Association of Health Insurance Status and Vaccination Coverage among Adolescents 13-17 Years of Age

Peng-jun Lu, MD, PhD, David Yankey, MPH, MS, Jenny Jeyarajah, PhD, MS, Alissa O'Halloran, MSPH, Benjamin Fredua, MS, Laurie D. Elam-Evans, PhD, MPH, and Sarah Reagan-Steiner, MD, MPH

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 for except ≥3 doses of human papillomavirus vaccine (HPV) among male adolescents. Among adolescents 13-17 years of age, vaccination of uninsured compared with insured adolescents, respectively, for tetanus toxoid, reduced content diphtheria toxoid, and acellular pertussis vaccine was 77.4% vs 86.8%; for ≥1 dose of meningococcal conjugate vaccine was 72.9% vs 81.7%; for ≥1 dose of HPV was 38.8% vs 50.2% among male and 42.9% vs 63.8% among female adolescents; for 3 doses of HPV was 24.9% vs 42.8% among female adolescents. 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 (female: ≥1 dose and 3 doses; and male: ≥1 doses) after adjusting for confounding variables.

Conclusions Overall, vaccination coverage was lower among uninsured adolescents. HPV vaccination coverage was lower than tetanus toxoid, reduced content diphtheria toxoid, and acellular pertussis vaccine Tdap and meningococcal conjugate vaccine 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. Limitation of current federally funded vaccination programs or access to healthcare would be expected to erode vaccine coverage of adolescents. *(J Pediatr 2017;■■:■■-■■).*

In 2015, 5.2% of children <18 years of age (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, and underinsured children receiving vaccines at a federally qualified health center or rural health center.[3-6]

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

ACA	Affordable Care Act
ACIP	Advisory Committee on Immunization Practices
CDC	Centers for Disease Control and Prevention
CHIP	Children's Health Insurance Program
HPV	Human papillomavirus vaccine
MenACWY	Meningococcal conjugate vaccine
NIS-Teen	National Immunization Survey-Teen
Tdap	Diphtheria toxoid, and acellular pertussis vaccine
VFC	Vaccines for Children

From the Immunization Services Division, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention, Atlanta, GA

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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-to12- 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 telephone survey of landline and cell phones (ie, a dual-frame survey) sponsored by the 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 2 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 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, military, Children's Health Insurance Program [CHIP], and some private), and uninsured. Sociodemographic (eg, 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 US Census poverty thresholds to determine income-to-poverty ratios.[11]

SUDAAN v 11.0.1 (Software for the statistical analysis of complex sampling data; Research Triangle Institute, Research Triangle Park, North Carolina) was used to calculate point estimates and 95% CIs. All analyses account for the complex sampling design of the NIS-Teen and the survey sampling weights.[8,10] Student *t* test was used to examine associations, with the significance level set at $\alpha < 0.05$. To assess adjusted vaccination coverage and adjusted prevalence ratios, 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 sexually transmitted diseases [STD]/school/teen clinics, others [such as military, women, infants, and children (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, and US Census region. All above variables were included in the multivariable regression model. 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 I** (available at www.jpeds.com) 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 I**). Insured and uninsured adolescents differed for all sociodemographic and access-to-care characteristics except age, sex, mother's marital status, number of vaccination providers, and metropolitan statistical areas (**Table I**).

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

Vaccination coverage was significantly lower among uninsured compared with insured adolescents for all vaccines and doses except ≥3 doses HPV vaccine among male adolescents. Comparing uninsured with insured adolescents 13-17 years of age, Tdap coverage was 77.4% vs 86.8%, respectively, MenACWY coverage was 72.9% vs 81.7%, ≥1 dose HPV coverage of male adolescents was 38.8% vs 50.2%, ≥1 dose HPV coverage of female adolescents was 42.9% vs 63.8%, 3 dose of

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