap and stored on the secure HIPAA compliant REDCap server. No PHI was downloaded. Access to the REDCap data was restricted to the project personnel.

Data collected for this project included basic demographics, status of PrEP use, provider type and department, HPV vaccination status, presence and type of HPV-related disease, and HPV testing results, if performed. A full description of the study measures can be found in Appendix 2.

The 2 primary outcomes of interest were the HPV vaccination rate and prevalence of any HPV-related disease among PrEP users at KUMC. After completing data collection, univariate analysis of patient characteristics, including demographics and primary outcomes, was conducted through REDCap to determine the frequency of the following: (1) each demographic category, (2) provider type and provider department, (3) patients who are either currently or previously on PrEP, (4) HPV vaccination status, (5) HPV-related disease status, and (6) patients with each HPV-related disease. Bivariate analysis was also conducted using open epi and chi square analysis to determine the relationships between vaccination status and (1) age (18-26 vs 27-45), (2) insurance coverage, and (3) provider type (Attending vs Resident). All data was reported in a chart-based format. Demographic data had its own chart, whereas the remaining information was combined into a separate chart.

## Results

As outlined in Table 1, the majority of study participants were male (94.9%), White (80.8%), and non-Hispanic (89.7%), with private insurance (88.5%). All patients were >18 years of age and the majority (78.2%) were <45. Most (64.1%) were single and most (88.0%) listed "men only" as their preferred sexual partners. There was also an adequate division between provider type, with 65.4% seeing an Attending and 32.1% seeing a Resident. The majority of participants (79.5%) were currently using PrEP.

Of the study participants, 56.25% were vaccinated in the 18 to 26 age group versus 18.6% vaccinated in the 27 to 45 age group ( $P=.0011$ , Figure 1). There was no documentation

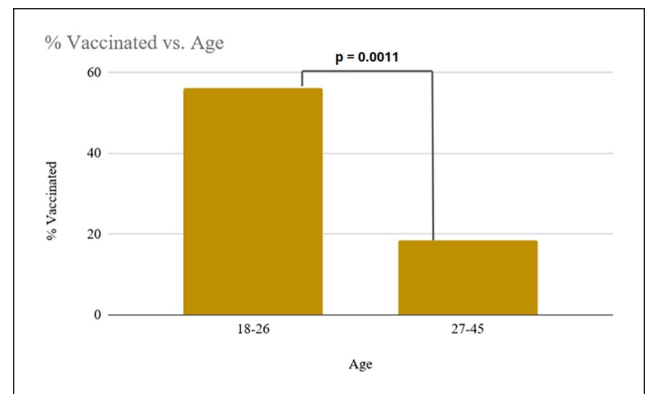
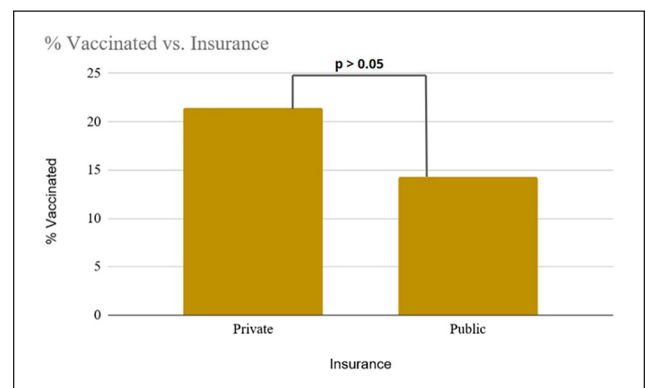
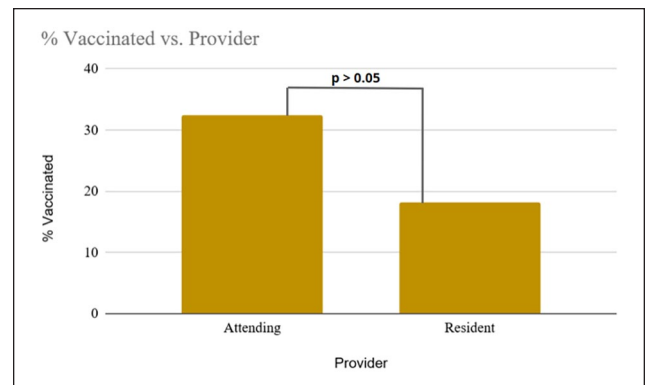
**Table 1.** Demographics.

Demographic characteristics of 78 participants	Frequency—n (%)
Gender identity	
Male	74 (94.9)
Female	2 (2.6)
Transgender male	1 (1.3)
Transgender female	1 (1.3)
Age (years)	
18-26	16 (20.5)
27-45	45 (57.7)
>45	17 (21.8)
White/Caucasian race	63 (80.8)
Non-Hispanic/Latino ethnicity	70 (89.7)
Private insurance holders	69 (88.5)
Relationship status	
Single	50 (64.1)
In a relationship, not married	18 (23.1)
Married	8 (10.3)
Divorced	2 (2.6)
Widowed	0
Primary provider types and departments	
Family medicine provider	77 (98.7)
Attending physician	51 (65.4)
Resident	25 (32.1)
Physician assistant	2 (2.6)
Nurse practitioner	0
PrEP use	
Currently using PrEP	62 (79.5)
Not currently using PrEP	16 (20.5)
Presence of HPV-related disease	
Yes	3 (3.8)
No	75 (96.2)
HPV-related disease type	
Genital cutaneous warts	2 (0.03)
Anal lesions ranging from anal intraepithelial neoplasia I (AIN I) to AIN 3 and anal cancer	1 (0.01)

of any patients having denied the vaccines. There were no statistically significant associations found between vaccination and the type of insurance ( $P > .05$ , Figure 2) or provider ( $P > .05$ , Figure 3). Three patients had an HPV-related disease (genital warts and anal lesions). All 3 of these patients were unvaccinated and under age 45.

## Discussion

The findings suggest that, despite frequent interactions with the medical system during PrEP appointments, many patients were still not being vaccinated against HPV. This is a significant missed opportunity to partner HIV and HPV prevention efforts and help prevent HPV complications for patients taking PrEP. Efforts should focus on increasing

**Figure 1.** Percent vaccinated versus age.**Figure 2.** Percent vaccinated versus insurance.**Figure 3.** Percent vaccinated versus provider.

routine vaccination of PrEP patients 18 to 26 and facilitating shared clinical decision making for patients 27 to 45.

PrEP patients aged 18 to 26 were 3 times more likely to be vaccinated against HPV compared to patients aged 27 to 45 in the current study; however, over 40% of those in the catchup age group still had no record of previous HPV vaccination. Some of the patients may have received HPV vaccination outside of KMUC health system. To ensure vaccine

coverage of PrEP patients, it should be standard practice to record HPV vaccine history in the patient record. The sensitivity of self-reported HPV vaccination for adult men who have sex with men was over 80% in a recent study.<sup>13</sup> HPV vaccination status can also be determined through immunization registries in some state and local municipalities.

It is important to note that, for individuals aged 27 to 45, the Advisory Committee on Immunization Practices (ACIP) advises shared decision making between providers and patients to determine vaccine administration. Vaccinating patients age 27 to 45 is less beneficial than the vaccinating before HPV exposure (ideally age 11-12). However, unvaccinated individuals, especially those with ongoing risk of exposure, still benefit from vaccination up to age 45 to protect against new HPV exposures. Interventions, such as decision aids, are needed to help facilitate the shared clinical decision recommendation in practice.

One significant factor that affects HPV vaccination rates is assigned sex at birth. Patients in this study were nearly 95% male. Nationally, males of all ages have lower HPV vaccination uptake when compared to females.<sup>14</sup> Many men, including MSM, view HPV as a risk only for women and are unaware of the potential health implications for themselves.<sup>9</sup> Less than 20% of gay and bisexual men nationally were aware that HPV can cause anal cancer.<sup>10</sup> Increasing knowledge of the health effects of HPV infection among men is crucial to increasing vaccinations in this population.

Our study also evaluated HPV related disease. Only 3 patients had documented HPV disease (3.8%). This is an expected finding given the lack of clear, evidence-based HPV screening practices among men. When testing is performed, the prevalence of genital HPV among men is much higher (45.2%).<sup>15</sup> The incidence and prevalence of current HPV infections among PrEP patients specifically has not been reported.

Primary care clinics would benefit from instituting HPV vaccine programs that target PrEP patients and individuals aged 27 to 45. For these programs to be widely effective, universal insurance coverage is needed. Coverage is broad for patients age 9 to 26 but some insurers have not yet expanded coverage for individuals age 27 to 45. The uncertainty of coverage leaves clinics unable to offer the vaccination without concern patients will later be charged. Many clinics either do not offer vaccination to patients above age 26 or require patients contact their insurance company to check approval status before initiating vaccination. This burden can lead to delayed vaccination and patients being lost to follow up.

Merck, the pharmaceutical company that manufactures the HPV vaccine, Gardasil, created a website (<https://www.merckvaccines.com/vaccine-resources-tools/plan-specific-information/>) that allows entry of insurance plan type and state to check insurance coverages status. Utilization of this resource has great potential to increase vaccination rates for

ages 27 to 45 but requires additional work by clinic staff and assumes the website is providing accurate, up to date information.

There are several strengths to this study. First, it demonstrates inadequate HPV vaccination coverage among PrEP users in a primary care clinic. There is limited data on HPV vaccine rates among PrEP patients in the literature. Second, it highlights a statistically significant difference in vaccination rates between individuals age 18 and 26 and 27 to 45. Third, it highlights an opportunity to partner HIV and HPV prevention strategies.

The study also had some limitations. First, the majority of patients in the study were MSM, White, and insured and therefore results might not be applicable to other PrEP patients such as non-MSM, people of color, and those without health insurance. Second, data were collected through a retrospective chart review, and it is possible participants in the study group received the HPV vaccine at another location, but it was not properly uploaded into their Electronic Medical Record.

Based on these findings we recommend that HPV vaccination be assessed for all PrEP patients and routinely recommended for those 26 years of age and younger. Furthermore, PrEP patients 27 to 45 should be informed about the availability of HPV vaccination and engaged in shared clinical decision making. MSM on PrEP should be informed about anal cancer risk factors, anal cancer prevention, and the availability of secondary screening. Future studies are needed to identify and evaluate implementation strategies including systems-level interventions that address patient and provider education, clinic workflows, and insurance coverage. These interventions should also address gaps in vaccine surveillance among PrEP patients.

## Appendix I

The following details how different information was obtained through chart review:

1. Gender identity was found below the patient's name on the left-hand side.
2. Age, race, ethnicity, and relationship status was found under the "History" tab at the top of a patient's chart and by clicking on the "Socioeconomic" tab on the left-hand side. Recent clinic notes were also used to determine current sexual practices and relationship status.
3. Sexual practices were found under the "History" tab at the top of a patient's chart and by clicking on the "Substance and Sexual Activity" tab on the left-hand side.
4. Provider information was found under "Chart Review" at the top of a patient's chart and by looking under "Notes."



5. Insurance status was found on the left-hand side of the patient's tab under "Coverage."
6. Whether the patient was currently on PrEP or was at least once in the past was found by either reviewing a recent clinic physician note under "Chart Review" and clicking "Notes" or reviewing their MAR under the "Meds" section of "Chart Review" and checking prior refill dates.
7. HPV vaccination status was found by clicking the "Snapshot" tab at the top of a patient's chart and by scrolling down to "Immunizations/Injections."
8. HPV-related diseases were recorded by going to the "History" tab at the top of a patient's chart and going through the "Problem List" screen.
9. Whether HPV DNA testing was performed was found under "Results" at the top of the patient's chart and by searching under the "Pathology" tab on the left-hand side.

## Appendix 2

Detailed description of data collected for this project:

- Demographics (gender identity, age, race, ethnicity, insurance coverage—private or public and which type, relationship status—married, single, divorced, widowed, in a relationship, current sexual practices—sex with men, women, and/or or transgender men/women).
- Provider type (Attending physician or Resident).
- Provider department (Family Medicine or Internal Medicine).
- Is/was the patient (1) currently on PrEP or (2) previously on it?
- HPV vaccination status (vaccinated, unvaccinated, or declined).
- Has the patient been diagnosed with a HPV-related disease (Yes or No)—if so, what was the disease (list of answer choices below)?
  - Cervical lesions ranging from cervical intraepithelial neoplasia 1 (CIN 1) to CIN 3 and cervical carcinoma.
  - Vulvar lesions ranging from vulvar intraepithelial neoplasia 1 (VIN 1) to VIN3 and vulvar cancer of any kind.
  - Vaginal lesions ranging from vaginal intraepithelial neoplasia 1 (VaIN 1) to VaIN 3 and any kind of vaginal cancer
  - Non-genital cutaneous warts.
  - Genital cutaneous warts.
  - Anal lesions ranging from anal intraepithelial neoplasia 1 (AIN 1) to AIN 3 and anal cancer.
  - Penile cancer.

- Oropharyngeal cancer of any kind.
- Bowen's disease.
- Respiratory papillomatosis.
- Other: \_\_\_\_\_.
- If a study participant has been diagnosed with an HPV-related disease, was HPV testing performed (Yes or No)? If yes, what was the result (HPV DNA-positive or -negative)?

### Declaration of Conflicting Interests

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### ORCID iDs

Kevin Skyes  <https://orcid.org/0000-0001-9379-3406>

Megha Ramaswamy  <https://orcid.org/0000-0003-4167-9024>

### References

1. Chaturvedi AK, Graubard BI, Broutian T, et al. Effect of prophylactic human papillomavirus (HPV) vaccination on oral HPV infections among young adults in the United States. *J Clin Oncol*. 2018;36:262-267.
2. Palefsky JM, Giuliano AR, Goldstone S, et al. HPV vaccine against anal HPV infection and anal intraepithelial neoplasia. *N Engl J Med*. 2011;365(17):1576-1585.
3. Mboumba Bouassa RS, Bélec L, Gubavu C, et al. High prevalence of anal and oral high-risk human papillomavirus in human immunodeficiency virus-uninfected French men who have sex with men and use preexposure prophylaxis. *Open Forum Infect Dis*. 2019;6(9):ofz291.
4. Fonner VA, Dalgligh SL, Kennedy CE, et al. Effectiveness and safety of oral HIV preexposure prophylaxis for all populations. *AIDS*. 2016;30(12):1973-1983.
5. Newcomb ME, Moran K, Feinstein BA, Forscher E, Mustanski B. Pre-exposure prophylaxis (PrEP) use and condomless anal sex: evidence of risk compensation in a cohort of young men who have sex with men. *J Acquir Immune Defic Syndr*. 2018;77(4):358-364.
6. Morgan E, Meites E, Markowitz LE, et al. Sexual positioning practices and anal human papillomavirus infection among young men who have sex with men and transgender women-Chicago, Illinois, 2016-2018. *Sex Transm Dis*. 2021;48(10):709-713.
7. Wheldon CW, Eaton LA, Watson RJ. Predisposing, enabling, and need-related factors associated with human papillomavirus vaccination intentions and uptake among black and hispanic sexual and gender diverse adults in the USA. *J Racial*

- Ethn Health Disparities*. Published online January 3, 2022. doi:10.1007/s40615-021-01214-1
8. Thompson EL, Wheldon CW, Rosen BL, Maness SB, Kasting ML, Massey PM. Awareness and knowledge of HPV and HPV vaccination among adults ages 27-45 years. *Vaccine*. 2020;38(15):3143-3148.
  9. Grace D, Gaspar M, Paquette R, et al. HIV-positive gay men's knowledge and perceptions of human papillomavirus (HPV) and HPV vaccination: a qualitative study. *PLoS One*. 2018;13(11):e0207953.
  10. Wheldon CW, Maness SB, Islam JY, Deshmukh AA, Nyitray AG. Gay and bisexual men in the US lack basic information about anal cancer. *J Low Genit Tract Dis*. 2021;25(1):48-52.
  11. Tsu VD, Cernuschi T, LaMontagne DS. Lessons learned from HPV vaccine delivery in low-resource settings and opportunities for HIV prevention, treatment, and care among adolescents. *J Acquir Immune Defic*. 2014;66:S209-S216.
  12. Pollock KG, Wallace LA, Wigglesworth S, McMaster D, Steedman N. HPV vaccine uptake in men who have sex with men in Scotland. *Vaccine*. 2019;37(37):5513-5514.
  13. Forward T, Meites E, Lin J, et al. Sensitivity of self-reported human papillomavirus vaccination history among 18- to 26-year-old men who have sex with men: Seattle, WA, 2016 to 2018. *Sex Transm Dis*. 2022;49(1):81-85.
  14. Kasting ML, Giuliano AR, Christy SM, Rouse CE, Robertson SE, Thompson EL. Human papillomavirus vaccination prevalence among adults aged 19-45 years: an analysis of the 2017 National Health Interview Survey. *Am J Prev Med*. 2020;59(6):837-849.
  15. Han JJ, Beltran TH, Song JW, Klaric J, Choi YS. Prevalence of genital human papillomavirus infection and human papillomavirus vaccination rates among US adult men: National Health and Nutrition Examination Survey (NHANES) 2013-2014. *JAMA Oncol*. 2017;3(6):810-816.