

Influenza Vaccination Among US Children With Asthma, 2005–2013



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The authors declare that they have no conflict of interest. The findings and conclusions in this report are those of the authors and do not necessarily represent the official positions of the Centers for Disease Control and Prevention.

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ABSTRACT

BACKGROUND: Children with asthma face higher risk of complications from influenza. Trends in influenza vaccination among children with asthma are unknown.

METHODS: We used 2005–2013 National Health Interview Survey data for children 2 to 17 years of age. We assessed, separately for children with and without asthma, any vaccination (received August through May) during each of the 2005–2006 through 2012–2013 influenza seasons and, for the 2010–2011 through 2012–2013 seasons only, early vaccination (received August through October). We used April–July interviews each year ($n = 31,668$) to assess vaccination during the previous influenza season. Predictive margins from logistic regression with time as the independent and vaccination status as the dependent variable were used to assess time trends. We also estimated the association between several sociodemographic variables and the likelihood of influenza vaccination.

RESULTS: From 2005 to 2013, among children with asthma, influenza vaccination receipt increased about 3 percentage points per year ($P < .001$), reaching 55% in 2012–2013. The percentage of all children with asthma vaccinated by October (early vaccination) was slightly above 30% in 2012–2013. In 2010–2013, adolescents, the uninsured, children of parents with some college education, and those living in the Midwest, South, and West were less likely to be vaccinated.

CONCLUSIONS: The percentage of children 2 to 17 years of age with asthma receiving influenza vaccination has increased since 2004–2005, reaching approximately 55% in 2012–2013.

KEYWORDS: asthma; children; influenza vaccination

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WHAT'S NEW

From 2005 to 2013, the percentage of children with asthma receiving the influenza vaccination increased approximately 3 percentage points per influenza season, reaching 55% in the 2012–2013 season. Approximately 30% of children with asthma received early vaccination in 2012–2013.

ANNUAL INFLUENZA VACCINATION is recommended by the Advisory Committee on Immunization Practices (ACIP) for all children more than 6 months of age.¹ However, ACIP and others have historically regarded the influenza vaccination as particularly important for children with asthma because of their increased risk for severe complications from influenza compared to children without asthma.^{2,3} Although asthma is one of several medical conditions that ACIP suggests confers higher risk on children,³ asthma represents one of the most prevalent chronic conditions among children, with approximately 9.3% of children, or more than 6.8 million children, with a current diagnosis of asthma in 2012.⁴ Further, patterns of vaccine use may differ for children with different med-

ical conditions, so examination of vaccination among children with asthma is of interest.⁵ ACIP also recommends early vaccination, preferably by October, for all children, including those with asthma, to confer protection during the entire influenza season.¹

Although influenza vaccination has been recommended for children with asthma and other chronic conditions since before 1990,⁶ recommendations for children without chronic conditions have changed over time. In 2004, influenza vaccination was recommended for all children 6 to 23 months of age as well as their household contacts.⁷ In 2006, the recommendation was expanded to all children 6 months to younger than 5 years of age.⁸ Starting with the 2008–2009 season, the recommendation was further expanded to include all children >6 months of age (barring contraindication).⁹

Previous assessments of influenza vaccination among children with asthma are sparse. One study examined the rate of influenza vaccination among children with asthma for the 1995–1997 influenza season among children enrolled in 4 health maintenance organizations on the West Coast of the United States, finding that approximately 10% of children with asthma received an influenza vaccination during each season.¹⁰ To our knowledge,

Brim et al¹¹ was the first to provide national population-level estimates of influenza vaccination coverage among children with asthma, examining the 2004–2005 influenza season and finding that the influenza vaccination rate was 29.0% among children 2 to 17 years of age with asthma and 10.3% among those without asthma. Although recent research has shown that coverage has increased since then among children with and without chronic conditions,¹² influenza vaccination among children with asthma specifically has not been evaluated since the 2004–2005 season, and trends over time are unknown.¹¹ In addition, the percentage of children with asthma who receive early influenza vaccination has not been examined.

In this study, we use nationally representative data to examine influenza vaccination among children 2 to 17 years of age from the 2004–2005 through the 2012–2013 influenza seasons, and we assess whether vaccination trends differ by asthma status. Also, we assessed, among children with asthma, which characteristics were associated with receiving any influenza vaccination and with receiving influenza vaccination early in the season (by the end of October).

METHODS

DATA SOURCE

Data are from the 2005–2013 National Health Interview Survey (NHIS), a nationally representative survey with a complex sample design, administered by the National Center for Health Statistics (NCHS). Data were from in-house NCHS files, which can be accessed in the NCHS Research Data Center. Within each participating family, one child 0 to 17 years of age (the sample child) was randomly selected, and health-related information was obtained from in-person interviews with a knowledgeable adult (usually a parent). The NHIS 2005–2013 sample child questionnaires included questions about the year and month of the child's most recent influenza vaccinations. Response rates for the NHIS sample child component ranged from 78.8% in 2006 to 69.0% in 2013.¹³ The NHIS was approved by the NCHS Research Ethics Review Board; this study did not require separate institutional review board approval.

IDENTIFICATION OF CHILDREN WITH ASTHMA

Current asthma status was based on affirmative responses to both of 2 questions: "Has a doctor ever told you that your child had asthma?" and "Does your child still have asthma?" We excluded children <2 years of age, given the difficulty of diagnosing asthma in this age group.¹⁴

IDENTIFICATION OF INFLUENZA VACCINATION

During 2005–2009, the respondent was asked whether the child had received an influenza vaccination injection in the last 12 months and, if so, when the most recent influenza vaccination injection was. Then the respondent was asked whether the child had received an influenza vaccine

by nasal spray (Flumist/Live Attenuated Virus vaccine) in the last 12 months. Children <9 years of age receiving the influenza vaccine for the first time should receive 2 doses of influenza vaccine, spaced at least 1 month apart.¹ Consequently, for children <9 years of age interviewed late in the season, the most recent influenza vaccination reported could be a second dose, creating a bias toward being identified as a later vaccination compared to when the initial vaccination actually occurred. Therefore, data from 2005–2009 were not included in our analyses estimating early vaccination.

For the 2010–2013 seasons, the NHIS questions were revised to assess whether a child had received any influenza vaccine in the last 12 months, how many vaccines they had received, when they received each vaccine, and whether each vaccine was an injection or a nasal spray. This new questionnaire structure allowed for determination of whether the first vaccination (if multiple vaccinations were reported) was received early or late in the influenza season. Vaccinations received during August through the following May were categorized as occurring during that influenza season. Vaccinations received during August through October were categorized as early vaccination. During the 2009–2010 influenza season, when both the seasonal trivalent influenza vaccine and the monovalent pandemic H1N1 vaccine were administered, NHIS asked about these 2 vaccinations separately. Only the seasonal trivalent influenza vaccine was used in our analysis because inclusion of either vaccination for the 2009–2010 season would have created an outlier from the overall vaccination trend.¹⁵ Live attenuated influenza vaccination and inactivated influenza vaccination are included together in all analyses. We examined the percentage of children receiving live attenuated influenza vaccine, but the percentage of children was too low among children with asthma to obtain separate statistically reliable estimates from these data. Because the focus of this study was to examine trends among children with asthma, we did not separately report estimates of live attenuated influenza vaccine for children without asthma.

COVARIATES

We included the following sociodemographic/geographic factors in our analysis on the basis of previously identified factors related to influenza vaccination in children^{10,12,16}: age group (2–5, 6–11, 12–17 years), sex, race/ethnicity (non-Hispanic white, non-Hispanic black, non-Hispanic other/multiple race, Hispanic), insurance type (private insurance, Medicaid/State Children's Health Insurance Program/other state insurance plan, other insurance, uninsured), highest level of parental education (less than high school, high school graduate/GED, some college/associates degree/technical school degree, college degree or more), urban or rural status based on NCHS urban–rural coding¹⁷ (large central–metro, large fringe–metro [suburbs], medium and small metropolitan areas, micropolitan and noncore areas), and geographic region (Northeast, Midwest, South, West). Measures of asthma severity were not available in the NHIS for the years used in this analyses,

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