

## Human Papillomavirus Vaccine Frequency for University of Kansas Medical Center Pediatric Patients

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### ABSTRACT

**Background.** Human papillomavirus (HPV) vaccination is recommended for all adolescents aged 11 to 12 years, but coverage in Kansas is exceptionally poor. To understand local coverage, receipt of the 3-dose HPV vaccine series among pediatric patients at the University of Kansas Medical Center (KUMC) was evaluated.

**Methods.** All patients aged 11 to 12 years who were seen by a KUMC primary care provider (family medicine and pediatrics) in 2013 were included in the retrospective chart review. Records were reviewed through December 31, 2014 to capture the number of HPV doses received, and receipt of other recommended vaccines (tetanus-diphtheria-pertussis and meningococcal conjugate). Pearson's chi-squared tests were used to evaluate relationships between HPV vaccination and patient characteristics.

**Results.** Of the 261 eligible females and 243 eligible males, 71.2% received  $\geq 1$  HPV vaccine dose, 55.2% received  $\geq 2$  doses, and 39.3% completed the HPV vaccine series (3 doses). Although vaccine initiation was slightly lower in males compared to females (67.1% vs. 75.1%,  $p = 0.047$ ), no difference in vaccine completion was seen between males and females (37.0% vs. 41.7%,  $p = 0.319$ ). Over 80% of patients received other concurrently recommended vaccines (Tdap: 81.7%, meningococcal: 81.3%). HPV series completion occurred more often among Spanish-speaking females compared to English-speaking females (59.5% vs 37.7%;  $p < 0.01$ ).

**Conclusions.** The proportion of adolescents who received the HPV vaccination at KUMC is substantially higher than national and state estimates, but there is room for improvement for both initiation and series completion. *KS J Med* 2016;9(1):1-5.

### INTRODUCTION

There are approximately 14 million new human papillomavirus (HPV) infections in the United States annually, making it the most common sexually transmitted infection in the country.<sup>1</sup> While the majority of HPV infections clear the body with no adverse outcomes, HPV also leads to an estimated 26,000 new

cases of cancer every year in the United States.<sup>2</sup> Cervical cancer is the most common HPV-associated cancer, but HPV also can cause cancer of the oropharynx, anus, penis, vagina, and vulva. In addition, some HPV types cause genital warts. Approximately 50% of initial HPV exposures occur during the middle to late teenage years;<sup>1</sup> therefore, the 3-dose HPV vaccine is recommended routinely for all adolescents aged 11 to 12 years as part of the vaccine platform that includes the meningococcal conjugate vaccine and the tetanus, diphtheria, and pertussis vaccine (Tdap).<sup>3</sup>

Despite recommendations, HPV vaccination coverage remains low, especially compared to the other vaccines on the adolescent platform.<sup>4</sup> Nationally, completion of the Tdap and meningococcal vaccines in 2013 was estimated at 86% and 78%, respectively. However, administration of at least one dose of the HPV vaccine (vaccine initiation) is reported at only 57% in females and 35% in males. HPV series completion is drastically lower at 37.6% in females and 13.9% in males. Vaccination rates vary substantially by geographic region within the United States. Among females, Kansas reported 40% coverage for HPV vaccine initiation (receipt of  $\geq 1$  HPV dose), the lowest in the country. For males, vaccine initiation coverage was only 25%. In Kansas, completion of the 3-dose series among females was 21%.

The University of Kansas Medical Center (KUMC), located in Kansas City (Wyandotte County), KS, is one of the few tertiary care centers in Kansas and serves as a major center of healthcare for Kansas residents. There are currently no data on local HPV series completion at KUMC. In Wyandotte County, HPV series completion is estimated at about 25% for both males and females.<sup>5</sup> The aim of this study was to determine vaccination coverage at KUMC for both HPV vaccination initiation and HPV vaccination completion to identify baseline coverage, factors associated with series initiation and completion, and opportunities for local improvements.

### METHODS

All medical records of KUMC outpatients who had at least one visit to KUMC in calendar year 2013 and were aged 11 or 12 years were reviewed. Eligible patients were seen in either the Family Medicine and/or select Pediatric (Prairie Village, Adolescent Clinic, and Medical Office Building) outpatient clinics at KUMC.

Data on HPV vaccination status and patient demographics were collected from either the visit where the first HPV vaccine dose was given (for all patients with at least one HPV vaccine dose in 2013) or the initial 2013 patient visit (for all patients without any HPV vaccine doses in 2013). Receipt of the other vaccines included on the adolescent platform (Tdap and meningococcal conjugate) was also captured. For patients who initiated the HPV vaccination series, additional data were reviewed through December 2014 to document receipt of any additional HPV vaccine doses. Extending the data collection period through December of 2014 allowed for sufficient time for patients to receive their second HPV vaccine dose (recommended for 2 months after the initial dose) and their third HPV vaccine dose (recommended for 6 months after the initial dose).

Initiation of the HPV vaccination series was defined as the proportion of the eligible population that received at least one dose ( $\geq 1$  dose) of the HPV vaccine within the study timeframe. Series completion was defined as the proportion of the population that received all three recommended doses of the HPV vaccine within the study timeframe. To evaluate possible differences in initiation and completion coverage, data were stratified by demographic variables (i.e., gender, race, ethnicity, and language spoken at home) that could be used to identify potential risk factors or motivators for series initiation and completion. Insurance status was not accessible for this project. Statistical analyses were calculated using the Statistical Package for the Social Sciences (SPSS). Person's Chi-squared tests were used to test for statistically significant differences, with statistical significance set to a p-value of  $< 0.05$ .

### RESULTS

Of 504 eligible patients, 51.8% were females (Table 1). About two-thirds of patients were non-Hispanic (68.5%), and charts of 80.8% showed that patients' primary language spoken at home was English. The most commonly noted race was white (38.9%), followed by black (23.2%).

**TABLE 1. Demographic characteristics of study population.**

		Number (%) (n=504)
<b>Gender</b>		
Male		243 (48.2)
Female		261 (51.8)
<b>Race</b>		
White		196 (38.9)
Black		117 (23.2)
Other		191 (37.9)
<b>Ethnicity</b>		
Hispanic		158 (31.5)
Non-Hispanic		344 (68.5)
<b>Language spoken at home</b>		
English		407 (80.8)
Spanish		85 (16.9)
Other		12 (2.4)

Almost three-quarters of patients (71.2%) had initiated the HPV vaccine series, receiving at least one HPV vaccine in 2013 (Figure 1). Roughly 82% of patients had received the other two vaccines recommended in the adolescent platform, Tdap and meningococcal conjugate. Over half (55.2%) of patients received at least two HPV vaccines by the end of 2014, and 39.3% of patients completed the HPV vaccine series (Figure 1). When stratified by gender, initiation and completion of the HPV vaccine series were very similar (Figure 1). Among females, 75.1% initiated the HPV vaccine, compared to

67.1% of males ( $p = 0.047$ ). Completion was 41.4% among females and 37.0% among males ( $p = 0.319$ ). Completion of the HPV series occurred more often among Spanish-speaking females (59.5%) compared to English-speaking females (37.7%;  $p < 0.01$ ; Table 2). Although not statistically significant, other noted trends included higher initiation and completion rates among Hispanics vs. non-Hispanics and non-whites vs. whites.

### DISCUSSION

Overall, HPV vaccination coverage at KUMC was substantially better than reported vaccination coverage at the state level (Figure 2). Vaccination initiation among females at KUMC was nearly double the coverage reported for the state of Kansas (75.1% vs 39.9%, respectively).<sup>5</sup> This is likewise true when comparing HPV vaccine initiation at KUMC to national coverage estimates. Based on the US Centers for Disease Control and Prevention (CDC) reported data, 57.3% of females and 34.9% of males have at least the first HPV vaccine dose.<sup>4</sup> Differences in coverage nationally, at the state level, and at KUMC also were apparent for HPV vaccine completion (3 doses), though less drastic.

While small differences in the vaccination coverage between females and males were seen, coverage in both groups was strikingly high, contrary to what has been reported previously for the state of Kansas and nationally.<sup>4,5</sup> This finding suggested equal promotion of the HPV vaccine to males and females at KUMC, despite prevailing beliefs that the HPV vaccine goal is to prevent cervical cancer.<sup>6,7</sup> Both state and national coverage estimates reflect a disparity in HPV coverage by sex; however the HPV vaccine has been recommended for both males and females since 2009.<sup>3,8</sup> KUMC performs on a similar level to the rest of the state and nation in regards to delivery of the Tdap vaccine, a vaccine long required for school admissions.<sup>4,5</sup> The other recommended adolescent vaccine, meningococcal conjugate, also is delivered more frequently at KUMC. Overall, administration of the recommended vaccines that are part of the adolescent platform exceeds other coverage estimates, possibly indicative of a generally broad approach to adolescent vaccine delivery practiced by KUMC nurses and clinicians. In anecdotal observations of clinical encounters conducted by the study authors, the HPV vaccine was recommended by the provider and presented as part of the adolescent platform. Provider recommendation is one of the main factors that can positively impact HPV vaccine uptake.<sup>9</sup>

Despite high HPV vaccine initiation, there was a gradual decline in the proportion of adolescents who received each additional HPV dose required to complete the series. The fact that the HPV vaccine requires multiple doses remains a barrier for series completion and adequate immunologic protection.

A two-dose series seemed to be non-inferior to a three-dose series in the short term.<sup>10</sup> Reducing the number of necessary doses could impact HPV vaccine series completion positively; however, other studies are needed to evaluate the true long term implications of fewer HPV vaccine doses.

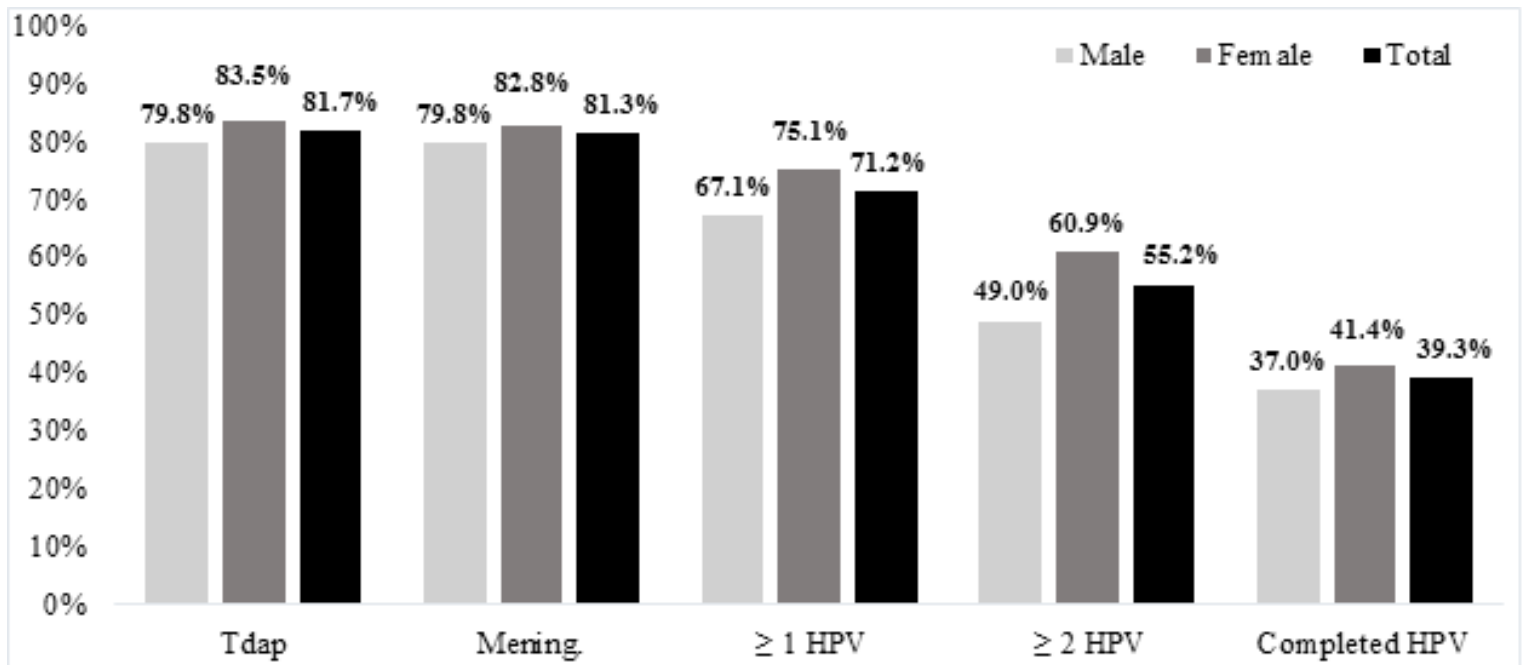


Figure 1. Vaccination coverage of recommended adolescent vaccines at KUMC, 2013.

Tdap= tetanus, diphtheria, and pertussis

Table 2. HPV vaccination coverage at KUMC by race, ethnicity and primary language spoken at home, 2013.

RACE					ETHNICITY				LANGUAGE			
Male HPV Series Completion					Male HPV Series Completion				Male HPV Series Completion			
Vaccine Status	Black	Other	White	p-value	Vaccine Status	Hispanic	Non-Hispanic	p-value	Vaccine Status	English	Spanish	p-value
Received ≥ 1 HPV dose					Received ≥ 1 HPV dose				Received ≥ 1 HPV dose			
72.4%	72.4%	57.5%	0.059	71.1%	65.4%	0.371	64.6%	79.1%	0.068			
Completed HPV Series					Completed HPV Series				Completed HPV Series			
34.5%	42.9%	32.2%	0.292	41.0%	35.2%	0.380	34.9%	46.5%	0.152			
Female HPV Series Completion					Female HPV Series Completion				Female HPV Series Completion			
Vaccine Status	Black	Other	White	p-value	Vaccine Status	Hispanic	Non-Hispanic	p-value	Vaccine Status	English	Spanish	p-value
Received ≥ 1 HPV dose					Received ≥ 1 HPV dose				Received ≥ 1 HPV dose			
81.4%	74.2%	72.5%	0.432	84.0%	82.2%	0.813	73.6%	85.7%	0.095			
Completed HPV Series					Completed HPV Series				Completed HPV Series			
40.7%	46.2%	37.6%	0.460	50.7%	37.8%	0.057	37.7%	59.5%	0.009			

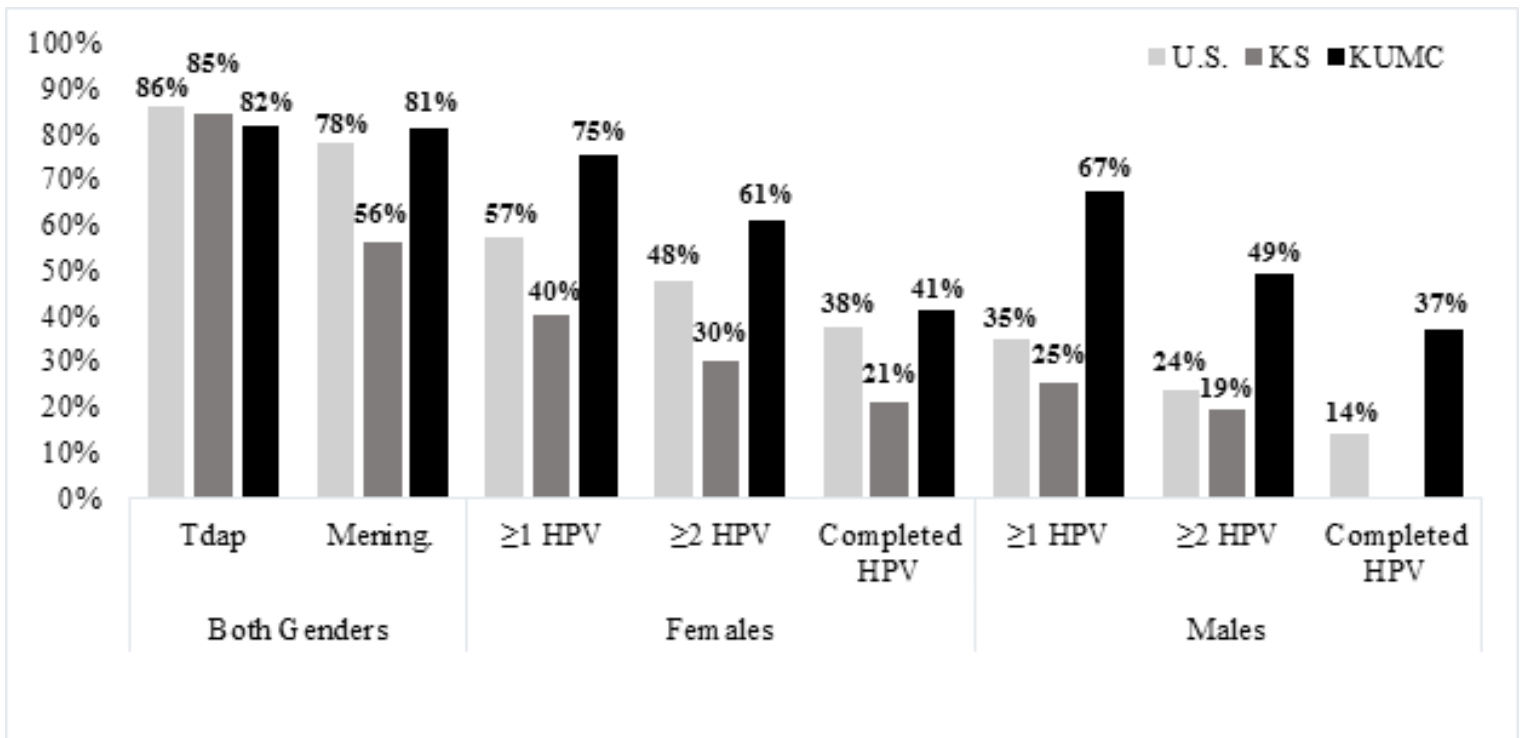


Figure 2. Comparison of vaccination coverage of recommended adolescent vaccines, United States, the state of Kansas,<sup>4</sup> and KUMC, 2013.

Note: No data were reported for males in Kansas who completed HPV vaccination.

KUMC = University of Kansas Medical Center

Tdap = tetanus, diphtheria, and pertussis

Mening. = meningococcal conjugate

HPV = human papillomavirus

There are other trends that highlight disparities that may impede vaccine series completion. National data showed higher HPV vaccine initiation among racial/ethnic minorities and those living in poverty, but higher HPV vaccine completion among white females and males and patients of higher socioeconomic status.<sup>11</sup> At KUMC, both higher initiation and completion rates were observed among minority populations, an important finding due to higher morbidity and mortality of HPV-associated cancers in these groups.<sup>12-14</sup> Barriers to vaccine completion, such as the added costs associated with extra appointments (i.e., transportation, etc.)<sup>11</sup> or youth not visiting a provider for a well-child visit may not be as prevalent among the population at KUMC, where the majority of the patient population consists of underserved ethnic/racial minorities who need to be seen for an annual well-child visit as a requirement for receiving Medicaid.

Vaccine receipt data for this study were collected from reviews of patient charts maintained at KUMC, which may not capture vaccine delivery at other institutions. Such underreporting would result in lower calculated HPV vaccine coverage than was present. In addition, calculated KUMC vaccination rates potentially could be higher than those reported here if patients were followed for a longer period of time. However, to follow

the HPV vaccine delivery schedule recommended by CDC, follow-up was limited to one year. Limited chart access led to only a few demographic variables being assessed. Possibly important variables, like insurance status, may play a role in vaccination success in the KUMC population. While the findings presented are not generalizable to other locations, these data showed that higher coverage of all three recommended adolescent vaccines can be achieved in a busy, urban clinic setting.

While HPV vaccine initiation and completion at KUMC are significantly higher than expected based on previously reported national and state data, there is a need for improvement to achieve the minimum 80% vaccination level recommended by the Advisory Committee on Immunization Practices (ACIP).<sup>3</sup> Further studies are needed to evaluate practices at KUMC, including identifying effective approaches to increase HPV vaccine series completion.



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