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Influenza vaccination among adults living with persons at high-risk for complications from influenza during early 2016-17 influenza season

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Abstract

Background: The Advisory Committee on Immunization Practices (ACIP) recommends all persons aged ≥6 months get vaccinated for influenza annually, placing particular emphasis on persons who are at increased risk for influenza-related complications and persons living with or caring for them.

Methods: Data from the 2016 National Internet Flu Survey (NIFS), a nationally representative, probability-based Internet panel survey of the noninstitutionalized U.S. civilian population aged ≥18 years, was used to compare influenza vaccination coverage among adults who live with household members at high-risk for complications from influenza with those who do not. Logistic regression was used to evaluate the difference in the adjusted vaccination coverage prevalence between persons living with and without high-risk household members.

Results: From the 2016 NIFS (n = 4,113), we estimated that 29.2% of noninstitutionalized U.S. adults had at least one household member at increased risk for influenza-related complications. Unadjusted influenza vaccination coverage was significantly higher for adults with a high-risk household member compared with those without (46.7% vs 38.6%, respectively). After adjustment for demographic and access-to-care factors, adults with high-risk household members were more likely to be vaccinated than those without (adjusted prevalence difference = 5.3 [0.3, 10.3]). Among vaccinated respondents with high-risk household members, 88.7% reported that protection of their family and close contacts was one of the reasons they were vaccinated.

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Potential conflicts of interest

All authors report no conflicts of interest relevant to this article.

Conclusion: Approximately half of adults living with someone at increased risk of complications from influenza did not report receiving an influenza vaccination. Vaccination reminder/recall for persons at increased risk should include reminders for their household contacts.

Keywords

Influenza vaccination; High-risk household contact

1. Introduction

Influenza virus infection can cause serious illness and death, resulting in an estimated 140,000 to 710,000 influenza-related hospitalizations and 12,000 to 56,000 influenza-related deaths annually in the United States [1]. Older adults, young children, those with chronic medical conditions, and pregnant women are at increased risk for complications from influenza [2–5]. Annual influenza vaccination can reduce the spread of influenza and its complications [1,2]. The Advisory Committee on Immunization Practices (ACIP) recommends that all persons aged ≥6 months receive an influenza vaccine each season, optimally before onset of influenza activity in the community [2]. Healthcare providers are encouraged to offer vaccination before the onset of influenza activity in the community, preferably by the end of October, if possible [2]. While all persons aged ≥6 months should be vaccinated annually, the ACIP recommendations emphasize vaccination of persons who are at increased risk for influenza-related complications and persons who live with or care for such persons [2]. Healthy persons infected with the influenza virus, including those who are asymptomatic, can transmit the virus to persons at higher risk for influenza-related complications [6].

Previous reports have shown that both early-season and end-of-season influenza vaccination coverage among persons with increased risk for influenza-related complications, including young children, adults aged ≥65 years, adults with high-risk medical conditions, and pregnant women, are higher compared with coverage among adults without these conditions [7–9]. However, with the exception of very young children, coverage among these groups with increased risk remains below Healthy People 2020 targets [10]. The few studies that have examined associations between influenza vaccination coverage and living in a household with a person at increased risk for influenza-related complications have focused on vaccination of children living with high-risk adults [11].or vaccination of household contacts of those with specific medical conditions (diabetes or cancer) [12,13]. The study presented here examined: (1) influenza vaccination coverage during early 2016–17 influenza season among adults living with a child aged ≤5 years or a household member with any of eleven conditions that increase the risk for influenza-related complications [2], (2) the difference in influenza vaccination among those with and without high-risk household members, and (3) reasons why adults with high-risk household members did and did not receive influenza vaccination. Vaccination coverage and differences in influenza vaccination among those with and without high-risk household members were also calculated restricted to adults aged ≤65 years and without high-risk medical conditions themselves to eliminate the effect of the adult's own high-risk status and to be comparable to previous estimates from the National Health Interview Survey (NHIS). This information can be used in

developing influenza vaccination campaign messages focused on protecting family members and close contacts from complications of influenza, particularly those at increased risk.

2. Methods

2.1. Study sample

Data for this analysis were obtained from the 2016 National Internet Flu Survey (NIFS), an annual survey that collects information about early-season influenza vaccination and knowledge, attitudes, behaviors, and barriers related to influenza and influenza vaccination in the noninstitutionalized U.S. adult population aged ≥18 years. The 2016 NIFS was conducted for Centers for Diseases Control and Prevention (CDC) by RTI International and GfK Custom Research, LLC during October 27-November 9,2016. Participants in the NIFS were randomly sampled from GfK KnowledgePanel®, a probability-based Internet panel designed to be representative of the noninstitutionalized U.S. population aged ≥18 years. KnowledgePanel® participants are initially chosen by a random selection of residential addresses and are continuously recruited. KnowledgePanel® sampling methodology has been previously described elsewhere [14,15].

Respondents in the NIFS were asked "*Since July 1, 2016, have you had a flu vaccination?*". Vaccination coverage was defined as the percent of respondents who reported receiving vaccination by the time they completed the survey, among those answering either "yes" or "no" to the vaccination question. Vaccinated and unvaccinated respondents were asked to respond "yes" or "no" to each of a series of reasons why they were or were not vaccinated, respectively. Respondents were defined as being at risk for complications from influenza if they reported currently having any of the following conditions: asthma, diabetes, a lung condition other than asthma, heart disease (other than high blood pressure, heart murmur, or mitral valve prolapse), a kidney condition, sickle cell anemia or other anemia, a neurologic or neuromuscular condition, obesity, a liver condition, a weakened immune system caused by chronic illness or by medicines taken for a chronic illness such as cancer, chemotherapy, HIV/AIDS, steroids, and transplant medicines, or being currently pregnant. Respondents were defined as having a household member at high risk for complications from influenza if they reported living in a household with a child aged ≤5 years or that any member of their household other than themselves currently had any of the conditions listed in the preceding sentence. A total of 4,305 adults aged ≥18 years completed the survey. Thirty-seven respondents were excluded because they did not report their vaccination status and 155 were excluded because they responded "don't know" to the question regarding health conditions of household members, leaving a final analytic sample size of 4,113.

2.2. Statistical analysis

Weighted t-tests were used to compare the estimated population distribution of demographics, high-risk conditions, access-to-care factors, and vaccination-related attitudes, along with influenza vaccination coverage by these factors, between respondents with and without high-risk household members. Analyses were repeated restricted to respondents aged <65 years without high risk medical conditions themselves to eliminate the effect of the respondent's own high-risk status and to be comparable to previous estimates from the

NHIS. Adjusted prevalence differences from multivariable logistic regression with predictive marginals were calculated to assess the independent relationship between influenza vaccination and having a household member at high risk for influenza-related complications, controlling for age, sex, race/ethnicity, marital status, education level, employment status, annual household income, region of residence, residence in a metropolitan statistical area, respondent's high-risk medical status, place of usual medical care, provider recommendation or offer of vaccination, and type of medical insurance. An interaction term between having a household member at high risk for influenza-related complications and the respondent having a high risk medical condition was tested in the model but was not statistically significant and not included in the final model.

Data were analyzed using SAS (version 9.4) and SUDAAN (version 11.0.0). All estimates were weighted to represent the U.S. general population of adults aged ≥18 years and to adjust for survey nonresponse. A p-value <0.05 was considered statistically significant for all analyses.

3. Results

From the 2016 NIFS, we estimated that 29.2% (95% confidence interval: 27.5%, 30.8%) of noninstitutionalized U.S. adults had at least one household member (excluding themselves) at high risk for influenza-related complications. The influenza vaccination coverage estimate was 41.0% overall, 46.7% among those who had a high-risk household member and 38.6% among those who did not ($p < 0.05$ for the comparison between persons with and without high-risk household members) (Table 1). Among adults aged <65 years with no high-risk medical conditions themselves, coverage was 38.1% among those who had a high-risk household member and 33.5% among those who did not ($p = 0.13$ for the comparison between persons with and without high-risk household members, data not shown).

Coverage was higher among adults with a high-risk household member compared with those without a high-risk household member in all sociodemographic subgroups except for persons: aged ≥65 years; of non-Hispanic other or multiple races; widowed, divorced or separated; with education less than a bachelor's degree; unemployed or not in the work force; with a household income $35,000-$49,999; living in the Midwest; and living in a non-metropolitan area (Table 1). Adults with a high-risk household member and who had a high-risk medical condition themselves were more likely to be vaccinated (53.0%) than those without a high-risk household member but with a high-risk medical condition themselves (43.9%). Adults with a high-risk household member were also more likely to be vaccinated than those without a high-risk household member if they had a usual place of medical care in a clinic, health center, doctor's office, or a health maintenance organization, received an offer of vaccination from a healthcare provider, or had public or private health insurance (Table 1). After adjustment for sociodemographic and access-to-care factors, adults with a high-risk household member were significantly more likely to have received influenza vaccination than those without (adjusted prevalence difference = 5.3 [0.3, 10.3], data not shown).

Those with and without high-risk household members were similarly likely to have a positive attitude towards the safety and effectiveness of influenza vaccination (85.9% and 86.2%, respectively). However, among those with a positive attitude, adults with a high-risk household member were more likely to be vaccinated (54.2%) than those without (45.6%) (Table 1). Those with a high-risk household member were more likely than those without to think that their chance of getting influenza without vaccination is high (48.8% versus 39.3%) and that their chance of passing influenza to someone else is likely (85.3% versus 79.6%). Persons who believed that their own chance of getting influenza without vaccination was high were equally likely to be vaccinated whether or not they had a high-risk household member (65.4% versus 63.7%). However, those who believed that their chance of passing influenza to someone else was "likely" were more likely to be vaccinated if they had a high-risk household member (50.6%) than if they did not (42.8%) (Table 1).

Reported reasons for vaccination are given in Table 2. "To protect myself from the flu" was the most commonly reported main reason for vaccination for both persons with and without high-risk household members (32.3% and 33.8%, respectively). While 88.7% of those living with a high-risk household member reported that protection of their family and close contacts was one of the reasons they were vaccinated, only 19.4% listed this as the main reason; this estimate was similar to the estimate of those without high-risk household members who listed this as their main reason for vaccination (16.3%).

Reasons for non-vaccination among those unvaccinated with no intent to be vaccinated are given in Table 3. "I don't think the flu shot works well" was the most commonly reported main reason for non-vaccination for both persons with and without high-risk household members. A combined 27.3% of unvaccinated adults living with high-risk household members reported a main reason for non-vaccination suggesting that they were not vaccinated because they did not believe they needed the vaccine for their personal protection ("I never get sick with the flu" [12.8%]; "I am healthy and don't need a flu vaccine" [8.5%]; and "I am not in a high-risk or priority group for flu vaccination" [6.0%]).

4. Discussion

This study found significantly higher vaccination coverage among adults with high-risk household members compared to those without after controlling for other factors in multivariable analysis. In contrast, previous studies found no association between influenza vaccination coverage and high-risk household members among children living with high-risk adults [11], and adults living with persons who have diabetes [12] or cancer [13]. However, coverage among all adults living with high-risk house hold members was 46.7% in the early 2016–17 influenza season, still remaining well below the Healthy People 2020 target of 70% for vaccination coverage among persons ≥6 months of age [10].

Historically, influenza vaccination coverage of adults living with persons with high-risk conditions, as measured from the NHIS, was low: 17% in 2006–07, 20% in 2007–08, and 24% in 2008–09 [6]. However, these NHIS estimates are limited to household respondents living with children with high-risk medical conditions or adults aged ≥65 years. Information regarding high-risk status of other adults aged 18–64 years in the household is no longer

available in the NHIS. The most recent population-based estimate from the NHIS of vaccination coverage among adults with all types of high-risk household members (including children and adults with high-risk medical conditions) was 18.1% in 2002 [16]. In the current NIFS, influenza vaccination coverage among U.S. adults without high-risk conditions but who live with high-risk household members, similar to the way estimates from the NHIS were calculated, was 38.1% in the early 2016–17 influenza season.

Factors associated with low influenza vaccination coverage among adults living with high-risk household members might include difficulty in identifying household contacts of high-risk persons and implementing household-contacts-based vaccination programs and those living with high-risk persons not considering themselves a potential threat if not vaccinated. Even though the influenza vaccination recommendation was expanded to include all persons ≥6 months of age in the 2010–11 season, the ACIP continued to emphasize that when vaccine supply is limited, persons at increased risk for complications attributable to influenza and persons who live with or care for persons at higher risk for influenza-related complications should be a focus of vaccination efforts [6]. Substantial improvement in annual influenza vaccination coverage among those living with high-risk persons could reduce the health impact of influenza. Expanded access through greater use of non-clinical settings and vaccine providers, such as pharmacies, could help increase vaccination coverage among adults with high-risk household members, as many of these adults do not have chronic medical conditions themselves and might not have a regular healthcare provider. Including vaccination reminders for household contacts along with recall and reminder systems for high-risk patients is another strategy that could increase vaccination uptake among adults living with high-risk household members [17].

While self-protection from influenza was the most common main reason given for vaccination in both those with and without high-risk household members, nearly 90% of vaccinated adults with high-risk household contacts reported that protection of those around them was one of the motivating factors in getting vaccinated. A recommendation and offer of influenza vaccination from a healthcare provider was associated with increased vaccination coverage among all adults in a previous analysis of NIFS data [14]. In the current analysis, adults with a high-risk household member who received an offer of vaccination from a healthcare provider had higher coverage than those without a high-risk household member who received a provider offer, suggesting further that having high-risk household contacts motivates vaccination. Moreover, those who believed they were “likely” to spread influenza to others if infected were more likely to be vaccinated if they had a high-risk household member than if they did not. Among unvaccinated respondents with high-risk household members, 27.3% reported a main reason for non-vaccination suggesting that they did not believe the vaccine is needed for their personal protection. Moreover, 34.7% of unvaccinated respondents with high-risk household members reported “I am not in a high-risk or priority group for flu vaccination” as one of their reasons for non-vaccination, when in fact the ACIP does include persons who live with or care for persons who are at increased risk for influenza-related complications as a priority group for vaccination [2]. These findings suggest that provider recommendations with education about influenza vaccination should emphasize the role of protecting family members and close contacts who might be at higher risk of influenza-related complications as a benefit of vaccination. While targeted

messages often focus on individuals with high-risk conditions, our analysis suggests that adults with high-risk medical conditions themselves are more likely to be vaccinated if they also have a household member with a high-risk condition. The effectiveness of vaccination campaigns might be increased if messaging is expanded to include protection of oneself in addition to close contacts.

This study has several limitations. First, vaccination coverage was reported early in the vaccination season; respondents might have been vaccinated after the survey was completed. Second, the estimates in this report are based on the NIFS, a survey of randomly selected Internet panel members. Although the Internet panel was probability-based, the estimates may not represent all adults in the United States, and bias may remain after the weighting adjustment. Third, the sample was based on respondents who agreed to participate in the NIFS through an invitation that referenced influenza vaccination. Estimates obtained from this study might be biased if participation was related to receipt of vaccination and the weighting adjustments did not eliminate such bias. Fourth, all data rely on self-report and are not validated with medical records. Fifth, only those English-speaking adults aged ≥18 years were eligible for the NIFS. Finally, the survey did not capture the ages of other adults living in the household, so we were unable to include living with persons aged ≥65 years in the definition of high-risk household contact.

5. Conclusion

Approximately half of adults living with someone at increased risk of complications from influenza did not report receiving an influenza vaccination early in the 2016–17 influenza season, leaving them at risk of potentially spreading influenza to vulnerable close contacts. Influenza vaccination messaging should include information about the importance of vaccinating oneself for the protection of family and close contacts. Vaccination recall and reminder systems for high-risk patients that include reminders for their household members to be vaccinated along with clinic-based education for all adults could lead to increased vaccination coverage among persons with high-risk contacts [17].

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Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily reflect the official position of the Centers for Disease Control and Prevention.

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Table 1

Influenza vaccination [*] coverage among adults with and without household members at increased risk of influenza-related complications [†] for early 2016–17 influenza season by demographic and access-to-care factors and vaccination-related attitudes – United States, National Internet Flu Survey, November 2016.

Respondent characteristic	Overall			With high-risk household member [†]			Without high-risk household member [†]		
	N [‡]	Weighted %	Vaccinated [*] % [§] (95% CI)	N [‡]	Weighted %	Vaccinated [*] % [§] (95% CI)	N [‡]	Weighted %	Vaccinated [*] % [§] (95% CI)
Total	4,113	100	41.0 (39.3, 42.8)	1,209	29.2 [‖]	46.7 (43.4, 50.1) [¶]	2,904	70.8 [**]	38.6 (36.6, 40.7)
Age									
18–49 years	1,381	52.9	34.8 (32.1, 37.6)	411	53.2	42.4 (37.0, 47.8) [¶]	970	52.8	31.7 (28.5, 34.9)
50–64 years	1,336	26.8	41.7 (38.8, 44.5)	394	26.6	47.3 (41.9, 52.8) [¶]	942	26.9	39.3 (35.9, 42.8)
≥65 years	1,396	20.3	56.3 (53.6, 59.1)	404	20.2	57.4 (52.3, 62.5)	992	20.3	55.9 (52.6, 59.1)
Gender									
Male	2,023	47.5	40.0 (37.4, 42.5)	530	42.2 [††]	47.5 (42.3, 52.8) [¶]	1,493	49.7	37.3 (34.4, 40.2)
Female	2,090	52.5	42.0 (39.5, 44.4)	679	57.8	46.2 (41.7, 50.6) [¶]	1,411	50.3	40.0 (37.0, 42.9)
Race/ethnicity									
Non-Hispanic white only	2,359	65.2	40.0 (37.8, 42.2)	624	60.2 [††]	45.5 (41.0, 50.1) [¶]	1,735	67.2	38.0 (35.4, 40.5)
Non-Hispanic black only	636	11.4	40.4 (36.0, 44.9)	220	14.1	47.1 (39.3, 54.9) [¶]	416	10.2	36.6 (31.3, 42.0)
Hispanic	580	15.6	44.0 (39.4, 48.6)	196	18.1	51.3 (43.1, 59.4) [¶]	384	14.6	40.3 (34.8, 45.9)
Non-Hispanic, other or multiple races	538	7.9	44.1 (38.5, 49.6)	169	7.6	44.9 (34.8, 55.0)	369	8.0	43.8 (37.2, 50.4)
Marital status									
Married/living with partner	2,601	63.5	42.0 (39.8, 44.2)	812	63.4 [††]	48.7 (44.6, 52.7) [¶]	1,789	63.6	39.2 (36.6, 41.8)
Widowed/divorced/separated	864	16.5	44.2 (40.3, 48.0)	194	12.9	41.3 (33.2, 49.3)	670	18.0	45.1 (40.7, 49.4)
Never married	648	20.0	35.3 (30.9, 39.7)	203	23.7	44.6 (36.5, 52.7) [¶]	445	18.4	30.3 (25.2, 35.4)
Education level									
Less than high school	261	10.3	42.0 (35.3, 48.8)	94	12.2 [††]	46.9 (35.4, 58.4)	167	9.5	39.4 (31.1,47.7)
High school	1,135	28.8	39.5 (36.2, 42.7)	366	31.1	44.0 (38.1, 49.9)	769	27.9	37.4 (33.5, 41.3)

Respondent characteristic	Overall			With high-risk household member†			Without high-risk household member†		
	N‡	Weighted %	Vaccinated* %§ (95% CI)	N‡	Weighted %	Vaccinated* %§ (95% CI)	N‡	Weighted %	Vaccinated* %§ (95% CI)
Some college	1,208	28.9	37.9 (34.7, 41.2)	368	30.3	42.8 (36.7, 49.0)	840	28.4	35.8 (32.0, 39.6)
Bachelor's degree or higher	1,509	32.0	44.8 (41.9, 47.8)	381	26.4	54.4 (48.4, 60.4)¶	1,128	34.3	41.8 (38.5, 45.2)
Employment									
Employed	2,241	62.0	38.2 (35.9, 40.6)	630	60.0	45.9 (41.3, 50.4)¶	1,611	62.8	35.2 (32.6, 37.9)
Unemployed	204	6.1	32.0 (24.2, 39.8)	70	6.8	32.4 (20.1, 44.8)	134	5.8	31.8 (22.0, 41.6)
Not in work force	1,668	32.0	48.1 (45.2, 50.9)	509	33.2	51.2 (45.9, 56.5)	1,159	31.4	46.7 (43.4, 50.1)
Annual household income									
<$35,000	964	22.7	38.9 (35.2, 42.6)	314	25.5	44.4 (37.7, 51.1)¶	650	21.6	36.2 (31.8, 40.6)
$35,000-$49,999	487	12.6	40.1 (34.8, 45.4)	142	12.3	43.6 (33.6, 53.6)	345	12.8	38.7 (32.5, 45.0)
$50,000-$74,999	733	17.5	38.0 (33.9, 42.1)	227	18.4	46.7 (39.0, 54.4)¶	506	17.1	34.1 (29.4, 38.9)
≥$75,000	1,929	47.2	43.4 (40.8, 45.9)	526	43.7	49.0 (44.0, 54.1)¶	1,403	48.6	41.3 (38.3, 44.2)
Region of residence									
Northeast	742	18.1	45.1 (40.9, 49.3)	205	17.8	53.2 (45.0, 61.4)¶	537	18.3	41.9 (37.0, 46.7)
Midwest	848	21.4	40.4 (36.5, 44.2)	262	22.4	44.3 (37.1, 51.6)	586	20.9	38.6 (34.0, 43.2)
South	1,492	37.1	39.9 (36.9, 42.8)	432	37.2	44.7 (39.1, 50.3)¶	1,060	37.1	37.9 (34.5, 41.3)
West	1,031	23.4	40.2 (36.7, 43.7)	310	22.6	47.4 (40.8, 54.1)¶	721	23.7	37.4 (33.2, 41.5)
MSA status									
Metro	3,598	85.7	41.4 (39.5, 43.3)	1,060	85.9	47.7 (44.0, 51.2)¶	2,538	85.7	38.8 (36.6, 41.0)
Non-metro	515	14.3	38.6 (33.7, 43.5)	149	14.1	41.2 (31.9, 50.4)	366	14.2	37.6 (31.8, 43.3)
High-risk condition‡‡									
Yes	1,534	33.3	47.9 (44.9, 50.9)	633	49.3††	53.0 (48.3, 57.8)¶	901	26.7	43.9 (40.2, 47.7)
No	2,579	66.7	37.6 (35.4, 39.8)	576	50.7	40.6 (35.9, 45.3)	2,003	73.3	36.7 (34.3, 39.2)
Place of usual medical care									
Clinic/health center/doctor's office/ HMO	2,954	77.8	44.5 (42.4, 46.6)	906	82.0††	50.0 (46.0, 53.9)¶	2,048	76.1	42.1 (39.6, 44.6)
Hospital emergency room or hospital outpatient department	97	2.2	46.7 (34.7, 58.6)	39	2.6	61.3 (44.2, 78.5)	58	2.1	39.3 (24.5, 54.1)

Respondent characteristic	Overall			With high-risk household member†			Without high-risk household member†		
	N‡	Weighted %	Vaccinated* %§ (95% CI)	N‡	Weighted %	Vaccinated* %§ (95% CI)	N‡	Weighted %	Vaccinated* %§ (95% CI)
Other or more than one place	198	5.1	40.6 (32.4, 48.7)	62	6.1	41.9 (27.6, 56.3)	136	4.7	39.8 (30.0, 49.7)
None	444	14.9	24.2 (19.7, 28.6)	80	9.4	27.6 (16.5, 38.7)	364	17.1	23.4 (18.5, 28.3)
Provider recommendation or offer of vaccination									
Offer	1,179	43.7	66.3 (63.0, 69.6)	407	46.5	71.3 (66.0, 76.6)¶	772	42.3	63.6 (59.4, 67.8)
Recommendation but no offer	400	14.2	48.0 (42.2, 53.9)	134	14.9	45.9 (35.9, 55.9)	266	13.8	49.2 (42.0, 56.4)
No recommendation or offer‖	1,038	42.1	31.0 (27.8, 34.3)	300	38.5	32.3 (26.0, 38.5)	738	43.9	30.5 (26.7, 34.3)
Type of health insurance									
Any public**	1,957	36.8	48.7 (46.1, 51.4)	608	40.1	54.0 (49.2, 58.8)¶	1,349	35.4	46.3 (43.1, 49.5)
Private/military	1,894	55.6	38.5 (36.0, 41.0)	526	53.0	44.2 (39.3, 49.1)¶	1,368	56.6	36.3 (33.5, 39.2)
None	228	7.7	24.2 (17.7, 30.7)	62	6.9	31.8 (17.4, 46.1)	166	8.0	21.5 (14.4, 28.5)
Attitude toward safety and effectiveness of influenza vaccination***									
Positive	3,480	86.1	48.1 (46.1, 50.1)	1,030	85.9	54.2 (50.6, 57.9)¶	2450	86.2	45.6 (43.3, 47.9)
Negative	496	13.9	5.3 (3.0, 7.5)	142	14.1	8.9 (3.0, 14.8)	354	13.8	3.7 (1.8, 5.7)
Think chance of getting flu without vaccination is.. †††									
High	1,648	42.1	64.3 (61.5, 67.1)	548	48.8††	65.4 (60.5, 70.3)	1,100	39.3	63.7 (60.3, 67.1)
Low	2,084	57.9	26.0 (23.8, 28.1)	560	51.2	31.6 (27.1, 36.1)¶	1,524	60.7	24.0 (21.6, 26.4)
Think chance of passing flu to someone else is…									
Likely‡‡‡	3,258	81.3	45.2 (43.2, 47.2)	1,013	85.3††	50.6 (46.9, 54.3)¶	2,245	79.6	42.8 (40.4, 45.2)
Unlikely	840	18.7	22.8 (19.7, 26.0)	189	14.7	24.6(17.7,31.5)	651	20.4	22.3 (18.7, 25.9)

CI = confidence interval.

*Respondents who reported receipt of influenza vaccination at the time of the survey (October 27-November 9, 2016).

†Includes living with a child aged ≤5 years or living with someone with asthma, diabetes, a lung condition other than asthma, heart disease (other than high blood pressure, heart murmur, or mitral valve prolapse), a kidney condition, sickle cell anemia or other anemia, a neurologic or neuromuscular condition, obesity, a liver condition, a weakened immune system caused by chronic illness or by medicines taken for a chronic illness such as cancer, chemotherapy, HIV/AIDS, steroids, and transplant medicines, and/or currently pregnant.

‡Unweighted sample size.

§ Weighted percent.

‖ Among all respondents. Remaining percentages reported in this column are among respondents with high-risk household members.

¶ $p < 0.05$ comparing vaccination coverage among those with and without high-risk household members.

** Among all respondents. Remaining percentages reported in this column are among respondents without high-risk household members.

†† $p < 0.05$ comparing distribution among those with and without high-risk household members.

‡‡ Respondent had a high-risk condition, including asthma, diabetes, a lung condition other than asthma, heart disease (other than high blood pressure, heart murmur, or mitral valve prolapse), a kidney condition, sickle cell anemia or other anemia, a neurologic or neuromuscular condition, obesity, a liver condition, a weakened immune system caused by chronic illness or by medicines taken for a chronic illness such as cancer, chemotherapy, HIV/AIDS, steroids, and transplant medicines, and/or currently pregnant.

‖‖ Includes respondents without a visit to a medical provider since July 1, 2016.

¶¶ Includes Medicare, Medi-Gap, Medicaid, State Children's Health Insurance Program, Indian Health Service, state-sponsored health plan, and other government programs.

*** Respondents were considered to have a positive attitude towards the safety and effectiveness of influenza vaccine if they answered "Very safe' or "Somewhat safe" to the question "How safe do you think the flu vaccine is?" and answered "Very effective" or "Somewhat effective" to the question "How effective do you think getting a flu vaccination is in preventing the flu?" Otherwise they were considered to have a negative attitude.

††† Responded "Very high" or "Somewhat high" compared with "Very low" or "Somewhat low" to the question "In general, if you do not get a flu vaccination, what do you think your chances are of getting the flu?".

‡‡‡ Responded "Very likely" or "likely" compared with "Unlikely" or "Very unlikely" to the question: "In general, if you get the flu, how likely do you think it is that you could pass the flu on to someone else?".

Table 2

Reported reasons for receiving influenza vaccination for early 2016–17 influenza season among vaccinated respondents (n = 1864) – United States, National Internet Flu Survey, 2016.

Reasons for vaccination	With high-risk household member		Without high-risk household member	
	All reasons*	Main reason	All Reasons	Main reason
	Weighted %	Weighted %	Weighted %	Weighted %
To protect myself from the flu	94.0	32.2	92.8	33.8
To protect family and close contacts from flu†	88.7	19.4	81.5	16.3
I get one every year—it is a habit	79.7	12.1	77.8	12.0
A doctor/healthcare provider recommended I get a flu vaccination	79.2	10.3	68.8	10.9
I'm at high risk for complications from the flu	37.2	7.5	23.9	5.9
I've experienced a severe case of the flu or someone close to me has and I don't want to repeat the experience	40.6	6.9	30.9	3.9‡
Flu vaccination was offered free of charge at work or elsewhere	58.9	4.3	56.8	8.1‡
To avoid missing work or other activities due to sickness with the flu	66.9	3.4	61.9	4.4
People I trust recommended I get a flu vaccination	64.3	2.5	53.1	1.5
It is convenient for me to get a flu vaccination	79.9	1.1	77.6	2.3
The flu season was bad last year	36.8	0.1	28.9	0.9†

*All reasons adults got a flu vaccination since July 1, 2016.

†Created based on selection of at least one of two separate statements: "To protect my family/children/friends from the flu" and "To protect people I live with or take care of".

‡$p < 0.05$ for the comparison of the main reason for vaccination between those with and without high-risk household members.

Table 3

Reported reasons for not receiving influenza vaccination for early 2016–17 influenza season among unvaccinated respondents[*] (n = 2249) - United States, National Internet Flu Survey, 2016.

Reasons for non-vaccination	With high-risk household member		Without high-risk household member	
	All reasons[†] Weighted %	Main reason Weighted %	All reasons Weighted %	Main reason[‡] Weighted %
I don't think the flu shot works well	55.0	18.7	55.9	16.9
I am worried about side effects of the flu vaccine	57.2	16.6	51.4	13.9
I never get sick with the flu	43.6	12.8	46.8	15.5
I am healthy and don't need a flu vaccine	53.8	8.5	57.4	10.7
I think I can get the flu from the flu shot	43.3	8.5	41.1	10.8
I do not trust government/doctors	26.3	7.9	21.0	6.1
I am not in a high-risk or priority group for flu vaccination	34.7	6.0	43.5	9.9
I didn't get around to it/didn't have the time to get one	18.5	4.6	16.1	3.3
I am afraid of needles and shots	22.2	4.2	16.2	3.5
I have a health condition that prevents me from getting it	6.6	2.9	2.1	0.9
If I get the flu, I can get medicine to treat it	48.2	2.7	45.9	4.4
It was not convenient to get one	17.4	2.7	12.8	1.6
I have an egg allergy that prevents me from getting it	3.4	2.1	1.4	0.4
Doctor did not recommend flu vaccine	13.5	0.8	12.7	0.4
My insurance doesn't cover flu vaccine	7.6	0.5	8.4	0.9
Flu vaccination costs too much	7.9	0.4	8.5	0.9
Doctor's office did not have flu vaccine available	2.4	0	2.3	0

[*] Restricted to respondents who reported that they were "unlikely" or "very unlikely" to get an influenza vaccination before the end of June 2017.

[†] All reasons adults have not received a flu vaccination since July 1, 2016.

[‡] No significant differences at $p < 0.05$ were found for the comparisons of the main reason for non-vaccination between those with and without high-risk household members.