Uptake of Human Papillomavirus Vaccine Among Adolescent Males and Females: Immunization Information System Sentinel Sites, 2009–2012

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.
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Abstract

Objective: The Advisory Committee on Immunization Practices (ACIP) has recommended routine human papillomavirus (HPV) vaccination at age 11 or 12 years for girls since 2006 and for boys since 2011. We sought to describe adolescent HPV vaccination coverage, doses administered from 2009 to 2012, and age at first vaccination by sex.

Methods: Aggregate data were analyzed from 8 Immunization Information System sentinel sites on HPV vaccinations in children and adolescents aged 11 to 12 years, 13 to 15 years, and 16 to 18 years. Vaccination coverage by age group was reported for 2009 to 2012, and weekly doses administered were determined. Age at first HPV vaccination was calculated for girls in 2007 and 2011 and for boys in 2011.

Results: This analysis included data on 2.9 million adolescents aged 11 to 18 years. There were small increases in coverage for girls, with receipt of ≥1 dose of HPV vaccine reaching 27.1% of ages 11 to 12, 47.9% of ages 13 to 15, and 57.1% of ages 16 to 18 by December 31, 2012. Uptake of ≥1 dose in boys reached ~18% for all age groups. Doses administered showed seasonal variation, with highest uptake before back to school among girls and steady increases in boys after the 2009 ACIP recommendation for permissive use. Doses administered to boys surpassed those administered to girls by September 2012. Among vaccinated girls, more received vaccine at the recommended age of 11 to 12 years in 2011 (74.2%) compared to 2007 (9.9%). In 2011, 27.3% of vaccinated boys received their first dose at age 11 to 12 years.

Conclusions: HPV vaccination coverage increased among adolescents between 2009 and 2012. However, increases among girls were small, and coverage for boys and girls remained below target levels.

Keywords: adolescent; human papillomavirus vaccine; immunization

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What's New

We report on human papillomavirus vaccination in adolescent boys using the Immunization Information System since the October 2011 Advisory Committee on Immunization Practices recommendation for routine use and to uniquely examine trends in doses administered to adolescent boys and girls by week since 2009.

Quadrivalent and bivalent human papillomavirus (HPV) vaccines were licensed for use in girls in 2006 and 2009, respectively.[1] In 2009, the quadrivalent HPV vaccine was licensed for use in boys.[2] The Advisory Committee on Immunization Practices (ACIP) recommended routine vaccination, involving a series of 3 doses, for 11- or 12-year-old girls in 2006[3] and for 11- or 12-year-old boys in 2011.[2] For male subjects, the recommendation for routine use followed guidance by ACIP stating that quadrivalent HPV vaccine may be provided to male subjects aged 9 to 26 years since October 2009.[2] In 2012, data from the National Immunization Survey–Teen (NIS-Teen) showed that 53.8% of female adolescents 13 to 17 years of age in the United States had received ≥1 HPV vaccine dose, and 33.4% had received 3 doses.[4] Data from 2012 NIS-Teen also indicated that 20.8% of male adolescents 13 to 17 years of age had received ≥1 HPV vaccine dose, and 8.3% had received 3 doses.[4]

The NIS is the main source of vaccine coverage data for children and adolescents in the United States and is used to monitor progress toward the Healthy People 2020 targets for vaccination coverage. The target is 80% 3-dose coverage among adolescent girls by the age of 13 to 15 years. In addition to the NIS, data from Immunization Information System (IIS) can be used to obtain coverage data. The NIS-Teen collects vaccination information for adolescents aged 13 to 17 years in the United States using a random-digit-dialed sample of landline and, starting in 2011, cellular telephone numbers. Parents/guardians

provide vaccination and sociodemographic information on the adolescent and are asked for permission to contact their child's vaccination provider. The provider is mailed a questionnaire to obtain a vaccination history from the medical record.[5,6] Data from IIS can serve as useful complements to NIS-Teen because IIS typically covers wider age ranges and may be able to provide local estimates; in addition, IIS data have been used to provide more timely information regarding vaccine use.[7–9]

The objectives of this study were to use IIS to examine vaccination coverage and doses administered in male and female adolescents from October 2009 through December 2012 to assess trends in vaccine administration during this time period and to compare age at first vaccination by sex.

METHODS

STUDY POPULATION

An IIS is a confidential, computerized, population-based information system that collects and consolidates vaccination data from vaccination providers. It also provides important tools for designing and sustaining effective immunization strategies at the provider and immunization program levels. These tools include clinical decision support, vaccination coverage reports, interoperability with electronic health record systems, and vaccine inventory management, as well as the ability to generate reminder and recall messages.[10] The IIS Sentinel Site Project is a collaborative project between the US Centers for Disease Control and Prevention (CDC) and selected state/city-based IIS to implement procedures to increase data completeness, timeliness, and accuracy. Data are also used for immunization program evaluation and vaccination coverage estimates. Although IIS sentinel site results are not intended to be representative of and generalizable to vaccination practices in the United States, rates have compared favorably to those from NIS (eg, influenza vaccination in children).[11] For the 2008 to 2012 IIS sentinel site project period, 4 sentinel site areas (Arizona, Colorado, Oregon, and Wisconsin) consisted of subsets of each state; the other 4 sentinel sites consisted of all of Michigan, Minnesota, North Dakota and New York City (Table 1). All sites are composed of geographically contiguous counties or zip code areas in which ≥85% of area vaccine provider sites that serve children and adolescents aged <19 years are registered (enrolled) with the IIS. Sites must also have a minimum of 20,000 children and at least 85% of children aged <19 years in their respective geographic areas who have at least 2 immunizations recorded in the IIS.[12]

DATA

Using IIS sentinel site data, vaccination records were assessed by quarter according to calendar year (quarter 1, January–March; quarter 2, April–June; quarter 3, July–September; quarter 4, October–December) for all adolescents aged 11 to 12 years, 13 to 15 years, and 16 to 18 years during quarter 4, 2009, through quarter 4, 2012. Birth cohorts were defined for each quarter to include all adolescents in the age groups. Age and vaccination status were determined as of the last day of the quarter; vaccinations given at any point until the end of the quarter were included in the analysis. Valid vaccinations were identified by CDC vaccine codes (CVX codes)[13] and included bivalent HPV vaccine for girls and quadrivalent HPV vaccine for boys and girls. Each site processed individual vaccination data in accordance with business rules established by the American Immunization Registry Association Modeling of Immunization Registry Operations Workgroup.[14] Within each age group, sites reported counts of the number of vaccine recipients by quarter, sex, and the number of HPV vaccine doses received to the CDC. Doses administered to 11 to 18-year-olds were reported for October 17, 2009, through December 31, 2012, in monthly and weekly intervals. For male and female adolescents aged 13 to 15 years old at the end of the specified quarters (quarter 3, 2007, and quarter 4, 2011, for girls; quarter 4, 2011, for boys), sites reported the number of adolescents by year of age at which they received their first HPV vaccination, regardless of whether it was in that quarter or at an earlier time. This study was exempt from institutional review board review because it involved examination of secondary, de-identified data.

ANALYSIS

Analyses were conducted using Microsoft Excel (2010) and SAS (SAS, Cary, NC) software. Vaccination coverage was calculated using denominators from the US Census intercensal population estimates.[15] Use of census-based denominators to calculate adolescent participation in IIS and vaccination coverage levels has been described elsewhere.[8,16] The unweighted average for the 8 sites (ie, average site-specific coverage) was calculated by summing the percentage of adolescents vaccinated at each site and dividing by 8, the total number of sites. Unweighted averages were used to allow for each site to be represented equally when calculating combined vaccination coverage. HPV series completion was calculated as the number of adolescents who received 3 doses of HPV vaccine out of the total number who received at least 1 dose. Unlike in the NIS-Teen,[4] series completion calculations included all adolescents who received ≥1 HPV doses in the denominator, regardless of the amount of time that had elapsed since the first HPV vaccination. Trend analyses were conducted for coverage in boys and girls using linear regression analyses (SAS, version 9.3 for Windows). Vaccination coverage estimates are expected to be lower among 11- to 12-year-olds because they are not older than the recommended vaccination age range and still have time to be vaccinated before their 13th birthday; however, the data provide useful information on patterns of uptake.

Weekly doses administered were calculated on the basis of the doses administered for the varying time periods. Intervals ranged from a single week up to month-long increments. In order to analyze the data in a consistent manner, a weekly average was calculated on the basis of the total number of doses administered for that month.