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National and state-specific estimates of settings of receiving HPV vaccination among adolescents in the United States

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Abstract

Purpose: Human papillomavirus (HPV) vaccination in the United States has been recommended for girls since 2006 and for boys since 2011. However, settings of receiving HPV vaccination has not been assessed. The purpose of this study is to assess settings of receiving HPV vaccination among adolescents in order to understand what strategies are needed to improve vaccination uptake.

Methods: Data from the 2018 National Immunization Survey–Teen (NIS–Teen) were analyzed to assess place of HPV vaccination overall, and by gender, quarter, and other selected variables among adolescents in the United States. The 2016–2018 NIS–Teen data were combined to assess state-specific place of HPV vaccination.

Results: Among vaccinated adolescents aged 13–17 years, a doctor’s office was the most common place where HPV vaccination was received (79.2%), followed by clinics, health centers, or other medical facilities (13.5%), health department (4.1%), hospital or emergency room (2.3%), pharmacies or stores (0.4%), and schools (0.5%). Overall, 99.1% of adolescents aged 13–17 years received HPV vaccination at medical settings and only 0.9% at nonmedical settings. Reported vaccination in nonmedical settings by state ranged from less than 0.1% in Delaware, Florida, and New Hampshire to 4.1% in North Dakota, with a median of 1.0%.

Conclusion: Doctor’s offices were the most common medical setting for adolescents to receive HPV vaccination. Less than 1% of adolescents received vaccination at nonmedical settings. Continuing work with medical and nonmedical settings to identify and implement appropriate strategies are needed to improve HPV vaccination coverage among adolescents.

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Keywords

human papillomavirus vaccine (HPV); vaccination; coverage; adolescents; place of vaccination; medical settings; nonmedical settings; National Immunization Survey-Teen (NIS-Teen)

Introduction

Human papillomavirus (HPV) is the most common sexually transmitted infection in men and women in the United States (1). Vaccination is an important tool to prevent and control HPV infection and its complications including genital warts, precancerous lesions, and cancer (2–6). Since 2006, routine HPV vaccination of females aged 11 or 12 years, as well as those aged 13 through 26 years not previously vaccinated, has been recommended by the Advisory Committee on Immunization Practices (ACIP) (2). In 2011, ACIP recommended routine vaccination of males aged 11 or 12 years and those aged 13–21 years not previously vaccinated; recommendations stated that males aged 22–26 may be vaccinated (3). A 3-dose schedule was initially recommended; in 2016, ACIP recommended a 2-dose schedule if the vaccination series is initiated before the 15th birthday (5). In 2019, recommendations for catch-up HPV vaccination were harmonized across genders through age 26 years (6).

HPV vaccination coverage among adolescents has increased over the years (7–10); however, it remains lower than the national target and other vaccinations recommended for adolescents (10, 11), and about 30% of adolescents had not received a single dose of the vaccine by 2018 after many years of HPV vaccine availability (10). In order to reach as many adolescents as possible and to maximize each encounter with a healthcare professional, the National Vaccine Advisory Committee (NVAC) developed recommendations for both medical setting and potential complementary settings (e.g., schools, and pharmacies) (12). Medical settings are important venues for healthcare delivery, including vaccinations, however, medical settings alone may not be sufficient to achieve high vaccination coverage among adolescents and nonmedical settings could provide expanded convenient access to vaccinations and enhance the overall capacity of the health care system to effectively deliver vaccinations (12). This study is seeking to understand which settings are preferred for HPV vaccination among adolescents in order to understand what strategies are needed to improve vaccination uptake.

Assessing place of HPV vaccination among adolescents is important in planning and implementing strategies for increasing HPV vaccination coverage among adolescents (13–16). This analysis used data from the 2018 National Immunization Survey–Teen (NIS–Teen) to assess place of HPV vaccination overall and by gender, quarter, and other characteristics among adolescents in the United States. The 2016–2018 NIS–Teen data were combined to assess state-specific place of HPV vaccination.

Methods

The NIS–Teen is a national, random–digit–dial (RDD) telephone survey conducted by the Centers for Disease Control and Prevention (CDC). The objective of the NIS–Teen is to provide timely, detailed information regarding vaccination coverage among adolescents

aged 13–17 years for vaccines recommended by ACIP, including HPV vaccine, and to evaluate factors associated with vaccination. Survey data are collected in two phases. In the first phase, the RDD telephone interview is conducted to identify households with age-eligible adolescents (aged 13–17 years at the time of interview) and to collect demographic information from the parent or guardian on adolescent, maternal, and household characteristics. Also, the interview includes questions on the adolescent's reported vaccination history. If the parent or guardian reported that the adolescent received the HPV vaccine, then they were asked about the type of place where the adolescent received an HPV shot in general but the survey did not ask this question for each dose in the series. After completing the interview, consent is requested to contact the vaccination provider(s). If consent is obtained, then in phase 2, the adolescent's vaccination providers are mailed a questionnaire to collect vaccination histories based on provider record for each recommended adolescent vaccine and selected childhood vaccines. The provider reported histories are used for determining vaccination coverage estimates (10, 17–18). Beginning in 2018, the NIS–Teen used a single-frame sample of cell phone lines. The landline telephone sample frame that was used from 2006 through 2017 was discontinued because of the declining number of landline-only households in the United States (19).

Data from the 2018 NIS–Teen were analyzed to assess place of HPV vaccination as reported by the parent or guardian responding to the survey among individuals who ever received HPV vaccine (≥ 1 HPV vaccine dose) based on provider report (CDC routinely reports HPV vaccination coverage based on provider report, but the detailed information regarding place of receiving HPV vaccination was only collected from the parents or guardian). To increase the sample size and get reliable state specific estimates, the 2016–2018 NIS–Teen data were combined to assess state-specific place of receiving HPV vaccination and HPV vaccination coverage. The 2018 NIS–Teen used only a cell-phone sample while the 2016 and 2017 NIS–Teen, included both a landline and a cell-phone sample (17–19). Place of vaccination question was asked the same way during 2016 through 2018. Place of HPV vaccination was stratified by setting (medical settings: doctor's office, hospital/emergency room, clinic/health center, or health department; nonmedical settings: pharmacy, school, or other non-medical place), state, and a few selected socio-demographic characteristics including age group, gender, race/ethnicity, and metropolitan statistical area (MSA). Because HPV vaccination is known to vary by the time of year (20) with more vaccination occurring during summer months, we also stratified place of vaccination by quarter of the year when the first dose was received assuming that parents may rush to get their child in compliance with school requirements and they may be more willing to go to a nonmedical setting for vaccination (e.g., Washington D.C., Hawaii, Rhode Island, and Virginia have school HPV vaccination mandate requirements). Of individuals who ever received HPV vaccine (≥ 1 HPV vaccine dose) based on provider report, those who: a) were not asked the question about the adolescent's place of HPV vaccination (presumably because the provider reported HPV vaccination and the parent did not report that the adolescent got the vaccine), and b) did not know, or refused to answer place of HPV vaccination question were excluded from our analysis. Difference in characteristics between those excluded from the analysis and those included in the analysis were assessed.

The proportion of vaccinated respondents by type of place was estimated overall and within subgroups defined by various socio-demographic variables. *T*-tests were used to compare estimates with the referent group. Additionally, *t*-tests were used for comparison with the prior adjacent quarter of vaccination. SUDAAN (Research Triangle Institute, Research Triangle Park, NC, version 11.03) was used to calculate point estimates and 95% confidence intervals (95% CIs). All analyses account for the complex sampling design of the NIS–Teen and the survey sampling weights (10, 17, 18). All tests were 2-sided with alpha set at 0.05. The NIS–Teen was approved by CDC, National Center for Health Statistics Research Ethics Review Board and the NORC (National Opinion Research Center) at the University of Chicago Institutional Review Board.

Results

The Council of American Survey Research Organizations (CASRO) response rate for the 2018 NIS–Teen was 23.3%, and only 48.3% of adolescents with completed interviews had adequate provider data (10, 17). Of individuals (12,756) who ever received HPV vaccine (1 HPV vaccine dose) based on provider report in the 2018 NIS–Teen, 2,750 (23.8%) participants were excluded from the analysis, yielding the final sample size for this study. Individuals excluded from our analysis included those who were not asked the question about the adolescent's place of HPV vaccination (presumably because provider reported HPV vaccination and the parent did not report that the adolescent got the vaccine) (1,697), and those who did not know, or refused to answer place of HPV vaccination question (1,053). Compared with those excluded from the analysis, participants included in the analysis were more likely to be female, white, have mother's with higher education, have higher household income, be born in the U.S., have health insurance, and have had a well-child visit based on the information collected from the providers (data not shown). Of those 10,006 adolescents aged 13–17 years who received their first HPV vaccine and whose parent answered the place of receiving HPV vaccination question, 5,940 (59.4%) were adolescents aged 13–15 years and 4,066 (40.6%) were adolescents aged 16–17 years (Table 1). Among vaccinated adolescents aged 13–17 years, a doctor's office was the most common place of receiving HPV vaccination (79.2%) (Table 1). The next most common place of vaccination were clinics, health centers, or other medical places (13.5%), followed by health department (4.1%), hospital or emergency room (2.3%), schools (0.5%), and pharmacies or stores (0.4%). There was no significant difference in place of vaccination between those aged 13–15 and 16–17 years. Overall, 99.1% of adolescents aged 13–17 years received HPV vaccination at medical settings and 0.9% at nonmedical settings (Table 1).

Among vaccinated adolescents, the proportion receiving vaccination in nonmedical settings was 0.9% among males aged 13–17 years and 0.8% among females aged 13–17 years (Table 2). The proportion of adolescents receiving vaccination in nonmedical settings was 1.6% among non-Hispanic blacks, 0.7% among Hispanics, and 0.9% among non-Hispanic adolescents of other races or multiple races compared with non-Hispanic white (0.9%). The proportion of adolescents receiving vaccination in nonmedical settings was 0.9% among those who resided in an MSA compared with those who did not reside in an MSA (0.7%). There were no significant differences in the proportion of adolescents receiving vaccination in nonmedical settings between age group, sex, race/ethnicities, and MSA.

Overall, among vaccinated adolescents aged 13–17 years, 17.3% were vaccinated in calendar quarter 1, 22.6% in quarter 2, 39.3% in quarter 3, and 20.7% in quarter 4 (Table 3); there were significant differences in the proportion receiving vaccination between some quarters (quarter 2, quarter 3, and quarter 4) compared with the prior adjacent quarter. Place of HPV vaccination did not vary by quarter of vaccination and over 98% of vaccinated adolescents aged 13–17 years had received vaccination in medical settings each quarter (Table 3).

Overall, among vaccinated adolescents aged 13–17 years, the proportion of adolescents receiving HPV vaccination in nonmedical settings ranged from less than 0.1% in three states (Delaware, Florida, and New Hampshire) to 4.1% in North Dakota, with a median of 1.0% (Table 4). Among adolescents aged 13–17 years, HPV vaccination coverage ranged from 48.0% in Wyoming to 88.9% in Rhode Island, with a median of 65.6%. State-specific HPV vaccination coverage among adolescents aged 13–17 years was not correlated ($r=0.14$, $p>0.05$) with state-specific proportion of vaccination in non-medical settings (Table 4). The proportion of adolescents receiving HPV vaccination at a pharmacy or store was low regardless of whether states allowed pharmacists to administer HPV vaccinations for children (0.3%) or not (0.1%).

Discussion

This study reports national estimates of place of HPV vaccination among adolescents aged 13–17 years. The findings provide a baseline for assessing place of HPV vaccination using future NIS–Teen data. In 2018, among vaccinated adolescents aged 13–17 years, a doctor's office was the most common place of receiving HPV vaccination. The next most common place of vaccination were clinics, health centers, or other medical places, followed by health department, hospital or emergency room, schools, and pharmacies or stores. The major finding from this study is that about 99% of vaccinated adolescents aged 13–17 years received HPV vaccination at medical settings. These settings can play an important role in increasing adolescent HPV vaccination.

While medical settings are the predominant place for adolescent HPV vaccination, there has been interest in HPV vaccination in non-medical settings, such as pharmacies; however, there are impediments to vaccination in pharmacies (21–25). Not all jurisdictions have laws authorizing pharmacists to administer HPV vaccine to adolescents. Even among 27 states that did allow pharmacists to administer HPV vaccines for children aged <18 years (21, 22), the proportion of vaccinated adolescents receiving HPV vaccine at a pharmacies/store was only 0.3%. Additionally, more than 30 states mandated pharmacy to put vaccination information into vaccine registries, and the pediatrician or family physician was able to see what has been given at the pharmacy. It is highly encouraged in the other states where integration is available but not yet required (26). Though success has been seen with pharmacy-based influenza vaccination among children, HPV vaccination may be different (16, 27). One possible reason is that influenza vaccination is an annual vaccination and parents might also receive influenza vaccination at the pharmacy at the same time. Of note, a 2017 survey found that parents are less willing to have their children vaccinated for HPV at a pharmacy; only 29% of parents would be willing to have their children vaccinated for

HPV at a pharmacy, versus 62% for influenza and 41% for Tdap vaccinations (27). Studies showed that the most frequently expressed barrier and concern about using pharmacies for HPV vaccination from parents of adolescents was apprehension of pharmacists' clinical training in vaccination and moreover, about 70% of parents did not know if pharmacists could vaccinate adolescents as young as 11 years of age at the pharmacy they typically use for their children's prescription medications (27, 28). Nevertheless, when allowable by state law, a pharmacy or store could provide extended, convenient access to vaccinations during off hours (e.g., evenings and weekends), and a low-cost option for adolescents to receive vaccination (23–24, 28–29).

Results from our study showed that there were no differences in place of HPV vaccination by age, gender, or race/ethnicity; other studies have reported that place of vaccination for influenza vaccination varies by these three variables (13–16). In the 2018–19 season, 67.6% of vaccinated children aged 6 months–17 years received influenza vaccination at a doctor's office (30), lower than the percentage receiving HPV vaccination at a doctor's office among adolescents aged 13–17 years (79.2%). A study assessing place of influenza vaccine showed that older children were more likely to receive influenza vaccination in nonmedical settings compared with younger children. Possible reasons for this finding include young children visiting their healthcare provider more frequently than older children, state pharmacy laws prohibiting vaccination of very young children, and availability of vaccination at some schools for school-aged children (16, 31).

School-located HPV vaccination has been proposed as a way to increase coverage (22), especially in underserved populations (32). In the U.S., some studies found that implementation of school-located HPV vaccination programs led to HPV series completion rate among females aged 11–12 years exceeding 80% (33, 34). Although the U.S. has school-located vaccination for other vaccines (35, 36), few HPV vaccination programs in schools have been implemented (37). Several barriers have been identified, including reimbursement; schools may not have mechanisms to bill insurance providers and payment for school-located vaccination could be denied by insurers as an out-of-network service (22). In addition, the need for parental consent has been found to be an impediment (22).

Studies have shown that vaccination in nonmedical settings is safe and incidence of adverse events is low (38–40). However, concern about side effects has been reported as a barrier to HPV vaccination at nonmedical or medical settings (21–22, 40–42). Increasing awareness of vaccine safety in nonmedical settings (e.g. pharmacies and schools) and encouraging those who may not visit their usual health care provider to seek vaccination in a convenient nonmedical setting was helpful for improving influenza vaccination, but has not been shown helpful for HPV vaccination (38–40).

Findings from this study indicate parents were more likely to seek HPV vaccination for their adolescents prior to or during summer months (Quarter 3), most likely associated with preparations for school entry. Although only two states (Rhode Island, and Virginia) and Washington D.C. had a requirement for HPV vaccination during the time of our study (43), 49 states and Washington D.C. had a school requirement for tetanus and reduced diphtheria toxoids and acellular pertussis vaccination (Tdap) and the majority of states had a school

requirement for quadrivalent meningococcal conjugate vaccine (MenACWY) (43, 44). HPV is frequently given during the same visit as Tdap and MenACWY. This study assumed that place of vaccination would vary by timing of vaccination since parents may have little time to get their child vaccinated and providers may be fully reserved so they might be willing to go to a nonmedical setting to receive vaccination prior to or during summer months. However, the results from this study did not support this hypothesis.

The findings in this study are subject to several limitations. First, the overall household response rate was low (23.3%), and bias in estimates might remain even after adjustment for nonresponse. Second, some provider-reported vaccination histories might not include all vaccines received (e.g., vaccines administered in nonmedical settings). Third, parents may confuse the difference between some medical settings (e.g., clinic and health center). Fourth, some schools may have health centers within the facility and those may be misconstrued as medical settings. The place of vaccination question did not distinguish a school-located clinic from a school-located health center. Fifth, parent-reported place of HPV vaccination is subject to recall error and of unknown accuracy. A large proportion (23.8% in 2018) of adolescents had missing data on parent-reported place of HPV vaccination. Over half of this missing data was from parents who reported their adolescent had not received HPV vaccination (so not asked place of HPV vaccination) but the provider reported HPV vaccination. Lastly, this study did not assess the settings for vaccination for the second and third doses.

Conclusion

This study provides a baseline for assessing place of HPV vaccination. It is important to understand adolescents and their parents/guardians go to and receive the HPV vaccination. Information on settings of vaccination can help guide where triaged information and where additional resources are needed to expand services at alternative locations. Findings from our study indicated that doctor's offices were the most common place where adolescents receive HPV vaccination and thus continued targeting of physicians for vaccine recommendations is important for improving vaccination coverage. Additionally, nonmedical settings could provide expanded convenient access to vaccinations and enhance the overall capacity of the health care system to effectively deliver vaccinations even though our study indicated that percentages of receiving HPV vaccination at nonmedical settings is low. Recommendations and collaborations among medical and nonmedical vaccination providers are needed to improve HPV vaccination coverage among adolescents. It might be interested in assessing what motivates those to get vaccinated at nonmedical settings for the future researches, and how this information be used to support vaccinations at nonmedical settings.

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Implications and Contribution:

The current uptake of HPV vaccination among adolescents in the U.S. is suboptimal. This study is seeking to understand which settings are preferred for HPV vaccination among adolescents in order to understand what strategies are needed to improve vaccination uptake. This is a new study to examine national estimates of settings of HPV vaccination among adolescents aged 13–17 years. The findings provide baseline information on place of receiving HPV vaccination among adolescents. Doctor's offices were the most common medical setting for adolescents to receive HPV vaccination. Less than 1% of adolescents received vaccination at nonmedical settings. Continued work with medical settings to identify and implement appropriate strategies are needed to improve HPV vaccination coverage among adolescents.

Table 1.

Reported place of human papillomavirus vaccination among adolescents aged 13–17 years in the United States–National Immunization Survey–Teen (NIS–Teen) 2018*

Place	Overall (N=10,006) % (95% CI)	13–15 years (N=5,940) % (95% CI)	16–17 years (N=4,066) % (95% CI)
Medical settings [†]	99.1 (98.7-99.4)	99.0 (98.4-99.4)	99.1 (98.6-99.5)
Doctor's office	79.2 (77.5-80.8)	78.9 (76.6-81.0)	79.7 (77.1-82.0)
Hospital/emergency room	2.3 (1.7-3.1)	2.2 (1.5-3.4)	2.3 (1.6-3.4)
Clinic/health center/other medical place	13.5 (12.1-15.0)	14.1 (12.2-16.1)	12.6 (10.6-14.9)
Health department	4.1 (3.5-4.8)	3.9 (3.2-4.7)	4.5 (3.5-5.7)
Nonmedical settings [‡]	0.9 (0.6-1.3)	1.0 (0.6-1.6)	0.9 (0.5-1.4)
School	0.5 (0.3-0.8)	0.4 (0.2-0.8)	0.6 (0.3-1.1)
Pharmacy	0.4 (0.2-0.7)	0.5 (0.2-1.1)	0.3 (0.1-0.5)
Other non-medical place	0.1 (0.0-0.2)	0.1 (0.0-0.3)	0.0 (0.0-0.1)

Abbreviations: CI=confidence interval.

* Individuals ever received human papillomavirus vaccination (≥1 dose). All proportions are weighted percentages. All *t*-tests between adolescents aged 13–15 years and 16–17 years were not significant (*P*>0.05).

[†] Doctor's office, hospital/emergency room, clinic/health center, or health department.

[‡] Pharmacy, school, or other non-medical place.

Table 2.

Human papillomavirus vaccination in nonmedical settings, by age, sex, and racial/ethnic groups and metropolitan statistical area –National Immunization Survey–Teen (NIS–Teen), United States, 2018*

Place	Overall (N=96)	13–15 years (N=54)	16–17 years (N=42)
	% (95% CI)	% (95% CI)	% (95% CI)
Nonmedical settings overall [†]	0.9 (0.6-1.3)	1.0 (0.6-1.6)	0.9 (0.5-1.4)
Sex			
Male [‡]	0.9 (0.5-1.6)	0.9 (0.5-1.6)	0.8 (0.4-1.6)
Female	0.8 (0.4-1.6)	1.0 (0.5-2.2)	0.9 (0.5-1.9)
Race/ethnicity			
Non-Hispanic white [‡]	0.9 (0.5-1.6)	1.1 (0.5-2.2)	0.6 (0.3-1.4)
Non-Hispanic black	1.6 (0.8-3.0)	1.6 (0.6-4.1)	1.5 (0.7-3.5)
Hispanic	0.7 (0.3-1.3)	0.5 (0.2-1.1)	1.0 (0.3-2.8)
Others or multiple races	0.9 (0.3-2.2)	0.8 (0.3-2.3)	1.0 (0.2-4.2)
Metropolitan Statistical Area			
Yes	0.9 (0.6-1.4)	1.0 (0.6-1.7)	0.9 (0.5-1.5)
No	0.7 (0.3-1.6)	0.6 (0.3-1.4)	0.8 (0.2-3.3)

Abbreviations: CI=confidence interval.

* Individuals ever received human papillomavirus vaccination (1 dose). All proportions are weighted percentages. All *t*-tests between adolescents aged 13–15 years and 16–17 years were not significant (P>0.05). All of comparison *t*-tests with the reference groups indicated were not significant (P>0.05).

[†]Pharmacy, school, or other nonmedical place.

[‡]Reference group.

Table 3.

Reported place of human papillomavirus vaccination by quarter of receiving initial dose of the vaccine among adolescents aged 13–17 years in the United States–National Immunization Survey–Teen (NIS–Teen) 2018*

Place	Quarter 1 (N=1,630)	Quarter 2 (N=2,313)	Quarter 3 (N=4,020)	Quarter 4 (N=2,043)
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Overall	17.3 (15.9-18.9)	22.6 (21.1-24.2) [‡]	39.3 (37.5-41.1) [‡]	20.7 (19.3-22.3) [‡]
Medical settings [†]	99.4 (99.0-99.7)	99.0 (97.6-99.6)	98.7 (97.7-99.2)	99.1 (98.1-99.5)
Doctor's office	79.2 (75.8-82.3)	78.9 (75.2-82.2)	78.5 (75.0-81.7)	80.5 (77.7-83.0)
Hospital/emergency room	2.3 (1.4-3.8)	2.9 (1.6-5.4)	1.9 (1.2-3.0)	1.8 (1.0-3.2)
Clinic/health center/other medical places	14.2 (11.4-17.4)	13.1 (10.4-16.3)	14.5 (11.6-18.0)	11.7 (9.7-14.0)
Health department	3.7 (2.8-5.0)	4.2 (3.0-5.8)	3.7 (2.7-5.1)	5.1 (3.9-6.7)
Nonmedical settings [§]	0.6 (0.3-1.0)	1.0 (0.4-2.4)	1.3 (0.8-2.3)	0.9 (0.5-1.9)
Pharmacy	0.3 (0.2-0.6)	0.6 (0.2-2.3)	0.4 (0.2-0.9)	0.1 (0.0-0.3)
School	0.3 (0.1-0.6)	0.3 (0.1-0.8)	0.8 (0.4-1.8)	0.7 (0.3-1.6)
Other non-medical places	//	0.1 (0.0-0.2)	0.0 (0.0-0.1)	0.1 (0.0-0.8)

Abbreviations: CI=confidence interval.

* Individuals ever received human papillomavirus vaccination (≥1 dose). All proportions are weighted percentages.

[†] Doctor's office, hospital/emergency room, clinic/health center, or health department.

[‡] p<0.05 for comparison with the prior adjacent quarter.

[§] Pharmacy, school, or other nonmedical places.

// No individuals reported vaccination at this place.

Table 4.

Percentage of vaccinated adolescents aged 13–17 years reported as receiving human papillomavirus vaccination in different settings by state – National Immunization Survey–Teen, United States, 2016–2018

State	Sample size	Medical setting*	Nonmedical setting [†]	HPV vaccination coverage (1 dose)
	N	% (95% CI)	% (95% CI)	% (95% CI)
National	60,124	99.1 (98.9-99.3)	0.9 (0.7-1.1)	64.7 (64.0-65.4)
Alabama [‡]	440	99.5 (97.3-99.9)	0.5 (0.1-2.7)	58.1 (54.5-61.7)
Alaska [‡]	575	98.3 (96.7-99.1)	1.7 (0.9-3.3)	64.0 (60.6-67.3)
Arizona	460	98.5 (95.5-99.5)	1.5 (0.5-4.5)	65.1 (61.4-68.7)
Arkansas	423	99.3 (97.1-99.8)	0.7 (0.2-2.9)	58.7 (55.1-62.3)
California [‡]	492	99.2 (97.5-99.7)	0.8 (0.3-2.5)	72.6 (68.9-76.1)
Colorado [‡]	527	98.9 (97.0-99.6)	1.1 (0.4-3.0)	70.9 (67.2-74.4)
Connecticut	544	99.1 (97.2-99.7)	0.9 (0.3-2.8)	67.9 (64.2-71.4)
Delaware [‡]	597	100.0 (-----) [§]	//	73.3 (69.8-76.5)
District of Columbia ^{‡,¶,***}	669	97.2 (94.5-98.6)	2.8 (1.4-5.5)	85.7 (82.7-88.3)
Florida	491	100.0 (-----) [§]	//	60.0 (56.1-63.7)
Georgia [‡]	541	99.4 (98.4-99.8)	0.6 (0.2-1.6)	66.6 (62.9-70.1)
Hawaii ^{**}	494	99.5 (96.8-99.9)	0.5 (0.1-3.2)	70.3 (66.7-73.6)
Idaho ^{‡,¶}	470	98.6 (96.6-99.4)	1.4 (0.6-3.4)	61.1 (57.3-64.8)
Illinois ^{‡,¶}	1,050	99.6 (99.0-99.8)	0.4 (0.2-1.0)	66.3 (63.7-68.8)
Indiana ^{‡,¶}	403	99.6 (98.2-99.9)	0.4 (0.1-1.8)	56.5 (52.7-60.1)
Iowa	530	98.7 (97.1-99.4)	1.3 (0.6-2.9)	68.5 (65.1-71.8)
Kansas	414	99.7 (98.9-99.9)	0.3 (0.1-1.1)	55.5 (51.7-59.2)
Kentucky ^{‡,¶}	387	99.7 (97.6-100.0)	0.3 (0.0-2.4)	51.5 (47.8-55.2)
Louisiana ^{‡,¶}	445	98.1 (95.1-99.3)	1.9 (0.7-4.9)	65.6 (62.0-69.0)
Maine	582	98.9 (96.7-99.6)	1.1 (0.4-3.3)	70.3 (66.8-73.6)
Maryland	751	99.5 (98.6-99.8)	0.5 (0.2-1.4)	69.5 (65.7-73.0)
Massachusetts	721	99.9 (99.3-100.0)	0.1 (0.0-0.7)	79.5 (76.4-82.2)
Michigan [‡]	513	98.6 (96.2-99.5)	1.4 (0.5-3.8)	67.0 (63.2-70.5)
Minnesota	518	99.5 (98.4-99.9)	0.5 (0.1-1.6)	68.0 (64.4-71.5)
Mississippi [‡]	321	99.4 (97.9-99.8)	0.6 (0.2-2.1)	49.0 (45.3-52.7)
Missouri [‡]	483	98.4 (96.0-99.4)	1.6 (0.6-4.0)	57.0 (53.2-60.7)
Montana	503	98.9 (97.8-99.5)	1.1 (0.5-2.2)	62.4 (58.6-66.0)
Nebraska [‡]	495	99.6 (98.2-99.9)	0.4 (0.1-1.8)	70.2 (66.5-73.6)
Nevada [‡]	491	97.4 (94.6-98.8)	2.6 (1.2-5.4)	65.3 (61.6-68.7)

State	Sample size	Medical setting*	Nonmedical setting [†]	HPV vaccination coverage (1 dose)
	N	% (95% CI)	% (95% CI)	% (95% CI)
New Hampshire	572	100.0 (-----) [§]	//	73.8 (70.3-77.0)
New Jersey	579	99.5 (98.3-99.9)	0.5 (0.1-1.7)	63.2 (59.6-66.7)
New Mexico [‡]	514	98.3 (96.7-99.1)	1.7 (0.9-3.3)	66.4 (62.8-69.7)
New York	945	99.0 (97.9-99.5)	1.0 (0.5-2.1)	69.1 (66.4-71.7)
North Carolina	498	99.3 (97.3-99.8)	0.7 (0.2-2.7)	64.3 (60.6-67.9)
North Dakota ^{‡,¶}	584	95.9 (93.5-97.4)	4.1 (2.6-6.5)	72.3 (68.7-75.5)
Ohio	540	98.7 (95.9-99.6)	1.3 (0.4-4.1)	62.8 (59.2-66.3)
Oklahoma [‡]	449	98.8 (96.8-99.6)	1.2 (0.4-3.2)	58.2 (54.3-61.9)
Oregon ^{‡,¶}	528	99.4 (96.8-99.9)	0.6 (0.1-3.2)	69.4 (65.9-72.8)
Pennsylvania	1,371	99.9 (99.6-100.0)	0.1 (0.0-0.4)	67.9 (64.7-70.9)
Rhode Island ^{**}	708	99.5 (98.6-99.8)	0.5 (0.2-1.4)	88.9 (86.3-91.1)
South Carolina	422	98.8 (96.4-99.6)	1.2 (0.4-3.6)	55.8 (51.9-59.7)
South Dakota [‡]	516	99.1 (97.6-99.7)	0.9 (0.3-2.4)	62.7 (59.0-66.2)
Tennessee [‡]	394	98.8 (96.7-99.6)	1.2 (0.4-3.3)	57.9 (54.0-61.7)
Texas ^{‡,¶}	2,918	99.0 (98.3-99.4)	1.0 (0.6-1.7)	55.7 (53.7-57.8)
Utah [‡]	440	98.9 (96.9-99.6)	1.1 (0.4-3.1)	58.5 (54.8-62.1)
Vermont	676	99.0 (96.9-99.7)	1.0 (0.3-3.1)	75.7 (72.6-78.6)
Virginia ^{**}	638	98.9 (96.8-99.6)	1.1 (0.4-3.2)	65.5 (60.9-69.8)
Washington [‡]	527	98.2 (95.9-99.2)	1.8 (0.8-4.1)	69.4 (65.7-72.8)
West Virginia	473	98.5 (96.7-99.4)	1.5 (0.6-3.3)	58.8 (55.1-62.4)
Wisconsin [‡]	527	98.9 (97.1-99.6)	1.1 (0.4-2.9)	67.0 (63.5-70.3)
Wyoming	363	99.7 (97.8-100.0)	0.3 (0.0-2.2)	48.0 (44.2-51.8)
<i>median</i>		99.0	1.0	65.6
<i>range</i>		(95.9 - 100.0)	(0.1 - 4.1)	(48.0 - 88.9)

Abbreviations: CI=confidence interval. All percentages are weighted percentages.

* Individuals ever received human papillomavirus vaccination (1 dose). Medical setting included doctor's office, hospital/emergency room, clinic/health center, or health department.

[†] Pharmacy, school, or other nonmedical place.

[‡] States allowing pharmacists to administer HPV vaccinations for children.

[§] Confidence interval not estimated because all adolescents were reported as receiving HPV vaccination at this setting.

// The percentage of adolescents received HPV vaccination at this setting is <0.1%.

[¶] States allowing pharmacists to administer HPV vaccinations for children but with age restrictions.

** States with school HPV vaccination mandate requirement.