

Human Papillomavirus (HPV) Vaccination Coverage among Rhode Island Adolescents, 2008–2016

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Human papillomavirus (HPV) is the most common sexually transmitted infection in the United States, with the highest rates of infection among people in their late teens and early 20s.^{1,2} 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 as well as genital warts in men and women.^{1,3} Every year in the United States, an estimated 19,200 women and 11,600 men are diagnosed with a cancer caused by HPV, and most of these cancers could be prevented with vaccination.^{1,2}

The Centers for Disease Control and Prevention (CDC) recommends routine HPV vaccination for boys and girls at 11–12 years of age before exposure to HPV to protect against cancers and genital warts caused by HPV infections.^{1,3} HPV vaccine is administered as a 2- or 3-dose series depending on age of vaccine initiation.^{1,3} In Rhode Island, HPV vaccine has been available to providers through the state supplied vaccine program since November 2006 for girls and since July 2011 for boys.

This report describes 1) trends of HPV vaccination coverage among adolescents 13–17 years of age, and 2) missed opportunities to administer the HPV vaccine in Rhode Island.

METHODS

We analyzed data from the 2008–2016 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 uses a random-digit-dialed telephone interview with parents/guardians of eligible adolescents to collect socio-demographic information and vaccination provider contact information. Providers are then contacted by mail, containing a standard questionnaire, to report the immunization history from the adolescent’s medical records.⁴ HPV vaccination coverage estimates presented in this report are based on provider-reported immunization information.⁴

In this report, up-to-date (UTD) doses of HPV vaccination were defined as completion of a 3-dose series for 2008–2015, and completion of a 2- or 3-dose series for 2016, as specified in the CDC’s updated schedule.^{1,3} A missed opportunity to administer the HPV vaccine was defined as a healthcare

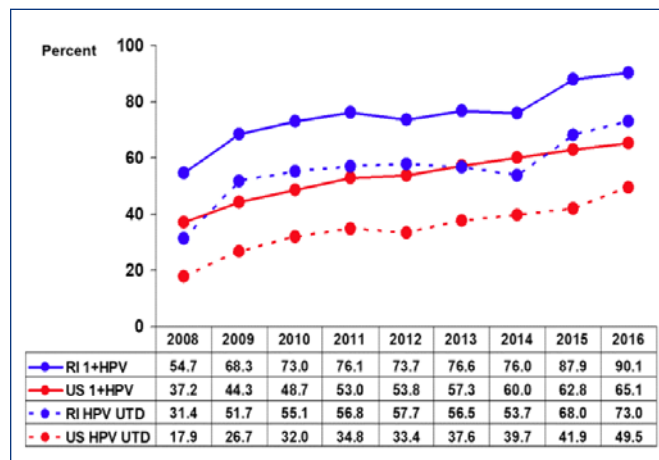
encounter where the adolescent received at least one adolescent vaccine (Tdap or MCV4) but did not receive the first dose of HPV vaccine. Trends of HPV vaccination coverage were presented from 2008 to 2016 for girls (n=1,534) and from 2012 to 2016 for boys (n=957) separately. Logistic regression was used to test the statistical significance of linear trend. Differences in vaccination coverage were considered statistically significant if $p < 0.05$.

RESULTS

Trends in HPV Vaccination Coverage for Girls

Figure 1 shows the trends in HPV vaccination coverage with ≥ 1 dose and UTD doses among girls 13–17 years of age. For Rhode Island girls, the overall trends in HPV vaccination coverage increased significantly during 2008–2016 for both ≥ 1 dose and UTD doses ($p < 0.001$ for both trends). More specifically, between 2008 and 2010, the early stage of vaccination, coverage with ≥ 1 HPV vaccine dose increased from 54.7% to 73.0% ($p < 0.01$) and coverage with UTD doses increased from 31.4% to 55.1% ($p < 0.001$). However, coverage rates leveled off during 2010–2014 for both ≥ 1 dose and UTD doses. Between 2014–2016, the most recent data available, coverage with ≥ 1 dose and UTD doses increased significantly, from 76.0% to 90.1% ($p < 0.01$) and from 53.7% to 73.0% ($p < 0.01$), respectively.

Figure 1. Trends in HPV vaccination coverage among girls 13–17 years of age, Rhode Island vs. United States, 2008–2016



Overall, HPV vaccination coverage rates among Rhode Island girls were significantly higher than the U.S. throughout the years, for both ≥ 1 dose and UTD doses. During 2008–2016, the differences in coverage rates between Rhode Island and the U.S. girls ranged from 16.0 percentage points in 2014 to 25.1 percentage points in 2015 for ≥ 1 dose, and ranged from 13.5 percentage points in 2008 to 26.1 percentage points in 2015 for UTD doses.

Trends in HPV Vaccination Coverage for Boys

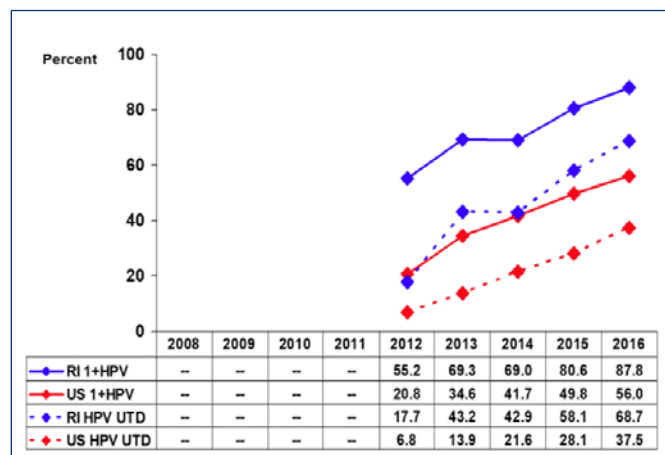
The overall trends in HPV vaccination coverage among Rhode Island boys increased significantly during 2012–2016, for both ≥ 1 dose and UTD doses ($p < 0.001$ for both trends) (Figure 2). More specifically, between 2012 and 2013, the early stage of vaccination, coverage rates increased significantly from 55.2% to 69.3% for ≥ 1 dose ($p < 0.05$) and from 17.7% to 43.2% for UTD doses ($p < 0.001$). However, between 2013 and 2014, coverage rates for both ≥ 1 dose and UTD doses did not change at all. During 2014–2016, coverage rates for ≥ 1 dose and UTD doses increased significantly again, from 69.0% to 87.8% ($p < 0.001$) and 42.9% to 68.7% ($p < 0.001$), respectively.

Overall, HPV vaccination coverage rates among Rhode Island boys were also significantly higher than the U.S. throughout the years. During 2012–2016, the differences in coverage rates between Rhode Island and the U.S. boys ranged from 27.3 percentage points in 2014 to 34.7 percentage points in 2013 for ≥ 1 dose, and ranged from 10.9 percentage points in 2012 to 31.2 percentage points in 2016 for UTD doses.

Differences in HPV Vaccination Coverage by Gender

Since HPV vaccine was introduced in 2006 for girls and in 2011 for boys, coverage rates for girls were higher than boys throughout the periods. However, the differences in HPV vaccination coverage between boys and girls in Rhode Island narrowed significantly during 2012–2016 due to faster increase in vaccination rates among boys than girls. Gender differences in HPV vaccination coverage decreased from 18.5 percentage points in 2012 to 2.3 percentage points in 2016 for ≥ 1 dose, and from 40.0 percentage points in 2012 to 4.3 percentage points in 2016 for UTD doses. In fact, gender

Figure 2. Trends in HPV vaccination coverage among boys 13–17 years of age, Rhode Island vs. United States, 2012–2016

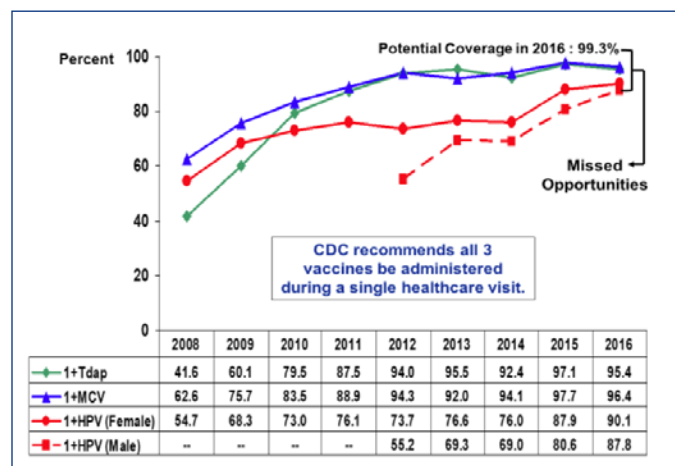


differences in coverage with ≥ 1 dose and UTD doses were no longer statistically significant in Rhode Island in 2016.

Missed Opportunities in HPV Vaccination

Figure 3 presents the coverage trends of three adolescent vaccines in Rhode Island – Tdap, MCV4, and HPV vaccines. CDC recommends that providers administer these adolescent vaccines at a single visit at ages 11–12 years to reduce the likelihood of missing opportunities for vaccination.¹ If these vaccines are administered at a single visit as recommended, coverage rates for ≥ 1 Tdap, ≥ 1 MCV4, and ≥ 1 HPV vaccine doses should be the same.

Figure 3. Missed opportunities in HPV vaccination among adolescents 13–17 years of age, Rhode Island, 2008–2016



During 2012–2014, coverage with ≥ 1 dose of HPV vaccine among girls and boys was significantly lower compared to the other two adolescent vaccines, indicating that there were substantial missed opportunities for administering HPV vaccine at visits when Tdap or MCV4 vaccine was given. Since 2014, coverage with ≥ 1 dose of HPV vaccine has increased significantly among both boys and girls, whereas the coverage of the other two vaccines remained stable. As a result, the difference in coverage between ≥ 1 dose of HPV vaccine and the other two vaccines narrowed significantly. If missed opportunities had been eliminated, the potential coverage rate for all three adolescent vaccines would have reached 99.3% in 2016 in Rhode Island. In 2016, the differences between potential and actual coverage rates for ≥ 1 HPV vaccine dose was 9.2 percentage points among girls and 11.5 percentage points among boys. (In 2014, the estimated potential coverage was 98.3%, and the differences between potential and actual coverage rates for ≥ 1 HPV vaccine dose was 22.3 percentage points among girls and 29.3 percentage points among boys.)

DISCUSSION

HPV vaccination coverage rates among Rhode Island adolescents 13–17 years of age were significantly higher than the U.S. In fact, Rhode Island has maintained the highest coverage rates in the nation during all study years.

However, in 2016, UTD doses for girls (73.0%) and boys (68.7%) were still well below the Healthy People 2020 goal of 80% coverage. Although HPV vaccination coverage in Rhode Island stagnated during 2010–2014 for girls, and during 2013–2014 for boys, we have achieved new and rapid increases since 2014. Recommended actions for healthcare providers and public health actions to improve HPV vaccination coverage are summarized below.

Recommended Actions 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 the vaccine series is most effective when administered before exposure to HPV.¹⁻³ To eliminate missed opportunities for vaccination, HCPs should provide a strong recommendation for HPV vaccine, since provider recommendation is the best predictor of vaccination, and routinely administer HPV vaccine the same day as other adolescent vaccines. Reminder/recall systems, use of KIDSNET (Rhode Island's Integrated Child Health and Immunization Information Systems) to monitor coverage rates, and using every encounter (well and sick visits) to assess vaccination status could improve HPV series completion rates.

Public Health Actions to Improve HPV Coverage Rates

Rhode Island has historically had higher HPV and other adolescent and childhood vaccination rates when compared nationally due to many factors. Rhode Island is a universal vaccine purchase state, one of only eight universal vaccine purchase states. All vaccine (for insured and uninsured) that is routinely recommended for children and adolescents is purchased by the state and provided to healthcare providers at no cost. Healthcare providers do not have to order vaccine privately or separate vaccine, therefore cost is not a barrier to the provider or the patient. In August 2015, the Rhode Island Department of Health (RIDOH) added HPV vaccine to the school immunization requirements to improve HPV vaccination coverage rates for students entering 7th grade.^{5,6} In the fall of 2016, Rhode Island's Vaccinate Before You Graduate (VBYG) program (http://www.health.ri.gov/programs/detail.php?pgm_id=1010), a school-located immunization catch-up program for high school students, expanded to include public middle school students.⁶ This expansion was initially funded by CDC's Prevention and Public Health Funding (PPHF). PPHF funding also provided an opportunity to build upon "AFIX" (Assessment, Feedback, Incentive, Exchange), a quality improvement practice to increase immunization coverage rates. The Office of Immunization hired a physician consultant to visit healthcare providers' offices identified with low HPV vaccination coverage rates. The visits include a review of all childhood and adolescent immunization coverage rates; however, a primary focus is on HPV vaccination. The consultant assesses current practices, addresses missed opportunities, and provides strategies for increasing HPV vaccination coverage rates.⁶

During 2/2015–10/16, the physician consultant completed

67 visits. All visits included participation of ≥ 1 practice clinician. Of the 67 practices receiving AFIX visits, 51 had increases in ≥ 1 HPV dose vaccination coverage of at least 5%. Rhode Island applied for and received another PPHF award in 2016 to increase HPV vaccination coverage rates through AFIX activities, which includes the successful physician-to-physician visits.

There are at least three limitations in this report. First, UTD doses were defined differently between 2008–2015 and 2016. If the updated HPV dosing schedule was applied retrospectively, vaccination rates with UTD doses for 2008–2015 might have been slightly higher. Second, HPV vaccination coverage might have been underestimated due to the possible incompleteness of provider-verified vaccination histories. Third, estimates of HPV vaccination coverage by gender in Rhode Island might be unreliable because of small sample sizes.

References

1. CDC. HPV Vaccine Information for Clinicians. Available at <http://www.cdc.gov/hpv/hcp/need-to-know.pdf>.
2. CDC. Genital HPV Infection – CDC Fact Sheet. Available at <https://www.cdc.gov/std/hpv/HPV-FS-July-2017.pdf>
3. Meites E, Kempe A, Markowitz LE. Use of a 2-dose schedule for human papillomavirus vaccination—updated recommendations of the Advisory Committee on Immunization Practices. *MMWR Morb Mortal Wkly Rep* 2016;65:1405–8.
4. CDC. National Opinion Research Center at the University of Chicago, 2017. National Immunization Survey-Teen: a user's guide for the 2016 public-use data file. Chicago, IL. Available at <https://www.cdc.gov/vaccines/imz-managers/nis/downloads/nis-teen-puf16-dug.pdf>.
5. State of Rhode Island and Providence Plantations Department of Health. Rules and Regulations Pertaining to Immunization and Communicable Disease Testing in Preschool, School, Colleges or Universities [R23-1-IMM]. Amended as of July 2014. Available at <http://sos.ri.gov/documents/archives/regdocs/released/pdf/DOH/7602.pdf>.
6. Washburn T, DeviWold A, Raymond P, et al. Current initiatives to protect Rhode Island adolescents through increasing HPV vaccination. *Human Vaccines & Immunotherapeutics* 2016; Vol. 12, No. 6:1633-1638.

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Disclosure

The authors have no financial interests to disclose.

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