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Predictors of influenza vaccination in the U.S. among children 9–13 years of age

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ABSTRACT

Background and objectives: U.S. estimates of seasonal influenza (flu) vaccine uptake in 2014–2015 were 62% for 5–12 year olds, dropping to 47% for 13–17 year olds. The Healthy People 2020 goal for these age groups is 80%. It is important to understand factors associated with influenza vaccination, especially for those ages where rates begin to decline. The objective of this study was to identify factors associated with influenza vaccination acceptance in 9–13 year old children.

Methods: An online U.S. survey of mothers of children aged 9–13 assessed children's influenza vaccine uptake in the previous season, healthcare utilization, sociodemographics, and vaccine attitudes. Multivariable logistic regression identified independent predictors of influenza vaccine status.

Results: There were 2363 respondents (Mean age = 38 years old). Referent children were 57% female and 66% non-minority race/ethnicity with a mean age of 10.6 years. By maternal report, 59% of children had received an influenza vaccine in the previous season. Predictors of influenza vaccine uptake included a recommendation or strong recommendation from a health care provider, seeing a health care provider in the past year, positive attitudes regarding the influenza vaccine, and being a minority race. Child gender, age, insurance coverage, and whether the child had a regular healthcare provider were not associated with influenza vaccine uptake (p = n.s.).

Conclusions: This sample reported overall rates of influenza vaccine uptake similar to national surveillance data, but still lower than national goals. Provider recommendations along with health attitudes and seeing a health care provider were associated with vaccine uptake. Promising interventions may include more directive physician messaging for influenza vaccine uptake in youth, encouraging more regular well-child visits during the adolescent years, and promoting influenza vaccination at alternative sites.

1. Introduction

The Advisory Committee for Immunization Practices (ACIP) and other organizations (e.g., the American Academy of Pediatrics) recommend influenza vaccination as a safe means of protecting against the contraction and spread of influenza viruses [1,2]. The ACIP recommends that any individual aged 6 months or older who is free of contraindications should receive influenza vaccine annually, ideally by October to ensure maximal likelihood of protection from that season's influenza viruses [1,2]. Vaccination of children aged 6 months to 18 years is particularly important as they have an increased risk of morbidity and mortality [2,3] and serve as a common reservoir to transmit influenza to those at the highest risk for mortality [3].

Despite these recommendations, influenza vaccination rates continue to fall short of the Healthy People 2020 goal of 70% annual coverage for those 6 months through 17 years old [4]. The CDC estimates that influenza vaccination coverage in the United States during the 2014–2015 influenza season was 61.8% for children aged 5–12 years old and 46.6% for those 13–17 years old [5]. And the influenza vaccination rate in 13–17 year olds is below other recommend vaccines for the same age group, such as Tdap (88%) and MenACWY (78%) [6]. The CDC's 2014–2015 influenza vaccine surveillance data does not suggest differences in influenza vaccine coverage by gender in children 6 months through 17 years old, but does identify differences in regards to age, race, and ethnicity [5].

Abbreviations: CDC, Centers for Disease Control and Prevention; ACIP, Advisory Committee on Immunization Practices; HCP, healthcare provider; SSI, Survey Sampling International.

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Specifically, influenza vaccination coverage in this age group decreased with increasing age. Vaccination coverage for non-Hispanic white (56.0%) and non-Hispanic black (58.3%) children was lower than for Hispanic (64.2%), Asian (72.1%), and mixed race (60.0%) children [5].

Researchers have investigated predictors of, and reasons behind, influenza vaccination behavior, however most of this research has focused on time periods around pandemics and included populations that have a heightened risk of mortality and transmission, such as pregnant women, infants, and health care workers [7–10]. The limited studies on healthy adolescents may be due, in part, to the fact that the universal recommendation for adolescents was issued relatively recently, in 2008 [1]. A recent systematic review of vaccine uptake during the 2009 pandemic included 37 articles. Of the 37 articles reviewed, 13 were general population samples, only 4 were from the United States, and none of those collected data on individuals under the age of 18 [11–13]. In a 2013 systematic review of seasonal influenza vaccine uptake in adults, the authors cited age, having a chronic disease, perception of vaccine efficacy, vaccine safety, and advice from health care professionals and family as key factors in influenza vaccine uptake. Research is similar in younger populations, where parents of children aged 2–12 cited prevention of influenza, reduction of influenza symptoms, and doctor's recommendation as the main factors in receiving influenza vaccine [14].

In a group of adolescents with conditions that put them at increased risk for influenza, vaccination uptake was associated with being male, younger age, having a preventive care visit, having a severe high-risk condition such as sickle cell or chronic metabolic disease, and being in the 2001 and 2002 influenza season as compared to the 1993 influenza season [15]. Other research on uptake of all recommended adolescent vaccines has focused on the role of healthcare providers (HCPs), suggesting that strong recommendations from HCPs can increase vaccine uptake [16,17]. Yet, these studies either focused on all adolescent recommended vaccines as a group and not on the influenza vaccine specifically [16], represented a small geographic region, [17] or limited the sample to those who were high risk [15].

The aims of this study were to examine factors associated with influenza vaccination among 9–13 year old children, as well as to describe some of the common reasons given by parents for vaccinating or not vaccinating children. Identifying sociodemographic and psychosocial factors associated with influenza vaccination may ultimately help to better tailor interventions to increase vaccination coverage in this understudied population.

2. Methods

2.1. Sample

Data for this cross-sectional study were collected via an online, U.S. survey conducted in August 2014, which assessed vaccine-related attitudes and behaviors concerning influenza and human papillomavirus (HPV) vaccination among mothers of children aged 9–13 years. This study was approved by the Indiana University Institutional Review Board (IRB# 1407645128) on July 24, 2014.

Participants were recruited through Survey Sampling International (SSI), a survey research company that maintains a national panel of over 4 million individuals in the United States. Each SSI panel member may participate in up to four surveys annually, and survey respondents are entered into a lottery for a monetary prize through SSI. E-mail invitations were sent at random by SSI to members of their U.S. panel meeting the study's target demographic (i.e., mothers or female legal guardians of a 9–13-year-old children living in their household). The email invitation was generic and did not include a description of the study. Initially, 3208 panelists responded by clicking on a link directing them to the Web-based survey, which was housed on the authors' university server. After being presented with a brief description of the study, 2860 women (89%) agreed to complete the survey. Of those agreeing to participate, 2446 (86%) met the eligibility criteria for participation and completed the survey during a one week time period. Screening questions asked if respondents were at least 18 years of age and parent or legal guardian to one or more children aged 9–13 years residing in the household. This resulted in a sample size of 2446 (86% of those agreeing to enter the survey), which has over 90% power to detect a mean difference of 0.15 at $p < 0.05$ between the vaccinated and unvaccinated groups. Respondents who reported having more than one child in the household in the specified age range were asked to keep their youngest child in mind as they completed the survey.

2.2. Measures

Influenza vaccine uptake was measured through a single question wherein the respondent was asked to indicate if the referent child had received an influenza vaccine, either a shot or the nasal mist, in the previous season (September 2013–March 2014), with response options being "yes," "no," or "don't know."

The survey also assessed the mother's report of whether her child's HCP had discussed influenza vaccination with her (yes, no, don't know). For those who reported that their HCP discussed influenza vaccine, a follow up question asked about the mother's perception of a provider recommendation of influenza vaccine with responses provided on a 5-point scale anchored at 1 = strongly discouraged flu vaccination and 5 = strongly encouraged flu vaccination with the middle anchor 3 = neither recommended nor discouraged flu vaccination. These two questions were then recoded into a single categorical variable of HCP communication about influenza vaccine with response options of did not discuss, discouraged/no recommendation given, encouraged, and strongly recommended (Table 1).

The survey included a 5-item perceived benefits of influenza vaccination scale (Cronbach's alpha = 0.95), which was composed of the following items: *The flu vaccine is the best way to protect my child from the flu; The flu vaccine is effective in preventing the flu; The vaccine is safe; It is important for the health of everyone for parents to vaccinate their children against the flu; and a vaccine could be a good way to protect your child from the flu.* The response options for these items ranged from 1 = strongly disagree to 5 = strongly agree. The perceived benefits scale was derived by calculating the mean value across the items, such that a higher score indicated greater perceived benefits of influenza vaccination.

Respondents provided basic demographic information about the referent child, including age, race/ethnicity, sex, location, and healthcare payer. Mothers also provided information regarding their child's utilization of healthcare services in the past year (e.g., whether the child saw a doctor, nurse, or other HCP in the past year) and whether the child had a regular HCP. A subset of participants from the study were randomly allocated to answer additional questions regarding either influenza vaccine or HPV vaccine. Those randomized to influenza vaccine questions were asked to report their most important reason for vaccine uptake or refusal from a list of common reasons.

2.3. Statistical analyses

Of the mothers who agreed to complete the survey, 2387 (98%) provided a response (yes/no/don't know) to the question about vaccine receipt during the previous influenza season. Children whose mothers responded with "don't know" were excluded from the analyses (n = 24), resulting in a final sample of 2363 mothers.

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