

Human Papillomavirus (HPV) Vaccination Coverage among Rhode Island Adolescents, 2008–2014

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Human papillomavirus (HPV) is the most common sexually transmitted infection. In the United States, approximately 79 million people are currently infected with human papillomavirus and another 14 million people become newly infected each year.¹⁻³ In fact, most sexually active adults become infected at some point in their lives, with the highest rates of infection among people in their late teens and early 20s.¹⁻³ Although most HPV infections are asymptomatic and transient, certain types can cause cancers of the cervix, vagina, and vulva in women; cancers of the penis in men; and cancers of the anus and oropharynx (back of the throat, base of the tongue, and tonsils) as well as genital warts in men and women.¹⁻³ Every year, an estimated 17,600 women and 9,300 men are diagnosed with a cancer caused by HPV, and many of these cancers could be prevented with vaccination.¹⁻³

CDC's Advisory Committee on Immunization Practices (ACIP) recommends HPV vaccination for adolescent girls and boys at ages 11 or 12 years to protect against cancers and genital warts caused by HPV infections. HPV vaccines are administered as a 3-dose series over 6 months, ideally, before adolescents are exposed to HPV.¹⁻³ In Rhode Island, HPV vaccine has been provided to clinicians through the state program since November 2006 for girls and since July 2011 for boys.

This report describes 1) the trends of HPV vaccination coverage among Rhode Island adolescents 13-17 years of age, 2) the missed opportunities to receive the HPV vaccine, and 3) the role of healthcare provider recommendations in HPV vaccine uptake.

METHODS

We analyzed data from the 2008-2014 National Immunization Survey – Teen (NIS-Teen). NIS-Teen has collected HPV vaccination information among adolescents aged 13–17 years since 2008 for girls and since 2011 for boys in each of the 50 states and selected areas. NIS-Teen is a two stage survey: 1) a random-digit-dialed telephone interview with an adolescent's parent/guardian to collect socio-demographics, parents' attitude on vaccines, as well as vaccination provider contact information (Household Survey), and 2) a mailed survey to the child vaccination providers to obtain immunization history information from the medical records (Provider Survey).^{4,5} HPV vaccination coverage data presented in this report is based on the Provider Survey^a and the information

on whether the parents received HPV vaccination recommendation by their child healthcare provider is based on the Household Survey. Both household and provider survey data are weighted to represent the entire adolescent population in Rhode Island. Details regarding NIS-Teen methodology, including weighting procedures and synthesizing provider-reported vaccination histories, are available elsewhere.^{4,5}

In this report, a missed opportunity to receive the HPV vaccine was defined as a healthcare encounter where the adolescent received at least one adolescent vaccine (Tdap or MCV4)^b but did not receive the first dose of HPV vaccine. The trends of HPV vaccination coverage were presented for girls and boys separately each year. However, we combined the most recent 3-year (2012–2014) data when examining the role of provider recommendations in receipt of HPV vaccination. Differences in vaccination coverage were considered statistically significant if $p < .05$.

RESULTS

Trends in HPV Vaccination Coverage

Figure 1 shows the trends in vaccination coverage with ≥ 1 and ≥ 3 doses of HPV vaccine among Rhode Island adolescent girls (2008-2014) and boys (2012-2014).^c For girls, HPV vaccination coverage for both ≥ 1 and ≥ 3 doses increased significantly in the early part of the period: during 2008-2010, coverage rates for ≥ 1 dose of HPV vaccine increased from 54.7% to 73.0% (18.3 percentage points increase, linear trend $p < 0.01$) and coverage rates for ≥ 3 doses increased from 31.4% to 55.1% (23.7 percentage points increase, linear trend $p < 0.001$). However, the coverage rates remained unchanged since 2010 for both ≥ 1 and ≥ 3 doses. The same pattern was observed in the coverage trends for boys. Coverage for both ≥ 1 and ≥ 3 doses of HPV vaccine among boys significantly increased only between 2012 and 2013 (from 55.2% to 69.3%; $p < .05$; for ≥ 1 dose and from 17.7% to 43.2%; $p < .0001$; for ≥ 3 doses). However, between 2013 and 2014, the coverage rates for both ≥ 1 and ≥ 3 doses did not change at all (from 69.3% to 69.0% and from 43.2% to 42.9%, respectively).

Overall, coverage rates with ≥ 1 and ≥ 3 doses of HPV vaccine among Rhode Island adolescents, both girls and boys, were much higher than the national coverage throughout the periods. For girls, during 2008-2014, the coverage difference between Rhode Island and the U.S. for ≥ 1 dose of HPV vaccine peaked in 2010 with 24.3 percentage points, but

it narrowed down to 16.0 percentage points in 2014. For boys, during 2012–2014, the coverage difference between Rhode Island and the U.S. for ≥1 dose of HPV vaccine peaked in 2012 with 34.7 percentage points, but it narrowed down to 27.3 percentage points in 2014 (The coverage rates for the U.S. were not presented in Figure 1).

Missed Opportunities in HPV Vaccination

Figure 2 presents the coverage trends of three adolescent vaccines in Rhode Island – Tdap, MCV4, and HPV vaccines. Although the CDC’s Advisory Committee on Immunization Practices (ACIP) recommends that adolescents aged 11–12 years receive these three vaccines during a single healthcare visit,⁸ there has been a substantial difference in coverage levels among vaccines. Coverage for ≥1 dose of HPV vaccine has remained lower compared with the other two vaccines, especially since 2010, which indicates many missed opportunities for administering HPV vaccine at visits when Tdap or MCV4 vaccine is given. The coverage rates for ≥1 dose of Tdap vaccine and ≥1 dose of MCV4 vaccine continuously increased from 2008 until 2012, where the coverage levels for both vaccines reached far above the Healthy People 2020 target of 80%. Their high coverage levels have been maintained since 2012. On the other hand, the coverage rate for ≥1 dose of HPV vaccine among girls increased from 2008 until 2010, where the coverage level was much lower than the other two vaccines, and then the coverage level stopped increasing. Because of the early stagnation in the increase in HPV vaccination coverage, the coverage difference between the HPV vaccine and the other vaccines has persisted since 2012. If HPV vaccine had been administered to adolescents during healthcare visits when they received Tdap or MCV4 vaccine, the coverage rate for ≥1 dose of HPV vaccine could have reached 98.3% (95% CI: 96.6%–99.9%) in 2014. In other words, if missed opportunities had been eliminated for adolescents 13–17 years of age in Rhode Island, the vaccination coverage for all three adolescent vaccines potentially could have reached 98.3%. The difference between the actual and potential coverage for ≥1 dose of HPV vaccine was 22.3 percentage points for girls and 29.3 percentage points for boys, compared to 5.9 percentage points for Tdap vaccine and 4.2 percentage points for MCV4 vaccine in 2014.

Provider’s Recommendations and Receipt of HPV Vaccination

As seen in **Figure 3** (2012–2014 combined data), the provider’s recommendation was significantly associated with the receipt of HPV vaccination for both adolescent girls and boys.

Figure 1. Trends of HPV vaccination coverage among adolescents 13–17 years of age, Rhode Island, 2008–2014^d

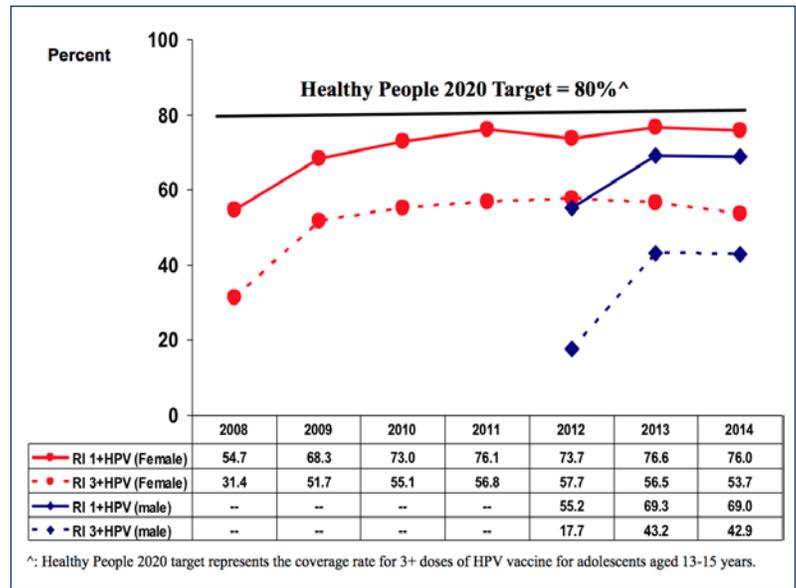
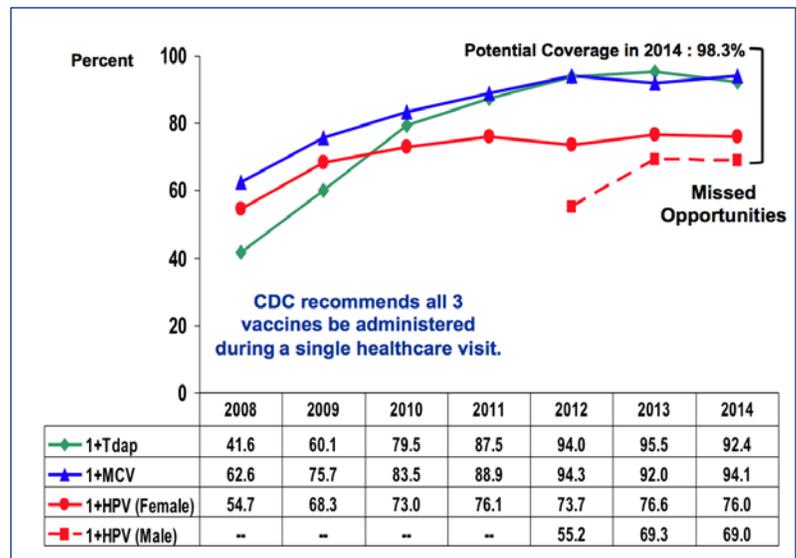
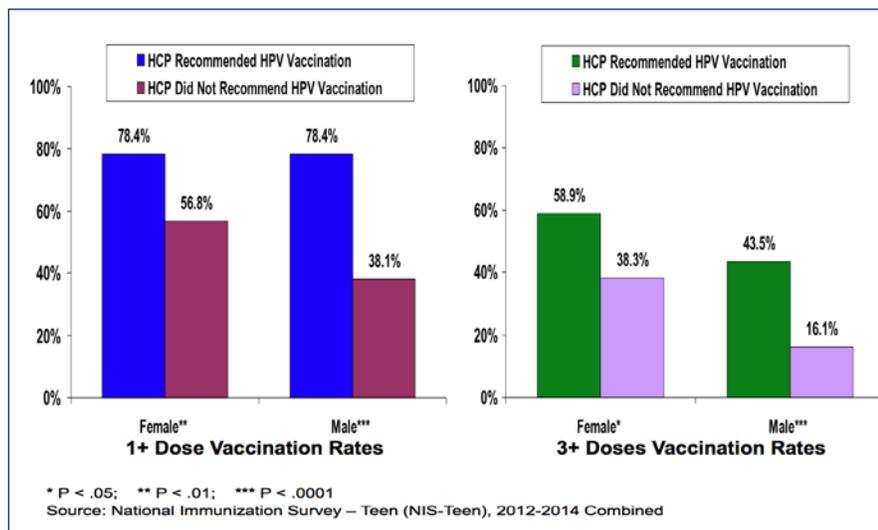


Figure 2. Missed opportunities in HPV vaccination among adolescents 13–17 years of age, Rhode Island, 2008–2014



Coverage rate for ≥1 dose of HPV vaccine was 78.4% (95% CI: 72.9%–83.9%) among girls whose parents reported receiving recommendations for the HPV vaccine by their child’s provider, compared to 56.8% (95% CI: 42.4%–71.3%) among girls whose parents reported not receiving recommendations ($p=0.0031$). The association was even more significant for boys: coverage rate for ≥1 dose of HPV vaccine was 78.4% (95% CI: 73.6%–83.2%) among boys whose parents reported receiving recommendations for the HPV vaccine, compared to 38.1% (95% CI: 28.2%–48.0%) among boys whose parents reported not receiving recommendations ($p<.0001$). The same patterns were found for ≥3 dose coverage among both

Figure 3. Provider Recommendation and Receipt of HPV Vaccine, Rhode Island, 2012–2014 combined



girls and boys. Coverage rates for ≥ 3 doses of HPV vaccine among girls was 58.9% (95% CI: 53.0%–64.9%) when their parents received provider's recommendations, compared to 38.3% (95% CI: 23.7%–53.0%) when their parents did not receive recommendations ($p=0.0123$). For boys, the coverage for ≥ 3 doses of HPV vaccine was 43.5% (95% CI: 37.4%–49.7%) when their parents received provider's recommendations, compared to 16.1% (95% CI: 8.7%–23.4%) when their parents did not receive recommendations ($p<.0001$) (Figure 3).

The parents of adolescents who did not receive the full 3 doses of HPV vaccine and who were unlikely to receive HPV vaccine in the next 12 months were asked to provide the main reasons for not vaccinating their teens (multiple responses were allowed). **Table 1** presents the top 5 reasons reported in the 2012–2014 NIS-teen. Among parents of girls, 17.5% (95% CI: 11.3%–23.7%) reported that the main reason was that HPV vaccination had not been recommended; among parents of boys, 31.5% (95% CI: 24.6%–38.4%) reported that HPV vaccination had not been recommended.

Table 1. Top five reasons for not vaccinating adolescents with HPV vaccine, Rhode Island, 2012–2014 combined

PARENTS OF GIRLS			PARENTS OF BOYS		
Reason	%	(95% CI)	Reason	%	(95% CI)
Not needed or necessary	18.1	10.5-25.7	Not recommended	31.5	24.6-38.4
Not recommended	17.5	11.3-23.7	Not needed or not necessary	14.1	9.2-18.9
Lack of knowledge	14.9	8.6-21.2	Lack of knowledge	11.7	6.4-17.0
Safety concern/Side effects	10.7	4.8-16.6	Child not sexually active	10.2	5.2-15.2
Child not sexually active	6.8	2.8-10.9	Safety concern/Side effects	6.6	3.1-10.0

DISCUSSION

Although the HPV vaccination coverage rates among Rhode Island adolescents 13–17 years of age, both girls and boys, were significantly higher than the U.S throughout the period, the coverage rates were much lower when compared to other routinely recommended adolescent vaccines. In 2014, nearly one in four adolescent girls (24%) and one in three adolescent boys (31%) in Rhode Island did not initiate the HPV vaccination series. Only 54% of girls and 43% of boys completed the full 3-dose series. HPV vaccination coverage rates in Rhode Island have not increased since 2010 for girls and since 2013 for boys. In addition, our data show that there have been many missed opportunities for HPV vaccinations, compared to the

other routinely recommended adolescent vaccines. If the missed opportunities were eliminated, coverage of one dose of HPV vaccine could have reached 98.3%.

Recommendations for Rhode Island Healthcare Providers

Healthcare providers (HCPs) play a critical role in improving HPV vaccination rates. HCPs should educate parents that HPV vaccine is safe and effective in preventing cervical cancer and genital warts, and that HPV vaccine is a 3-dose series administered over 6 months that is most effective when given before their child is exposed to HPV.^{1,2} To eliminate missed opportunities for vaccination, HCPs should make a strong recommendation for HPV vaccine, since it is the strongest predictor of vaccination, and administer HPV vaccine the same way and the same day as other adolescent vaccines. Reminder/recall systems, use of KIDSNET (Rhode Island's Integrated Child Health Information System that includes the Immunization Information System) to monitor coverage rates, and using every encounter (well and sick visits) to assess vaccination status could improve HPV series completion rates.

Public Health Action to Improve HPV Coverage Rates

In an effort to improve HPV vaccination coverage in Rhode Island, in August of 2015 the Rhode Island Department of Health (RIDOH) implemented a school requirement with a graduated approach as follows. In fall 2015, one HPV vaccine dose was required for entry into 7th grade. For fall 2016, one dose will be required for 7th grade entry and two

doses will be required for 8th grade entry. For fall 2017 and thereafter, one dose will be required for 7th grade entry, two doses will be required for 8th grade entry, and three doses will be required for 9th grade entry.⁹ In addition, Rhode Island's *Vaccinate Before You Graduate (VBYG)* program, a catch-up vaccination program for high school students, has been expanded to the public middle schools effective in fall 2015, to eliminate access barriers for students to receive the HPV vaccination series.^{e,10}

There are several limitations in this report. First, the vaccination coverage trends during 2008–2014 should be interpreted with caution, as the NIS-Teen data collection methods changed in 2011⁶ and 2014⁷. Second, HPV vaccination coverage might have been underestimated due to the possible incompleteness of provider-verified vaccination histories. Third, the provider's recommendations for HPV vaccination data were reported by parents/guardians, which is subject to recall bias. Despite these limitations, this report provides important information on HPV vaccination among Rhode Island adolescents.

Footnotes

a HPV vaccination coverage does not distinguish between bivalent (2vHPV) and quadrivalent (4vHPV) vaccines. Although the nine-valent HPV vaccine (9vHPV) was licensed in December 2014, the vaccine was not distributed until 2015 and therefore the 9vHPV vaccine was not administered to adolescents during this study period.

b Annual influenza vaccination was not included in this analysis, even though it is routinely recommended for all people ≥ 6 months of age during the flu season.

c Although the NIS-Teen has presented the HPV vaccination coverage data for boys since 2011, this report did not include the 2011 coverage data for boys because Rhode Island state program has provided HPV vaccine to clinicians since July 2011 for boys.

d The vaccination coverage trends during 2008–2014 should be interpreted with caution, as the NIS-Teen data collection methods changed in 2011⁶ and 2014⁷.

e This expansion was initially funded by CDC's Prevention and Public Health Funding (PPHF) funds.

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Disclosure

The authors have no financial interests to disclose.

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