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Association of health insurance status and vaccination coverage among adolescents 13-17 years

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Abstract

Objective: To assess selected vaccination coverage among adolescents by health insurance status and other access-to-care characteristics.

Study Design: The 2015 National Immunization Survey-Teen data were used to assess vaccination coverage disparities among adolescents by health insurance status and other access-to-care variables. Multivariable logistic regression analysis and a predictive marginal modeling were conducted to evaluate associations between health insurance status and vaccination coverage.

Results: Overall, vaccination coverage was significantly lower among uninsured compared with insured adolescents for all vaccines assessed except HPV vaccination (≥3 doses) among males. Among adolescents 13-17 years, Tdap vaccination coverage (≥1 dose) was 77.4% versus 86.8% among uninsured compared with insured adolescents, respectively. MenACWY vaccination coverage (≥1 dose) was 72.9% versus 81.7%. HPV vaccination coverage (≥1 dose) was 38.8% versus 50.2% among males and 42.9% versus 63.8% among females. HPV vaccination coverage (≥3 doses) was 24.9% versus 42.8% among females. In addition, vaccination coverage differed by the following: type of insurance among insured adolescents, having a well-child visit at 11-12 years of age, and number of healthcare provider contacts in the past year. Uninsured were less likely than insured adolescents to be vaccinated for HPV (females: ≥1 dose and ≥3 doses; and males: ≥1 doses) after adjusting for confounders.

Conclusions: Overall, vaccination coverage was lower among uninsured adolescents. HPV vaccination coverage was lower than coverage for Tdap and MenACWY vaccines in both insured and uninsured adolescents. Wider implementation of effective evidence-based strategies is needed to help improve vaccination coverage among adolescents, particularly for those who are uninsured.

Keywords

Adolescent vaccination; vaccination coverage; health insurance status; type of health insurance

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Introduction

In 2015, 5.2% of children <18 years (4.1 million) were uninsured (1). Cost can be a barrier to receiving timely preventive medical care including vaccinations. Uninsured children are less likely than those who are insured to receive recommended vaccines and benefit from the protection that vaccines afford (2–6).

The Vaccines for Children (VFC) Program helps provide vaccines to children whose parents or guardians may not be able to afford them (3). This helps ensure that all children have the opportunity to obtain their recommended vaccinations on schedule (3). The eligibility for the VFC Program includes Medicaid-eligible children, uninsured children, children who are American Indian or Alaska Native (AIAN), and underinsured children receiving vaccines at a federally-qualified health center (FQHC) or rural health center (RHC) (3, 4–6).

The adolescent immunization schedule, updated annually by the Advisory Committee on Immunization Practices (ACIP), provides current recommendations for vaccinating adolescents. ACIP recommends that adolescents routinely receive 1 dose of tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) vaccine, 2 doses of meningococcal conjugate (MenACWY) vaccine, and 2 or 3 doses of human papillomavirus (HPV) vaccine (7). Vaccination is the most effective strategy for preventing vaccine-preventable diseases and their complications. HPV vaccination coverage among adolescents, however, remains below *Healthy People 2020* targets (8–9).

Assessing vaccination coverage disparities among adolescents by health insurance status is important for developing strategies to reduce or eliminate such disparities. This study uses data from the 2015 National Immunization Survey-Teen (NIS-Teen) to examine and address the following questions: 1) What is vaccination coverage with ≥1 dose Tdap, ≥1 dose MenACWY, and ≥1 and ≥3 HPV doses among adolescents by health insurance status (insured vs. uninsured), 11-12 year well-child visit, and number of healthcare provider contacts in the past 12 months? 2) Among insured adolescents, does vaccination coverage differ by type of health insurance? 3) Do disparities in vaccination coverage by insurance status remain after taking into account sociodemographic and access-to-care variables?

Methods:

The 2015 NIS-Teen data were analyzed. NIS-Teen is a national, random-digit–dial (RDD) telephone survey of landline and cell phones (i.e., a dual-frame survey) sponsored by the Centers for Disease Control and Prevention (CDC). Objectives of the NIS-Teen include providing timely, detailed information regarding vaccination coverage among adolescents aged 13-17 years for vaccines recommended by the ACIP, including Tdap, MenACWY, and HPV vaccines, and evaluating factors associated with vaccination. Data are collected in the NIS-Teen in two-phases. In the first phase, a household interview is conducted to identify households with age-eligible adolescents and to collect sociodemographic information from the parent or guardian on adolescent, maternal, and household characteristics, receipt of a provider recommendation for selected vaccines, and access-to-care characteristics. After completing the household interview, consent is requested to contact the adolescent's

vaccination providers. If consent is obtained, vaccination providers are mailed a questionnaire to collect provider-reported vaccination history data (8, 10).

In 2015, the Council of American Survey Research Organizations (CASRO) response rate was 56.4% for the landline sample and 29.8% for the cell phone sample. Of completed household interviews, 53.4% from the landline and 48.9% from the cell phone sample had adequate provider-reported vaccination data. A total of 21,875 adolescents were included in the analytic sample (8, 10).

Vaccination coverage estimates for Tdap, MenACWY, and HPV vaccines are based on provider-reported vaccination data. Vaccination coverage (≥1 dose) were assessed for Tdap and MenACWY vaccines, and vaccination coverage (≥1 and ≥3 doses) were assessed for HPV vaccine (ACIP recommendations for 2 dose schedule for those initiating before age 15 years was published in December 2016 (7) and did not apply when the 2015 NIS-Teen data were collected). Covariates from the household interview questions were selected to measure associations between vaccination coverage and health insurance status (private insurance only, any Medicaid (enrolled in Medicaid regardless of having private or other types of health insurance), other types of insurance (including Indian Health Service (IHS), military, Children's Health Insurance Program (CHIP), and some private), and uninsured). Sociodemographic (e.g., mother's marital status), health insurance status, and access-to-care variables reflect the status at the time of interview. For poverty status, household income and number of persons living in the household were used with 2014 U.S. Census poverty thresholds to determine income-to-poverty ratios (11).

SUDAAN 11.0.1 (Software for the statistical analysis of complex sampling data, Research Triangle Institute, Research Triangle Park, NC) was used to calculate point estimates and 95% confidence intervals (CIs). All analyses account for the complex sampling design of the NIS-Teen and the survey sampling weights (8, 10). T-tests were used to examine associations with the significance level set at $\alpha<0.05$. To assess adjusted vaccination coverage and adjusted prevalence ratios (PR), we used multivariable logistic regression and predicted marginal modeling comparing insured with uninsured adolescents, controlling for age group at the time of interview, adolescent's race/ethnicity, mother's educational level, mother's marital status, mother's age, adolescent's country of origin, household poverty level, type of health insurance (except among uninsured), number of healthcare provider contacts within past 12 months, provider-reported well-child visit at 11–12 years, number of vaccination providers, vaccination facility types (all public, all private, all hospital, all STD/school/teen clinics, others [such as military, WIC clinics, and pharmacies], and mixed [including adolescents who received vaccines from facilities in more than one of the previously listed categories], metropolitan statistical area (MSA), and U.S. Census region. The NIS-Teen was approved by the Ethics Review Board of the National Center for Health Statistics, Centers for Disease Control and Prevention.

Results:

The 2015 NIS-Teen included a total of 21,875 adolescents aged 13-17 years with adequate provider data. Table 1 shows weighted sociodemographic and access-to-care characteristics

of the study population. Overall, 51.9% had private insurance only, 36.5% had Medicaid, 7.2% had other insurance, and 4.4% had no insurance (Table 1). Insured and uninsured adolescents differed for all socio-demographic and access-to-care characteristics except age, gender, mother's marital status, number of vaccination providers, and MSA (Table 1).

Overall, coverage among adolescents 13-17 years was 86.4% for Tdap vaccination, 81.3% for MenACWY vaccination, 49.8% for HPV vaccination (≥1 dose) among male adolescents, and 62.8% for HPV vaccination (≥1 dose) among female adolescents, 28.1% for HPV vaccination (≥3 doses) among male adolescents, and 41.9% for HPV vaccination (≥3 doses) among female adolescents (Table 2).

Vaccination coverage was significantly lower among uninsured compared with insured adolescents for all vaccines and doses except HPV vaccine (≥3 doses) among males. Comparing uninsured with insured adolescents 13-17 years, Tdap vaccination coverage was 77.4% versus 86.8%, respectively, MenACWY vaccination coverage was 72.9% versus 81.7%, HPV coverage of male adolescents (≥1 dose) was 38.8% versus 50.2%, HPV coverage of female adolescents (≥1 dose) was 42.9% versus 63.8%, HPV coverage of male adolescents (≥3 dose) was 22.7% versus 28.3%, and HPV coverage of female adolescents (≥3 dose) was 24.9% versus 42.8% (Table 2).

In addition, vaccination coverage among insured adolescents aged 13-17 years varied by type of health insurance (Table 2). Among insured adolescents, vaccination coverage was significantly higher among adolescents with Medicaid compared with those with only private health insurance for HPV vaccination (≥1 dose) among both males and females, and HPV vaccination (≥3 doses) among males (Table 2). Among insured adolescents, vaccination coverage did not significantly differ by type of health insurance for Tdap and MenACWY vaccination (Table 2).

Among insured adolescents, vaccination coverage for Tdap, MenACWY, and HPV (≥1 dose and ≥3 doses) was significantly higher among those who had a well-child visit at 11-12 years of age compared with those who did not (Table 3). Among uninsured adolescents, Tdap, MenACWY, and HPV (females, ≥3 doses) vaccination coverages were significantly higher among those who had a well-child visit at 11-12 years of age compared with those who did not (Table 3).

Vaccination coverage among insured adolescents 13-17 years tended to be significantly higher among those reporting two or more healthcare provider contacts in the past year compared with those who had not visited a healthcare provider in the past year (except Tdap coverage among those with ≥4 healthcare provider contacts) (Table 4). Among insured adolescents who had 4 or more healthcare provider contacts within the past year, 12.7% −71.4% did not receive recommended vaccinations (not receiving Tdap vaccination, 12.7%; MenACWY, 17.0%; HPV (≥1 dose), 47.2% (male), and 31.7% (female); and HPV (≥3 doses), 71.4% (male), and 50.8% (female) (Table 4). Among uninsured adolescents, there were statistically significant differences in vaccination coverage by number of provider contacts for some vaccinations (Table 4).

Results based on multivariable logistic regression analysis and a predictive marginal model showed that uninsured adolescents were less likely than insured adolescents to be vaccinated for HPV (females: ≥1 dose and ≥3 doses; and males: ≥1 dose) after adjusting for confounders (Table 5). The difference in adjusted vaccination coverage between insured and uninsured adolescents ranged from −15.1% (HPV vaccination (≥3 doses) among females) to −2.7% (MenACWY vaccination) (Table 5).

Discussion:

Overall, the proportion of the U.S. population with health insurance coverage has increased from 83.7% in 2010 to 90.9% in 2015, and health insurance coverage among children <18 years has increased from 90.2% in 2010 to 94.8% in 2015 (1, 12, 13). The increase in health insurance coverage may reflect the implementation of the Affordable Care Act (ACA) (e.g., ACA might lead to increases in insurance coverage through Medicaid expansion and new insurance plans available through Marketplace) (14, 15). This study assessed vaccination coverage by health insurance status among adolescents in the United States. Our study is important for understanding factors that contribute to disparities in vaccination coverage among adolescents and implementing effective strategies to improve vaccination coverage (2, 4–6). Our study showed that, for adolescents 13-17 years, coverage with most vaccines and doses was lower among uninsured compared with insured adolescents, and after controlling for sociodemographic and access-to-care variables based on our multivariable analysis, uninsured remained less likely than insured adolescents to be vaccinated for HPV. Also, vaccination coverage tended to increase with number of health-care provider contacts, was higher for adolescents having a well-child visit at 11-12 years of age, and higher for adolescent enrolled in Medicaid compared to private insurance for some HPV vaccination measures. Substantial improvement in vaccination coverage among adolescents, especially among those without health insurance will be needed. Collaboration among providers, parents, adolescents, and public health professionals is needed to overcome barriers to vaccination and improve adolescent vaccination coverage, especially HPV vaccination (16–18).

Among insured adolescents, the type of health insurance was associated with vaccination coverage levels. In this study, HPV coverage (≥1 dose) is higher among with those with Medicaid compared with privately insured in both males and females. This result might be due to less upfront cost for purchasing an expensive vaccine among VFC providers since they get it free from the government, and in addition, there have been provider surveys that showed that the higher the percentage of teens insured by Medicaid in a practice, the more likely the physician is to strongly and appropriately recommend HPV vaccine (19, 20). Studies have shown that the number of children <18 years of age with private health insurance declined during 1999 through 2015 (1, 12, 13) and the number of publicly insured (e.g., Medicaid, CHIP) increased, likely in part due to expansions in Medicaid eligibility. This shift from private to public insurance coverage among children could also have an impact on vaccination coverage among adolescents. Better understanding is needed for factors influencing vaccination by type of health insurance.

Removing cost barriers to vaccination might improve coverage among privately insured adolescents (2, 4–6, 21). For example, HPV vaccine is one of the most expensive vaccines, costing $129-$163 per dose in the private sector, and requiring a 3-dose series (since 2016, 2-doses of HPV vaccine was recommended if the first dose was received before age 15, which will mitigate cost issues to some extent) (22–23). Adolescents may be at risk for not receiving HPV vaccine due to higher out-of-pocket costs. Additionally, because of costs and concerns about reimbursement, some providers might not stock or offer the vaccine, which might contribute to lower vaccination rates among this population (24–25). By providing vaccines free of charge to VFC providers and ameliorating the up-front purchasing cost for HPV vaccine, VFC program might provide better access to vaccination for VFC-eligible adolescents (3).

Prevalence of not having health insurance decreased with implementation of ACA (1, 12, 13), and from the 2015 NIS-Teen, 4% of adolescents 13-17 years were uninsured. Vaccination coverage was significantly lower among uninsured compared with insured adolescents for all vaccines and doses except HPV vaccine (≥3 doses) among males. Even though VFC may provide free vaccine to uninsured adolescents, there are other barriers to vaccine uptake or vaccine series completion, such as opportunity costs (time/lost work days/ lost wages to parents in getting in to see vaccination provider), out-of-pocket costs for office visits, etc. (17, 25–26). Additionally, uninsured may relate to access-to-care, as measured by well-child visit or number of healthcare provider contacts. One of the possible reasons for lower vaccination coverage among uninsured might be that uninsured adolescents are less likely to see providers, and thus have less opportunity for vaccination. School laws might mitigate this effect to some extent (27). It is important for improving vaccination coverage of uninsured adolescents if possible approaches to increase access to providers who can offer them free vaccines via VFC could be found and implemented. Although uninsured adolescents are VFC-eligible, additional financial barriers may exist.

Among insured adolescents for all vaccines studied, and among uninsured adolescents for Tdap and MenACWY vaccination, those with a well-child visit at 11-12 years of age were more likely to have received recommended vaccinations than those who did not. For insured adolescents, in many cases vaccination coverage was higher among adolescents with two or more healthcare provider contacts in the past year compared with those who had no healthcare visits in the past year. Among uninsured adolescents, higher vaccination coverage was also observed for those with provider contacts in the past 12 months compared to those with no visits except for ≥3 HPV doses. These observations suggests that a well-child visit and healthcare provider contacts might have facilitated opportunities to be reminded of the need for vaccinations and discussions about vaccinations that were indicated and a recommendation and decision to vaccinate. Other studies found that persons who have a usual place for health care or medical home and who seek medical care one or more times during the year are more likely to be vaccinated and receive other preventive services than those who have not (28). Physician recommendations for vaccination are associated with vaccination receipt (29–32). Adolescents who have more contact with the healthcare system may have more opportunities to discuss their vaccination status and receive vaccination (30–33).

State Medicaid programs and CHIP have historically been required to cover selected clinical preventive services for children with no cost-sharing (34). The Affordable Care Act (ACA) also established new requirements for all non-grandfathered private insurance plans, including all plans available through the Health Insurance Marketplace, to cover selected clinical preventive services for children, such as those recommended by the AAP Bright Futures and ACIP-recommended immunizations (14, 15, 35). Other provisions of the ACA create incentives for primary care, including increased payments for primary care services provided by primary care doctors. Though uninsured adolescents have historically been eligible for vaccines free of charge through VFC (36), improved access to insurance coverage, whether through private insurance or Medicaid and CHIP may decrease some of the other access-to-care barriers (e.g., less out-of- pocket office visit costs, which could potentially increase the rate of routine well-child visits among those currently uninsured), provide more vaccination opportunities and should help to improve vaccination coverage among adolescents (14, 15, 37).

The findings in this study are subject to limitations. First, household response rates were 56.4% (landline sample) and 29.8% (cell phone sample), respectively. Only 53.4% (landline sample) and 48.9% (cell phone sample) of completed household interviews also had adequate provider-reported vaccination data. Some bias may remain after weighting adjustments designed to mitigate potential bias from incomplete data from the sample frame and non-response (38, 39). Second, some provider-confirmed vaccination histories might not include all vaccinations received and might have underestimated vaccination coverage. In a sensitivity analysis model that included incomplete coverage of the target population by the sampling frame, nonresponse bias, and under-ascertainment of vaccination status, 2012 NIS-Teen estimates of Tdap, MenACWY, and HPV (≥1 dose) coverage were estimated to be lower than true values by 1-3 percentage points (10). Third, the NIS-Teen collects children's current health insurance status and did not reflect insurance status when each vaccine was received. Fourth, since we assessed vaccines that may have been administered a few years earlier, adolescents who are now uninsured may be less likely to have a provider who has their full vaccination records. Thus, the requirement for provider verification of vaccination may result in misclassification.

Tdap, MenACWY, and HPV vaccination coverage was lower among uninsured compared with insured adolescents, and uninsured adolescents were more likely to be Hispanic, to have a mother with less than a high school education, to be born outside U.S., to live below poverty level, to have no provider visits in past year or no well-child visit at 11-12 years, and to have been vaccinated by all public providers. Although HPV vaccination coverage (≥1 doses) was 11-12 percentage points higher for adolescents on Medicaid compared to those with private health insurance, HPV coverage was substantially lower than Tdap and MenACWY coverage overall and within each health insurance category. Vaccination coverage can be increased by implementation of evidence based strategies such as standing orders, provider reminders alone or clinic-based client education, expanded access in healthcare settings, provider assessment and feedback, or health systems interventions in combination (40–42). Providers, parents, and adolescents can use every health care visit, whether for health problems, well-checks, or physicals for sports, school, or camp, as an

opportunity to review adolescents' vaccination histories and ensure that every adolescent receives recommended vaccines (40–42).

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TABLE 1.

Sample characteristics of adolescents aged 13-17 years, by health insurance status-United States-NIS-Teen 2015

	All adolescents	Insured*			Uninsured
		overall	Private only	Any Medicaid	Other†	
Characteristic	**N**	**%**	**%**	**%**	**%**	**%**
Total	21,875	20,967 (95.6)	12,253 (51.9)	7,010 (36.5)	1,704 (7.2)	908 (4.4)
Age (years)						
13-15	13,488	60.7	59.1	63.0	61.3	59.6
16-17	8,387	39.3	40.9	37.0	38.7	40.4
Gender						
Male	11,367	51.3	51.4	51.2	50.7	47.1
Female	10,508	48.7	48.6	48.8	49.3	52.9
Race/ethnicity‡						
Non-Hispanic White	12,835	54.6	69.2	35.3	47.0	30.7§
Non-Hispanic Black	2,228	14.2	8.5	21.7	17.4	10.2
Hispanic	4,610	21.5	13.1	32.9	23.9	51.1
Non-Hispanic American Indian/Alaska Native	290	0.8	0.3	1.3	2.2	--//
Non-Hispanic Asian	751	4.0	4.6	3.4	2.8	--//
Non-Hispanic Other or Multiple Races	1,161	4.9	4.3	5.3	6.7	--//
Mother's educational level						
<High School	2,955	12.5	2.6	26.6	11.7	35.2§
High School	3,626	22.6	14.6	33.4	26.0	28.3
Some college or college graduate	5,776	26.0	23.9	28.0	30.6	21.5
>College graduate	9,518	38.9	59.0	11.9	31.7	15.1
Mother's maital status						
Married	15,147	67.5	79.8	48.5	67.2	64.1
Widowed/divorced/separated	3,778	23.6	17.1	33.6	24.7	27.3
Never married	1,475	8.8	3.1	17.9	8.1	8.6

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	All adolescents	Insured*			Uninsured
		overall	Private only	Any Medicaid	Other†	
Characteristic	**N**	**%**	**%**	**%**	**%**	**%**
Mother's age						
≤34 years	1,866	67.5	79.8	48.5	67.2	64.1§
35-44 years	9,241	23.6	17.1	33.6	24.7	27.3
≥45 years	10,768	8.8	3.1	17.9	8.1	8.6
Adolescent's county of origin						
Born in U.S.	20,825	95.8	97.0	94.3	94.3	79.5§
Born outside U.S.	891	4.2	3.0	5.7	5.7	20.5
Income to poverty ratio¶						
<1.33%	6,307	32.0	6.8	69.3	24.4	57.6§
1.33% - <3.22%	5,987	28.2	28.6	24.9	41.5	30.9
3.22% - <5.03%	4,851	20.3	32.4	3.7	16.8	8.0
>5.03%	4,730	19.6	32.2	2.1	17.2	3.5
Physician contacts within past year						
None	2,932	14.0	14.2	13.3	16.1	34.9§
1	6,119	30.1	32.5	26.5	30.4	28.7
2-3	7,929	35.7	35.7	36.2	33.1	24.6
≥4	4,681	20.2	17.6	24.0	20.4	11.9
Well child visit at age 11-12 years**						
Yes	10,472	48.0	53.4	41.7	41.3	27.4§
No	5,341	21.9	19.9	24.3	24.3	40.9
Don't Know	6,062	30.1	26.8	34.0	34.4	31.7
Number of vaccination providers						
1	12,138	58.5	60.0	57.0	55.7	51.5
2	6,150	26.2	26.2	26.7	23.2	29.1
≥3	3,539	15.3	13.8	16.4	21.0	19.4
Metropolitan Statistical Area (MSA)						

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	All adolescents	Insured*			Uninsured
		overall	Private only	Any Medicaid	Other†	
Characteristic	**N**	**%**	**%**	**%**	**%**	**%**
Urban area	9,105	39.7	36.7	44.5	37.3	41.5
Suburban area	8,459	47.6	53.3	39.6	47.7	41.4
Rural area	4,311	12.7	10.0	15.9	15.0	17.0
U.S. Census Region						
Northeast	4,049	16.9	18.8	13.5	20.3	11.1§
Midwest	4,666	21.8	23.6	21.4	11.2	15.8
South	8,355	37.4	34.4	40.2	45.0	51.1
West	4,805	23.9	23.2	24.9	23.5	22.0
Vaccination facility types						
All private facilities	10,891	56.0	65.3	45.4	43.0	26.6§
All public facilities	3,157	12.9	7.1	20.3	17.2	29.4
All hospital facilities	2,311	9.2	8.8	10.1	7.4	7.0
All STD/school/teen clinics	331	1.3	1.0	1.6	--//	--//
Mixed††	4,753	19.4	17.2	22.3	20.7	26.8
Other‡‡	301	1.2	0.6	NA	9.9	--//

*Insurance categories are mutually exclusive.

†IHS, military, CHIP, and some private.

‡Including non-Hispanic white, non-Hispanic black, Hispanic, non-Hispanic American Indian/Alaska Native (AI/AN), non-Hispanic Asian, and non-Hispanic others and multiple race.

§Significant difference between insured and uninsured (by chi-square test, $p<0.05$).

//Data were suppressed due to sample size < 30 or relative standard error > 30%.

¶For poverty status, household income and numbers of persons living in the household were used with 2014 U.S. Census poverty thresholds to determine income-to-poverty ratios.

**Status of health-care visit at age 11-12 years based on provider reported data.

††Mixed indicates that the adolescent received vaccinations at multiple providers of different facility types.

##Includes military, WIC clinics, and pharmacies.

Table 2.

Vaccination coverage among adolescents 13-17 years of age by health insurance status, United States--NIS-Teen 2015

	All adolescents	Insured*			Uninsured
		overall insured	Private only	Any Medicaid	Other†	
Vaccine	**%‡ (95% CI)**	**% (95% CI)**	**% (95% CI)**		**% (95% CI)**	**% (95% CI)**
Tdap (≥1 dose)						
	86.4 (85.4-87.3)	86.8 (85.8-87.7)	87.6 (86.2-88.9)	85.8 (84.1-87.3)	86.0 (82.7-88.8)	77.4 (71.1-82.7)§
MenACWY (≥1 dose)						
	81.3 (80.2-82.3)	81.7 (80.6-82.7)	81.7 (80.2-83.0)	82.1 (80.3-83.8)	79.3 (75.3-82.7)	72.9 (66.4-78.5)§
HPV (≥1 dose)						
Male						
	49.8 (48.0-51.6)	50.2 (48.4-52.1)	45.7 (43.4-48.0)	57.5 (54.2-60.7)//	46.3 (40.2-52.5)	38.8 (30.3-48.1)§
Female						
	62.8 (61.0-64.5)	63.8 (62.0-65.5)	59.6 (57.2-61.9)	70.9 (67.9-73.8)//	57.8 (51.1-64.3)	42.9 (34.0-52.2)§
HPV (≥3 doses)						
Male						
	28.1 (26.6-29.7)	28.3 (26.8-29.9)	26.7 (24.8-28.7)	31.4 (28.4-34.5)//	24.4 (20.1-29.3)	22.7 (14.9-33.0)
Female						
	41.9 (40.1-43.7)	42.8 (41.0-44.6)	42.2 (39.8-44.7)	44.3 (41.2-47.4)	39.4 (32.7-46.4)	24.9 (18.3-32.8)§

*Insurance categories are mutually exclusive.

†IHS, military, CHIP, and some private.

‡Percentages are weighted.

§$p < 0.05$ by t-test comparing insured vs. uninsured.

//$p < 0.05$ by t-test where private insurance only is the reference group.

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Table 3.

Vaccination coverage among adolescents 13-17 years of age by age group, health insurance and well child visit status, United States--NIS-Teen 2015

	Insured*			Uninsured*		
	Well child visit at age 11-12 years†			Well child visit at age 11-12 years†		
	Yes	No	Do not know	Yes	No	Do not know
Vaccine	%‡ (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Tdap (≥1 dose)	94.8 (93.7-95.7)§	79.6 (77.4-81.7)	79.2 (76.9-81.2)	92.3 (85.6-96.0)§	79.1 (70.7-85.5)	63.3 (49.9-75.0)§
MenACWY (≥1 dose)	90.9 (89.6-92.0)§	69.0 (66.5-71.4)	76.1 (73.9-78.2)§	94.0 (89.4-96.7)§	60.3 (49.4-70.2)	72.1 (61.2-81.0)
HPV (≥1 dose)						
Male	55.6 (52.9-58.2)§	42.4 (38.9-46.0)	47.6 (44.0-51.2)§	48.3 (34.7-62.2)	30.1 (19.1-44.0)	40.6 (24.1-59.4)
Female	68.3 (65.8-70.7)§	54.6 (50.9-58.3)	62.9 (59.4-66.3)§	58.3 (34.1-79.0)	35.2 (24.0-48.3)	39.1 (26.3-53.6)
HPV (≥3 doses)						
Male	33.5 (31.1-35.9)§	20.4 (17.8-23.1)	26.2 (23.2-29.4)§	35.2 (23.0-49.6)	--//	--//
Female	48.9 (46.3-51.5)§	32.8 (29.4-36.4)	40.0 (36.4-43.6)§	41.0 (23.4-61.2)§	16.6 (9.4-27.7)	21.2 (12.4-33.8)

*Insurance categories are mutually exclusive.

†Well-child visit at age 11-12 years based on provider reported data.

‡Percentages are weighted.

§p <0.05 by t-test with no well-child visit as the reference group.

//Data are suppressed due to sample size < 30 or relative standard error > 30%.

Table 4.

Vaccination coverage among adolescents 13-17 years of age by health insurance and number of healthcare provider contacts in past year, United States--NIS-Teen 2015

	Insured*				Uninsured*			
	Provider contacts in the past 12 months				Provider contacts in the past 12 months			
	0	1	2-3	≥4	0	1	2-3	≥4
Vaccine	**%† (95% CI)**	**% (95% CI)**	**% (95% CI)**	**% (95% CI)**	**% (95% CI)**	**% (95% CI)**	**% (95% CI)**	**% (95% CI)**
Tdap (≥1 dose)								
	84.5 (81.6-87.1)	85.8 (83.7-87.7)	87.9 (86.4-89.2)‡	87.3 (85.2-89.3)	74.9 (64.4-83.1)	74.0 (58.4-85.2)	80.1 (68.7-88.1)	90.0 (78.1-95.8)‡
MenACWY (≥1 dose)								
	77.0 (73.5-80.1)	80.6 (78.3-82.7)	83.2 (81.7-84.7)‡	83.0 (81.0-84.9)‡	68.7 (58.2-77.5)	82.6 (74.5-88.5)‡	69.3 (57.3-79.1)	93.0 (84.5-97.0)‡
HPV (≥1 dose)								
Male								
	41.3 (36.5-46.2)	48.1 (44.6-51.5)‡	54.5 (51.7-57.4)‡	52.8 (48.8-56.7)‡	22.9 (14.8-33.7)	47.2 (29.1-66.0)‡	41.8 (25.8-59.7)	--§
Female								
	57.5 (51.8-62.9)	60.2 (56.3-63.9)	65.2 (62.5-67.8)‡	68.3 (65.1-71.5)‡	34.2 (22.6-48.1)	60.8 (45.3-74.5)‡	47.5 (32.7-62.7)	--§
HPV (≥3 doses)								
Male								
	22.6 (18.6-27.1)	28.0 (25.0-31.3)‡	31.1 (28.6-33.7)‡	28.6 (25.4-32.0)‡	--§	--§	--§	--§
Female								
	36.3 (30.6 42.4)	38.8 (35.3-42.4)	44.3 (41.5-47.2)‡	49.2 (45.6-52.9)‡	23.3 (13.9-36.4)	31.0 (17.5-48.9)	27.7 (16.0-43.5)	25.4 (8.6-55.2)

*Insurance categories are mutually exclusive.

†Percentages are weighted.

‡$p < 0.05$ by t-test comparing against no healthcare provider contacts in the past 12 months.

§Data are suppressed due to sample size < 30 or relative standard error > 30%.

Table 5.

Adjusted vaccination coverage and adjusted prevalence ratios by health insurance status among adolescents 13-17 years of age, United States--NIS-Teen 2015

	Insured	Uninsured		
Vaccine	**Adjusted vaccination coverage[*] (95 % CI)**	**Adjusted vaccination coverage (95% CI)**	**Adjusted prevalence ratio[†] (95 % CI)**	**Adjusted Prevalence Difference[†] (95 % CI)**
Tdap (≥1 dose)	86.7 (85.7-87.8)	82.9 (78.1-87.7)	0.96 (0.90-1.01)	−3.8 (−8.8-1.1)
MenACWY (≥1 dose)	81.9 (80.8-83.0)	79.2 (74.5-83.9)	0.97 (0.91-1.03)	−2.7 (−7.6-2.1)
HPV (≥1 dose)				
Male	49.6 (47.7-51.5)	37.4 (28.1-46.7)	0.75 (0.56-0.94)[‡]	−12.2 (−21.7-−2.7)
Female	62.9 (61.0-64.7)	47.8 (37.6-57.9)	0.76 (0.60-0.92)[‡]	−15.1 (−25.5-−4.7)
HPV (≥3 doses)				
Male	28.2 (26.5-29.8)	23.8 (14.8-32.7)	0.84 (0.52-1.16)	−4.4 (−13.4-4.7)
Female	42.6 (40.7-44.5)	29.6 (21.0-38.2)	0.69 (0.49-0.90)[‡]	−13.0 (−21.8-−4.1)

[*] Multivariable logistic model was conducted to estimate adjusted vaccination coverage, prevalence, and prevalence difference (variables included in the model are health insurance status, age group, race/ethnicity, mother's educational level, mother's marital status, mother's age, adolescent's country of origin, poverty level, number of healthcare provider contacts within past 12 months, provider reported well-child visit at age 11-12 years, number of vaccination providers, Metropolitan Statistical Area (MSA), U.S. region, and facility type)

[†] The reference group is insured adolescents.

[‡] $p < 0.05$.