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Disparities in Human Papillomavirus Vaccine Awareness Among US Parents of Preadolescents and Adolescents

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Abstract

Background—Improved parental awareness of human papillomavirus (HPV) vaccines could increase uptake of vaccines early in the life course, thereby reducing adolescents' later risk for HPV infection and cancer. As such, we sought to determine factors related to parental awareness of HPV vaccines, using a nationally representative population-based sample.

Methods—We examined data on 5735 parents of preadolescents and adolescents aged 8 to 17 years from the 2010 National Health Interview Survey. Parents were asked if they had ever heard of HPV vaccines or shots. Multivariable logistic regression analyses were used to examine the odds of parental awareness of HPV vaccines, controlling for relevant covariates.

Results—Most US parents (62.6%) heard of HPV vaccines. Multivariable results revealed parents of children who were older, female, and insured were more likely to have heard of HPV vaccines; parents who were female, white (non-Hispanic), English speakers, born in the United States, married or living with a partner, more educated, and had higher income were also more likely to be aware of HPV vaccines. Notably, parents of children who had a well-child checkup in the last 12 months were significantly more likely to have heard of HPV vaccines (odds ratio, 1.23; 95% confidence interval, 1.04–1.46).

Conclusions—Given the significant disparities in parental awareness of HPV vaccines, improving access to preventive pediatric health care could offer an opportunity to increase parental awareness. In addition, public health efforts that provide culturally sensitive information in a variety of languages may be an effective way to reach vulnerable groups.

Human papillomavirus (HPV) is a sexually transmitted disease that infects an estimated 14 million people aged 15 to 59 years annually in the United States, with approximately 7 million HPV infections occurring annually among individuals aged 15 to 24 years.¹ Human papillomavirus infections have been causally linked to cervical cancer, anal cancer, vaginal cancer, vulvar cancer, penile cancer, oropharyngeal cancer, and genital warts.² Furthermore, racial and ethnic,^{3–7} socioeconomic,^{3,8} and other disparities^{4,6} exist in HPV-associated

cancers, suggesting that the burden of HPV-related diseases disproportionately affects vulnerable populations.

The first quadrivalent vaccine protecting against 4 strains of HPV was approved by the US Food and Drug Administration for girls and women aged 9 to 26 years in 2006 and boys and men aged 9 to 26 years in 2009. Current clinical guidelines recommend routine administration of HPV vaccines for boys and girls at ages 11 to 12 years.⁹ However, less than 34% of US adolescent girls aged 13 to 17 years completed all 3 doses of HPV vaccines in 2012, with substantial disparities existing in vaccine series completion.¹⁰ Furthermore, despite a recent rise in vaccine uptake for US adolescent boys, receipt of any dose of HPV vaccines among adolescent boys remains low,¹⁰ and many parents are unaware that HPV vaccines can be given to boys.¹¹

Risk reduction and health promotion early in the life course can optimize children's developmental trajectories and their risk for disease as adults; as such, reducing HPV-related disease burden in adults and improving vaccine uptake among adolescents will likely require an understanding of the upstream (or antecedent) factors that contribute to parents' decisions to vaccinate their pre-adolescents and adolescents. Previous work suggests that a number of factors affect a child's receipt of HPV vaccines, including parental awareness¹² and provider recommendation.¹³ Therefore, improved parental awareness of HPV vaccines could increase uptake of vaccines early in the life course, thereby reducing adolescents' later risk for HPV infection and cancer. However, with a disconnect existing between recommended administration of HPV vaccines and parental awareness, understanding the upstream factors contributing to this disconnect is a public health imperative. Prior studies have attempted to characterize the factors that influence parental awareness of HPV and HPV vaccines; however, many of these studies have limited generalizability.^{14–17} To our knowledge, no study has examined the determinants of HPV vaccine awareness in a nationally representative sample of parents of US male and female preadolescents and adolescents.

We sought to investigate how multiple sociodemographic and access-related factors influence a crucial upstream factor related to adolescent vaccine receipt and to explore potential pathways that may inform future HPV risk reduction efforts across the life course. Specifically, we sought to understand the contributing factors to parental awareness of HPV vaccines using the most recent data from a nationally representative, population-based sample of parents of both male and female preadolescents and adolescents.

MATERIALS AND METHODS

Data Source and Study Population

Data are from the 2010 National Health Interview Survey (NHIS), a nationally representative sample of the US, noninstitutionalized population. Our sample included 5735 parents or legal guardians (hereafter "parents")^I who had any children between the ages of 8 and 17 years and were interviewed about their child as part of the Sample Child (SC)

^IWe excluded families where a parent or legal guardian was present in the household but was not the respondent for the SC component of the NHIS (n = 270).

component of the NHIS. Within families, children were randomly selected to participate in the SC component of the NHIS; a knowledgeable adult (typically a parent or guardian) answered questions on the SC's behalf.

Measures

Data on child and parent sex and age, parent race and ethnicity (white non-Hispanic, black non-Hispanic, other non-Hispanic, and Hispanic), marital status (married or living with partner; divorced, widowed or separated; and never married), educational attainment (no or some high school, high school graduate, some college, and college or beyond), if the child had any siblings aged 8 to 17 years, and US region of residence (Northeast, Midwest, South, and West) were examined. Child health insurance status was categorized into 4 mutually exclusive categories: any private (continuously insured during the past year), public only (continuously insured during the past year), partial (private or public coverage with any period of uninsurance <12 months), and none (uninsured for the entire year preceding the survey). The child was classified as having a usual source of care (USC) if they reported that they had 1 place that they usually went to when needing routine or preventive care (such as a physical examination or well-child checkup) and if that place was located in an outpatient clinic or doctor's office. Children who did not report a usual provider or listed a hospital emergency department or multiple places as their usual place of care were classified as not having USC. Children's receipt of a well-child checkup during the 12 months preceding the survey was assessed. The parent's primary language was derived from the language in which the NHIS was administered and dichotomized as English versus any other language. Parent's acculturation was determined by their country of birth and number of years lived in the United States (born in the United States, born outside the United States, and lived in the United States for <10, 10–<15, or 15 years). Family incomes were classified as below 100%, 100% to 199%, 200% to 399%, 400% or more of the federal poverty level (FPL), or unknown.^{II}

Parental Awareness

As part of the SC component, parents of all children aged 8 to 17 years were asked a series of questions about HPV vaccines. Parental awareness of HPV vaccines was defined as answering affirmatively (vs. negatively) to the following question: "Two vaccines, or shots, to prevent the HPV infection are available in the United States. Both vaccines prevent cervical cancer and one also prevents genital warts. The two HPV vaccines are sometimes called CERVARIX® [GlaxoSmithKline, Middlesex, UK] or GARDASIL® [Merck & Co., Inc., Whitehouse Station, NJ]. Before this survey, have you ever heard of HPV vaccines or shots?"

^{II}Predefined NHIS poverty thresholds are based on the weighted average federal poverty thresholds (US Census Bureau) for the previous calendar year, as the reference period for income questions in the NHIS is the previous calendar year. For example, the 2010 NHIS applies the 2009 federal poverty threshold (such that a family of 4 with an annual income of \$21,954 in 2009 is at 100% of the FPL).

Analytic Approach

SAS 9.2 (SAS Institute Inc, Cary, NC) was used to construct the analytic files, and STATA 11 (StataCorp LP, College Station, TX) was used to perform all analyses, accounting for the complex design of the NHIS. Sample characteristics, by parental awareness, are described in Table 1; χ^2 test and Kruskal-Wallis analyses were used to test for differences in child, parent, and family characteristics by parental awareness of HPV vaccines. Multivariable logistic regression models were used to examine the odds of parent awareness of HPV vaccines, adjusting for child, parent, and family factors (Table 2).

Sensitivity Analyses—We repeated all analyses on sub-samples that only included parents of children aged 9 to 17 years and 11 to 17 years, as HPV vaccines are licensed for administration beginning at age 9 years and national guidelines recommend vaccine receipt beginning at age 11 years. Neither the descriptive nor multivariable comparisons change substantially when a sample of only parents of children aged 9 to 17 years or 11 to 17 years were used (data not shown).

The University of Wisconsin-Madison Health Sciences Institutional Review Board considered this study exempt from review because the data were already collected and deidentified.

RESULTS

Overall, 62.6% of parents reported having ever heard of HPV vaccines (Table 1). Parents who had heard of HPV vaccines were more likely to have a child who was female, was privately insured, had a USC, and had a well-child checkup. These parents were also more likely to be female, white (non-Hispanic), an English speaker, born in the United States, married or living with their partner, and more educated. Parents who had heard of the vaccines were also more likely to be members of families with incomes above 200% of the FPL and living in the Midwest.

Multivariable results revealed that female parents and parents of female children had statistically significantly higher odds of having heard of HPV vaccines than did male parents and parents of male children (adjusted odds ratios [AORs], 2.40 [95% confidence interval {CI}, 2.04–2.81] and 1.86 [95% CI, 1.60–2.16], respectively; Table 2). In addition, parents of older children (AOR, 1.04; 95% CI, 1.01–1.07) were also more likely to have heard of HPV vaccines. Parents of uninsured children had 42% lower odds of having heard of HPV vaccines as compared with parents of privately insured children (AOR, 0.58; 95% CI, 0.40–0.84). The odds of hearing about HPV vaccines for parents whose child had received a checkup in the past year were 1.23 times greater than parents whose child had not received a checkup (95% CI, 1.04–1.46). The odds of hearing about HPV vaccines increased as parents' educational attainment level increased and were lower for parents who were divorced, widowed, or separated compared with their married and partnered counterparts. There was a strong inverse relationship between family income (<200% of FPL) and the odds of parental awareness. Finally, parents whose primary language was not English and parents who were born outside the United States had significantly lower odds of HPV

vaccine awareness, as did all minority parents compared with their white (non-Hispanic) counterparts.

DISCUSSION

This study investigated factors correlated with parental awareness of HPV vaccines using the most recent data from a nationally representative, population-based sample of parents of both male and female preadolescents and adolescents. Our results suggest that improving access to preventive pediatric health care may offer an opportunity to increase parental awareness of HPV vaccines. However, significant racial and ethnic, language and acculturation, and education-based, income-based, and insurance-based disparities remain.

Not surprisingly, we found that parents of female children were more aware of HPV vaccines, as the delayed approval of and recommendations for vaccine usage in boys likely contributed to these disparities. In addition, because HPV-associated cancers are more common overall in girls than boys, due primarily to cancer site (i.e., cervix, vulva, and vagina),^{18–20} providers, patients, and parents may be more aware of HPV vaccination because of presumed greater benefits for girls than boys. However, the incidence rate of HPV-associated cancers in sex-neutral sites (i.e., anus and oropharynx) is more than twice as high for boys than girls,^{18–20} underscoring the importance of improving awareness about vaccine receipt for boys. Given that HPV-infected boys are not only subject to HPV-associated cancers but increased risk of HPV-related diseases for their sexual partners,^{21,22} health care providers and public health officials should strive to inform parents of male children about the HPV vaccines, which may directly lead to increased uptake.²³ Furthermore, as older children are more likely to be sexually active, it is essential that they be vaccinated before their first sexual experience. Therefore, from a life course perspective, it is imperative that HPV awareness is promoted among parents of younger children to ensure vaccination at age 11 to 12 years, which can prevent subsequent HPV-related disease burden.

Consistent with our findings, previous studies have demonstrated that racial and ethnic minorities are less likely to have heard of HPV vaccines,^{15,16,24} as are women born outside the United States.²⁴ Importantly, racial and ethnic minorities are also more likely to experience HPV-related disease burden.²⁵ Our results suggest that low acculturation or English-language proficiency may substantially contribute to such racial and ethnic disparities. As other evidence suggests that language in particular may moderate how individuals obtain information about HPV vaccines,²⁶ providing culturally sensitive information and information in a variety of languages may improve awareness for vulnerable groups. For example, evidence suggests that “radionovelas,” short stories delivered via radio, may be a particularly effective strategy to increase HPV awareness among Spanish-speaking parents,²⁷ as well as among parents with low levels of acculturation, because radio-novelas present information in a familiar language and are culturally tailored. Moreover, health literacy may be particularly important for understanding parental awareness in this group and should be investigated in future work. Given evidence to suggest that gaps in knowledge and sociocultural communication practices may affect Hispanic girls’ receipt of HPV vaccines,^{28,29} it is a public health necessity to educate

Hispanic parents about HPV vaccines. Because disparities in parental awareness likely contribute to disparities in vaccine receipt and then to disparities in HPV infection and disease burden, intervening on upstream factors such as parental awareness may exert a critical dampening effect on racial and ethnic disparities that would otherwise widen across the life course.

Differences in parental awareness by parental education and family income, 2 important components of socioeconomic status (SES), may also be contributing to vaccine uptake and to well-established disparities in incidence of certain HPV-associated cancers.^{3,8} Given the large number of children who may be affected by these SES disparities, new efforts to improve parental awareness should focus on low-SES groups. A one-time, education-based intervention led by a community health educator at a public school is one strategy that has been proven effective for increasing HPV vaccine knowledge among parents of school-aged children.³⁰ Such easily accessible and informative, yet brief, interventions may be the best way to reach low-SES groups and may be particularly useful for wide-reaching dissemination of information, as participation in these interventions do not require insurance or a participation fee.

Our findings have important clinical implications, as we identified potential opportunities to improve parental awareness and uptake of HPV vaccines in the clinical setting. Importantly, we found that parents were more likely to be aware of HPV vaccines when their child had received a well-child checkup in the past 12 months, indicating that pediatricians and family health care providers may serve as an important lifeline for HPV vaccine-related information for parents. Although parents who seek regular well-childcare for their children may be more likely to be aware of HPV vaccines given their preventive health care seeking behavior, parents whose children did not receive an annual checkup conversely may be less aware of HPV vaccines because of general barriers to health care access. Health care providers have a unique opportunity to inform parents about HPV vaccines and promote its administration among their preadolescent and adolescent patients,³¹ particularly when these providers are the only or primary resource in the medical decision-making process for families. Furthermore, parental awareness of HPV vaccines may not be necessary for vaccine receipt when doctors routinely recommend the vaccine, and parents follow the providers' advice. However, parental awareness of HPV vaccines is a particularly crucial precondition to children's receipt of HPV vaccines when providers do *not* routinely recommend HPV vaccines or when children and their parents do not have consistent access to a trusted provider.

Our findings have significant implications for child health insurance policy, as this study reports that children's access to health insurance may be critical in ensuring that parents learn about HPV vaccines in the health care setting. The association between children's uninsurance and lower parental awareness may be a result of decreased access to preventive care. For these parents and children, public health interventions that focus on providing information in a health care setting may fail to effectively improve awareness of HPV vaccines. Nonmedical settings could be used to improve parental awareness of the vaccines and vaccine receipt among groups with diminished health care access. For example, public school immunization programs that enable vaccine receipt among uninsured children may be

an effective way to promote both parental awareness and more widespread receipt of vaccines. However, the requirement of policy, legislative, and fiscal support for schools is likely a substantial obstacle to enacting school-based provision of health services, such as vaccines. Because school-based programs have the unique opportunity to reach many, if not all, of the identified vulnerable groups, overcoming such obstacles may be an important step toward closing the downstream gaps in HPV-related diseases and cancers.

Limitations and Strengths

This study has important limitations. The cross-sectional nature of the NHIS survey limits the ability for causal inference. In addition, data on HPV vaccine awareness and covariates are based solely on household reports and may be subject to reporting bias. Furthermore, the parent's primary language was derived from the language in which the survey was conducted and may not accurately reflect the *preferred* primary language of the parent, leading to an underestimation of the number of parents whose primary language is one other than English. Similarly, our measure of acculturation is based on country of birth and time spent in the United States and may not be a particularly nuanced proxy. However, the use of this more crude proxy for acculturation may contribute to conservative estimates of this effect. Finally, we do not have information regarding the content of the well-child visit and cannot determine if the HPV vaccination was discussed.

This study also has important strengths. We are the first study to investigate parental awareness of HPV vaccines using a nationally representative US sample of both boys and girls aged 8 to 17 years using the most recent data available, thereby providing important information and comparisons regarding populations previously not addressed in the literature. In addition, by using a large, nationally representative population-based sample, we were able to provide generalizable results while adjusting for potential confounders.

CONCLUSIONS

This study contributes to the literature surrounding upstream barriers to the receipt of HPV vaccines among male and female preadolescent and adolescent children in the United States, specifically by addressing factors that could influence HPV vaccine awareness among the parents of these children. We found that improving access to preventive pediatric health care may offer an opportunity to increase parental awareness of the vaccines; however, significant racial and ethnic, language and acculturation, and education-based, income-based, and insurance-based disparities remain. As such, public health efforts that provide culturally sensitive information in a variety of languages, in medical and non-medical settings, may be an effective way to reach vulnerable groups. Although reducing disparities in parental awareness of HPV vaccines will arm parents with vital information that may lead to increases in vaccination rates, families may ultimately require improved access to vaccination recommendations and services to expand vaccination rates and improve health outcomes for children across their life spans.

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Table 1
Sociodemographic Characteristics and Parental Awareness of HPV Vaccines among Parents of US Preadolescents and Adolescents (8–17 years), 2010
National Health Interview Survey

	Total	Yes, Heard of Vaccine	No, Never Heard of Vaccine	Overall χ^2 P Value	χ^2 P Value*
Total: weighted	37,584,665	23,546,544	14,038,121		
% : weighted		62.6%	37.4%		
Total: unweighted	5735	3419	2316		
% : unweighted		59.6%	40.4%		
Child characteristics					
Sex				<0.0001	
Male	50.8%	56.4%	43.6%		
Female	49.2%	69.1%	30.9%		
Mean age (SD), y	12.52 (2.88)	12.59 (2.80)	12.39 (3.02)	0.0504	
Has a USC?				<0.0001	
Yes	95.8%	63.6%	36.4%		
No	4.2%	41.7%	58.3%		
Health insurance status				<0.0001	
Any private	57.3%	70.3%	29.7%		<0.0001
Public only	29.8%	54.5%	45.5%		<0.0001
Partial	7.2%	56.8%	43.2%		0.0395
None	5.7%	36.4%	63.6%		<0.0001
Had a well-child checkup in the last 12 mo?				<0.0001	
Yes	74.3%	65.0%	35.0%		
No	25.7%	55.9%	44.1%		
No. siblings aged 8–17 y in household				0.1270	
None	37.1%	61.3%	38.7%		
1	62.9%	63.5%	36.5%		
Parent characteristics					
Respondent's relationship to child				0.0013	
Biological/Adoptive/Step parent	96.4%	63.1%	36.9%		
Legal guardian	3.6%	50.4%	49.6%		

	Total	Yes, Heard of Vaccine	No, Never Heard of Vaccine	Overall χ^2 P Value	χ^2 P Value*
Sex					
Male	26.7%	51.1%	48.9%	<0.0001	
Female	73.3%	66.9%	33.1%		
Mean age (SD), y	41.56 (7.95)	41.67 (7.46)	41.38 (8.78)	0.2536	
Race/Ethnicity					
White (non-Hispanic)	61.2%	70.8%	29.2%	<0.0001	<0.0001
Black (non-Hispanic)	14.3%	58.9%	41.1%		0.0393
Other (non-Hispanic)	5.1%	43.6%	56.4%		<0.0001
Hispanic	19.3%	44.7%	55.3%		<0.0001
Primary language					
English	92.2%	65.6%	34.4%	<0.0001	
Other	7.8%	27.9%	72.1%		
Acculturation					
Born in US	79.0%	68.7%	31.3%	<0.0001	<0.0001
Born outside US, in US 15 y	14.1%	44.9%	55.1%		<0.0001
Born outside US, in US 10–<15 y	3.7%	33.2%	66.8%		<0.0001
Born outside US, in US <10 y	3.2%	25.9%	74.1%		<0.0001
Marital status					
Married, living with partner	75.0%	64.1%	35.9%	0.0027	0.0025
Divorced/Widowed/Separated	17.0%	59.7%	40.3%		0.0797
Never married	8.0%	55.6%	44.4%		0.0064
Education attainment					
No or some high school	15.1%	38.2%	61.8%	<0.0001	<0.0001
High school graduate	22.6%	57.2%	42.8%		0.0006
Some college	33.4%	68.1%	31.9%		<0.0001
College or beyond	28.9%	73.4%	26.6%		<0.0001
Family characteristics					
Income as a % of FPL [†]				<0.0001	
<100% of FPL	18.7%	47.9%	52.1%		<0.0001
100%–199% of FPL	19.4%	56.3%	43.7%		<0.0001
200%–399% of FPL	26.9%	68.4%	31.6%		<0.0001

	Total	Yes, Heard of Vaccine	No, Never Heard of Vaccine	Overall χ^2 P Value	χ^2 P Value*
400%+ of FPL	26.3%	73.6%	26.4%		<0.0001
Unknown	8.7%	57.7%	42.3%		0.0385
Region of US				0.0006	
Northeast	15.8%	60.3%	39.7%		0.2609
Midwest	24.2%	67.4%	32.6%		0.0023
South	35.8%	63.9%	36.1%		0.2538
West	24.1%	57.6%	42.4%		0.0013

Weighted column percentages are displayed in the “Total” column, whereas weighted row percentages are displayed elsewhere. Weighted means and SDs are displayed for continuous variables.

* χ^2 test for each category of characteristic.

† Predefined NHIS poverty thresholds are based on the weighted average federal poverty thresholds (US Census Bureau) for the previous calendar year, as the reference period for income questions in the NHIS is the previous calendar year.

FPL indicates federal poverty level; HPV, human papillomavirus; SD, standard deviation; US, United States; USC — usual source of care.

Table 2

Multivariable Logistic Regression Predicting Parental Awareness of HPV Vaccines Among Parents of US Preadolescents and Adolescents (8–17 years), 2010 National Health Interview Survey

	Heard of HPV Vaccines (vs. Never Heard of Vaccines)			
	OR	95% CI	AOR	95% CI
Child characteristics				
Sex				
Male	1.00	Reference	1.00	Reference
Female	1.73	1.51	1.97	1.60
Age				
Age	1.02	1.00	1.05	1.01
Has a USC?				
Yes	2.44	1.76	3.38	1.29
No	1.00	Reference	1.00	Reference
Health insurance status				
Any private	1.00	Reference	1.00	Reference
Public only	0.51	0.44	0.59	0.91
Partial	0.56	0.43	0.72	0.98
None	0.24	0.18	0.33	0.58
Had a well-child checkup in the last 12 mo?				
Yes	1.47	1.27	1.69	1.23
No	1.00	Reference	1.00	Reference
No. siblings aged 8–17 y in household				
None	1.00	Reference	1.00	Reference
1	1.10	0.97	1.24	0.98
1.29				
Parent characteristics				
Respondent's relationship to child				
Biological/Adoptive/Step parent	1.00	Reference	1.00	Reference
Legal guardian	0.60	0.43	0.82	0.72
Sex				
Male	1.00	Reference	1.00	Reference
Female	1.93	1.67	2.22	2.40
2.81				

	Heard of HPV Vaccines (vs. Never Heard of Vaccines)				
	OR	95% CI	AOR	95% CI	
Age	1.01	1.00	1.01	0.99	1.01
Race/Ethnicity					
White (non-Hispanic)	1.00	Reference	1.00	Reference	
Black (non-Hispanic)	0.59	0.49	0.72	0.59	0.89
Other (non-Hispanic)	0.32	0.24	0.42	0.37	0.69
Hispanic	0.33	0.28	0.40	0.61	0.96
Primary language					
English	1.00	Reference	1.00	Reference	
Other	0.20	0.16	0.25	0.51	0.95
Acculturation					
Born in US	1.00	Reference	1.00	Reference	
Born outside US, in US 15 y	0.37	0.31	0.44	0.49	0.80
Born outside US, in US 10–<15 y	0.23	0.16	0.31	0.33	0.73
Born outside US, in US <10 y	0.16	0.11	0.23	0.21	0.47
Marital status					
Married, living with partner	1.00	Reference	1.00	Reference	
Divorced/Widowed/Separated	0.83	0.70	0.99	0.65	0.95
Never married	0.70	0.55	0.89	0.64	1.13
Education attainment					
No or some high school	0.46	0.37	0.58	0.56	0.93
High school graduate	1.00	Reference	1.00	Reference	
Some college	1.59	1.31	1.94	1.09	1.66
College or beyond	2.06	1.69	2.52	1.37	2.23
Family characteristics					
Income as a % of FPL *					
<100% of FPL	0.33	0.27	0.41	0.46	0.86
100%–199% of FPL	0.46	0.38	0.56	0.58	0.97
200%–399% of FPL	0.78	0.65	0.93	0.76	1.14
400%+ of FPL	1.00	Reference	1.00	Reference	
Unknown	0.49	0.38	0.63	0.48	0.86

	Heard of HPV Vaccines (vs. Never Heard of Vaccines)					
	OR	95% CI	AOR	95% CI		
Region of US						
Northeast	1.12	0.88	1.42	0.82	0.63	1.06
Midwest	1.52	1.22	1.89	1.09	0.86	1.38
South	1.30	1.08	1.56	1.13	0.92	1.38
West	1.00	Reference	1.00	Reference		Reference

Multivariable (adjusted) results control for child sex, age, USC, health insurance, well-child checkup, number of siblings (ages 8–17 years), respondent’s relationship to the index child, parent sex, age, race/ethnicity, primary language, acculturation, marital status, educational attainment, family income, and US region of residence.

* Predefined NHIS poverty thresholds are based on the weighted average federal poverty thresholds (US Census Bureau) for the previous calendar year, as the reference period for income questions in the NHIS is the previous calendar year.

FPL indicates federal poverty level; HPV, human papillomavirus; US, United States; USC, usual source of care; OR, (unadjusted) odds ratio; AOR, adjusted odds ratio; CI, confidence interval.