



# Human Papilloma Virus Knowledge Among University Students, Staff, and Faculty in the State of Indiana During 2016, 2019, and 2022

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## Abstract

Studies of Human Papillomavirus (HPV) knowledge among university students have previously been conducted, typically to the exclusion of faculty and staff. The study aim was to assess HPV knowledge among university students, staff, and faculty in the state of Indiana during 2016, 2019, and 2022. The three samples comprised a total of 1275, 1056, and 403 students, staff, and faculty respectively during 2016, 2019, and 2022. Ages ranged from 18 to 70+ each year of the study. A 27-item survey was administered including sociodemographic questions and quantitative HPV knowledge questions were modified from a previously validated instrument. Descriptive statistics characterized the study participants and differences in scores were reported. Among the overall sample who answered receiving the vaccine question ( $n=1917$ ), 39% had received the HPV vaccine. HPV knowledge significantly increased among students from 2016 to 2019 but decreased in 2022. Among staff, there was a significant knowledge difference between 2016 and 2022, but no significant knowledge difference among the faculty. About 86% of the total sample did not know that HPV usually does not need any treatment. Further, participants correct knowledge scores were less than average on the following items: HPV can cause throat cancer (49%); HPV can be transmitted by skin-to-skin contact (42%). More education and campus-wide efforts need to be implemented to increase awareness and accurate HPV-knowledge. Targeted and individual messaging for students, staff, and faculty may be a way to increase awareness of HPV and improve HPV knowledge.

**Keywords** Human papillomavirus · Vaccines · College health · Health promotion

## Introduction

According to the Centers for Disease Control and Prevention, human papillomavirus (HPV) is the most common sexually transmitted infection, and more than 42 million people living in the United States currently have HPV [1, 2]. While most HPV infections disappear within 2 years, some last longer and cause various types of cancers in approximately 36,000 women and men [1]. HPV-related cancers include cervical cancer in women, penile cancer in men, and oropharyngeal cancer in both women and men [1]. In 2006 and

2009, the HPV vaccination was approved for use in females and males, respectively, aged 9 through 26 [3, 4]. In 2018, adults aged 27–45 became eligible for the HPV Vaccine [5]. The HPV vaccine can prevent cervical cancer and has potential to prevent more than 90% of HPV-related cancers [3].

During recent years, emphasis has been placed on public health communication campaigns to promote awareness about HPV and its vaccine, increasing vaccine uptake [6]. However, beginning in 2019 with the COVID-19 pandemic and a reduction in preventive health services, a decline in HPV vaccinations also resulted [7]. Given the age of college students and the availability of health centers or clinics on campus, most universities and colleges are ideal locations for HPV campaigns [8]. Yet, studies have shown that improving HPV knowledge and HPV vaccination uptake can be difficult in the college student population [9–12]. Thompson et al., found that among a total of 548 college students between the years of 2008–2015, HPV knowledge improved but misperceptions about HPV-related outcomes persisted [13]. However, Yahia et al. found that when conducting

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novel, multi-faceted, and interdisciplinary HPV campaigns, it is possible to increase HPV knowledge and vaccination rates [8]. Improving accurate knowledge about HPV, resulting cancers and outcomes, and increasing vaccination uptake requires a collaborative and coordinated effort among many including parents and family members [4, 14–16], health-care professionals [17], adolescent boys and girls [15, 18], and those within the recommended age guidelines for the HPV vaccine [5, 19]. To expand the literature and encompass more adults within a range of the HPV vaccine age, we designed an HPV study to survey students, staff, and faculty at a public, state university at three-year increments between 2016 and 2022.

## Methods

The study was conducted at a public state university located in the state of Indiana. The university has undergraduate and graduate programs housed within five academic colleges including Business, Education, Engineering, Health and Human Services, and Technology. A cross-sectional HPV knowledge survey was distributed during 2016, 2019, and 2022 to currently enrolled undergraduate and graduate students, and currently employed staff and faculty using a university-wide email list.

## Procedures

Eligible participants were sent an email via a campus-wide email list following Institutional Review Board exemption. The email included a brief statement about the study, invitation to voluntarily participate in the anonymous survey, a link to the informed consent and survey. Study years 2016 and 2019 also included a reminder email sent to all students, staff, and faculty 1 week after the initial email, and an additional reminder email was sent a week later only to all students. In 2022, only the initial recruitment email was sent; no follow-up reminder emails were sent. During each year, the survey link remained open for a total of 8 weeks.

## Instrument

A 27-item survey was administered. Sociodemographic questions included age, race/ethnicity, gender, health status, and educational level. Quantitative HPV knowledge and perception questions were modified from a previously validated instrument [20]. Fifteen HPV knowledge questions with Likert scale answers were aggregated to produce a single knowledge score with correct answers. Additional questions included HPV vaccination status, whether participants knew/had known anyone with HPV-related cancer, if they

ever received HPV information (if so, from where), and level of interest in receiving more HPV information.

## Statistical Analysis

Descriptive statistics were used to characterize the study participants and one-way analysis of variance assessed differences between knowledge mean scores of students, staff and faculty. Analyses were done using statistical Package for Social Sciences (SPSS) for windows version 29 (IBM, Armonk, NY, USA).

## Results

### Participant Characteristics

The three samples comprised a total of 1275, 1056, and 403 students, staff, and faculty respectively for the years of 2016, 2019, and 2022. Ages ranged from 18 to 70+ each year of the study (Table 1).

### HPV Vaccination Rate

Among the overall sample who answered receiving the vaccine question ( $n = 1917$ ), 39% had received the HPV vaccine. By role, students had significantly higher vaccination percentage among the three cohorts. The vaccination rate was lower among staff and faculty (Table 2). Female participants had significantly higher vaccination percentage (49.5%) among the vaccinated group, and in the three cohorts (Table 3).

### HPV Knowledge Score

The overall sample average score was 10.22 ( $SD = 3.72$ ). The unvaccinated group had an average knowledge score of 11.60 ( $SD = 2.51$ ) compared to the vaccinated group score of 11.01 ( $SD = 2.71$ ) and “don’t know if vaccinated” group score of 8.55 ( $SD = 4.07$ ). Overall, there was a significant change between 2016 and 2019 but there was no change between 2019 and 2022. The knowledge score significantly increased among student participants from 2016 to 2019 but decreased in 2022. Among staff, there was a significant difference between 2016 and 2022. There was no significant difference among the faculty over the years. The changes are shown in Table 4.

### HPV Knowledge Items Between 2016, 2019, and 2022

Among the three cohorts, the 2016 participants were significantly ( $p < 0.01$ ) less likely than 2019 and 2022 cohorts

**Table 1** Participant Demographic Information

Characteristic	2016 Survey N = 1275*		2019 Survey N = 1056*		2022 Survey N = 403*	
	n	%	n	%	n	%
Student	920	72.2	693	68.7	234	59.2
Staff	208	16.3	195	19.4	111	28.1
Faculty	147	11.5	120	11.9	50	12.7
Age (years)						
18–21	516	40.4	334	33.2	123	31.1
22–26	209	16.9	183	18.2	63	15.9
27–35	165	12.9	144	14.3	55	13.9
36–45	163	12.8	144	14.3	50	12.6
46–60	164	12.9	145	14.4	73	18.4
61–70	51	4.0	51	5.1	28	7.1
70+	8	.6	4	.4	4	1.0
Gender						
Female	928	73.4	738	73.7	261	69.2
Male	333	26.3	254	25.4	86	22.8
Other	3	.2	10	1.0	25	6.6
Race/Ethnicity						
White/Caucasian	1014	80.0	858	81.8	330	82.7
Black/African American	120	9.4	94	9.0	29	7.3
Hispanic/Latino	62	5.0	34	3.2	16	4.0
Asian	21	1.7	26	2.5	10	2.5
American Indian/Alaska Native	4	.3	10	1.0	4	1.0
Hawaiian/Pacific Islander	1	.1	3	.3	1	.3
Other	15	1.2	24	2.3	0	.0
Education						
Graduate school	361	28.3	272	27.0	122	30.8
College graduate	198	15.6	215	21.3	73	18.4
Some college/Associate degree	424	33.3	332	32.9	125	31.6
High School	290	22.8	188	18.7	75	18.9
Some School	2	.2	0	.0	1	.3
No formal education	0	.0	1	.1	0	.0

\*Total number of surveys completed, but not all respondents answered all survey questions

**Table 2** Vaccination Rate by Role

	N	Yes (%)	No (%)	Don't Know (%)
Total sample	1917	39.1	53.0	8.0
Student	1484	51.4	38.2	10.4
Staff	268	16.3	80.7	2.9
Faculty	165	7.0	90.1	2.9

to accurately report that HPV always has visible signs and symptoms; HPV can cause throat cancer; HPV usually doesn't need treatment; using condoms reduces the risk of getting HPV; only people who have many sexual partners get HPV. The 2019 cohort is less likely than the 2016 and 2022 cohorts to report having HPV is the same as having HIV/AIDS; HPV can cause HIV/AIDS; and HPV is rare.

**Table 3** Vaccination Rate by Role and Gender

Role	N	Yes (%)		No (%)		Don't Know	
		Female	Male	Female	Male	Female	Male
Total sample	1917	25.2	13.9	34.9	18.4	5.4	2.2
Student	1484	51.8	40.4	40.4	47.8	7.8	11.8
Staff	268	17.5	18.9	78.6	79.2	3.9	1.9
Faculty	165	8.1	0	90.9	87.8	1.0	12.2

**Table 4** Composite HPV Knowledge Score by Role and Total Sample

Variable	2016		2019		2022	
	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)
Total sample	1275	9.87 (3.98)	1008	10.58 (3.41)	395	10.41 (3.54)
Student	920	9.62 (4.09)	693	10.45 (3.47)	234	9.72 (3.76)
Staff	208	10.03 (3.38)	195	10.58 (3.26)	111	11.14 (3.11)
Faculty	147	11.12 (3.82)	120	11.30 (3.82)	50	12.00 (2.37)

The 2016 cohort is less likely than the 2019 cohort to report HPV is very rare; HPV can be cured with antibiotics; a person could have HPV for many years without knowing it. Whereas the 2022 cohort is more likely than both 2016 and 2019 to report that a person could have HPV for many years without knowing it. There was a significant difference between the three cohorts on the following items: anyone can get HPV; HPV can cause throat cancer; and HPV can cause different types of cancer. About 86% of the total sample did not know that HPV usually does not need any treatment. Further, participants correct knowledge scores were less than average on the following items: HPV can cause throat cancer (49%); HPV can be transmitted by skin-to-skin contact (42%). These knowledge item comparisons are shown in Table 5.

## Discussion

In this study examining HPV knowledge among students, staff, and faculty on a university campus at three points in time over a six-year period, we found that HPV knowledge increased among staff and faculty each year. However,

among students, although HPV knowledge increased in 2019 as compared to 2016, knowledge decreased in 2022. Our findings suggest that HPV knowledge in general was increasing prior to the COVID-19 pandemic which occupied much of the public's attention during 2020 and 2021. The HPV communication efforts (e.g. billboards, commercials) may account for the increased knowledge change from 2016 to 2019, and the shifted emphasis on the pandemic in 2020 and 2021 may account for the reduced knowledge and interest reflected in the 2022 survey. The decrease in HPV knowledge among students may be attributable to the COVID-19 pandemic, which is consistent with previous studies showing a disruption in primary care access, where the majority of HPV vaccines and education are provided, because of the pandemic [7, 21].

In the current study, females were shown to be more knowledgeable about HPV and had a higher vaccination percentage. This finding aligns with previous studies that report females to have more accurate HPV knowledge and HPV vaccine uptake than males [22–24]. However, there continues to be a lack of knowledge about the association between HPV and the types of cancer it can cause [15, 19]. While the majority of participants in our three

**Table 5** Comparison of HPV Knowledge items between 2016, 2019, and 2022

Questions	2016 % correct N = 1275	2019 % correct N = 1056	2022 % correct N = 403
HPV is very rare	80	84	80
HPV always has visible signs and symptoms	77	83	82
HPV can cause cervical cancer	83	85	83
HPV can cause throat cancer	43	51	54
HPV can cause different types of cancer	69	76	72
HPV can be cured with antibiotics	59	65	63
There are many types of HPV	63	64	61
Anyone can get HPV	85	89	92
HPV usually doesn't need any treatment	12	15	15
Using condoms reduces the risk of getting HPV	72	77	77
HPV can be transmitted by skin-to-skin contact	40	42	44
Only people who have many sexual partners get HPV	81	85	88
A person could have HPV for many years without knowing it	85	89	87
Having HPV is the same as having HIV/AIDS	80	86	82
HPV can cause HIV/AIDS	56	60	57

studies correctly identified that “HPV can cause cervical cancer,” far fewer correctly identified that “HPV can cause throat cancer.” The lack of understanding that HPV can cause many different cancers, not just cervical cancer, contributes to the ongoing challenge of increasing accurate knowledge about HPV.

This study was unique in that it assessed HPV knowledge and HPV vaccine among participants representing different professional roles at the university as student, staff, and faculty. The study participants also spanned a continuum of age ranging from 18 to over 71 years. This particular study did not include demographic roles such as parents/guardians, grandparents, siblings, and others, but previous research has shown associations between parent opinion and adolescent HPV vaccination [25, 26]. Similarly, studies have shown associations between how faculty can influence student behavior [27, 28]. While the relationships among students, staff, and faculty was not specifically included in the parameters of this study, the extent to which staff and faculty can influence students and help to increase accurate HPV knowledge may help to improve HPV vaccine update and knowledge on university campuses.

## Conclusion

This study assessed HPV knowledge among university students, staff, and faculty in the state of Indiana during 2016, 2019, and 2022. This study adds to the literature, offering a better understanding of HPV knowledge not previously identified. More education and campus-wide efforts need to be implemented to increase awareness and accurate HPV-knowledge. Targeted and individual messaging for students, staff, and faculty may be a way to increase awareness of HPV and improve HPV knowledge.

**Author Contributions** Both authors contributed to survey dissemination, data collection, data analysis, and writing.

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**Data Availability** Authors have data saved in SPSS.

**Code Availability** Not applicable.

## Declarations

**Competing interests** We have no relationships or interests that influenced or biased this work.

**Ethical Approval** This research was deemed exempt by the Institutional Review Board at Indiana State University.

**Consent to Participate** Informed consent was obtained from all participants.

**Consent for Publication** The authors give the journal consent to publish.

## References

- Centers for Disease Control and Prevention. *HPV Infection*. 2021 July 23, 2021 [cited 2022 Dec 22]; Available from: <https://www.cdc.gov/hpv/parents/about-hpv.html>
- Centers for Disease Control and Prevention. *Genital HPV Infection – Basic Fact Sheet*. 2022 April 12, 2022 [cited 2022 Dec 22]; Available from: <https://www.cdc.gov/std/hpv/stdfact-hpv.htm>
- Centers for Disease Control and Prevention. *Human Papillomavirus (HPV) Vaccination: What Everyone Should Know*. 2021 Nov 16, 2021 [cited 2022 December 22]; Available from: <https://www.cdc.gov/vaccines/vpd/hpv/public/index.html>
- Kornides, M., et al. (2019). Associations between HPV vaccination among women and their 11–14-year-old children. *Human Vaccines & Immunotherapeutics*, 15(7–8), 1824–1830.
- Polonijo, A. N., Mahapatra, D., & Brown, B. (2022). “I thought it was just For teenagers”: Knowledge, attitudes, and beliefs about HPV vaccination among women aged 27 to 45. *Women’s Health Issues*, 32(3), 301–308.
- Head, K. J., et al. (2018). A retrospective and prospective look at strategies to increase adolescent HPV vaccine uptake in the United States. *Human Vaccines & Immunotherapeutics*, 14(7), 1626–1635.
- Turner, K., et al. (2023). Impact of the COVID-19 pandemic on human papillomavirus (HPV) vaccination among a national sample of United States adults ages 18–45: A cross-sectional study. *Preventive Medicine Reports*, 31, 102067.
- Yahia, A., et al. (2022). A community-based, interdisciplinary approach to improving HPV vaccine uptake at a large urban public university. *Journal of American College Health*, 1, 1–7.
- Barnard, M., et al. (2019). Interventions to increase uptake of the human papillomavirus vaccine in unvaccinated college students: A systematic literature review. *Preventive Medicine Reports*, 14, 100884.
- Hopfer, S. (2012). Effects of a narrative HPV vaccination intervention aimed at reaching college women: A randomized controlled trial. *Prevention Science*, 13(2), 173–182.
- Long, A. G., Roberts, C. M., & Hayney, M. S. (2017). Pharmacy student involvement with increasing human papillomavirus (HPV) vaccination among international college students. *Journal of the American Pharmacists Association*, 57(1), 127–128.
- Nkwonta, C. A., Dawson, R. M., & Adegboye, A. (2022). “I don’t think I have a chance to get it”: International university student HPV knowledge and preventive behaviors. *Journal of American College Health*, 70(1), 240–247.
- Thompson, E. L., et al. (2018). Changes in HPV knowledge among college women from 2008 to 2015. *Journal of Cancer Education*, 33(2), 278–283.
- Washington, A., et al. (2022). “Should I give it to my kids?”: Factors that influence HPV vaccine hesitancy among African American parents. *Cancer Epidemiology, Biomarkers & Prevention*, 31(7), 1512.
- Lindsay, A. C., et al. (2022). “I don’t think he needs the HPV vaccine cause boys can’t have cervical cancer”: A qualitative study of Latina mothers’ (Mis) understandings about human

- papillomavirus transmission, associated cancers, and the vaccine. *Journal of Cancer Education*, 37(2), 370–378.
16. Berenson, A. B., et al. (2014). Effect of the decision-making process in the family on HPV vaccination rates among adolescents 9–17 years of age. *Human Vaccines & Immunotherapeutics*, 10(7), 1807–1811.
  17. Sackey, M. E., Markey, K., & Grealish, A. (2022). Healthcare professional's promotional strategies in improving Human papillomavirus (HPV) vaccination uptake in adolescents: A systematic review. *Vaccine*, 40(19), 2656–2666.
  18. Chantler, T., et al. (2020). Does electronic consent improve the logistics and uptake of HPV vaccination in adolescent girls? A mixed-methods theory informed evaluation of a pilot intervention. *British Medical Journal Open*, 10(11), e038963.
  19. Kim, J., Dove, M. S., & Dang, J. H. T. (2022). Sociodemographic factors associated with HPV awareness/knowledge and cervical cancer screening behaviors among caregivers in the U.S. *BMC Womens Health*, 22(1), 335.
  20. Waller, J., et al. (2013). Validation of a measure of knowledge about human papillomavirus (HPV) using item response theory and classical test theory. *Preventive Medicine*, 56(1), 35–40.
  21. Whaley, C. M., et al. (2020). Changes in health services use among commercially insured U.S. populations during the COVID-19 pandemic. *JAMA Network Open*, 3(11), e2024984.
  22. Marlow, L. A., et al. (2013). Knowledge of human papillomavirus (HPV) and HPV vaccination: An international comparison. *Vaccine*, 31(5), 763–769.
  23. Chido-Amajuoyi, O. G., et al. (2021). Declining awareness of HPV and HPV vaccine within the general US population. *Human Vaccines & Immunotherapeutics*, 17(2), 420–427.
  24. Alber, J. M., et al. (2021). HPV vaccine-related beliefs and knowledge among adults 18–45 years old. *American Journal of Health Education*, 52(1), 30–36.
  25. Glenn, B. A., et al. (2023). Effectiveness and feasibility of three types of parent reminders to increase adolescent human papillomavirus (HPV) vaccination. *Preventive Medicine*, 169, 107448.
  26. Myhre, A., et al. (2020). Associations between risk-perception, self-efficacy and vaccine response-efficacy and parent/guardian decision-making regarding adolescent HPV vaccination. *Papillomavirus Res*, 10, 100204.
  27. Bank, B. J., Slavings, R. L., & Biddle, B. J. (1990). Effects of peer, faculty, and parental influences on students' persistence. *Sociology of Education*, 63(3), 208–225.
  28. LaMastro, V. (2001). Influence of perceived institutional and faculty support on college students' attitudes and behavioral intentions. *Psychological Reports*, 88(2), 567–580.

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