RESEARCH LETTERS

Prevalence of Human Papillomavirus Infection in Young Women Receiving the First Quadrivalent Vaccine Dose

The objective of this study was to determine human papillomavirus (HPV) prevalence and identify factors associated with infection in sexually experienced and inexperienced females initiating HPV vaccination.

Methods. Participants were 13- to 21-year-old females receiving their first HPV vaccine dose, recruited from an adolescent primary care clinic between June 2008 and June 2010. These data are from the baseline visit of a longitudinal study that was approved by the hospital's institutional review board. Each participant completed a questionnaire assessing sociodemographic factors and behaviors. History of sexual contact was assessed using the following item: "Have you ever had sexual contact with a male or female (by sexual contact we mean genital, skin-to-skin contact only)?" Sexual experience was defined as a response of yes to the following item: "Have you ever had sex with a male or female (by sex we mean vaginal or anal sex)?" Cervicovaginal swabs were self- or clinician-collected and tested for HPV DNA.[1,2] Logistic regression models were estimated to determine variables associated with HPV infection in sexually experienced and inexperienced females. The outcome measure was infection with 1 or more HPV types.

Results. Of the 259 eligible females, 190 (73.4%) were sexually experienced. Sexually experienced females were older than sexually inexperienced females (mean [SD] age, 17.6 [2.2] years vs 14.8 [1.3] years; $P < .001$); there were no significant differences by race or health insurance coverage. Seventy-eight percent of females were African American, 16.6% reported having no health insurance, and 75.2% had public insurance. Among sexually experienced females, the mean (SD) number of lifetime male sexual partners was 5.7 (7.3), 40.7% reported a history of *Chlamydia*, and 24.3% reported a history of gonorrhea. Thirteen percent of sexually inexperienced females reported a history of sexual contact, and none reported a history of *Chlamydia* or gonorrhea.

All swabs tested for HPV DNA were adequate for analyses, defined as positive for β-globin. The prevalence of HPV in sexually experienced and inexperienced females is shown in the **Table**. Among sexually experienced females, 70.0% (133 of 190) were HPV positive (≥1 type): 17.4% (33 of 190) for HPV-16 and 6.3% (12 of 190) for HPV-18. The only variable independently associated with HPV in a multivariable model was history of multiple sexual partners (2-5 partners vs 1: odds ratio, 6.2; 95% CI, 2.1-18.1 and ≥6 partners vs 1: odds ratio, 10.3; 95% CI, 2.6-41.5).

Among sexually inexperienced females, 11.6% (8 of 69) were HPV infected: 2.9% (2 of 69) for HPV-16, 0% for HPV-18, and 4.3% (3 of 69) for any vaccine-type HPV. Human papillomavirus types 16 and 68, each detected in 2.9% (2 of 69), were the most commonly detected types. Five participants (62.5%) had multiple types: 2 had 2 types and 3 had 3 types. No variables were significantly associated with HPV in sexually inexperienced females.

Comment. The prevalence of HPV in this population was higher than that reported in a nationally representative sample of young women, likely because of differences in sexual behaviors in the 2 populations studied.[3] As expected, sexually inexperienced females had lower rates of HPV than sexually experienced females; however, a subgroup of sexually inexperienced females was positive for both vaccine and nonvaccine types. Our finding that 11.6% of sexually inexperienced females were positive for at least 1 HPV type is consistent with findings of previous studies that enrolled females who were likely to have had sexual contact.[4-6] We found that 4.3% of sexually inexperienced females were already infected with vaccine-type HPV, potentially through hand-genital or genital, skin-to-skin contact. This demonstrates that sexually inexperienced females are at risk for HPV infection and supports national recommendations to target HPV vaccination to 11- to 12-year-old girls. Clinicians and parents should not delay HPV vaccination because an adolescent is not sexually active.

Lea E. Widdice, MD
Darron R. Brown, MD
David I. Bernstein, MD, MA
Lili Ding, PhD
Deesha Patel, BA
Marcia Shew, MD
J. Dennis Fortenberry, MD, MS
Jessica A. Kahn, MD, MPH

Author Affiliations: Divisions of Adolescent Medicine (Drs Widdice and Kahn) and Infectious Diseases (Dr Bernstein) and Center for Epidemiology and Biostatistics (Dr Ding), Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio; Departments of Medicine (Dr Brown), Microbiology and Immunology (Dr Brown), and Pediatrics (Drs Shew and Fortenberry), Indiana University School of Medicine, Indianapolis; and Rollins School of Public Health, Emory University, Atlanta, Georgia (Ms Patel).

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Table. Overall and Type-Specific HPV Infection at the Time of HPV Vaccine Initiation in 13- to 21-Year-Old Females, by Sexual Experience

	No. (%)			
	Total (N = 259)	Sexually Experienced (n = 190)	Sexually Inexperienced (n = 69)	*P* Value
No. of HPV types detected, mean (SD) [range]	1.7 (2.3) [0-12]	2.3 (2.4) [0-12]	0.2 (0.7) [0-3]	
Overall HPV[a]	141 (54.4)	133 (70.0)	8 (11.6)	<.001[b]
Bivalent vaccine types[c]	42 (16.2)	40 (21.1)	2 (2.9)	<.001[d]
Quadrivalent vaccine types[e]	61 (23.6)	58 (30.5)	3 (4.3)	<.001[d]
Nonavalent vaccine types[f]	90 (34.7)	85 (44.7)	5 (7.2)	<.001[d]
Multiple types[g]	103 (39.8)	98 (51.6)	5 (7.2)	<.001[d]
At least 1 high-risk type[h]	111 (42.9)	105 (55.3)	6 (8.7)	<.001[d]
High-risk types other than HPV-16 and HPV-18[h]	98 (37.8)	93 (48.9)	5 (7.2)	<.001[d]
HPV-6	20 (7.7)	19 (10.0)	1 (1.4)	.02[d]
HPV-11	5 (1.9)	4 (2.1)	1 (1.4)	>.99[d]
HPV-16	35 (13.5)	33 (17.4)	2 (2.9)	.002[d]
HPV-18	12 (4.6)	12 (6.3)	0	NA
HPV-26	4 (1.5)	4 (2.1)	0	NA
HPV-31	7 (2.7)	7 (3.7)	0	NA
HPV-33	1 (0.4)	1 (0.5)	0	NA
HPV-35	16 (6.2)	16 (8.4)	0	NA
HPV-39	16 (6.2)	16 (8.4)	0	NA
HPV-40	10 (3.9)	10 (5.3)	0	NA
HPV-42	18 (6.9)	18 (9.5)	0	NA
HPV-45	11 (4.2)	11 (5.8)	0	NA
HPV-51	15 (5.8)	14 (7.4)	1 (1.4)	.08[d]
HPV-52	22 (8.5)	21 (11.1)	1 (1.4)	.01[d]
HPV-53	17 (6.6)	17 (8.9)	0	NA
HPV-54	11 (4.2)	11 (5.8)	0	NA
HPV-55	9 (3.5)	9 (4.7)	0	NA
HPV-56	13 (5.0)	12 (6.3)	1 (1.4)	.19[d]
HPV-58	24 (9.3)	23 (12.1)	1 (1.4)	.007[d]
HPV-59	21 (8.1)	20 (10.5)	1 (1.4)	.02[d]
HPV-61	7 (2.7)	6 (3.2)	1 (1.4)	.68[d]
HPV-62	20 (7.7)	20 (10.5)	0	NA
HPV-64	1 (0.4)	1 (0.5)	0	NA
HPV-66	21 (8.1)	20 (10.5)	1 (1.4)	.02[d]
HPV-67	6 (2.3)	6 (3.2)	0	NA
HPV-68	16 (6.2)	14 (7.4)	2 (2.9)	.25[d]
HPV-69	0	0	0	NA
HPV-70	3 (1.2)	2 (1.1)	1 (1.4)	>.99[d]
HPV-71	0	0	0	NA
HPV-72	1 (0.4)	1 (0.5)	0	NA
HPV-73	11 (4.2)	11 (5.8)	0	NA
HPV-81	8 (3.1)	7 (3.7)	1 (1.4)	.69[d]
HPV-82	6 (2.3)	6 (3.2)	0	NA
HPV-83	14 (5.4)	14 (7.4)	0	NA
HPV-84	21 (8.1)	20 (10.5)	1 (1.4)	.02[d]
HPV-IS39	2 (0.8)	2 (1.1)	0	NA
HPV-CP610	20 (7.7)	20 (10.5)	0	NA

Abbreviations: HPV, human papillomavirus; NA, not applicable because one or more categories had no subjects.
[a] Overall HPV = positivity for 1 or more HPV types.
[b] χ^2 Test.
[c] Bivalent vaccine types = positivity for HPV-16 and/or HPV-18.
[d] Fisher exact test.
[e] Quadrivalent vaccine types = positive for HPV-16, HPV-18, HPV-6, and/or HPV-11.
[f] Nonavalent vaccine types = positive for HPV-16, HPV-18, HPV-6, HPV-11, HPV-31, HPV-33, HPV-45, HPV-52, and/or HPV-58.
[g] Multiple types = positive for 2 or more HPV types.
[h] High-risk HPV types = 16, 18, 31, 33, 35, 39, 45, 51, 52, 53, 56, 58, 59, and 68.

Correspondence: Dr Widdice, Division of Adolescent Medicine, Cincinnati Children's Hospital Medicine Center, 3333 Burnet Ave, MLC 4000, Cincinnati, OH 45229 (lea.widdice@cchmc.org).

Author Contributions: *Study concept and design:* Widdice, Bernstein, Shew, Fortenberry, and Kahn. *Acquisition of data:* Brown, Patel, and Kahn. *Analysis and interpretation of data:* Widdice, Brown, Bernstein, Ding, Fortenberry, and Kahn. *Drafting of the manuscript:* Widdice, Bernstein, Patel, and Fortenberry. *Critical revision of the manuscript for important intellectual content:* Widdice, Brown, Bernstein, Ding, Patel, Shew, Fortenberry, and Kahn. *Statistical analysis:* Widdice and Ding. *Obtained funding:* Fortenberry and Kahn. *Administrative, tech-*

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Trends in Competitive Venue Beverage Availability: Findings From US Secondary Schools

Competitive beverages include all beverages served or sold in schools outside of federally reimbursable meal programs.[1] The Alliance for a Healthier Generation developed a set of criteria known as the School Beverage Guidelines,[2] which identify approved beverage types, caloric content, and volume by school level. Approved beverages for all school levels include water, fat-free/low-fat milks, and 100% juices (approved volume and caloric content vary across grades). Additional beverages approved only for high school include no-/low-calorie beverages and drinks with up to 66 calories per 8 ounces. The Alliance guideline approval of drinks with up to 66 calories per 8 ounces currently includes the top sports drinks sold in the United States, which are classified as sugar-sweetened beverages because of added sugars.[3] This article (1) uses the Alliance guidelines as a framework to present trends in competitive venue beverage availability in US secondary schools from 2006-2007 to 2010-2011 and (2) examines differences in access between middle and high school students.

Methods. Analyses used annual data from school years 2006-2007 to 2010-2011 collected through the Youth, Education, and Society study from nationally representative samples of US schools that have eighth, 10th, or 12th grades. Questionnaires were collected from 1477 middle schools and 1575 high schools for a combined response rate of 82.5%. Mailed questionnaires were sent to each sampled school's principal with the suggestion that food service personnel complete the detailed questions on cross-venue beverage availability. Participants indicated whether beverages were available in each of the various venues noted and were then asked about the availability of specific beverages in each venue. Detailed methods are available elsewhere.[4]

Results. Ninety-one percent of middle school students and 99% of high school students attended schools with beverages sold through a competitive venue in the 2010-2011 school year, representing a significant decrease of 6 percentage points for middle school students and 1 percentage point for high school students from 2006-2007 (**Table**). Vending machine beverage availability significantly declined for both middle and high school students during the 4-year interval examined.

The significant decline observed in overall middle school competitive venue beverage availability occurred across most beverage types. However, middle school availability of beverages with Alliance approval only for high school remained very high (71% of students) in 2010-2011. Middle school availability also remained high for high-calorie fruit drinks (23%) and higher-fat milks (36%)—beverages not approved for either middle or high schools. Other than approved beverages (waters, 100% juices, lower-fat milks), the beverage with the highest middle school availability was a sugar-sweetened beverage: sports drinks (55% of students in 2010-2011).

High school students had significantly higher availability of all beverages examined than did middle school students. High school availability of regular soft drinks dropped by more than half across the study period, from 54% of students in 2006-2007 to 25% in 2010-2011. Significant decreases also were observed for higher-fat milks and high-calorie fruit drinks; still, their availability rates remained high at 48% and 31% of students, respectively. Overall high school student sugar-sweetened beverage availability also showed a significant decline (down to 88% by the 2010-2011 school year). However, sports drink availability showed no significant decline, with 83% of high school students having availability at school in 2010-2011.

Comment. The American Academy of Pediatrics has reaffirmed its 2004 policy statement calling for the elimination of sweetened drinks in schools.[5,6] Sweetened drinks have been found to be the primary source of added dietary sugars in children,[7] and sugar-sweetened beverages obtained at school have been found to significantly

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