



## Missed Opportunity to Provide HPV Vaccine and Educate Adolescents: Rhode Island Middle and High School Students' Self-Reported HPV Vaccination, 2013 RI YRBS

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The nation's cancer status report in 2013 highlighted that cancers attributable to human papilloma virus (HPV) increased in the past decade, particularly cancers in the oropharynx and anus.<sup>1</sup> HPV vaccine is crucial in reducing the burden of HPV-associated cancers, by protecting against HPV infections that cause cervical, vulvar, vaginal, anal and oropharyngeal cancers.<sup>2,3</sup> Non-cancerous lesions, such as genital warts, are also prevented by the currently licensed HPV vaccine.<sup>3</sup> The Centers for Disease Control and Prevention (CDC)'s Advisory Committee on Immunization Practices (ACIP) has recommended vaccination against HPV for young females since 2007, and young males since 2011.<sup>3</sup> Despite the robust evidence on vaccine efficacy, safety and cost benefit, only 56% of girls and 43% of boys ages 13–17 years in Rhode Island, were estimated to be up-to-date on the three-dose HPV vaccine series, according to the 2013 National Immunization Survey (NIS)-Teen.<sup>4</sup> The national Healthy People 2020 goal (IID-11.4) is to reach at least 80% coverage among female adolescents ages 13–15 years.<sup>5</sup>

To identify challenges and opportunities in current HPV vaccine coverage, Rhode Island adolescents' self-reported receipt of HPV vaccine was examined in this study. With the study aimed to assess any missed opportunity in provision of HPV vaccine, the authors further evaluated demographic and other characteristics of adolescents who had a recent primary care visit but did not receive HPV vaccine or were not aware of their vaccination status.

### METHODS

#### Data Source and Study Population

The data used for this analysis were obtained from the 2013 **Rhode Island Youth Risk Behavior Survey (YRBS)**. The YRBS is a biennial statewide survey of public middle and high school students, developed by the CDC to monitor health risk behaviors related to leading causes of injury, violence, morbidity and mortality among youth.<sup>6</sup> In collaboration with the Rhode Island Department of Elementary and Secondary Education, the Rhode Island Department of Health has conducted the YRBS since 1997. During the spring of 2013, 2,338 students from 23 public middle schools and 2,453 students from 22 public high schools completed the self-administered paper survey. Overall response rates, determined by school and student response rates, were 81% and 71% for middle and high school surveys, respectively.

Data from middle and high school surveys combined for adolescents aged 13–18 years were included in this study (sample size of 3,728 that represents 59,374 adolescents). The age range was determined taking into consideration the current ACIP recommendations of routine HPV vaccination at ages 11–12 years, and catch-up vaccination for 13 years and older, if not previously vaccinated.

#### Variables Analyzed

The outcome variable, *self-reported receipt of HPV vaccine*, was derived from a state optional question that was included for the first time in the Rhode Island YRBS, and asked respondents if they ever received HPV vaccine (“a vaccine to prevent human papillomavirus or HPV infection, also called the cervical cancer vaccine, HPV shot or GARDASIL”). Adolescents' receipt of HPV vaccine was cross-examined with receipt of a regular check-up or physical exam in the past 12 months. To assess demographic and potential explanatory characteristics of adolescents who *did not* reportedly receive or *were not sure* of receiving HPV vaccine, although they had a primary care encounter in the past year through a regular check-up or physical exam, the following variables were analyzed: 1) gender, 2) age, 3) race/ethnicity, 4) having ever had sexual intercourse, and 5) having ever been taught about AIDS or HIV infection in school as a proxy indicator of exposure to sexual health education.

#### Statistical Analyses

Data were weighted to the probability of selection and adjusted to reflect the grade, gender and race/ethnicity distribution of the Rhode Island public middle and high school students.<sup>6</sup> All analyses were stratified by gender, considering differential HPV vaccine uptake by gender; the routine HPV vaccine recommendation for boys was added in later years. Bivariate analyses using the chi-square test were done to identify any significant differences between the various groups (at  $p < .05$ ), with respect to *not having received HPV vaccine or not knowing of HPV vaccination status*. To identify important predictors of the outcome variable, gender-stratified multivariate logistic regression analyses were conducted. The statistical significance of the regression coefficients was tested using the Wald statistics (at  $p < .05$ ). SAS survey procedures were used for all the analyses in the study to account for the complex sampling design.

## RESULTS

### Characteristics of the Study Population

As summarized in **Table 1**, among adolescents aged 13–18 years, approximately three of ten girls and boys, respectively, ever had sexual intercourse (girls: 29.4%, 95% CI=24.7%-34.2%; boys: 31.6%, 95% CI=26.8%-36.3%). The majority of adolescents responded they had ever been taught about AIDS or HIV infection in school and had a regular check-up or physical exam in the past 12 months. No gender difference was observed, regarding sexual experience, AIDS/HIV education, and recent primary care visit.

### Self-reported Receipt of HPV Vaccine

Among girls 13 years and older, 56% (55.8%, 95% CI=52.0%–59.6%) reported ever having the HPV vaccine. A significantly lower percentage of boys in the same age group reported they ever received HPV vaccine (37.3%, 95% CI=33.7%–40.9%,  $p<0.0001$ ) (**Table 1** and **Figure 1**). For both genders of the adolescents, those who had a regular check-up or physical exam in the past year were more likely to report their receipt of HPV vaccine, compared with counterpart adolescents who did not have a primary care visit ( $p<0.0001$ , **Figure 1**).

### Not Having HPV Vaccine or Not Knowing of Vaccination Status among Adolescents Who Had a Check-up or Physical Exam

About 4 of 10 girls and 6 of 10 boys reported they *did not* receive or *were not sure* of receipt of the vaccine, although they had a primary care visit in the past year (Girls: 38.3%, 95% CI=34.6%–41.9%; Boys: 58.7%, 95% CI=54.9%–62.5%) (**Figure 2**). The proportions of these girls and boys were significantly higher among younger cohorts than older ones.

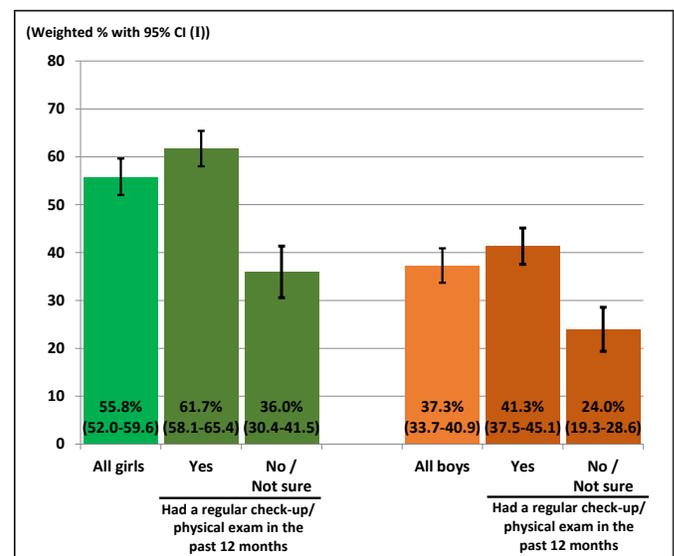
The results of multiple logistic regression analyses confirm that adolescent's age, sexual experience and sex education, independently, affect the likelihood of not having received HPV vaccine or not knowing about the vaccination. The strengths of associations with each variable category were not uniform by gender. Odds of not having received the vaccine were greater among girls in age 13–14 years (AOR=2.40, 95% CI=1.54–3.75, compared with 17–18 years), and who

**Table 1.** Number and Percent of the Rhode Island Adolescents Ages 13-18 Years by Gender and Study Variables, 2013 RI Youth Risk Behavior Survey (YRBS)

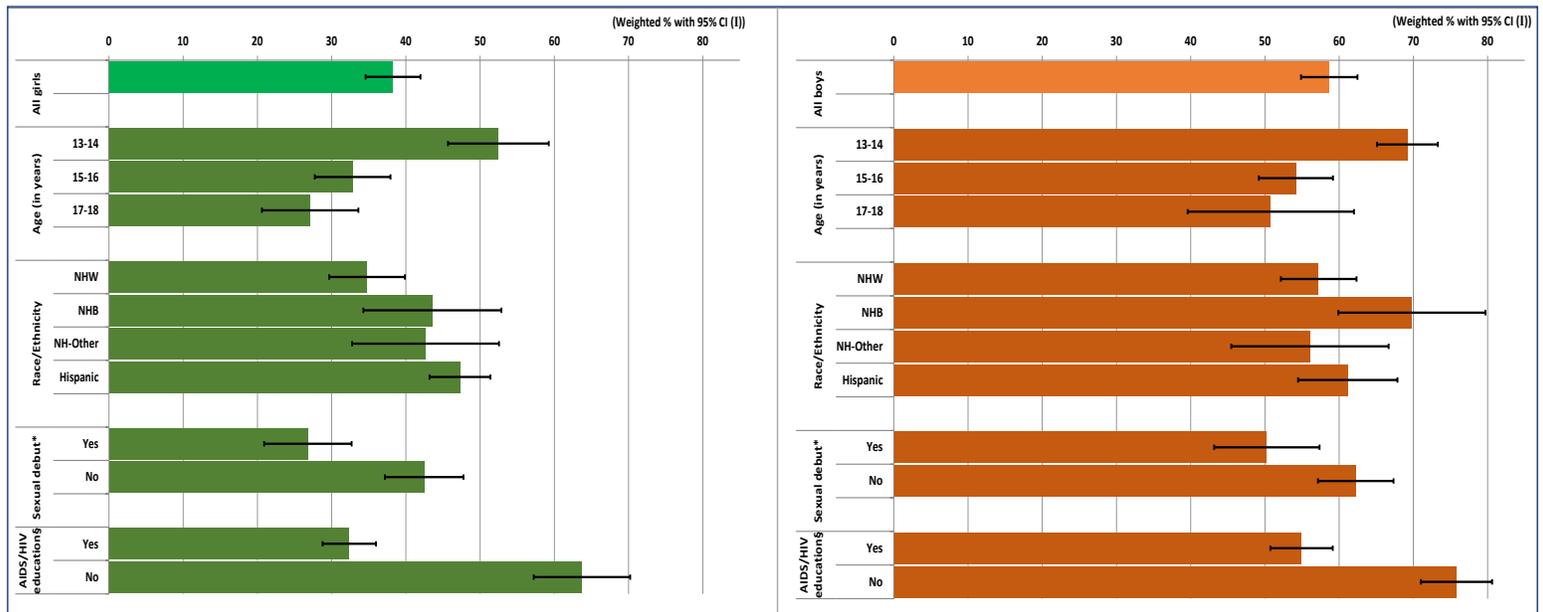
Variable Category	GIRL		BOY	
	n* (unweighted)	Weighted % (95% CI)	n* (unweighted)	Weighted % (95% CI)
<b>Age</b>				
13-14 years	815	38.1 (33.9–42.4)	751	37.0 (32.2–41.8)
15-16 years	713	36.6 (30.9–42.3)	674	38.3 (33.1–43.6)
17-18 years	395	25.3 (20.8–29.7)	380	24.7 (20.3–29.1)
<b>Race/Ethnicity</b>				
Non-Hispanic White	956	65.6 (53.1–78.1)	852	62.9 (51.2–74.5)
Non-Hispanic Black	154	7.4 (3.1–11.7)	178	9.7 (4.3–15.1)
Non-Hispanic Other	196	5.7 (4.1–7.3)	211	6.8 (5.1–8.5)
Hispanic	577	21.3 (12.8–29.8)	517	20.6 (13.2–28.0)
<b>Ever had sexual intercourse</b>				
Yes	481	29.4 (24.7–34.2)	500	31.6 (26.8–36.3)
No	1,326	70.6 (65.8–75.3)	1,136	68.4 (63.7–73.2)
<b>Ever been taught about AIDS or HIV infection in school</b>				
Yes	1,402	78.0 (72.1–84.0)	1,311	76.9 (72.9–80.9)
No/Not sure	471	22.0 (16.0–27.9)	425	23.1 (19.1–27.1)
<b>Had a regular check-up or physical exam in the past 12 months</b>				
Yes	1,425	78.1 (74.7–81.5)	1,285	76.9 (73.7–80.1)
No/Not sure	424	21.9 (18.5–25.3)	429	23.1 (19.9–26.3)
<b>Ever had HPV vaccine</b>				
Yes	992	55.8 (52.0–59.6)	600	37.3 (33.7–40.9)
No	306	16.0 (13.1–18.8)	409	23.6 (20.9–26.2)
Not sure	568	28.2 (25.0–31.4)	699	39.1 (36.9–41.4)
<b>TOTAL</b>	<b>1,923</b>	<b>48.9 (46.4–51.3)</b>	<b>1,805</b>	<b>51.1 (48.7–53.6)</b>

\* Frequency for each category may not add up to total because of missing data. CI=confidence interval

**Figure 1.** Rhode Island Adolescents (13-18 years old) Who Reportedly Ever Received HPV Vaccine by Gender and Recent Primary Care Visit, 2013 RI Youth Risk Behavior Survey (YRBS)



**Figure 2.** Rhode Island Adolescents (13-18 years old) Who Have Never Received HPV Vaccine/Were Not Sure of HPV Vaccination among Those Who Had Primary Care Visit (a Check-Up or Physical Exam) in the Past 12 Months, 2013 RI Youth Risk Behavior Survey (YRBS)



NHW= Non-Hispanic White, NHB= Non-Hispanic Black, NH-Other= Non-Hispanic Other  
 \* measured with question “Have you ever had sexual intercourse?”  
 § measured with question “Have you ever been taught about AIDS or HIV infection in school?”

did not have AIDS/HIV education (AOR=2.61, 95% CI=1.79–3.81). Among boys, those who never had sexual intercourse (AOR=1.47, 95% CI=1.05–2.06) and who never had AIDS/HIV education in school (AOR=2.57, 95% CI=1.89–3.49) were significantly more likely not to have received HPV vaccine than those who ever had sexual intercourse and AIDS/HIV education. In respect to racial/ethnic differences, Hispanic girls and non-Hispanic Black boys, compared to non-Hispanic White peers, were more likely not to report their receipt of HPV vaccine, even though they had a primary care visit in the preceding year.

**DISCUSSION**

Despite the recommended routine HPV vaccination schedule starting at age 11–12 years, this study’s findings showed that, among adolescents aged 13 years and older who had a primary care visit in the past year, only 62% of girls and 41% of boys reported they ever received HPV vaccine. Research showed that HPV vaccine is more likely than other recommended vaccines to be refused by parents.<sup>7,8</sup> Low vaccine coverage by younger age adolescents may be determined by parental or provider factors; parents may delay or refuse the

**Table 2.** Adjusted Odds Ratios for Not Having Received HPV Vaccine/Not Being Sure of HPV Vaccination among Rhode Island Adolescents (13-18 years old) Who Had Primary Care Visit (a Check-Up or Physical Exam) in the Past 12 Months, 2013 RI Youth Risk Behavior Survey (YRBS)

Variable Category	GIRL	BOY
	Adjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)
<b>Age</b>		
13-14 years vs. 17-18 years	<b>2.40 (1.54–3.75)</b>	1.69 (0.92–3.10)
15-16 years vs. 17-18 years	1.35 (0.89–2.04)	1.04 (0.65–1.65)
<b>Race/Ethnicity</b>		
Non-Hispanic Black vs. NHW	1.17 (0.76–1.81)	<b>2.15 (1.12–4.11)</b>
Non-Hispanic Other vs. NHW	1.26 (0.69–2.31)	0.83 (0.53–1.30)
Hispanic vs. NHW	<b>1.59 (1.17–2.15)</b>	1.09 (0.68–1.73)
<b>Ever had sexual intercourse</b>		
No vs. Yes	1.47 (0.90–2.38)	<b>1.47 (1.05–2.06)</b>
<b>Ever been taught about HIV/AIDS in school</b>		
No/Not sure vs. Yes	<b>2.61 (1.79–3.81)</b>	<b>2.57 (1.89–3.49)</b>

NHW=Non-Hispanic White  
 CI=confidence interval  
 Bold font indicates that 95% CI does not include 1.00.

vaccination, or providers do not strongly recommend, delay, or sometimes do not recommend the vaccine at all. Consistent evidence shows that a strong provider recommendation is the most critical factor to reduce non-compliance rates.<sup>8,9</sup>

Because the YRBS solely relies on adolescents' self-report, the reported prevalence rates are understandably lower than those from the NIS-Teen, which uses estimates derived from the parent/guardian survey and verified with immunization records.<sup>10</sup> According to the 2013 NIS-Teen, 77% of girls and 69% of boys aged 13–17 years in Rhode Island initiated at least one dose of HPV vaccine.<sup>4</sup> The reporting gap between the adolescents' self-report in the YRBS and the NIS-Teen may arise from adolescents' lack of awareness and recall bias, supported by this study finding that a large number of adolescents could not provide an affirmative response to the HPV vaccine question (Table 1). Adolescents who were actually vaccinated, recently or years ago, may not have recalled the vaccinations because of the following reasons: 1) parental consent is required for vaccine administration for adolescents; and parents and providers may not sufficiently, or at all, discuss with adolescents during primary care visits or afterward; and 2) adolescents may not actively engage in discussion with parents and providers regarding the care and counseling they receive.

The results of this study, along with the NIS-Teen report, indicate that many Rhode Island teens have not been vaccinated or fully vaccinated against HPV. Primary care visits should be fully utilized as opportunities to educate not only parents but also the adolescent patient. Reviewing vaccination history with parents and adolescent patients, and assuring up-to-date vaccination are core components during primary care visits.<sup>11</sup> Adolescents benefit from information on the type of vaccines they receive and specific diseases they are protected from by getting those vaccines and other preventive measures. A recent study in an urban hospital-based clinic in the US reported most adolescents perceived the benefits of being vaccinated and the importance of safer sexual behavior after receipt of the first HPV vaccination.<sup>12</sup> This Rhode Island YRBS study found that AIDS/HIV education at school was positively associated with adolescents' self-report of HPV vaccine. Even though authors are not able to evaluate the content, delivery, and receptiveness of AIDS/HIV education in school, an implication from this finding is that adolescents' exposure to a type of sexual health education may reinforce their knowledge on safe sex and perception on protection against HPV infection. It is important to provide age-appropriate counseling at the time of vaccination and the benefits and limitations of HPV vaccination, particularly for teenagers.

The findings in this report are subject to at least three limitations. First, the YRBS data rely on adolescents' self-report and self-recall, as mentioned above, and these anonymous reports are not possible to be verified with secondary sources, such as health record review. Second, due to inherent limitations of cross-sectional study, the authors cannot make a causal inference to explain HPV vaccine coverage among adolescents. Third, the YRBS data provided only a limited number of demographic, sexual experience, and sexual education variables. For further study, more explanatory variables (e.g., medical home establishment, relationship/

satisfaction with provider, content and effectiveness of sexual health education, awareness/knowledge of sexual health, cultural/linguistic barrier, etc.) need to be developed and included in the survey with the HPV vaccine variable.

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## Disclosures

The authors and/or spouses/significant others have no financial interests to disclose.

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