

National, Regional, State, and Selected Local Area Vaccination Coverage Among Adolescents Aged 13–17 Years — United States, 2015

Sarah Reagan-Steiner, MD¹; David Yankey, MS¹; Jenny Jeyarajah, MS²; Laurie D. Elam-Evans, PhD¹; C. Robinette Curtis, MD¹; Jessica MacNeil, MPH³; Lauri E. Markowitz, MD⁴; James A. Singleton, PhD¹

The Advisory Committee on Immunization Practices (ACIP) recommends that adolescents aged 11–12 years routinely receive vaccines to prevent diseases, including human papillomavirus (HPV)-associated cancers, pertussis, and meningococcal disease (1). To assess vaccination coverage among adolescents in the United States, CDC analyzed data collected regarding 21,875 adolescents through the 2015 National Immunization Survey-Teen (NIS-Teen).^{*} During 2014–2015, coverage among adolescents aged 13–17 years increased for each HPV vaccine dose among males, including ≥ 1 HPV vaccine dose (from 41.7% to 49.8%), and increased modestly for ≥ 1 HPV vaccine dose among females (from 60.0% to 62.8%) and ≥ 1 quadrivalent meningococcal conjugate vaccine (MenACWY) dose (from 79.3% to 81.3%). Coverage with ≥ 1 HPV vaccine dose was higher among adolescents living in households below the poverty level, compared with adolescents in households at or above the poverty level.[†] HPV vaccination coverage (≥ 1 , ≥ 2 , or ≥ 3 doses) increased in 28 states/local areas among males and in seven states among females. Despite limited progress, HPV vaccination coverage remained lower than MenACWY and tetanus, diphtheria, and acellular pertussis vaccine (Tdap) coverage, indicating continued missed opportunities for HPV-associated cancer prevention.

NIS-Teen monitors vaccination coverage among adolescents aged 13–17 years in the 50 states, District of Columbia (DC),

selected local areas, and territories[§] using a random-digit-dialed sample of landline and cell phone numbers.[¶] Through telephone interviews with adolescents' parents/guardians, information is collected on adolescent, maternal, and household sociodemographic characteristics and vaccination providers. After receiving respondent consent, questionnaires are mailed to all identified vaccination providers to obtain immunization information from medical records.^{**} All coverage estimates are based on provider-reported vaccination histories from adolescents with adequate provider data. In 2015, national estimates included information regarding 21,875 adolescents (10,508 females and 11,367 males).^{††} NIS-Teen methodology, including methods for weighting and synthesizing provider-reported vaccination histories, has been described separately (ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NIS/NISTEENPUF14_DUG.pdf). A revised adequate provider data definition was implemented in 2014 and retrospectively applied to 2013 NIS-Teen data for purposes of comparability (<http://www.cdc.gov/vaccines/imz-managers/coverage/nis/teen/apd-report.html>). Statistical comparisons were made using t-tests on weighted data to

[§] Local areas that received Federal Section 317 immunization funds were sampled separately: Chicago, Illinois; New York, New York; Philadelphia County, Pennsylvania; Bexar County, Texas; and Houston, Texas. Two local areas (in Texas) were oversampled: El Paso County and Hidalgo County. Three territories were sampled separately in 2015: Guam, Puerto Rico, and the U.S. Virgin Islands.

[¶] All identified cellular telephone households were eligible for interview. Sampling weights were adjusted for dual-frame (landline and cellular telephone), nonresponse, noncoverage, and overlapping samples of mixed telephone users. A description of NIS-Teen dual-frame survey methodology and its effect on reported vaccination estimates is available at <http://www.cdc.gov/vaccines/imz-managers/coverage/nis/child/dual-frame-sampling.html>.

^{**} The overall Council of American Survey Research Organizations (CASRO) response rate was 33.0%. Response rates for the landline and cell phone samples were 56.4% and 29.8%, respectively. For completed interviews in the states and local areas, 4,784 landline calls (53.4%) and 17,091 cell phone calls (48.9%) had adequate provider data. Overall, for states and local areas, 22% of completed interviews with adequate provider data were from landlines and 78% were from cell phones. For U.S. territories, the landline and cell phone sample CASRO rates were 52.1% and 22.6% for Guam, 57.8% and 37.4% for Puerto Rico, and 69.6% and 41.5% for the U.S. Virgin Islands, respectively. The CASRO response rate is the product of three other rates: 1) the resolution rate (the proportion of telephone numbers that can be identified as either for business or residence), 2) the screening rate (the proportion of qualified households that complete the screening process), and 3) the cooperation rate (the proportion of contacted eligible households for which a completed interview is obtained).

^{††} Adolescents from Guam (192 females and 227 males), Puerto Rico (158 females and 181 males), and the U.S. Virgin Islands (222 females and 236 males) were excluded from the national estimates.

^{*} Eligible participants were born during January 1997–February 2003. Tdap represents coverage with ≥ 1 Tdap dose at or after age 10 years. DMenACWY represents coverage with the quadrivalent meningococcal conjugate vaccine or meningococcal-unknown type vaccine. ACIP published Category B recommendations for the use of serogroup B meningococcal (MenB) vaccines in October 2015 (<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6441a3.htm>), with administration preferred at ages 16–18 years. Coverage with MenB vaccines is not included in 2015 NIS-Teen vaccination coverage estimates. HPV vaccination coverage represents receipt of any HPV vaccine and does not distinguish among 9-valent (9vHPV), quadrivalent (4vHPV), or bivalent (2vHPV) vaccines. Some adolescents might have received more than the 3 recommended HPV vaccine doses. Except as noted, coverage estimates for ≥ 1 and ≥ 2 varicella vaccine doses were obtained among adolescents with no history of varicella disease. Influenza vaccination coverage data are not included in this report but are available online at <http://www.cdc.gov/flu/fluaxview/index.htm>.

[†] Adolescents were classified as being below the federal poverty level if their total family income was less than the federal poverty level specified for the applicable family size and number of children aged <18 years. All others were classified as at or above the poverty level. Poverty status was unknown for 767 adolescents (<http://www.census.gov/topics/income-poverty/poverty.html>).

account for the complex survey design. Differences were considered statistically significant at $p < 0.05$.

National Vaccination Coverage

In 2015, among males, coverage with ≥ 1 HPV vaccine dose was 49.8% and with ≥ 3 doses was 28.1%; among females coverage with ≥ 1 dose was 62.8% and with ≥ 3 doses was 41.9% (Table 1) (Figure 1). During 2014–2015, among males, coverage with each HPV vaccine dose increased, with percentage point increases of 8.1 for ≥ 1 dose, 7.6 for ≥ 2 doses, and 6.5 for ≥ 3 doses. Among females, coverage with ≥ 1 HPV vaccine dose increased modestly (2.8 percentage points). Among all adolescents, coverage with ≥ 1 MenACWY dose increased 2.0 percentage points to 81.3%. Among adolescents aged 17 years, coverage with ≥ 2 MenACWY doses increased 4.8 percentage points to 33.3%; an additional 5.3% (95%

confidence interval [CI] = 4.4%–6.4%) received their first MenACWY dose on or after their 16th birthday.

In 2015, among all adolescents (females and males combined), HPV vaccination coverage with ≥ 1 dose was 56.1% (95% CI = 54.9%–57.4%), with ≥ 2 doses was 45.4% (95% CI = 44.2%–46.7%), and with ≥ 3 doses was 34.9% (95% CI = 33.7%–36.1%). Among all adolescents, coverage with ≥ 1 HPV vaccine dose was 30.3 percentage points lower than coverage with ≥ 1 Tdap dose and 25.2 percentage points lower than coverage with ≥ 1 MenACWY dose.

Vaccination Coverage by Selected Characteristics

In 2015, ≥ 1 -dose HPV vaccination coverage among females aged 13 years was lower than coverage among females aged ≥ 15 years, but was similar among males in all age groups (Table 1). Although HPV vaccination coverage remained

TABLE 1. Estimated vaccination coverage with selected vaccines and doses among adolescents aged 13–17* years, by age at interview — National Immunization Survey–Teen (NIS-Teen), United States, 2015

Vaccine/Dose	Age (yrs)					Total	
	13 (n = 4,476) % (95% CI)	14 (n = 4,567) % (95% CI)	15 (n = 4,445) % (95% CI)	16 (n = 4,403) % (95% CI)	17 (n = 3,984) % (95% CI)	2015 (n = 21,875) % (95% CI)	2014 (n = 20,827) % (95% CI)
Tdap [†] ≥ 1 dose	86.5 (± 2.0)	88.7 (± 1.7)	86.0 (± 2.2)	85.0 (± 2.5)	85.6 (± 2.2)	86.4 (± 1.0)	87.6 (± 0.9)
MenACWY [§]							
≥ 1 dose	79.2 (± 2.4)	81.9 (± 2.4)	81.3 (± 2.3)	81.4 (± 2.4)	82.5 (± 2.1) [¶]	81.3 (± 1.0) ^{**}	79.3 (± 1.1)
≥ 2 doses ^{††}	—	—	—	—	33.3 (± 2.7)	33.3 (± 2.7) ^{**}	28.5 (± 2.8)
HPV ^{§§} vaccine							
Females							
≥ 1 dose	56.4 (± 4.2)	61.2 (± 4.0)	62.7 (± 4.0) [¶]	63.0 (± 3.9) [¶]	70.6 (± 3.5) [¶]	62.8 (± 1.8) ^{**}	60.0 (± 1.9)
≥ 2 doses	42.6 (± 4.2)	49.0 (± 4.1) [¶]	53.1 (± 4.1) [¶]	54.2 (± 4.0) [¶]	61.7 (± 3.9) [¶]	52.2 (± 1.8)	50.3 (± 1.9)
≥ 3 doses	29.5 (± 3.9)	37.3 (± 4.0) [¶]	44.1 (± 4.0) [¶]	44.2 (± 3.9) [¶]	54.4 (± 4.0) [¶]	41.9 (± 1.8)	39.7 (± 1.9)
Males							
≥ 1 dose	48.7 (± 3.9)	47.0 (± 4.2)	51.4 (± 3.9)	51.5 (± 4.0)	50.4 (± 3.8)	49.8 (± 1.8) ^{**}	41.7 (± 1.8)
≥ 2 doses	36.7 (± 3.8)	38.5 (± 4.1)	40.4 (± 3.7)	38.6 (± 3.8)	40.9 (± 3.8)	39.0 (± 1.7) ^{**}	31.4 (± 1.7)
≥ 3 doses	24.9 (± 3.5)	27.7 (± 3.9)	28.6 (± 3.3)	30.6 (± 3.6) [¶]	28.8 (± 3.3)	28.1 (± 1.6) ^{**}	21.6 (± 1.6)
MMR ≥ 2 doses	91.5 (± 1.6)	91.4 (± 1.7)	90.7 (± 1.9)	89.1 (± 2.0)	90.7 (± 1.4)	90.7 (± 0.8)	90.7 (± 0.8)
Hepatitis B vaccine ≥ 3 doses	91.0 (± 1.9)	91.8 (± 1.7)	91.7 (± 2.0)	89.7 (± 2.1)	91.4 (± 1.3)	91.1 (± 0.8)	91.4 (± 0.7)
Varicella							
History of varicella ^{¶¶}	10.9 (± 1.6)	16.5 (± 2.5) [¶]	15.9 (± 2.1) [¶]	20.5 (± 2.3) [¶]	25.6 (± 2.6) [¶]	17.8 (± 1.0) ^{**}	21.0 (± 1.1)
No history of varicella							
≥ 1 dose vaccine	95.4 (± 1.5)	95.3 (± 1.8)	93.9 (± 2.1)	94.3 (± 1.9)	95.7 (± 1.1)	94.9 (± 0.8)	95.2 (± 0.6)
≥ 2 doses vaccine	86.8 (± 2.0)	84.4 (± 2.4)	82.6 (± 2.6) [¶]	79.2 (± 2.9) [¶]	82.2 (± 2.3) [¶]	83.1 (± 1.1) ^{**}	81.0 (± 1.2)
History of varicella or received ≥ 2 doses vaccine	88.3 (± 1.8)	86.9 (± 2.0)	85.4 (± 2.3)	83.4 (± 2.4) [¶]	86.8 (± 1.8)	86.1 (± 0.9)	85.0 (± 0.9)

Abbreviations: CI = confidence interval; HPV = human papillomavirus; MenACWY = quadrivalent meningococcal conjugate vaccine; MMR = measles, mumps, and rubella vaccine; Tdap = tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine.

* Adolescents (n = 21,875) in the 2015 NIS-Teen were born during January 1997–February 2003.

[†] Includes percentages receiving Tdap vaccine at or after age 10 years.

[§] Includes percentages receiving MenACWY or meningococcal–unknown-type vaccine.

[¶] Statistically significant difference ($p < 0.05$) in estimated vaccination coverage by age; reference group was adolescents aged 13 years.

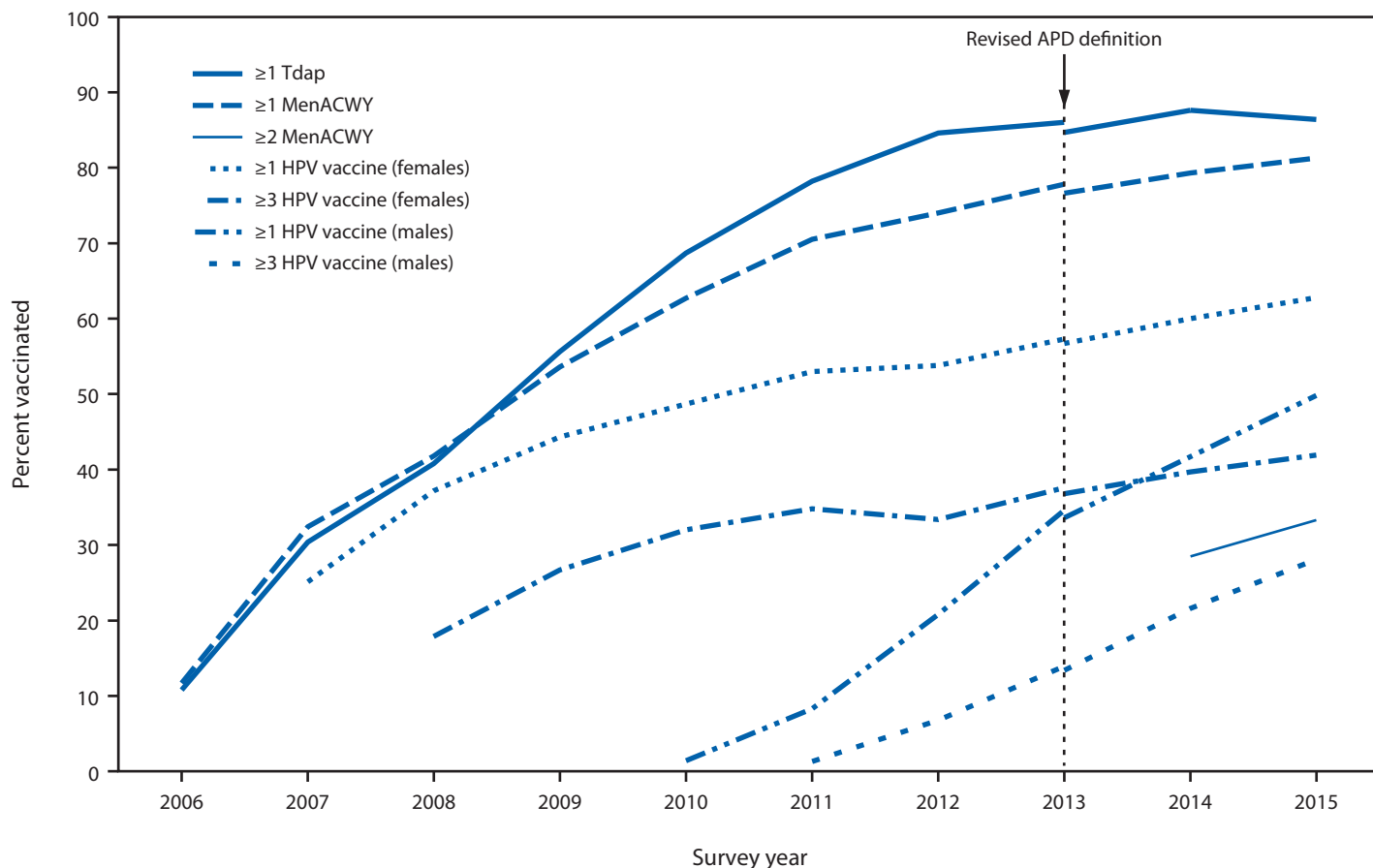
^{**} Statistically significant difference ($p < 0.05$) compared with 2014 NIS-Teen estimates.

^{††} ≥ 2 doses of MenACWY or meningococcal–unknown-type vaccine. Calculated only among adolescents who were 17 years of age at interview (n = 3,984); does not include adolescents who received their first dose of MenACWY vaccine at or after age 16 years.

^{§§} HPV vaccine, 9-valent (9vHPV), quadrivalent (4vHPV), or bivalent (2vHPV). Percentages in the table are reported separately for females only (n = 10,508) and for males only (n = 11,367). Coverage with ≥ 1 HPV vaccine dose among all adolescents (females and males combined) aged 13–17 years was 56.1% (95% CI = 54.9%–57.4%); with ≥ 2 doses was 45.4% (95% CI = 44.2%–46.7%), and with ≥ 3 doses was 34.9% (95% CI = 33.7%–36.1%). 9vHPV, 4vHPV, or 2vHPV are recommended for females and 9vHPV or 4vHPV are recommended for males. Some adolescents might have received more than the 3 recommended HPV vaccine doses.

^{¶¶} By parent/guardian report or provider records.

FIGURE 1. Estimated vaccination coverage with selected vaccines and doses* among adolescents aged 13–17 years, by survey year — National Immunization Survey-Teen, United States, 2006–2015†



Abbreviations: ACIP = Advisory Committee on Immunization Practices; APD = adequate provider data; HPV = human papillomavirus; MenACWY = quadrivalent meningococcal conjugate vaccine; NIS-Teen = National Immunization Survey-Teen; Tdap = tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine, * *Tdap*: ≥1 dose Tdap at or after age 10 years; ≥1 *MenACWY*: ≥1 dose MenACWY or meningococcal-unknown type vaccine; ≥2 *doses MenACWY*: ≥2 doses MenACWY or meningococcal-unknown type vaccine, calculated only among adolescents aged 17 years at time of interview (does not include adolescents who received their first dose of MenACWY at or after 16 years of age); ≥1 *HPV vaccine*: ≥1 dose HPV vaccine, 9-valent (9vHPV), quadrivalent (4vHPV) or bivalent (2vHPV); ACIP recommends 9vHPV, 4vHPV or 2vHPV for females and 9vHPV or 4vHPV for males (the routine ACIP recommendation was made for females in 2006 and for males in 2011); ≥3 *HPV vaccine*: ≥3 doses HPV vaccine.

† NIS-Teen implemented a revised APD definition in 2014 and retrospectively applied the revised APD definition to 2013 data. Estimates using different APD definitions may not be directly comparable.

higher among females than among males, the percentage point difference in coverage estimates decreased over time (Figure 1). Coverage with each HPV vaccine dose and with ≥1 MenACWY dose was higher among Hispanic adolescents than among non-Hispanic white (white) adolescents; however, coverage with ≥2 measles, mumps, and rubella vaccine (MMR) doses and ≥3 hepatitis B vaccine doses was lower among Hispanic adolescents (Table 2). Coverage with ≥1 HPV vaccine dose was higher among non-Hispanic black (black) adolescents, compared with white adolescents. Adolescents living below the federal poverty level had higher ≥1- and ≥2-dose HPV vaccination coverage than did adolescents living at or above the poverty level. Among subgroups stratified by race/ethnicity and poverty status, ≥1-dose HPV vaccination coverage was higher

among Hispanic and black adolescents living below the poverty level compared with white adolescents living at or above the poverty level, and higher for black males compared to white males among those living at or above the poverty level. §§

§§ Among females, ≥1-dose HPV vaccination coverage estimates stratified by race/ethnicity and poverty status were: 72.9% (95% CI = 63.7%–80.4%) for Hispanic females below the poverty level, 72.3% (95% CI = 65.1%–78.6%) for non-Hispanic black females below the poverty level, and 59.3% (95% CI = 56.9%–61.5%) for non-Hispanic white females at or above the poverty level (reference group). Among males, ≥1-dose HPV vaccination coverage estimates were 70.8% (95% CI = 64.2%–76.6%) for Hispanic males below the poverty level, 60.2% (95% CI = 51.9%–68.0%) for non-Hispanic black males below the poverty level, 51.9% (95% CI = 45.5%–58.3%) for non-Hispanic black males at or above the poverty level, and 43.4% (95% CI = 41.2%–45.6%) for non-Hispanic white males at or above the poverty level (reference group).

State-Specific Vaccination Coverage

In 2015, vaccination coverage varied among the 50 states and DC (Table 3). Among males, ≥ 1 -dose HPV vaccination coverage ranged from 34.8% (Kentucky) to 80.6% (Rhode Island) (Figure 2), and among females, from 47.7% (Wyoming) to 87.9% (Rhode Island) (Figure 3). Among males, ≥ 3 -dose HPV vaccination coverage ranged from 16.0% (Tennessee) to 58.1% (Rhode Island), and among females, from 24.4% (Mississippi) to 68.0% (Rhode Island). Coverage with ≥ 1 Tdap

dose ranged from 69.7% (Alaska) to 97.1% (Rhode Island) and for ≥ 1 MenACWY dose ranged from 55.3% (Mississippi) to 97.7% (Rhode Island).

Compared with 2014, HPV vaccination coverage among males (≥ 1 , ≥ 2 , or ≥ 3 doses) increased in 28 states/local areas (e.g., range for ≥ 1 HPV vaccine dose = 10.5–24.7 percentage points). Among females, HPV vaccination coverage (≥ 1 , ≥ 2 , or ≥ 3 doses) increased in seven states: Hawaii (≥ 2 , ≥ 3 doses), Kansas (≥ 2 doses), Nevada (≥ 1 , ≥ 2 doses), New Jersey (≥ 1 ,

TABLE 2. Estimated vaccination coverage among adolescents aged 13–17 years,* by race/ethnicity,[†] poverty level,[§] and selected vaccines and doses — National Immunization Survey–Teen (NIS-Teen), United States, 2015

Vaccine/Dose	Race/Ethnicity						Poverty status	
	White, non-Hispanic (n = 12,835) % (95% CI) [¶]	Black, non-Hispanic (n = 2,228) % (95% CI)	Hispanic (n = 4,610) % (95% CI)	American Indian/Alaska Native, non-Hispanic (n = 290) % (95% CI)	Asian, non-Hispanic (n = 751) % (95% CI)	Multiracial (n = 1,074) % (95% CI)	Below poverty level (n = 4,544) % (95% CI)	At or above poverty level (n = 16,564) % (95% CI)
Tdap**≥ 1 dose	86.6 (± 1.1)	86.0 (± 2.6)	85.3 (± 2.8)	87.6 (± 5.6)	86.0 (± 4.8)	90.6 (± 2.7) ^{††}	85.0 (± 2.1)	87.0 (± 1.1)
MenACWY^{§§}								
≥ 1 dose	79.5 (± 1.2)	81.7 (± 3.0)	85.0 (± 2.6) ^{††}	83.9 (± 5.9)	83.3 (± 5.3)	80.8 (± 5.3)	82.6 (± 2.1)	80.5 (± 1.2)
≥ 2 doses ^{¶¶}	30.8 (± 3.1)	33.6 (± 6.3)	37.9 (± 8.1)	35.0 (± 20.3)	37.1 (± 15.0)	40.7 (± 11.3)	36.5 (± 6.9)	32.2 (± 2.9)
HPV*** vaccine								
Females								
≥ 1 dose	59.2 (± 2.1)	66.9 (± 4.4) ^{††}	68.4 (± 4.8) ^{††}	70.5 (± 11.4)	63.8 (± 9.0)	62.0 (± 8.3)	70.0 (± 4.1) ^{†††}	60.4 (± 2.0)
≥ 2 doses	49.4 (± 2.1)	51.9 (± 4.8)	57.8 (± 4.9) ^{††}	55.4 (± 14.3)	58.1 (± 9.4)	51.1 (± 8.0)	56.6 (± 4.1) ^{†††}	50.5 (± 2.1)
≥ 3 doses	39.6 (± 2.1)	40.8 (± 4.6)	46.2 (± 4.9) ^{††}	38.7 (± 12.9)	53.5 (± 9.8) ^{††}	42.5 (± 7.7)	44.4 (± 3.9)	41.3 (± 2.1)
Males								
≥ 1 dose	43.8 (± 2.0)	54.0 (± 4.9) ^{††}	58.9 (± 5.0) ^{††}	58.5 (± 12.5) ^{††}	49.6 (± 9.9)	58.8 (± 6.9) ^{††}	61.1 (± 3.9) ^{†††}	46.0 (± 2.0)
≥ 2 doses	34.9 (± 1.9)	37.1 (± 4.4)	47.8 (± 4.9) ^{††}	48.6 (± 12.2) ^{††}	39.8 (± 10.1)	46.8 (± 7.2) ^{††}	46.7 (± 4.1) ^{†††}	36.3 (± 1.9)
≥ 3 doses	25.2 (± 1.7)	26.0 (± 3.8)	35.0 (± 4.5) ^{††}	34.6 (± 11.1)	30.7 (± 9.9)	30.6 (± 6.4)	31.0 (± 3.8)	27.4 (± 1.7)
MMR ≥ 2 doses	91.7 (± 0.8)	91.9 (± 2.2)	88.1 (± 2.2) ^{††}	91.1 (± 4.7)	87.5 (± 4.5)	90.5 (± 3.0)	89.5 (± 1.8)	90.9 (± 0.9)
Hepatitis B vaccine ≥ 3 doses	92.5 (± 0.8)	92.5 (± 2.2)	87.4 (± 2.6) ^{††}	93.1 (± 3.9)	89.2 (± 3.9)	90.6 (± 3.0)	90.3 (± 1.8)	91.1 (± 1.0)
Varicella								
History of varicella ^{§§§}	18.1 (± 1.2)	14.3 (± 2.2) ^{††}	19.6 (± 3.0)	22.3 (± 6.9)	16.4 (± 4.4)	17.0 (± 3.8)	18.9 (± 1.9)	17.4 (± 1.2)
No history of varicella								
≥ 1 dose vaccine	95.4 (± 0.8)	95.3 (± 2.3)	93.1 (± 2.4)	96.0 (± 2.6)	94.0 (± 3.6)	96.7 (± 1.8)	94.8 (± 1.7)	94.7 (± 0.9)
≥ 2 doses vaccine	82.8 (± 1.3)	84.9 (± 3.0)	82.3 (± 3.0)	86.9 (± 6.5)	84.5 (± 5.2)	82.7 (± 5.8)	85.4 (± 2.2) ^{†††}	82.2 (± 1.3)
History of varicella or received ≥ 2 doses varicella vaccine	85.9 (± 1.1)	87.1 (± 2.6)	85.7 (± 2.5)	89.8 (± 5.1)	87.1 (± 4.3)	85.7 (± 5.0)	88.2 (± 1.8) ^{†††}	85.3 (± 1.1)

Abbreviations: CI = confidence interval; HPV = human papillomavirus; MenACWY = quadrivalent meningococcal conjugate vaccine; MMR = measles, mumps, and rubella vaccine; Tdap = tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine.

* Adolescents (n = 21,875) in the 2015 NIS-Teen were born during January 1997–February 2003.

[†] Adolescents' race/ethnicity were reported by their parents or guardians. Adolescents identified in this report as white, black, Asian, American Indian/Alaska Native, or multiracial were reported by the parents or guardians as non-Hispanic. Adolescents identified as multiracial had more than one race category selected. Adolescents identified as Hispanic might be of any race. Native Hawaiian or other Pacific Islanders were not included in the table because of small sample sizes.

[§] Adolescents were classified as below poverty level if their total family income was less than the federal poverty level specified for the applicable family size and number of children aged <18 years. All others were classified as at or above the poverty level (<http://www.census.gov/topics/income-poverty/poverty.html>). Poverty status was unknown for 767 adolescents; these adolescents were not included in the estimates by poverty status.

[¶] Estimates with 95% CI half-widths >10 might not be reliable.

** Includes percentages receiving Tdap vaccine at or after age 10 years.

^{††} Statistically significant difference (p<0.05) in estimated vaccination coverage by race/ethnicity; reference group was non-Hispanic white adolescents.

^{§§} Includes percentages receiving MenACWY and meningococcal-unknown type vaccine.

^{¶¶} ≥ 2 doses of MenACWY or meningococcal-unknown type vaccine. Calculated only among adolescents who were 17 years of age at interview (n = 3,984). Does not include adolescents who received their first dose of MenACWY vaccine at or after age 16 years.

^{***} HPV vaccine, 9-valent (9vHPV), quadrivalent (4vHPV), or bivalent (2vHPV). Percentages are reported separately for females only (n = 10,508) and for males only (n = 11,367). 9vHPV, 4vHPV, or 2vHPV are recommended for females, and 9vHPV or 4vHPV are recommended for males. Some adolescents might have received more than the 3 recommended HPV vaccine doses.

^{†††} Statistically significant difference (p<0.05) in estimated vaccination coverage by poverty level; reference group was adolescents living at or above poverty level.

^{§§§} By parent/guardian report or provider records.

TABLE 3. Estimated vaccination coverage with selected vaccines and doses* among adolescents aged 13–17 years,† by HHS Regions and state, selected local areas, or territories — National Immunization Survey-Teen (NIS-Teen), United States, 2015

HHS Region/State/ Territory	All adolescents (n = 21,875)		Females (n = 10,508)			Males (n = 11,367)		
	≥1 Tdap [§] % (95% CI) ^{¶¶}	≥1 MenACWY [¶] % (95% CI)	≥1 HPV ^{**} % (95% CI)	≥2 HPV ^{††} % (95% CI)	≥3 HPV [§] % (95% CI)	≥1 HPV ^{**} % (95% CI)	≥2 HPV ^{††} % (95% CI)	≥3 HPV ^{§§} % (95% CI)
United States overall	86.4 (±1.0)	81.3 (±1.0)***	62.8 (±1.8)***	52.2 (±1.8)	41.9 (±1.8)	49.8 (±1.8)***	39.0 (±1.7)***	28.1 (±1.6)***
Region I	92.3 (±2.1)	89.7 (±2.3)	73.0 (±4.6)	63.1 (±5.1)	53.7 (±5.2)	65.8 (±4.6)***	55.2 (±4.8)***	40.8 (±4.6)***
Connecticut	93.7 (±3.0)	93.5 (±3.1)	70.9 (±8.2)	64.3 (±8.7)	55.2 (±9.1)	65.3 (±7.8)***	58.2 (±8.1)***	42.0 (±8.3)***
Maine	87.7 (±4.0)	77.7 (±5.3)	66.0 (±8.3)	53.9 (±8.7)	44.1 (±8.6)	65.8 (±7.9)***	58.7 (±8.3)***	46.7 (±8.4)***
Massachusetts	91.2 (±4.1)	89.5 (±4.4)	73.5 (±8.6)	63.0 (±9.5)	52.8 (±9.7)	63.0 (±8.8)	50.9 (±9.1)	35.2 (±8.5)
New Hampshire	92.4 (±3.9)	87.7 (±4.4)	74.2 (±8.8)	59.7 (±10.0)	51.4 (±10.0)	69.8 (±7.9)***	55.1 (±9.0)	47.1 (±9.1)***
Rhode Island	97.1 (±1.6)***	97.7 (±1.5)	87.9 (±4.9)***	77.9 (±6.7)	68.0 (±7.4)***	80.6 (±5.8)***	66.6 (±7.1)	58.1 (±7.4)***
Vermont	95.8 (±2.4)	84.4 (±4.3)	68.7 (±8.1)	59.1 (±8.3)	54.4 (±8.4)	66.1 (±7.6)***	56.9 (±7.9)***	41.1 (±7.8)
Region II	88.4 (±2.4)	89.3 (±2.2)***	64.5 (±5.0)***	56.4 (±5.2)***	46.5 (±5.3)***	57.2 (±5.0)***	46.8 (±5.0)***	35.7 (±4.7)***
New Jersey	87.2 (±4.4)	95.7 (±2.4)	69.0 (±7.8)***	56.3 (±8.6)***	45.0 (±8.8)	50.9 (±8.8)***	41.4 (±8.7)***	30.9 (±8.3)
New York (NY)	89.0 (±2.9)	86.2 (±3.1)***	62.3 (±6.4)	56.4 (±6.5)	47.3 (±6.6)	60.3 (±6.1)***	49.4 (±6.1)***	38.1 (±6.9)***
NY-City of New York	90.6 (±3.5)	84.8 (±4.6)	65.3 (±8.7)	60.0 (±9.1)	46.1 (±9.3)	72.3 (±7.4)***	60.1 (±8.5)***	47.9 (±8.7)
NY-rest of state	88.0 (±4.2)	87.1 (±4.0)***	60.3 (±8.8)	54.1 (±9.0)	48.0 (±9.1)	52.6 (±8.5)	42.6 (±8.3)	31.7 (±7.6)
Region III	87.4 (±2.4)	84.6 (±2.7)	63.0 (±4.8)	53.9 (±5.0)	44.2 (±4.9)	51.1 (±4.7)	43.0 (±4.6)***	32.9 (±4.4)***
Delaware	88.7 (±3.8)	87.5 (±4.1)	67.6 (±8.4)	60.9 (±8.9)	52.8 (±9.1)	62.9 (±7.6)	53.2 (±8.0)	43.0 (±8.0)
District of Columbia	81.3 (±5.0)	90.9 (±3.4)	76.5 (±7.7)	67.5 (±8.7)	58.8 (±9.2)	73.0 (±7.8)	57.6 (±8.9)	40.9 (±8.7)
Maryland	86.5 (±4.5)	87.3 (±4.4)	66.0 (±9.0)	61.7 (±9.1)	43.7 (±9.3)	55.0 (±9.4)	46.6 (±9.5)	31.3 (±8.9)
Pennsylvania (PA)	91.7 (±2.7)	94.7 (±2.1)	62.2 (±7.7)	56.4 (±7.7)	47.8 (±7.7)	55.9 (±7.1)	48.2 (±7.1)***	38.3 (±6.9)***
PA-Philadelphia	86.1 (±4.6)	91.2 (±3.5)	79.3 (±6.8)	68.1 (±8.1)	58.6 (±8.5)	79.5 (±7.1)***	61.2 (±8.6)	43.4 (±9.1)***
PA-rest of state	92.5 (±3.0)	95.2 (±2.3)	60.0 (±8.6)	54.9 (±8.7)	46.4 (±8.7)	52.8 (±8.0)	46.5 (±8.0)***	37.7 (±7.8)***
Virginia	82.2 (±6.4)†††	66.8 (±7.7)	61.2 (±11.1)	43.9 (±11.4)	38.5 (±11.0)	40.1 (±10.6)	32.0 (±9.9)	25.7 (±9.3)
West Virginia	85.8 (±4.1)***	86.0 (±4.3)	62.0 (±8.6)	49.7 (±8.8)	39.2 (±8.6)	45.3 (±8.5)	36.6 (±8.3)	27.1 (±7.6)
Region IV	86.9 (±1.9)	75.1 (±2.4)	59.4 (±3.8)	45.0 (±3.9)	35.9 (±3.7)	43.7 (±3.8)***	33.7 (±3.6)***	22.5 (±3.0)***
Alabama	93.3 (±3.2)	72.1 (±5.8)	57.7 (±9.2)	50.4 (±9.3)	40.8 (±9.3)	39.4 (±8.6)***	30.3 (±8.3)***	22.6 (±7.9)***
Florida	87.3 (±4.9)	70.4 (±6.4)	62.5 (±9.6)	44.6 (±9.7)	36.8 (±9.3)	45.3 (±9.9)	33.2 (±9.1)	19.8 (±6.9)
Georgia	90.2 (±4.0)	87.0 (±4.6)***	54.4 (±9.5)	38.7 (±8.9)†††	32.3 (±8.4)†††	51.0 (±8.5)	42.5 (±8.4)***	27.5 (±7.6)
Kentucky	84.0 (±4.7)	79.0 (±5.2)	57.4 (±8.6)	47.2 (±8.7)	36.2 (±8.5)	34.8 (±8.2)	25.2 (±7.5)	17.1 (±6.1)
Mississippi	74.7 (±5.3)	55.3 (±6.0)***	52.4 (±8.0)	37.2 (±7.7)	24.4 (±6.6)	38.9 (±8.9)***	29.6 (±8.5)***	21.4 (±8.0)
North Carolina	93.4 (±3.0)	78.5 (±5.1)	65.7 (±8.5)	53.5 (±8.9)	37.8 (±8.7)†††	48.0 (±8.6)	40.3 (±8.5)	29.8 (±8.0)
South Carolina	77.8 (±5.5)	69.0 (±5.9)	53.7 (±9.0)	43.3 (±9.0)	34.3 (±8.5)	35.1 (±8.3)	26.4 (±7.7)	21.0 (±7.5)
Tennessee	79.7 (±5.4)	76.7 (±5.6)	59.7 (±8.7)	46.7 (±9.0)	38.9 (±8.8)***	38.2 (±8.9)	26.0 (±8.1)	16.0 (±6.8)
Region V	85.8 (±1.9)	83.9 (±1.9)***	62.0 (±3.6)	50.9 (±3.6)	41.0 (±3.6)	47.1 (±3.5)***	36.0 (±3.3)	26.2 (±2.9)***
Illinois (IL)	89.1 (±3.0)	79.0 (±3.8)	62.0 (±5.9)	52.0 (±6.1)	40.2 (±6.0)	44.3 (±6.3)	34.3 (±6.0)	26.8 (±5.6)
IL-Chicago	87.2 (±4.7)	82.8 (±5.1)	70.8 (±8.2)	62.1 (±9.0)	47.7 (±9.6)	68.1 (±9.0)	53.9 (±9.7)	41.6 (±9.7)***
IL-rest of state	89.5 (±3.5)	78.1 (±4.4)	60.0 (±7.0)	49.9 (±7.2)	38.6 (±7.0)	39.1 (±7.4)	29.9 (±6.9)	23.6 (±6.4)
Indiana	89.7 (±4.0)	92.3 (±3.4)	53.7 (±9.0)	43.1 (±8.8)	30.9 (±8.0)†††	43.2 (±9.0)***	34.3 (±8.6)***	27.5 (±8.1)***
Michigan	74.0 (±5.5)	95.0 (±2.5)	67.6 (±8.3)	56.9 (±8.9)	47.2 (±9.2)	52.3 (±8.3)	40.2 (±8.2)	28.6 (±7.2)
Minnesota	90.4 (±3.9)	83.6 (±4.8)***	65.5 (±8.8)	51.3 (±8.9)	44.5 (±8.8)	57.1 (±8.7)	36.2 (±8.3)	22.4 (±6.6)
Ohio	86.7 (±5.1)	76.1 (±6.0)	61.0 (±9.9)	47.8 (±9.9)	37.8 (±9.4)	43.7 (±9.0)	32.0 (±8.1)	21.0 (±6.7)
Wisconsin	88.0 (±4.1)	81.6 (±4.6)	60.5 (±8.7)	53.2 (±8.9)	47.3 (±8.9)	46.4 (±8.1)	42.1 (±8.1)	33.5 (±7.8)
Region VI	86.1 (±1.9)	86.4 (±1.7)	60.5 (±3.8)***	50.2 (±3.9)	39.5 (±3.7)	44.1 (±3.6)	34.7 (±3.3)***	26.0 (±3.0)***
Arkansas	91.2 (±3.4)***	81.5 (±4.6)***	63.5 (±8.4)	49.4 (±8.9)	34.0 (±8.4)	44.2 (±8.1)	28.9 (±7.2)	16.4 (±5.8)
Louisiana	91.0 (±3.4)	90.9 (±3.6)	60.3 (±8.6)	53.3 (±8.9)	39.3 (±8.8)	49.5 (±7.9)	39.1 (±7.8)	30.5 (±7.4)
New Mexico	85.9 (±4.2)	72.5 (±5.3)	66.7 (±7.6)	55.6 (±7.8)	40.6 (±7.5)	54.3 (±8.5)	49.9 (±8.5)***	40.3 (±8.2)***
Oklahoma	84.4 (±4.8)	68.1 (±6.4)	58.1 (±10.0)	43.4 (±9.9)	32.2 (±9.1)	52.9 (±8.9)	40.1 (±9.0)	35.7 (±8.9)***
Texas (TX)	85.1 (±2.6)	89.6 (±2.2)	60.1 (±5.1)***	50.4 (±5.2)	40.9 (±5.0)	41.4 (±4.8)	32.9 (±4.4)	24.0 (±3.8)
TX-Bexar County	85.7 (±4.5)	88.5 (±4.3)	56.2 (±8.5)	46.5 (±8.6)	32.8 (±8.2)	40.3 (±9.0)	28.9 (±8.3)	19.9 (±7.2)
TX-City of Houston	83.3 (±5.3)	87.2 (±4.8)	66.9 (±10.1)	58.1 (±10.7)	42.8 (±10.8)	58.6 (±9.6)	46.4 (±10.0)	22.7 (±8.0)
TX-El Paso County	83.4 (±3.9)	85.5 (±3.8)†††	75.4 (±6.6)	64.6 (±7.1)	52.2 (±7.4)	60.7 (±7.2)	47.8 (±7.2)	34.4 (±6.6)
TX-Hidalgo County	81.3 (±4.0)	88.8 (±3.3)	66.9 (±6.7)	56.7 (±7.1)	40.7 (±7.0)	52.3 (±7.3)	43.7 (±7.2)	34.1 (±6.8)
TX-rest of state	85.4 (±3.2)	90.1 (±2.7)	58.9 (±6.4)	49.1 (±6.4)	41.0 (±6.3)	38.7 (±5.8)	30.9 (±5.3)	23.5 (±4.7)
Region VII	86.3 (±2.6)***	70.7 (±3.4)***	60.2 (±5.1)***	49.3 (±5.3)***	37.9 (±5.1)	44.8 (±5.0)***	34.6 (±4.8)***	24.4 (±4.5)***
Iowa	85.5 (±4.6)***	75.0 (±5.3)***	66.7 (±8.0)	62.3 (±8.2)	49.8 (±8.6)	48.0 (±8.7)***	37.0 (±8.2)	23.9 (±7.2)
Kansas	87.3 (±4.2)***	63.7 (±5.9)	50.9 (±8.8)	43.6 (±8.6)***	31.7 (±8.0)	36.0 (±8.1)	26.3 (±7.4)	18.5 (±6.7)
Missouri	85.7 (±4.9)	69.7 (±6.5)	59.3 (±10.0)	43.4 (±10.4)	31.5 (±9.7)	44.7 (±9.8)***	33.7 (±9.5)***	25.1 (±9.1)***
Nebraska	87.7 (±4.1)	78.1 (±4.8)	67.3 (±7.9)	55.5 (±8.5)	48.2 (±8.6)	54.3 (±7.9)***	46.9 (±7.8)***	32.2 (±7.2)
Region VIII	87.5 (±2.2)	76.6 (±2.7)***	57.8 (±4.9)	47.9 (±4.9)	36.8 (±4.7)	52.0 (±4.8)***	42.6 (±5.0)***	28.7 (±4.7)***
Colorado	93.3 (±2.9)	85.6 (±4.3)***	65.3 (±8.2)	57.7 (±8.6)	46.0 (±8.7)	63.2 (±8.4)***	52.7 (±9.0)***	37.1 (±8.8)***
Montana	89.5 (±3.7)	65.8 (±5.4)	55.0 (±8.5)	41.8 (±8.3)	34.8 (±8.0)	46.0 (±8.0)***	33.3 (±7.7)***	21.7 (±6.8)
North Dakota	88.9 (±4.5)	91.6 (±4.0)	70.5 (±8.2)	60.9 (±9.0)	47.1 (±9.1)	62.3 (±8.9)***	53.1 (±9.1)***	38.4 (±8.6)***
South Dakota	72.4 (±5.8)	55.5 (±6.3)	53.2 (±9.1)	42.3 (±8.9)	32.4 (±8.7)	39.2 (±8.5)	28.6 (±7.8)	22.0 (±7.2)

See table footnotes on next page.

TABLE 3. (Continued) Estimated vaccination coverage with selected vaccines and doses* among adolescents aged 13–17 years,† by HHS Regions and state, selected local areas, or territories — National Immunization Survey-Teen (NIS-Teen), United States, 2015

HHS Region/State/ Territory	All adolescents (n = 21,875)		Females (n = 10,508)			Males (n = 11,367)		
	≥1 Tdap [§] % (95% CI) ^{¶¶}	≥1 MenACWY [¶] % (95% CI)	≥1 HPV ^{**} % (95% CI)	≥2 HPV ^{††} % (95% CI)	≥3 HPV ^{§§} % (95% CI)	≥1 HPV ^{**} % (95% CI)	≥2 HPV ^{††} % (95% CI)	≥3 HPV ^{§§} % (95% CI)
Utah	82.0 (±5.2)	71.5 (±5.8)	47.8 (±9.4)	35.9 (±8.8)	24.6 (±7.7)	40.9 (±8.9)***	33.7 (±8.7)***	19.9 (±7.6)
Wyoming	87.9 (±4.1)	58.7 (±6.4)	47.7 (±9.6)	37.6 (±9.4)	26.5 (±8.7)	37.1 (±8.8)	30.8 (±8.5)***	18.8 (±6.9)
Region IX	83.3 (±4.4)	78.7 (±4.6)	67.3 (±7.6)	59.2 (±7.8)	47.6 (±7.8)	56.8 (±7.7)	41.3 (±7.6)	29.0 (±7.1)
Arizona	86.6 (±3.8)	87.6 (±3.8)	68.3 (±7.4)	56.1 (±8.1)	44.2 (±8.3)	51.3 (±8.2)	40.6 (±8.2)***	27.0 (±7.3)***
California	82.5 (±5.6)	77.2 (±5.9)	66.7 (±9.6)	59.7 (±9.9)	48.4 (±9.9)	58.5 (±9.8)	41.8 (±9.7)	29.5 (±9.0)
Hawaii	79.6 (±4.9)	78.7 (±5.0)	71.3 (±8.0)	64.1 (±8.4)***	52.4 (±8.8)***	62.5 (±8.0)	50.2 (±8.4)	36.2 (±8.1)
Nevada	88.3 (±4.3)	78.0 (±5.3)***	72.0 (±7.8)***	57.6 (±9.0)***	42.5 (±9.2)	44.5 (±8.8)	31.9 (±8.1)	23.7 (±7.2)
Region X	85.3 (±2.7)	75.1 (±3.2)	65.3 (±5.0)	53.4 (±5.2)	43.6 (±5.2)	49.5 (±5.0)	41.9 (±5.0)***	29.5 (±4.6)***
Alaska	69.7 (±5.8)	55.7 (±6.2)	57.0 (±8.7)	46.3 (±8.7)	36.9 (±8.4)	41.6 (±8.5)	30.3 (±7.8)	18.8 (±6.4)
Idaho	82.5 (±5.2)***	81.4 (±5.2)	57.3 (±8.9)	43.5 (±9.0)	30.3 (±8.2)	44.2 (±8.9)	36.4 (±8.6)***	26.4 (±7.9)
Oregon	89.4 (±3.8)	75.2 (±5.5)	70.0 (±8.1)	55.4 (±9.0)	48.9 (±9.0)	58.6 (±8.4)***	48.2 (±8.7)***	35.7 (±8.5)***
Washington	85.3 (±4.5)	75.4 (±5.1)	65.8 (±8.1)	55.8 (±8.4)	45.1 (±8.4)	46.8 (±8.0)	41.2 (±7.8)	28.0 (±7.1)
Range^{§§§}	(69.7–97.1)	(55.3–97.7)	(47.7–87.9)	(35.9–77.9)	(24.4–68.0)	(34.8–80.6)	(25.2–66.6)	(16.0–58.1)
Territory								
Guam	79.6 (±4.6)	76.2 (±4.8)	68.9 (±7.8)	50.5 (±8.3)	37.0 (±7.9)	52.2 (±7.8)	38.0 (±7.6)	22.4 (±6.4)
Puerto Rico	82.5 (±5.2)	87.9 (±4.3)	77.4 (±7.8)	52.7 (±9.7)	42.0 (±9.4)	68.1 (±8.6)	44.3 (±9.1)	30.8 (±8.7)
U.S. Virgin Islands	82.0 (±4.0)	56.0 (±5.4)	40.4 (±7.7)	25.8 (±6.9)	16.4 (±5.9)	35.5 (±7.1)	18.6 (±5.5)	11.8 (±4.6)

Abbreviations: CI = confidence interval; HHS = U.S. Department of Health and Human Services; HPV = human papillomavirus; MenACWY = quadrivalent meningococcal conjugate vaccine; MMR = measles, mumps, rubella vaccine; Tdap = tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine.

* Estimates for additional measures, including MMR, hepatitis B, and varicella vaccines are available (<http://www.cdc.gov/vaccines/vaxview/teenvaxview>).

† Adolescents (n = 21,875) in the 2015 NIS-Teen were born during January 1997–February 2003.

§ ≥1 dose Tdap at or after age 10 years.

¶ ≥1 dose of MenACWY or meningococcal-unknown type vaccine.

** ≥1 dose HPV vaccine, 9-valent (9vHPV), quadrivalent (4vHPV), or bivalent (2vHPV). Percentages are reported separately for females only (n = 10,508) and males only (n = 11,367). 9vHPV, 4vHPV, or 2vHPV are recommended for females, and 9vHPV or 4vHPV are recommended for males.

†† ≥2 doses of HPV vaccine, including 9vHPV, 4vHPV or 2vHPV.

§§ ≥3 doses of HPV vaccine, including 9vHPV, 4vHPV or 2vHPV. Some adolescents might have received more than the 3 recommended HPV vaccine doses.

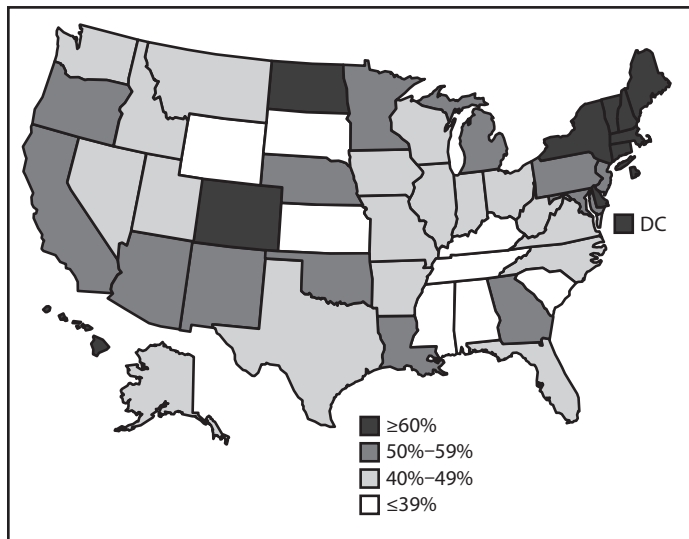
¶¶ Estimates with 95% CI half-widths >10 might not be reliable.

*** Statistically significant (p<0.05) percentage point increase from 2014.

††† Statistically significant (p<0.05) percentage point decrease from 2014.

§§§ Range excludes all selected local areas and territories.

FIGURE 2. Estimated vaccination coverage with ≥1 dose of HPV vaccine* among male adolescents aged 13–17 years† — National Immunization Survey-Teen,‡ United States, 2015



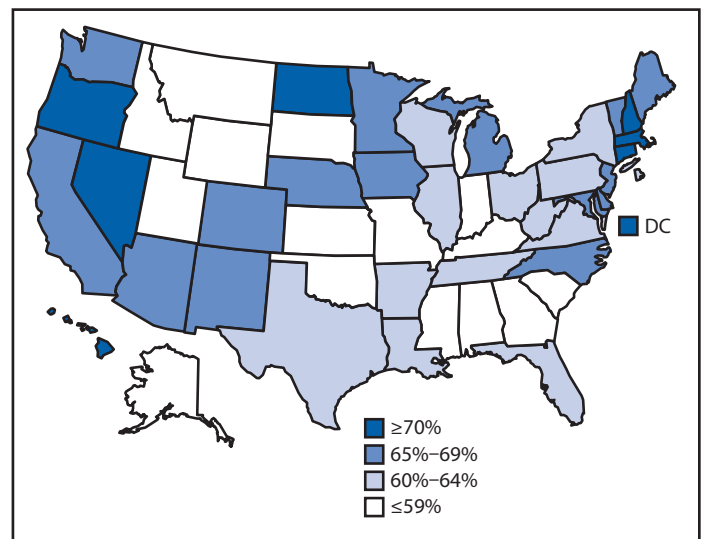
Abbreviation: HPV = human papillomavirus.

* The Advisory Committee on Immunization Practices recommends 9-valent or quadrivalent HPV vaccine for males.

† National coverage = 50% (n = 11,367); percentages reported among males only.

‡ Includes male adolescents born January 1997 through February 2003.

FIGURE 3. Estimated vaccination coverage with ≥1 dose of HPV vaccine* among female adolescents aged 13–17 years† — National Immunization Survey-Teen,‡ United States, 2015



Abbreviation: HPV = human papillomavirus.

* The Advisory Committee on Immunization Practices recommends 9-valent, quadrivalent, or bivalent HPV vaccine for females.

† National coverage = 63% (n = 10,508); percentages reported among females only.

‡ Includes female adolescents born January 1997 through February 2003.

≥2 doses), Rhode Island (≥1, ≥3 doses), Tennessee (≥3 doses), and Texas (≥1 dose) (e.g., range for ≥1 HPV vaccine dose = 9.4–21.0 percentage points). Three states experienced decreases in ≥3-dose HPV vaccination coverage among females (Georgia, Indiana, and North Carolina; range = 13.5–16.2 percentage points). No decreases in HPV vaccination coverage were observed among males.

Healthy People 2020 Targets Among Adolescents Aged 13–15 Years

In 2015, the *Healthy People 2020* target (80%) for adolescents aged 13–15 years^{¶¶} was met nationally for the fifth survey year for ≥1 dose of Tdap (87.1% [95% CI = 85.9%–88.2%]) and, for the first survey year, for ≥1 dose of MenACWY (80.8% [95% CI = 79.4%–82.1%]). Targets were not met for ≥3 HPV doses (target 80%) in males (27.1% [95% CI = 25.1%–29.2%]) or females (37.1% [95% CI = 34.8%–39.5%]) or ≥2 varicella vaccine doses (target = 90%) (84.6% [95% CI = 83.2%–85.9%]).

Discussion

In 2015, coverage with each HPV vaccine dose increased among males, however, among females, ≥1-dose HPV vaccination coverage increased only modestly, and no change was observed in coverage with ≥2 and ≥3 HPV doses. During 2015, as in previous years, coverage with ≥1 HPV vaccine dose was lower than coverage with Tdap and MenACWY, two other vaccines routinely recommended at age 11–12 years. These gaps in coverage demonstrate ongoing missed opportunities for HPV vaccination at visits when other recommended vaccines are administered. A revised Healthcare Effectiveness Data and Information Set (HEDIS) measure will be implemented in 2017 to assess receipt of Tdap, MenACWY, and HPV vaccines by age 13 years in both females and males combined in one composite indicator (2), enabling health plans to evaluate their performance in administering these vaccines to adolescents.

Each year in the United States, an estimated 24,600 newly diagnosed cancers are attributable to the two high-risk HPV types targeted by all currently licensed HPV vaccines, and an additional 3,800 are attributable to the five additional high-risk HPV types included in the 9-valent HPV vaccine (3). Improvement in HPV vaccination coverage among adolescents

Summary

What is already known about this topic?

To prevent diseases, including human papillomavirus (HPV)-associated cancers, pertussis, and meningococcal disease, routine immunization of adolescents aged 11–12 years is recommended by the Advisory Committee on Immunization Practices. During 2006–2014, national coverage with ≥1 dose of tetanus-diphtheria-acellular pertussis vaccine (Tdap) and ≥1 dose of quadrivalent meningococcal conjugate vaccine (MenACWY) increased annually. Since 2007, among females, HPV vaccination coverage has lagged behind Tdap and MenACWY coverage, with gaps of 28 and 17 percentage points, respectively, in 2014. HPV vaccination coverage among males has increased annually since 2011, but remains lower than coverage among females.

What is added by this report?

In 2015, vaccination coverage among adolescents aged 13–17 years increased for each HPV vaccine dose among males, ≥1 HPV vaccine dose among females, and ≥1 MenACWY among all adolescents. HPV vaccination coverage continues to be lower than Tdap and MenACWY coverage. Wide variation in coverage by state was observed for all vaccines assessed. In 2015, 28 states and local areas achieved increases in HPV vaccination coverage among males, and seven states achieved increases among females.

What are the implications for public health practice?

Although national-level ≥1-dose HPV vaccination coverage increased in 2015 among adolescents, it remained lower than Tdap and MenACWY coverage. This suggests that HPV vaccine is not being routinely administered at visits when other recommended vaccines are given, and demonstrates ongoing missed opportunities for the prevention of HPV-associated outcomes, including cancers. Routine age-appropriate administration of all recommended vaccines to adolescents aged 11–12 years, and strong, consistent recommendations by clinicians are important to maintaining high vaccination coverage for Tdap and MenACWY vaccines and improving HPV vaccination coverage.

is needed to decrease the number of future HPV-associated cancers (4). Strong clinician recommendations for HPV vaccination, and coadministration of the first HPV vaccine dose with Tdap and MenACWY vaccine at age 11–12 years during the same visit, would improve HPV vaccination coverage. Reasons for low HPV vaccination coverage, particularly among younger adolescents, include lack of a strong clinician recommendation for HPV vaccine at age 11–12 years, recommending vaccination inconsistently based on perceived risk for adolescents' HPV exposure, or not recommending coadministration of routine vaccines (5,6). Clinicians also might overestimate parental concerns and underestimate HPV vaccine demand (7). Resources for clinicians to facilitate optimal communication with parents and adolescents regarding HPV and other recommended vaccines are available at <http://www.cdc.gov/hpv/>.

^{¶¶} *Healthy People 2020* targets for vaccination coverage among adolescents aged 13–15 years are 80.0% for ≥1 Tdap, ≥1 MenACWY, and ≥3 HPV vaccine doses among females and males, and 90.0% for ≥2 varicella vaccine doses (<https://www.healthypeople.gov/2020/topics-objectives/topic/immunization-and-infectious-diseases/objectives>). State and selected local area-level coverage estimates for vaccines included in the *Healthy People 2020* objectives among adolescents aged 13–15 years will be available at <http://www.cdc.gov/vaccines/vaxview/teenvaxview>.

At a national level, ≥ 1 and ≥ 2 HPV and ≥ 2 varicella vaccination coverage estimates among adolescents living below the federal poverty level were higher than among those living at or above the poverty level. Coverage with other vaccines was similar by poverty status. Differences in HPV vaccination coverage by race/ethnicity and poverty status have been observed previously (8). Higher HPV vaccination coverage among adolescents living below the poverty level might, in part, be because of the routine provision of strong recommendations for HPV vaccination and consistent coadministration of vaccines by clinicians caring for adolescents from lower income households (5,6). Other factors might include clinicians' participation in, and adolescents' eligibility for, the Vaccines for Children (VFC) program^{***} and differential vaccine acceptance by poverty status.

Many states and local areas achieved increases in HPV vaccination coverage. In 2014–2015, CDC provided technical assistance and Prevention and Public Health Fund (PPHF) resources to immunization programs and national partner organizations to implement interventions for improving HPV vaccination coverage.^{†††} Activities included clinician education, clinical practice quality improvement strategies (e.g., CDC's Assessment, Feedback, Incentives, and eXchange programmatic initiative [<http://www.cdc.gov/vaccines/programs/afix/index.html>]), patient reminder/recall (9), communication campaigns, and stakeholder engagement.^{†††} Measurable impact of quality improvement activities at a clinical practice level can be achieved in short time horizons, but the impact of programmatic interventions on population-level vaccination coverage outcomes can take time to occur and be difficult to sustain. Also, because NIS-Teen assesses vaccination coverage among adolescents aged 13–17 years, the impact of activities targeted at improving HPV vaccination at the recommended age of 11–12 years will not be measurable until at least 1–2 years after implementation. However, evidence suggests that multifaceted interventions that emphasize providing strong recommendations for routine, on-time vaccination at age 11–12 years might be effective in improving HPV vaccination delivery (9,10).

^{***} Children and adolescents aged ≤ 18 years who are Medicaid-eligible, uninsured, or American Indian/Alaska Native (as defined by the Indian Health Care Improvement Act) are eligible to receive vaccines from providers through the VFC program. Children categorized as "underinsured" (because their health plans do not include coverage for recommended vaccinations) are eligible to receive VFC vaccines if they are served by a rural health clinic or federally qualified health center or under an approved deputization agreement. (<http://www.cdc.gov/vaccines/programs/vfc/providers/eligibility.html>).

^{†††} CDC provided PPHF resources to 22 state and local immunization programs, the Academic Pediatric Association, American Academy of Pediatrics, American Cancer Society, the National Area Health Education Center Organization, and National Association of County and City Health Officials (<http://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2015-10/hpv-03-curtis.pdf>).

The findings in this report are subject to at least five limitations. First, the overall household response rate was 33.0% (56.4% for the landline and 29.8% for the cell phone samples), and only 53.4% of landline-completed and 48.9% of cell phone-completed interviews had adequate provider data. Second, bias in estimates might remain even after adjustment for household and provider nonresponse and phoneless households.^{§§§} Weights have been adjusted for the increasing number of cell phone-only households over time. Nonresponse bias might change, which could affect comparisons of estimates between survey years. Third, estimates stratified by state/local area and those stratified by race/ethnicity might be unreliable because of small sample sizes. Fourth, multiple statistical tests were conducted, and a small number might be significant because of chance alone. Finally, ≥ 2 -dose MenACWY coverage likely underestimates the proportion of adolescents who receive ≥ 2 MenACWY doses. Adolescents might receive their second MenACWY dose after age 17 years (1); because NIS-Teen includes adolescents aged 13–17 years, receipt of MenACWY at age ≥ 18 years cannot be captured in coverage estimates.

Widespread improvement in HPV vaccination coverage among males was observed in 2015 suggesting that clinicians are increasingly administering HPV vaccine to males in accordance with ACIP recommendations. However, HPV vaccination coverage among adolescents remains lower than vaccination coverage with Tdap and the first MenACWY vaccine dose, demonstrating that HPV vaccine is not consistently coadministered with other recommended vaccines, and that missed opportunities for HPV-associated cancer prevention are occurring. A revised HEDIS measure planned for implementation in 2017 will enable improved assessment of receipt of Tdap, MenACWY, and HPV vaccines by age 13 years among adolescents covered by U.S. health plans (2). Resources are available to help clinicians effectively communicate with parents and adolescents regarding the importance of HPV vaccination. Tools are available for immunization programs and partner organizations, including cancer prevention stakeholders, to improve awareness of and demand for vaccines recommended for adolescents, including HPV vaccine. Interventions aimed at improving HPV vaccination coverage are ongoing. To optimize protection of adolescents against vaccine-preventable diseases, including HPV-associated cancers, it is important for clinicians to consistently recommend and coadminister Tdap, MenACWY, and HPV vaccines at age 11–12 years.

^{§§§} A total survey error model of 2011 NIS-Teen that included comparison with provider-reported data from National Health Interview Survey participants indicated coverage estimates were 2.9–5.9 percentage points higher as a result of noncoverage and household nonresponse error; however, these estimates of bias might be too high because they do not account for possible underascertainment of vaccination status (<http://www.amstat.org/meetings/jsm/2012/onlineprogram/abstractdetails.cfm?abstractid=304324> and <http://www.cdc.gov/vaccines/imz-managers/coverage/nis/child/downloads/total-survey-error-NIS-2011.pdf>).

¹Immunization Services Division, National Center for Immunization and Respiratory Diseases, CDC; ²Carter Consulting, Inc., Atlanta, Georgia; ³Division of Bacterial Diseases, National Center for Immunization and Respiratory Diseases, CDC; ⁴Division of Viral Diseases, National Center for Immunization and Respiratory Diseases, CDC.

Corresponding author: Sarah Reagan-Steiner, sreagansteiner@cdc.gov, 404-639-2811.

References

1. Robinson CL; Advisory Committee on Immunization Practices (ACIP), ACIP Child/Adolescent Immunization Work Group. ACIP Child/Adolescent Immunization Work Group. Advisory Committee on Immunization Practices recommended immunization schedules for persons aged 0 through 18 years—United States, 2016. *MMWR Morb Mortal Wkly Rep* 2016;65:86–7. <http://dx.doi.org/10.15585/mmwr.mm6504a4>
2. National Committee for Quality Assurance. NCQA updates quality measures for HEDIS® 2017 (press release). Washington, DC: National Committee for Quality Assurance; 2016. <http://www.ncqa.org/newsroom/details/ncqa-updates-quality-measures-for-hedis-2017>
3. Viens LJ, Henley SJ, Watson M, et al. Human papillomavirus–associated cancers—United States, 2008–2012. *MMWR Morb Mortal Wkly Rep* 2016;65:661–6. <http://dx.doi.org/10.15585/mmwr.mm6526a1>
4. Chesson HW, Ekweeme DU, Saraiya M, Dunne EF, Markowitz LE. The estimated impact of human papillomavirus vaccine coverage on the lifetime cervical cancer burden among girls currently aged 12 years and younger in the United States. *Sex Transm Dis* 2014;41:656–9. <http://dx.doi.org/10.1097/OLQ.0000000000000199>
5. Allison MA, Hurley LP, Markowitz L, et al. Primary care physicians' perspectives about HPV vaccine. *Pediatrics* 2016;137:e20152488. <http://dx.doi.org/10.1542/peds.2015-2488>
6. Gilkey MB, Malo TL, Shah PD, Hall ME, Brewer NT. Quality of physician communication about human papillomavirus vaccine: findings from a national survey. *Cancer Epidemiol Biomarkers Prev* 2015;24:1673–9. <http://dx.doi.org/10.1158/1055-9965.EPI-15-0326>
7. Healy CM, Montesinos DP, Middleman AB. Parent and provider perspectives on immunization: are providers overestimating parental concerns? *Vaccine* 2014;32:579–84. <http://dx.doi.org/10.1016/j.vaccine.2013.11.076>
8. Reagan-Steiner S, Yankey D, Jeyarajah J, et al. National, regional, state, and selected local area vaccination coverage among adolescents aged 13–17 years—United States, 2014. *MMWR Morb Mortal Wkly Rep* 2015;64:784–92. <http://dx.doi.org/10.15585/mmwr.mm6429a3>
9. Community Preventive Services Task Force. The community guide—guide to community preventive services: increasing appropriate vaccination. Atlanta, GA: Community Preventive Services Task Force; 2016. <http://www.thecommunityguide.org/vaccines/index.html>
10. Smulian EA, Mitchell KR, Stokley S. Interventions to increase HPV vaccination coverage: a systematic review. *Hum Vaccin Immunother* 2016;12:1566–88. <http://dx.doi.org/10.1080/21645515.2015.1125055>