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# Knowledge of influenza vaccination recommendation and early vaccination uptake during the 2015–16 season among adults aged $\geq 18$ years – United States

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## ABSTRACT

**Background:** Since 2010, the Advisory Committee on Immunization Practices (ACIP) has recommended that all persons aged  $\geq 6$  months receive annual influenza vaccination.

**Methods:** We analyzed data from the 2015 National Internet Flu Survey (NIFS), to assess knowledge and awareness of the influenza vaccination recommendation and early influenza vaccination coverage during the 2015–16 season among adults. Predictive marginals from a multivariable logistic regression model were used to identify factors independently associated with adults' knowledge and awareness of the vaccination recommendation and early vaccine uptake during the 2015–16 influenza season.

**Results:** Among the 3301 respondents aged  $\geq 18$  years, 19.6% indicated knowing that influenza vaccination is recommended for all persons aged  $\geq 6$  months. Of respondents, 62.3% indicated awareness that there was a recommendation for influenza vaccination, but did not indicate correct knowledge of the recommended age group. Overall, 39.9% of adults aged  $\geq 18$  years reported having an influenza vaccination. Age 65 years and older, being female, having a college or higher education, not being in work force, having annual household income  $\geq \$75,000$ , reporting having received an influenza vaccination early in the 2015–16 season, having children aged  $\leq 17$  years in the household, and having high-risk conditions were independently associated with a higher correct knowledge of the influenza vaccination recommendation. **Conclusions:** Approximately 1 in 5 had correct knowledge of the recommendation that all persons aged  $\geq 6$  months should receive an influenza vaccination annually, with some socio-economic groups being even less aware. Clinic based education in combination with strategies known to increase uptake of recommended vaccines, such as patient reminder/recall systems and other healthcare system-based interventions are needed to improve vaccination, which could also improve awareness.

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## 1. Introduction

Influenza is a major cause of morbidity and mortality among adults in the United States [1–4]. Influenza illness burden among healthy adults 18–49 years is an important cause of outpatient medical visits and loss of workdays [5,6]. Influenza vaccination has been shown to be a cost-effective tool for reducing morbidity and mortality associated with influenza among adults [5,7–18].

Prior to 2010, the adult groups recommended for annual vaccination included persons 50 years and older, pregnant women, persons 18–49 years with medical conditions associated with higher risk of complications from influenza infection, healthcare personnel, and close contacts of high-risk persons [19]. Since the 2010–11 influenza season, the Advisory Committee on Immunization Practices (ACIP) has recommended annual influenza vaccination for all persons 6 months of age and older, including healthy adults 18–49 years who were not close contacts of persons at high-risk [1]. Healthy adults aged 18–49 year was added to the recommendations in the 2010–11 season given the known significant morbidity and economic impact of influenza in working age adults [1]. In addition, the universal vaccination recommendation also

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eliminates the need to determine whether each person has one or more specific indications for vaccination and emphasizes the importance of preventing influenza among persons of all ages [1].

Influenza vaccination is the most effective strategy for preventing influenza and its complications; however, vaccination coverage has been suboptimal [1,20–22]. Knowledge and awareness of the influenza vaccination recommendation might be related to vaccination coverage [20,23], but information about levels of knowledge and association between knowledge and vaccination among adult population groups is limited.

Data from the 2015 National Internet Flu Survey (NIFS) were analyzed to assess knowledge and awareness of influenza vaccination recommendation and early vaccination during the 2015–16 season among adults aged  $\geq 18$  years in the United States.

## 2. Methods

The NIFS is an annual survey and collects information about early-season influenza vaccination, and knowledge, attitudes, behaviors, and barriers related to influenza and influenza vaccination in the non-institutionalized U.S. adult population. The 2015 NIFS was conducted for Centers for Diseases Control and Prevention (CDC) by RTI International and GfK Custom Research, LLC during October 29–November 11, 2015. The survey was conducted using a probability-based Internet panel, the GfK KnowledgePanel, designed to be representative of the non-institutionalized U.S. population 18 years or older<sup>®</sup> [24].

For this ongoing panel, participants are initially chosen by a random selection of telephone numbers and residential addresses. Persons in selected households are then invited by telephone or mail to participate in the web-enabled KnowledgePanel<sup>®</sup>. For those who agree to participate but do not already have Internet access, both a laptop and Internet access are provided at no cost. The laptop was delivered to the residence of the panel members in exchange for members completing a short survey on a weekly basis. The device is theirs to keep if they remain on the panel for three years. Most members are able to install the hardware without additional assistance, although GfK maintains a telephone technical support line and will, when needed, provide on-site installation. Panel members may contact the panel member support department for questions using a toll-free number. Totally, of the 3301 members who completed the survey, 250 were furnished with devices/Internet access by GfK. People who already have computers and Internet service participate using their own equipment.

The 2015 NIFS sampling design was a single-stage stratified sample with oversampling of select subgroups of particular analytical interest. Twelve mutually exclusive design strata were defined as the interaction of two categorical variables—age (18–49 years, 50–64 years, and 65 years and older) and race/ethnicity (Hispanic, non-Hispanic white, non-Hispanic black, and non-Hispanic other/multiple races)—known for all members of the probability-based Internet panel. Independent random samples were selected within each design stratum. A total of 6148 panel members across the 12 design strata were randomly sampled using probabilities of selection inversely proportional to the KnowledgePanel<sup>®</sup> survey weight (a base weight adjusted for nonresponse) from 42,075 eligible panelists, with a target of 4025 completed surveys. A total of 3301 completed the survey, with a completion rate of 53.7% (unweighted), and 57.6% (weighted).

In the 2015 NIFS, a new question was added to the survey regarding knowledge of the influenza vaccination recommendation that all persons age 6 months and older be vaccinated.

Respondents were asked: “Who do you believe the flu vaccine is recommended for?” The potential answers to the question included: (1) all persons age 13 years and older; (2) only adults age 18 years and older with chronic medical conditions; (3) all

persons age 6 years and older; (4) all persons age 6 months and older; (5) persons of any age; (6) none of the above; (7) don’t know. Individuals could select only one response to this question. Persons who stated “(4) all persons age 6 months and older” were considered to have correct knowledge of the influenza vaccination recommendation. Respondents who answered either “(1) all persons age 13 years and older” or “(2) only adults age 18 years and older with chronic medical conditions” or “(3) all persons age 6 years and older” or “(5) persons of any age” were considered to have awareness that there was a recommendation for influenza vaccination, but not the correct knowledge of the recommended age group. Persons who stated either “(6) none of the above” or “(7) don’t know” were considered to have neither knowledge nor awareness of the influenza vaccination recommendation.

To determine influenza vaccination coverage, respondents were asked: “Since July 1, 2015, have you had flu vaccination?” and individuals were considered to have received an influenza vaccination if they reported having received the vaccine since July 1, 2015. Influenza vaccination coverage estimates represent approximately the cumulative proportion of persons vaccinated by the time the survey was conducted [21]. Metropolitan Statistical Areas (MSA) status is categorized as metro and non-metro. Metro includes anyone in a metropolitan areas (having at least one urbanized area of 50,000 or more population plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties) or micropolitan areas (having at least one urban cluster of at least 10,000 but less than 50,000 population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties). Non-metro includes anyone living outside of both a metropolitan and micropolitan area.

SAS release 9.3 (SAS Inc. Cary, NC) and SUDAAN 11.0 (RTI, Research Triangle Park, NC) were used to calculate point estimates and 95% confidence intervals for knowledge or awareness of the influenza vaccination recommendation, and early season influenza vaccination coverage. *T*-tests were used to test for differences in knowledge or awareness of the influenza vaccination recommendation, neither knowledge nor awareness of influenza vaccination recommendation, and vaccination coverage and for each variable. A two-sided significance level of 0.05 was adopted for all statistical tests. All percentages in the tables were weighted estimates and the tests were conducted based on the weighted estimates. Multivariable logistic regression models with predictive marginals were used to identify factors independently associated with knowledge or awareness of the influenza vaccination recommendation, neither knowledge nor awareness of influenza vaccination recommendation, and influenza vaccination coverage among adult populations. We did *t*-tests for each variable within each column, and the reference group for each variable within each column is shown in Table 4. Independent variables in the models which may be associated with vaccination or awareness of recommendation were selected based on previous studies [20,22–23].

## 3. Results

Sociodemographic and access-to-care characteristics of the study population are shown in Table 1.

Among all adults aged  $\geq 18$  years, only 19.6% indicated correct knowledge of the influenza vaccination recommendation (those who answered that “the vaccine is recommended for all persons age 6 months and older”) (Table 2). Among those indicating correct knowledge of the influenza vaccination recommendation, influenza vaccination coverage was 53.5%, significantly higher than those with incorrect answers including, “only adults age 18 years and older with chronic medical conditions” (33.4%); “all persons

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