HHS Public Access

Author manuscript

Vaccine. Author manuscript; available in PMC 2018 February 20.

Published in final edited form as:

Vaccine. 2017 May 25; 35(23): 3104–3115. doi:10.1016/j.vaccine.2017.04.028.

Awareness among adults of vaccine-preventable diseases and recommended vaccinations, United States, 2015

Peng-jun Lu[a,*], **Alissa O'Halloran**[a], **Erin D. Kennedy**[a], **Walter W. Williams**[a], **David Kim**[a], **Amy Parker Fiebelkorn**[a], **Sara Donahue**[b], and **Carolyn B. Bridges**[a]

[a]Immunization Services Division, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention, 1600 Clifton Road, NE, Atlanta, GA 30333, USA

[b]Abt Associates Inc., 55 Wheeler St., Cambridge, MA 02118, USA

Abstract

Background—Adults are recommended to receive select vaccinations based on their age, underlying medical conditions, lifestyle, and other considerations. Factors associated with awareness of vaccine-preventable diseases and recommended vaccines among adults in the United States have not been explored.

Methods—Data from a 2015 internet panel survey of a nationally representative sample of U.S. adults aged ≥19 years were analyzed to assess awareness of selected vaccine-preventable diseases and recommended vaccines for adults. A multivariable logistic regression model with a predictive marginal approach was used to identify factors independently associated with awareness of selected vaccine-preventable infections/diseases and corresponding vaccines.

Results—Among the surveyed population, from 24.6 to 72.1% reported vaccination for recommended vaccines. Awareness of vaccine-preventable diseases among adults aged ≥19 years ranged from 63.4% to 94.0% (63.4% reported awareness of HPV, 71.5% reported awareness of tetanus, 72.0% reported awareness of pertussis, 75.4% reported awareness of HZ, 75.8% reported awareness of hepatitis B, 83.1% reported awareness of pneumonia, and 94.0% reported awareness of influenza). Awareness of the corresponding vaccines among adults aged ≥19 years ranged from 59.3% to 94.1% (59.3% HZ vaccine, 59.6% HPV vaccine, 64.3% hepatitis B vaccine, 66.2% pneumococcal vaccine, 86.3% tetanus vaccines, and 94.1% influenza vaccine). In multivariable analysis, being female and being a college graduate were significantly associated with a higher level of awareness for majority of vaccine-preventable diseases, and being female, being a college graduate, and working as a health care provider were significantly associated with a higher level of awareness for majority of corresponding vaccines.

[*]Corresponding author at: National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention, 1600 Clifton Road, NE, Mail Stop A-19, Atlanta, GA 30333, USA. lhp8@cdc.gov (P.-j. Lu).

Conflict of interest statement

All authors have no conflicts of interest to be stated.

Disclaimer

The findings and conclusions in this manuscript are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

Conclusions—Although adults in this survey reported high levels of awareness for most vaccines recommended for adults, self-reported vaccination coverage was not optimal. Combining interventions known to increase uptake of recommended vaccines, such as patient reminder/recall systems and other health-care system-based interventions, and ensuring patients' vaccination needs are assessed, are needed to improve vaccination of adults.

Keywords

Adult vaccination; Vaccine-preventable diseases; Adult vaccine awareness; Adult vaccination

1. Introduction

The prevalence of vaccine-preventable diseases is higher among adults than among children [1–4]. Every year thousands of adults in the United States suffer serious health problems, are hospitalized, and die due to diseases for which vaccines are available [5]. During the 2015–16 season, influenza hospitalization rates ranged from 20.3 per 100,000 to 321.1 per 100,000, depending on age group, with an estimated 310,000 hospitalizations [2]. About 74% of these hospitalizations occurred among adults aged 50 years and older [2]. Approximately 28,000 cases of invasive pneumococcal disease occur annually, of which 90% are among adults [5,6]. Human papillomavirus (HPV) is the most common sexually transmitted infection in the United States. More than 50% of sexually active men and women will acquire HPV infection in their lifetime [7], and an estimated 6.2 million persons aged 14–44 years are newly infected every year [8,9]. Of these new infections, 74% occur among persons age 15–24 years [8]. Approximately 1 million cases of herpes zoster (HZ, shingles) are reported annually among older adults in the United States, with approximately 10–50% of those affected suffering post-herpetic neuralgia [4,10,11].

Vaccination is the most effective strategy for preventing vaccine-preventable diseases and their complications. The adult immunization schedule [12], updated annually by the Advisory Committee on Immunization Practices (ACIP), provides current recommendations for vaccinating adults. However, adult vaccination coverage remains low for most routinely recommended vaccines and is well below *Healthy People 2020* targets [13–15]. Low vaccination coverage might be related to low awareness of both vaccine-preventable diseases and recommended vaccines for adults [13]. Data on awareness among adults in the United States of vaccine-preventable diseases and recommended vaccines are limited [16].

We used data from a 2015 internet panel survey of a nationally representative sample of U.S. adults aged ≥19 years to assess their awareness of selected vaccine-preventable diseases and vaccines including influenza, pneumococcal (including both polysaccharide and conjugate vaccines), tetanus (tetanus-diphtheria toxoid [Td] and tetanus diphtheria with acellular pertussis [Tdap]), HPV, and herpes zoster, and their self-reported vaccination status. We evaluated factors independently associated with awareness of selected vaccine-preventable diseases and vaccines among adult populations.

2. Methods

An Internet panel survey of U.S. adults was conducted in early 2015 for the Centers for Diseases Control and Prevention (CDC) by Abt Associates, Inc. (Cambridge, Massachusetts). Survey participants were recruited from KnowledgePanel®, a pre-existing national probability-based internet panel operated by Gesellschaft für Konsumforschung (GfK) [17]. A nationally representative sample of U.S. adults ≥19 years of age was selected; Hispanics, non-Hispanic blacks, and non-Hispanic other adults or adults identifying multiple races were oversampled. The survey field period was February 27 to March 23, 2015. Overall, 4016 notification emails were sent to sampled panel members, 2760 were confirmed contacts (defined as touching the opening page of the survey either as a click-through from the email link provided by GfK or directly from the KnowledgePanel® member portal), and 2683 completed the survey, with a response rate of 67%, and cooperation rate of 97%. Estimates were weighted to the adult population of the United States.

The survey collected information about the National Vaccine Advisory Committee Standards for Adult Immunization Practice [18], including adult experience of vaccination assessment, recommendation, offer, and referral during healthcare and/or pharmacy visits in the past 12 months. The survey also collected other vaccination-related information, including adult vaccination, knowledge of vaccine-preventable diseases and vaccines.

We examined awareness of selected vaccine-preventable diseases and vaccines by selected covariates. Persons with health conditions that increase the risk for pneumococcal infections were defined as persons who currently have one or more of the following conditions: chronic lung condition (i.e., asthma, chronic bronchitis, chronic obstructive pulmonary disease, emphysema), any kind of liver condition, weak or failing kidneys, a chronic heart condition (i.e., coronary heart disease, angina, heart attack, or other heart disease), diabetes other than gestational diabetes, and a weakened immune system. To determine travel status, respondents were asked “Have you ever traveled outside of the United States to countries other than Europe, Japan, Australia, New Zealand or Canada, since 1995?” For the purposes of this study we referred to travelers to hepatitis B-endemic areas as “travelers”.

We used SAS release 9.3 (SAS Inc. Cary, NC) and SUDAAN 11.0 (RTI, Research Triangle Park, NC) to analyze the data. All analyses were weighted to reflect the U.S. adult population. T-tests were used to test for differences in vaccination coverage and awareness of selected vaccine-preventable diseases and vaccines by the selected covariates. A two-sided significance level of 0.05 was adopted for all statistical tests. A multivariable logistic regression model with a predictive marginal approach was used to identify factors independently associated with awareness of selected vaccine-preventable diseases and vaccines among adult populations.

3. Results

Characteristics of the study population are shown in Table 1. In our study population, 5.5% of participants reported that cost was a barrier to receiving vaccines in the past 12 months,

and 5.2% reported that they were unable to receive a vaccine in the past 12 months because their insurance did not cover the cost.

Among all adults aged ≥19 years, 50.0% reported influenza vaccination; influenza vaccination was significantly higher among those aged 50–64 years (50.3%) and aged ≥65 years (74.7%) compared with those aged 19–49 years (41.3%) (Table 2). In adults aged 19–64 years with conditions that increase the risk for pneumococcal disease, 37.5% reported pneumococcal vaccination compared with 72.1% of adults aged ≥65 years. For adults aged ≥19 years, 67.9% reported tetanus vaccination with a greater proportion of those aged 50–64 years (72.2%) and those aged ≥65 years (81.4%) reporting vaccination compared with adults aged 19–49 years (61.0%). Among adults aged ≥19 years, 24.6% reported hepatitis B vaccination. Of adults ≥60 years, 35.2% reported herpes zoster vaccination. HPV vaccination was reported by 27.1% of females aged 19–26 years (Table 2).

Overall awareness of vaccine-preventable diseases and vaccines was high for most demographic groups. Among all adults aged ≥19 years, awareness of vaccine-preventable diseases ranged from 63.4% (HPV) to 94.0% (influenza) (Table 3). Awareness among adults of the corresponding vaccines against these diseases was similar to or higher than awareness of the disease for influenza, HPV, and Td/Tdap vaccines; vaccine awareness was lower than disease awareness for pneumococcal, hepatitis B, and HZ vaccines (Table 4).

Table 3 also presents the results of bi-variable analyses to assess characteristics associated with higher or lower level of awareness of selected vaccine-preventable diseases. Being a college graduate, and having a high-risk condition were significantly associated with a higher level of awareness of all the vaccine-preventable diseases assessed among adults aged ≥19 years. Being female, and having private health insurance were significantly associated with a higher level of awareness for 6 of 7 of the vaccine-preventable diseases assessed. Being in an older age group was significantly associated with a higher level of awareness for all of the diseases assessed except hepatitis B and HPV. Hispanic ethnicity was significantly associated with a lower level of awareness of all the vaccine-preventable diseases assessed. Report of being “never married” was significantly associated with a lower level of awareness of all the vaccine-preventable diseases assessed except hepatitis B, HZ, and HPV.

Table 4 shows the results of bi-variable analyses to assess characteristics associated with level of awareness of selected vaccines. Being female, having a high-risk condition, living in a household with an income of $25,000–$74,999, living in a household with an income ≥ $75,000, and having private health insurance were significantly associated with a higher level of awareness for 5 of the 6 vaccines assessed among adults aged ≥19 years. Being a college graduate was significantly associated with a higher level of awareness for all of the vaccines assessed except influenza and pneumococcal vaccines. Being in an older age group was significantly associated with a higher level of awareness for all of the vaccines assessed except Td/Tdap and HPV. Non-Hispanic black race/ethnicity was significantly associated with a lower level of awareness for all of the vaccines assessed except hepatitis B. Hispanic ethnicity was significantly associated with a lower level of awareness for all the vaccines assessed except HPV. Report of being “never married” was significantly associated with a lower level of awareness of all of the vaccines assessed except Hepatitis B and HPV.

Table 5 shows the results of multivariable analyses to assess characteristics independently associated with higher or lower level of awareness of selected vaccine-preventable diseases. Being female was significantly associated with a higher level of awareness for all of the vaccine-preventable diseases assessed among adults aged ≥19 years except influenza. Being a college graduate was significantly associated with a higher level of awareness for all of the vaccine-preventable diseases assessed among adults aged ≥19 years except pneumonia and HZ disease. Hispanic ethnicity was significantly associated with a lower level of awareness for tetanus, pertussis, HZ, and HPV disease.

Table 6 shows the results of multivariable analyses to assess characteristics associated with higher or lower level of awareness of selected vaccines. Being female and being a college graduate were significantly associated with a higher level of awareness for all vaccines assessed among adults aged ≥19 years except influenza and pneumococcal vaccines. Volunteering or working in a healthcare setting was associated with a higher awareness of all vaccines assessed except influenza and Td/Tdap vaccines. Being in an older age group was significantly associated with a higher level of awareness for all vaccines except influenza, hepatitis B, and Td/Tdap. Non-Hispanic black race/ethnicity was significantly associated with a lower level of awareness for all vaccines except influenza, pneumococcal, and hepatitis B vaccines.

4. Discussion

Overall, adult vaccination coverage was low, especially among younger adults. Awareness of selected vaccine-preventable diseases among adults aged ≥19 years ranged from a high of 94.0% (influenza) to a low of 63.4% (HPV, though awareness was 66.8% for adults aged 19–26 years), and awareness of vaccines ranged from 94.1% (influenza) to 59.3% (HZ, though awareness was 73.4% for adults aged ≥60 years). The characteristics that were associated with awareness of selected vaccine-preventable diseases and vaccines varied by diseases and vaccines. To our knowledge, this is the first comprehensive assessment of awareness of selected vaccine-preventable diseases and vaccines recommended for adults. This study provides baseline data for monitoring of U.S. adults' awareness of selected vaccine-preventable diseases and vaccines.

The percentages of persons vaccinated with adult vaccines in this report is similar to that from other national studies, especially for HZ and HPV vaccination [13,14,19]. Several studies have demonstrated persistent racial/ethnic differences in receipt of routinely recommended adult vaccines [13,14,19]. Previous studies also found that having health insurance coverage and a usual place for health care are each associated with higher vaccination coverage among adults [13,20–22]. Characteristics that might contribute to low vaccination coverage among adult populations might include limited public awareness about adult vaccinations, lack of vaccine requirements for adults, lack of provider assessment, recommendation, and referral of routine vaccinations for adults during health care visits, the cost of stocking vaccines, inadequate and/or inconsistent payment for vaccines and vaccine administration, complexities in adult vaccine and administration payment by private as well as public insurers, and lack of health insurance and limited funding for programs to vaccinate uninsured adults [13,20–29].

While cost is often cited as a potential barrier to receiving vaccines, this study found only 5.5% of respondents reported that cost was a barrier to receiving vaccines in the past 12 months, and 5.2% of participants reported that they were unable to receive a vaccine in the past 12 months because their insurance did not cover the cost. This was a small portion of the population and indicated that cost was not as big a barrier as we think for adult populations. The Patient Protection and Affordable Care Act requires that certain clinical preventive services including all ACIP recommended vaccines be provided at no cost by qualified health plans and with no or limited cost-sharing under Medicare. These policy changes should help to improve adult vaccination coverage [30,31].

Furthermore, in our study, awareness was generally high for most vaccine-preventable diseases and vaccines. Awareness for some vaccine-preventable diseases and vaccines were particularly high. For example, awareness of both influenza disease and influenza vaccine was as high as 94%. High awareness but low vaccination coverage seen in the study might indicate that high awareness does not always result in high vaccination coverage, and awareness was not enough to motivate individuals to get vaccinated [32]. Further study is needed to understand the role of awareness on vaccination seeking and vaccination accepting behavior. Possible reasons for higher awareness of influenza disease and vaccine include the prevalence of influenza and the high rates of influenza-related morbidity and mortality among adults in the United States, the seasonality of influenza compared to other diseases that do not have seasonal peaks, media attention that is usually pervasive during influenza seasons, and influenza vaccination promotion activities and events organized by national and local organizations [1,13,33–35].

Overall, lower awareness for some vaccine-preventable diseases and vaccines could be a consequence of providers not recommending vaccination to their adult patients. More physician contacts may indicate more opportunities to discuss their health status and vaccination indications with their providers and thus patients may know or understand more about diseases and vaccinations. Failure to seek out routine and preventive medical care might be related to low awareness of some vaccine-preventable diseases and recommended vaccines. For example, about 26% of adults under 50 years did not see a provider in the past 12 months (CDC unpublished data). Individuals who did not see a provider in the past 12 months had lower vaccination coverage with the exception of hepatitis B and HPV vaccines based on our study. Awareness of the need for vaccinations might increase the frequency of provider visits. Low awareness might lead to possibly lower chance of accepting vaccination if offered. Since patients may not seek vaccination services, each provider visit, including non-routine visits, is a critical opportunity to ensure provider implementation of vaccination services, assessing vaccination needs and recommending necessary adult vaccines to protect adult patients and improve coverage.

Adult awareness of both HZ and HPV vaccines for vaccination recommended groups (73.4% among those ≥60 years, and 65.8% among those 19–26 years, respectively) was overall lower than awareness of influenza vaccine (94.1% among those ≥19 years). This lower awareness might be due to the relatively more recent national recommendations for these vaccines (first recommended for adults in 2006–2007) compared with influenza vaccine and that influenza vaccination is promoted and offered annually, providing many

opportunities to increase awareness [8,36]. Awareness of HZ vaccine based on our study has increased compared with the 2007 estimate (27%), however awareness of HPV vaccine decreased compared with the 2007 estimate (76–83%) [37,38]. Efforts should be directed to provide comprehensive, accessible, and appropriate communication messages on HPV vaccine [8]. Patients aged ≥60 years must also be fully educated on the potential risks and benefits of the HZ vaccine and vaccine payment options. Improved awareness about shingles vaccine could improve vaccination coverage and further reduce incidence of shingles and its associated complications.

Several racial and ethnic differences in awareness of vaccine-preventable diseases and vaccines were noted: adults of non-Hispanic black and Hispanic race/ethnicity had significantly lower awareness for most diseases and vaccines compared with adults of non-Hispanic white race/ethnicity. Some studies have demonstrated lower disease and vaccine-related knowledge levels among adults of non-Hispanic black and Hispanic race/ethnicity compared with adults of non-Hispanic white race/ethnicity [37–41]. This finding might reflect lower prevalence of vaccination services being offered to black and Hispanic patients, and lower knowledge levels can limit the ability of patients to request vaccination when appropriate [37–41]. Female respondents had a higher level of awareness of most of the diseases and vaccines than men. This finding remained after controlling for other factors. Consistent with other studies, higher education level was also associated with higher awareness of most diseases and vaccines [37–41]. These results suggest that efforts should be made to provide better education about diseases and vaccines to non-Hispanic black, Hispanic, and other race/ethnicity adults, adult males, and adults with lower levels of education.

The findings from this study showed that working or volunteering in a health care setting was associated with higher level of awareness of many vaccines compared with not working or volunteering in this setting. Additionally, up to one third of respondents who reported working or volunteering in health care did not indicate awareness of select vaccines (3% reported not being aware of influenza vaccine, 10% Td/Tdap, 23% HPV, 30% pneumococcal, 33% hepatitis B, and 34% shingles). Individuals who work or volunteer in health care settings can acquire infectious diseases from patients or transmit infectious diseases to patients, visitors, other staff, and their own families [42,43]. By 2014, influenza, Tdap, and hepatitis B vaccination coverage among health care personnel were not optimal (65.4%, 42.1%, and 60.7%, respectively) [13]. Employer vaccination requirements or on on-site vaccination services were important to improve vaccination coverage and reduce transmission of infectious disease in health care settings [29,42].

The findings in this study are subject to limitations. First, data for this study were collected by self-report. Vaccination was not verified by medical records and may be subject to recall bias. However, adult self-reported vaccination status has been shown to be sensitive and specific [44–47]. Second, non-coverage and nonresponse bias may remain even after weighting adjustments. Finally, those who respond to internet surveys or agree to be on internet survey panels may not be representative of the US adult population.

The findings from this study demonstrate previously reported low vaccination coverage among U.S. adults, but relatively high levels of awareness. Further research is needed to understand the role of awareness of vaccine-preventable diseases and vaccines [48] and ways to reduce the gap between awareness and vaccination. The Standards for Adult Immunization Practice should be incorporated into routine clinical practice for every visit regardless of clinical setting [18]. Combining interventions known to increase uptake of recommended vaccines, such as patient reminder/recall systems and healthcare system-based interventions (e.g., client reminder and recall systems, clinic-based client education, expanded access in health care settings, provider assessment and feedback, provider reminders, and use of standing order programs), and ensuring patients' vaccination needs are assessed, are needed to improve vaccination of adults [18,29].

Acknowledgments

We thank James A. Singleton and Stacie M. Greby for their thoughtful review of the manuscript.

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Table 1

Demographic, health, health care employment, and health care access characteristics of adults aged ≥19 years participating in an Internet panel survey, on vaccination assessment and recommendations by providers at healthcare visits, United States, February–March 2015.

	All adults	
Characteristic	**Sample (N)**	**Weighted[a] %**
Total	2683	100.0
Age		
19–49 years	1198	54.9
50–64 years	767	26.3
≥65 years	718	18.8
Sex		
Male	1282	48.2
Female	1401	51.8
Race/ethnicity		
Hispanic	636	15.1
Non-Hispanic white	793	65.6
Non-Hispanic black	613	11.5
Other	641	7.8
Marital status		
Married or unmarried couple	1602	60.4
Divorced, widowed, or separated	516	16.7
Never married	565	22.9
Education level		
≤high school	992	40.7
Some college or technical school	544	22.0
College graduate or higher education	1147	37.4
Employment		
Employed	1411	56.1
Unemployed	203	8.1
Not in work force	1069	35.8
Annual household income		
<$25,000	561	20.1
$25,000–$74,999	1127	38.9
≥$75,000	995	40.9
Region		
Northeast	437	17.8
Midwest	474	21.6
South	1028	37.2
West	744	23.4
Metropolitan Statistical Area		
Yes	2369	85.1

Characteristic	All adults	
	Sample (N)	Weighted[a] %
No	314	14.9
Conditions that increase risk for pneumococcal disease[a]		
Yes	823	30.0
No	1685	70.0
Health-care personnel[b]		
Yes	198	6.6
No	2473	93.4
Health insurance		
Private	1729	67.2
Public only	757	25.3
None	186	7.5
Provider visit for health care in the past 12 months		
Yes	2297	95.1
No	120	4.9
Unable to receive vaccine due to cost in the past 12 months		
Yes	152	5.5
No	2428	94.5
Unable to receive vaccine because insurance did not cover in the past 12 months		
Yes	139	5.2
No	2413	94.8
Living with a child <18 years		
Yes	788	32.6
No	1895	67.4

[a]Currently have one or more chronic medical conditions (a doctor, nurse, or other medical professional ever said that you have at least one of the following): lung or breathing problem (e.g., asthma or other chronic lung problem), any kind of liver condition, any kind of kidney condition, or any kind of heart condition (other than high blood pressure), diabetes or sugar diabetes (other than during pregnancy); and respond that still have that condition/those conditions), or currently have weakened immune system (a doctor, nurse, or other medical professional ever said that you have a weakened immune system, and still have that condition).

[b]Volunteered or worked in a hospital, medical clinic, doctor's office, dentist's office, nursing home, pharmacy, or some other health-care facility in the past 12 months.

Table 2

Vaccination reported by adults aged ≥19 years participating in a panel survey on vaccination assessment and recommendations by providers at healthcare visits, by demographic, health and travel characteristics, February–March 2015.

Vaccinations and age groups	Vaccination coverage % (95% CI)
Influenza vaccination (last 12 months)	
≥19 years	50.0 (47.3–52.6)
19–49 years	41.3 (37.6–45.0)
50–64 years	50.3 (45.6–55.0)[a]
≥65 years	74.7 (69.0–79.6)[a]
Pneumococcal vaccination (ever received)	
19–64 years with conditions that increase risk for pneumococcal disease[b]	37.5 (31.1–44.4)
≥65 years	72.1 (66.1–77.4)[a]
Tetanus vaccination (ever received)	
≥19 years	67.9 (65.3–70.5)
19–49 years	61.0 (57.1–64.8)
50–64 years	72.2 (67.9–76.1)[a]
≥65 years	81.4 (76.1–85.7)[a]
Hepatitis B vaccination (ever received)	
≥19 years	24.6 (22.2–27.2)
19–49 years	27.6 (24.2–31.3)
≥50 years	20.9 (17.7–24.4)[a]
Travelers to hepatitis B-endemic areas aged ≥19 years	34.8 (30.3–39.6)
Non-travelers to hepatitis B-endemic areas aged ≥19 years	19.5 (16.8–22.5)[a]
Shingles vaccination (ever received)	
≥60 years	35.2 (30.2–40.6)
60–64 years	25.2 (18.0–34.2)
≥65 years	40.1 (33.7–46.9)[a]
Human papillomavirus vaccination (ever received)	
Male aged 19–26 years	_[c]
Female aged 19–26 years	27.1 (18.2–38.4)

[a] $p < 0.05$ by T test comparing against reference group (50–64 and 65+ vs. 19–49; 65+ vs 19–64 HR; 50+ vs 19–49; 19+ travelers vs 19+ non-travelers; 65+ vs 60–64).

[b] Currently have one or more chronic medical conditions (a doctor, nurse, or other medical professional ever said that you have at least one of the following): lung or breathing problem (e.g., asthma or other chronic lung problem), any kind of liver condition, any kind of kidney condition, or any kind of heart condition (other than high blood pressure), diabetes or sugar diabetes (other than during pregnancy); and respond that still have that condition/those conditions), or currently have weakened immune system (a doctor, nurse, or other medical professional ever said that you have a weakened immune system, and still have that condition).

[c] Estimate may not be reliable due to relative standard error (RSE) > 30%.

Table 3

Awareness of selected vaccine-preventable diseases among adults aged ≥19 years participating in an Internet panel survey on vaccination assessment and recommendations by providers at healthcare visits, by demographic, health, health care employment, and health care access characteristics, United States, February–March 2015.

Characteristic	Disease awareness						
	Influenza % (95% CI)	Pneumonia % (95% CI)	Hepatitis B % (95% CI)	Tetanus % (95% CI)	Pertussis % (95% CI)	Shingles % (95% CI)	HPV % (95% CI)
Total	94.0 (92.7–95.1)	83.1 (81.0–84.9)	75.8 (73.5–78.0)	71.5 (69.1–73.7)	72.0 (69.6–74.2)	75.4 (73.1–77.6)	63.4 (60.8–65.9)
Age							
19–26 years	NA	NA	NA	NA	NA	NA	66.8 (59.2–73.6)
≥27 years[a]	NA	NA	NA	NA	NA	NA	62.8 (60.1–65.5)
19–49 years[a]	92.6 (90.5–94.3)	80.0 (77.0–82.8)	74.7 (71.3–77.8)	67.3 (63.8–70.6)	68.5 (65.0–71.7)	NA	NA
50–64 years	95.1 (93.2–96.6)	86.3 (82.9–89.1)[b]	77.9 (73.9–81.4)	75.7 (71.5–79.3)[b]	74.3 (70.2–78.1)[b]	NA	NA
≥65 years	96.3 (93.5–97.9)[b]	87.5 (83.0–91.0)[b]	76.1 (70.4–81.0)	77.9 (72.5–82.5)[b]	78.8 (73.5–83.2)[b]	NA	NA
19–59 years[a]	NA	NA	NA	NA	NA	73.3 (70.5–75.9)	NA
≥60 years	NA	NA	NA	NA	NA	81.1 (76.9–84.6)[b]	NA
Sex							
Male[a]	92.8 (90.7–94.4)	78.5 (75.2–81.5)	70.2 (66.6–73.6)	67.1 (63.5–70.6)	64.6 (61.0–68.1)	69.5 (65.9–72.9)	53.9 (50.1–57.7)
Female	95.1 (93.3–96.4)	87.3 (84.8–89.4)[b]	81.0 (78.0–83.6)[b]	75.5 (72.2–78.4)[b]	78.7 (75.7–81.5)[b]	80.9 (77.9–83.5)[b]	72.1 (68.8–75.3)[b]
Race/ethnicity							
Hispanic	88.4 (83.7–91.9)[b]	75.3 (70.2–79.7)[b]	66.6 (61.2–71.6)[b]	55.9 (50.4–61.2)[b]	53.3 (47.9–58.6)[b]	62.1 (56.6–67.3)[b]	54.9 (49.5–60.2)[b]
Non-Hispanic white[a]	95.9 (94.2–97.1)	85.5 (82.7–87.9)	77.5 (74.2–80.4)	76.5 (73.2–79.5)	77.1 (73.9–80.0)	79.2 (76.1–82.1)	65.9 (62.3–69.3)
Non-Hispanic black	90.2 (86.8–92.9)[b]	80.8 (76.5–84.4)	77.1 (72.6–81.1)	63.6 (58.7–68.2)[b]	68.7 (64.0–73.1)[b]	72.6 (67.9–76.8)[b]	60.5 (55.7–65.1)
Other	94.1 (91.7–95.8)	81.2 (77.4–84.5)	77.7 (73.7–81.2)	70.8 (66.5–74.6)[b]	69.7 (65.4–73.7)[b]	73.6 (69.5–77.4)[b]	62.9 (58.4–67.1)
Marital status							
Married or unmarried couple[a]	95.6 (94.2–96.7)	84.5 (82.1–86.7)	76.2 (73.3–78.9)	73.4 (70.4–76.2)	74.3 (71.4–77.0)	76.1 (73.2–78.7)	63.4 (60.2–66.6)
Divorced, widowed, or separated	93.8 (90.4–96.0)	83.3 (78.0–87.5)	77.8 (72.1–82.6)	76.7 (71.0–81.5)	74.6 (68.9–79.7)	79.7 (74.3–84.2)	62.5 (56.1–68.5)
Never married	89.8 (85.6–92.9)[b]	79.1 (73.9–83.4)[b]	73.2 (67.7–78.1)	62.5 (56.8–67.9)[b]	63.9 (58.2–69.2)[b]	70.6 (65.2–75.6)	63.9 (58.2–69.1)
Education level							

Characteristic	Disease awareness						
	Influenza % (95% CI)	Pneumonia % (95% CI)	Hepatitis B % (95% CI)	Tetanus % (95% CI)	Pertussis % (95% CI)	Shingles % (95% CI)	HPV % (95% CI)
≤High school[a]	90.7 (88.1–92.8)	79.2 (75.8–82.3)	71.8 (68.0–75.4)	66.3 (62.4–70.0)	66.5 (62.6–70.2)	72.6 (68.8–76.1)	54.6 (50.4–58.6)
Some college or technical school	95.5 (92.3–97.4)[b]	85.0 (80.3–88.8)[b]	75.4 (69.9–80.2)	72.6 (67.0–77.6)	73.2 (67.6–78.1)[b]	74.7 (69.2–79.5)	63.9 (58.0–69.4)[b]
College graduate or higher education	96.6 (95.0–97.7)[b]	86.1 (83.0–88.7)[b]	80.4 (76.9–83.4)[b]	76.4 (72.7–79.7)[b]	77.2 (73.6–80.4)[b]	78.9 (75.4–82.1)[b]	72.7 (69.0–76.2)[b]
Employment							
Employed[a]	93.6 (91.7–95.1)	81.3 (78.4–83.9)	74.4 (71.1–77.3)	70.5 (67.3–73.6)	70.3 (67.1–73.4)	73.8 (70.6–76.8)	65.6 (62.3–68.9)
Unemployed	89.1 (81.9–93.6)	77.5 (68.9–84.3)	72.9 (64.0–80.2)	63.5 (54.3–71.8)	63.1 (53.9–71.4)	67.4 (58.4–75.3)	60.3 (51.0–68.9)
Not in work force	95.6 (93.7–97.0)	87.1 (84.0–89.7)[b]	78.7 (75.0–82.1)	74.7 (70.8–78.3)	76.5 (72.8–79.9)[b]	79.8 (76.2–83.0)[b]	60.5 (56.2–64.7)
Annual household income							
<$25,000[a]	88.6 (84.4–91.7)	78.4 (73.4–82.7)	73.7 (68.3–78.4)	64.6 (59.0–69.8)	66.7 (61.2–71.9)	73.1 (67.8–77.8)	58.2 (52.4–63.8)
$25,000–$74,999	93.9 (91.8–95.5)[b]	84.3 (81.2–87.0)[b]	77.7 (74.1–80.9)	74.3 (70.7–77.7)[b]	74.5 (70.9–77.8)[b]	77.6 (74.1–80.8)	62.5 (58.4–66.4)
≥$75,000	96.7 (94.8–97.9)[b]	84.2 (80.8–87.1)[b]	75.1 (71.2–78.6)	72.1 (68.2–75.8)[b]	72.1 (68.2–75.7)	74.5 (70.7–78.0)	66.8 (62.7–70.6)[b]
Region							
Northeast[a]	92.7 (88.8–95.3)	85.3 (80.7–88.9)	81.8 (76.7–85.9)	76.0 (70.4–80.9)	74.3 (68.7–79.2)	78.3 (72.9–82.9)	66.5 (60.4–72.1)
Midwest	95.1 (92.0–97.0)	85.4 (80.8–89.1)	76.1 (70.6–80.8)	74.5 (69.0–79.2)	75.5 (70.1–80.1)	78.3 (73.0–82.8)	66.6 (60.8–72.0)
South	94.0 (91.9–95.6)	81.6 (78.0–84.7)	73.9 (69.9–77.5)[b]	69.0 (65.0–72.8)[b]	69.9 (65.9–73.6)	73.5 (69.5–77.0)	60.8 (56.5–64.9)
West	93.9 (90.6–96.0)	81.6 (77.2–85.4)	74.1 (69.2–78.4)[b]	69.1 (64.1–73.7)	70.2 (65.3–74.7)	73.7 (68.9–78.0)	62.2 (57.1–67.0)
Metropolitan Statistical Area							
Yes[a]	93.5 (92.0–94.7)	82.4 (80.2–84.5)	75.5 (73.0–77.8)	70.4 (67.8–72.9)	70.8 (68.3–73.3)	74.8 (72.3–77.1)	63.0 (60.2–65.7)
No	96.7 (93.5–98.3)[b]	86.9 (81.5–90.9)	77.6 (71.0–83.1)	77.3 (70.8–82.6)[b]	78.3 (72.0–83.5)[b]	79.1 (72.8–84.3)	65.6 (58.6–71.9)
Persons with medical conditions[c]							
Yes	96.5 (94.5–97.8)[b]	87.7 (84.1–90.6)[b]	80.5 (76.1–84.2)[b]	78.0 (73.6–81.9)[b]	80.5 (76.2–84.2)[b]	83.3 (79.3–86.7)[b]	58.9 (53.6–63.9)[b]
No[a]	93.6 (91.9–95.0)	81.6 (79.0–84.0)	74.2 (71.3–76.9)	68.9 (65.9–71.8)	69.0 (66.1–71.9)	72.5 (69.6–75.3)	65.5 (62.5–68.5)
Health-care personnel[d]							
Yes	91.8 (85.7–95.4)	77.4 (68.7–84.3)	73.1 (63.6–80.8)	68.1 (58.4–76.4)	72.3 (63.0–80.1)	72.7 (63.6–80.2)	74.0 (65.6–81.0)[b]
No[a]	94.3 (92.9–95.4)	83.7 (81.6–85.6)	76.2 (73.8–78.4)	71.9 (69.4–74.2)	72.2 (69.7–74.5)	75.9 (73.5–78.1)	62.8 (60.1–65.4)
Health insurance							

Vaccine. Author manuscript; available in PMC 2018 February 20.

Characteristic	Disease awareness						
	Influenza % (95% CI)	**Pneumonia % (95% CI)**	**Hepatitis B % (95% CI)**	**Tetanus % (95% CI)**	**Pertussis % (95% CI)**	**Shingles % (95% CI)**	**HPV % (95% CI)**
Private	95.2 (93.7–96.4)[b]	84.5 (82.0–86.7)[b]	76.6 (73.7–79.3)[b]	73.4 (70.5–76.2)[b]	73.7 (70.7–76.4)[b]	76.2 (73.4–78.9)[b]	67.0 (63.9–70.0)
Public only	92.6 (89.6–94.9)	83.5 (79.5–86.9)[b]	78.1 (73.6–82.0)[b]	71.5 (66.7–75.8)[b]	72.5 (67.8–76.7)[b]	76.4 (71.9–80.5)[b]	56.5 (51.3–61.5)
None[a]	89.8 (83.5–93.8)	72.0 (63.3–79.3)	64.7 (55.6–72.9)	56.9 (47.6–65.6)	57.8 (48.7–66.4)	66.1 (57.3–73.9)	57.4 (48.2–66.2)
Provider visit for health care in the past 12 months							
Yes	95.4 (94.1–96.4)	84.7 (82.6–86.6)	77.1 (74.6–79.4)	73.6 (71.0–76.0)	74.0 (71.4–76.4)	77.1 (74.6–79.4)	64.5 (61.7–67.2)
No[a]	90.7 (79.8–96.0)	79.1 (66.6–87.8)	76.0 (63.8–85.1)	65.0 (52.5–75.8)	71.9 (60.0–81.4)	72.8 (60.5–82.4)	69.9 (58.0–79.5)
Unable to receive vaccine due to cost in the past 12 months							
Yes	92.5 (83.7–96.7)	86.5 (78.0–92.0)	65.8 (54.1–75.8)[b]	67.0 (55.8–76.5)	65.1 (53.9–74.9)	68.0 (56.7–77.5)	57.5 (46.1–68.3)
No[a]	95.0 (93.7–96.0)	83.9 (81.8–85.8)	77.3 (74.9–79.6)	72.8 (70.3–75.2)	73.4 (71.0–75.7)	76.8 (74.4–79.0)	64.5 (61.8–67.1)
Unable to receive vaccine because insurance did not cover in the past 12 months							
Yes	91.1 (83.0–95.6)	79.6 (68.4–87.6)	67.7 (55.8–77.7)	66.3 (54.6–76.2)	65.8 (54.1–75.9)	70.9 (59.3–80.4)	52.0 (40.0–63.8)[b]
No[a]	95.0 (93.7–96.0)	84.1 (82.0–86.0)	77.4 (75.0–79.7)	73.1 (70.6–75.4)	73.4 (71.0–75.7)	76.8 (74.5–79.1)	64.9 (62.2–67.5)
Living with a child <18 years							
Yes	94.9 (92.6–96.6)	82.4 (78.8–85.6)	77.4 (73.4–80.9)	70.0 (65.8–74.0)	72.4 (68.2–76.1)	74.8 (70.7–78.5)	70.9 (66.7–74.8)[b]
No[a]	93.5 (91.8–94.9)	83.4 (80.9–85.6)	75.0 (72.1–77.7)	72.2 (69.2–74.9)	71.8 (68.8–74.5)	75.7 (72.9–78.4)	59.7 (56.5–62.8)

[a] Reference level.

[b] $p < 0.05$ by T test compared to reference level.

[c] Currently have one or more chronic medical conditions (a doctor, nurse, or other medical professional ever said that you have at least one of the following): lung or breathing problem (e.g., asthma or other chronic lung problem), any kind of liver condition, any kind of kidney condition, or any kind of heart condition (other than high blood pressure), diabetes or sugar diabetes (other than during pregnancy); and respond that still have that condition/those conditions), or currently have weakened immune system (a doctor, nurse, or other medical professional ever said that you have a weakened immune system, and still have that condition).

[d] Volunteered or worked in a hospital, medical clinic, doctor's office, dentist's office, nursing home, pharmacy, or some other health-care facility in the past 12 months.

Table 4

Awareness of selected vaccines among adults aged ≥19 years participating in an Internet panel survey on vaccination assessment and recommendations by providers at healthcare visits, by demographic, health, health care employment, and health care access characteristics, United States, February–March 2015.

Characteristic	Vaccine awareness					
	Influenza % (95% CI)	Pneumococcal % (95% CI)	Hepatitis B % (95% CI)	Td or Tdap % (95% CI)	Shingles % (95% CI)	HPV % (95% CI)
Total	94.1 (92.7–95.2)	66.2 (63.7–68.6)	64.3 (61.8–66.8)	86.3 (84.5–87.9)	59.3 (56.7–61.8)	59.6 (57.0–62.2)
Age						
19–26 years	NA	NA	NA	NA	NA	65.8 (58.2–72.6)
≥27 years[a]	NA	NA	NA	NA	NA	58.6 (55.9–61.3)
19–49 years[a]	92.1 (89.9–93.9)	56.9 (53.3–60.5)	66.8 (63.3–70.2)	85.5 (82.9–87.9)	NA	NA
50–64 years	96.3 (94.2–97.7)[b]	70.8 (66.5–74.7)[b]	63.3 (58.6–67.7)	87.2 (84.2–89.7)	NA	NA
≥65 years	96.6 (93.6–98.3)[b]	86.6 (81.9–90.1)[b]	58.6 (52.4–64.5)[b]	87.3 (82.9–90.7)	NA	NA
19–59 years[a]	NA	NA	NA	NA	53.9 (50.8–56.9)	NA
≥60 years	NA	NA	NA	NA	73.4 (68.8–77.5)[b]	NA
Sex						
Male[a]	93.9 (91.9–95.4)	61.9 (58.2–65.5)	59.3 (55.6–63.0)	83.4 (80.7–85.9)	53.5 (49.7–57.3)	50.9 (47.1–54.7)
Female	94.3 (92.2–95.9)	70.1 (66.6–73.3)[b]	69.0 (65.4–72.3)[b]	89.0 (86.5–91.0)[b]	64.6 (61.0–68.0)[b]	67.7 (64.3–71.0)[b]
Race/ethnicity						
Hispanic	90.3 (85.9–93.4)[b]	52.0 (46.7–57.3)[b]	56.6 (51.2–61.8)[b]	77.1 (71.9–81.6)[b]	43.8 (38.7–49.1)[b]	55.9 (50.6–61.2)
Non-Hispanic white[a]	95.2 (93.3–96.6)	71.1 (67.7–74.4)	65.3 (61.8–68.8)	91.0 (88.6–92.9)	64.4 (60.8–67.9)	61.5 (57.9–65.0)
Non-Hispanic black	91.4 (88.0–93.9)[b]	60.7 (55.7–65.4)[b]	65.8 (61.1–70.3)	72.3 (67.6–76.6)[b]	53.7 (48.9–58.4)[b]	54.1 (49.3–58.8)[b]
Other	96.1 (93.8–97.5)	59.9 (55.3–64.2)[b]	68.7 (64.4–72.7)	85.5 (82.1–88.3)[b]	54.2 (49.6–58.6)[b]	59.2 (54.7–63.5)
Marital status						
Married or unmarried couple[a]	95.2 (93.5–96.4)	68.8 (65.7–71.8)	65.6 (62.3–68.7)	89.4 (87.4–91.1)	62.8 (59.5–65.9)	60.5 (57.2–63.7)
Divorced, widowed, or separated	95.8 (92.8–97.5)	72.6 (66.7–77.9)	61.6 (55.2–67.6)	87.3 (82.9–90.7)	64.1 (57.8–69.9)	55.6 (49.1–61.8)
Never married	90.0 (85.7–93.2)[b]	54.3 (48.6–59.9)[b]	63.1 (57.4–68.4)	77.4 (72.3–81.7)[b]	46.4 (40.8–52.1)[b]	60.3 (54.6–65.6)
Education level						

Characteristic	Vaccine awareness					
	Influenza % (95% CI)	Pneumococcal % (95% CI)	Hepatitis B % (95% CI)	Td or Tdap % (95% CI)	Shingles % (95% CI)	HPV % (95% CI)
≤High school[a]	93.4 (91.1–95.2)	65.4 (61.5–69.2)	58.5 (54.4–62.4)	80.3 (77.1–83.2)	55.3 (51.2–59.4)	50.3 (46.2–54.4)
Some college or technical school	92.9 (89.1–95.5)	62.9 (57.0–68.4)	62.1 (56.1–67.8)	86.1 (81.4–89.7)[b]	56.1 (50.1–61.9)	61.5 (55.6–67.1)[b]
College graduate or higher education	95.5 (93.3–97.0)	68.9 (64.9–72.6)	72.0 (68.2–75.5)[b]	92.9 (90.8–94.6)[b]	65.4 (61.4–69.2)[b]	68.7 (64.8–72.3)[b]
Employment						
Employed[a]	94.3 (92.4–95.7)	60.8 (57.3–64.1)	66.0 (62.6–69.2)	87.6 (85.3–89.6)	57.3 (53.8–60.7)	64.0 (60.6–67.2)
Unemployed	89.0 (81.3–93.8)	56.6 (47.5–65.3)	56.8 (47.6–65.5)	78.2 (69.9–84.8)[b]	41.6 (33.1–50.5)[b]	54.6 (45.4–63.4)
Not in work force	94.9 (92.6–96.6)	76.8 (73.0–80.2)[b]	63.5 (59.2–67.6)	86.2 (83.0–88.8)	66.4 (62.2–70.4)[b]	54.0 (49.6–58.3)[b]
Annual household income						
<$25,000[a]	88.5 (84.1–91.8)	61.7 (56.0–67.1)	57.4 (51.5–63.0)	76.3 (71.1–80.7)	51.4 (45.6–57.2)	52.8 (47.0–58.5)
$25,000–$74,999	95.7 (93.8–97.0)[b]	69.3 (65.5–72.9)[b]	65.8 (61.8–69.6)[b]	87.7 (85.2–89.9)[b]	62.3 (58.3–66.2)[b]	58.5 (54.4–62.5)
≥$75,000	95.3 (93.0–96.9)[b]	65.4 (61.2–69.3)	66.3 (62.2–70.2)[b]	89.9 (87.0–92.2)[b]	60.3 (56.1–64.3)[b]	64.0 (59.9–67.9)[b]
Region						
Northeast[a]	95.1 (90.9–97.4)	73.1 (67.5–78.0)	66.7 (60.5–72.4)	87.5 (83.0–90.9)	62.7 (56.5–68.6)	68.0 (62.0–73.4)
Midwest	93.4 (89.5–96.0)	66.6 (60.7–72.1)	65.1 (59.2–70.6)	87.1 (82.7–90.5)	58.5 (52.5–64.3)	57.5 (51.5–63.2)[b]
South	93.8 (91.5–95.5)	66.5 (62.4–70.4)	61.5 (57.2–65.5)	85.1 (82.0–87.7)	59.7 (55.5–63.8)	57.4 (53.1–61.6)[b]
West	94.4 (91.6–96.3)	60.0 (54.9–64.9)[b]	66.4 (61.3–71.1)	86.7 (82.9–89.7)	56.6 (51.5–61.7)	58.9 (53.7–63.8)[b]
Metropolitan Statistical Area						
Yes[a]	93.8 (92.2–95.1)	65.6 (62.9–68.2)	65.1 (62.4–67.8)	86.1 (84.2–87.8)	59.4 (56.6–62.2)	60.8 (58.0–63.5)
No	95.7 (92.2–97.6)	69.4 (62.6–75.4)	59.7 (52.6–66.5)	87.5 (82.1–91.5)	58.4 (51.3–65.1)	52.8 (45.8–59.7)[b]
Persons with medical conditions[c]						
Yes	97.1 (94.9–98.4)[b]	80.9 (76.5–84.7)[b]	64.6 (59.4–69.5)	89.6 (86.4–92.1)[b]	67.5 (62.4–72.2)[b]	53.1 (47.8–58.2)[b]
No[a]	93.0 (91.1–94.5)	60.9 (57.8–63.9)	65.6 (62.6–68.6)	85.8 (83.5–87.8)	56.2 (53.0–59.3)	62.6 (59.6–65.6)
Health-care personnel[d]						
Yes	94.4 (88.5–97.4)	69.8 (60.3–77.9)	77.0 (68.2–84.0)[b]	89.7 (83.2–93.9)	65.7 (56.2–74.1)	76.9 (68.7–83.5)[b]
No[a]	94.2 (92.7–95.4)	66.0 (63.4–68.6)	63.6 (60.9–66.1)	86.2 (84.3–87.9)	58.9 (56.2–61.5)	58.6 (55.9–61.2)
Health insurance						

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Characteristic	Vaccine awareness					
	Influenza % (95% CI)	**Pneumococcal % (95% CI)**	**Hepatitis B % (95% CI)**	**Td or Tdap % (95% CI)**	**Shingles % (95% CI)**	**HPV % (95% CI)**
Private	95.2 (93.5–96.4)[b]	66.7 (63.6–69.7)[b]	67.1 (64.0–70.0)[b]	89.3 (87.2–91.1)[b]	61.1 (57.9–64.2)[b]	62.5 (59.3–65.5)
Public only	93.3 (90.2–95.4)	69.2 (64.4–73.7)[b]	61.0 (55.9–66.0)	82.3 (78.4–85.7)	60.3 (55.2–65.2)[b]	53.1 (47.9–58.2)
None[a]	89.4 (82.5–93.8)	50.2 (41.0–59.3)	52.1 (42.8–61.2)	74.3 (65.8–81.4)	39.4 (30.7–48.9)	57.3 (48.1–66.1)
Provider visit for health care in the past 12 months						
Yes	95.3 (93.9–96.4)	69.6 (67.0–72.2)[b]	65.6 (62.8–68.3)	87.9 (86.0–89.5)	62.4 (59.6–65.1)[b]	60.7 (57.9–63.5)
No[a]	88.9 (76.2–95.2)	53.0 (41.1–64.7)	64.6 (52.0–75.4)	84.7 (73.1–91.9)	48.6 (36.9–60.5)	64.7 (52.6–75.2)
Unable to receive vaccine due to cost in the past 12 months						
Yes	96.9 (92.6–98.7)	74.9 (64.8–82.8)	57.7 (46.2–68.5)	84.6 (76.3–90.4)	64.5 (53.3–74.4)	66.3 (55.2–75.8)
No[a]	94.5 (93.1–95.7)	66.5 (63.9–69.0)	65.5 (62.8–68.1)	87.4 (85.6–89.1)	59.7 (56.9–62.3)	60.2 (57.4–62.8)
Unable to receive vaccine because insurance did not cover in the past 12 months						
Yes	96.4 (91.9–98.4)	66.0 (54.1–76.2)	42.3 (31.0–54.5)[b]	81.9 (72.5–88.6)	63.2 (51.5–73.6)	52.2 (40.3–64.0)
No[a]	94.7 (93.2–95.8)	67.0 (64.3–69.5)	66.3 (63.6–68.9)	87.3 (85.5–89.0)	59.8 (57.1–62.5)	60.6 (57.9–63.2)
Living with a child <18 years						
Yes	93.4 (90.7–95.4)	61.9 (57.4–66.2)[b]	69.4 (65.0–73.4)	88.4 (85.4–90.8)	54.4 (49.8–58.9)	69.7 (65.5–73.7)
No[a]	94.4 (92.7–95.7)	68.3 (65.2–71.1)	61.9 (58.7–65.0)	85.3 (83.0–87.4)	61.6 (58.5–64.7)	54.7 (51.5–57.9)

[a] Reference group.

[b] $p < 0.05$ by *T* test compared to reference level.

[c] Currently have one or more chronic medical conditions (a doctor, nurse, or other medical professional ever said that you have at least one of the following): lung or breathing problem (e.g., asthma or other chronic lung problem), any kind of liver condition, any kind of kidney condition, or any kind of heart condition (other than high blood pressure), diabetes or sugar diabetes (other than during pregnancy); and respond that still have that condition/those conditions), or currently have weakened immune system (a doctor, nurse, or other medical professional ever said that you have a weakened immune system, and still have that condition).

[d] Volunteered or worked in a hospital, medical clinic, doctor's office, dentist's office, nursing home, pharmacy, or some other health-care facility in the past 12 months.

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Table 5

Multivariable-adjusted associations of demographic, health, health care employment, and health care access characteristics with awareness of selected vaccine-preventable diseases among adults aged ≥19 years participating in an Internet panel survey on vaccination assessment and recommendations by providers at healthcare visits, United States, February–March 2015.

	Disease awareness						
Characteristic	**Influenza Prevalence ratio (adjusted)[a]**	**Pneumonia Prevalence ratio (adjusted)[a]**	**Hepatitis B Prevalence ratio (adjusted)[a]**	**Tetanus Prevalence ratio (adjusted)[a]**	**Pertussis Prevalence ratio (adjusted)[a]**	**Shingles Prevalence ratio (adjusted)[a]**	**HPV Prevalence ratio (adjusted)[a]**
Age							
19–26 years	NA	NA	NA	NA	NA	NA	1.07 (0.94,1.23)
≥27 years	NA	NA	NA	NA	NA	NA	ref
19–49 years	ref	ref	ref	ref	ref	NA	NA
50–64 years	1.00 (0.97,1.03)	1.04 (0.98,1.10)	1.03 (0.96,1.11)	1.03 (0.95,1.12)	1.00 (0.92,1.08)	NA	NA
≥65 years	1.03 (1.00,1.06)	1.03 (0.95,1.13)	0.94 (0.84,1.06)	1.03 (0.92,1.16)	1.02 (0.91,1.15)	NA	NA
19–59 years	NA	NA	NA	NA	NA	ref	NA
≥60 years	NA	NA	NA	NA	NA	1.03 (0.95,1.12)	NA
Sex							
Male	ref	ref	ref	ref	ref	ref	ref
Female	1.00 (0.98,1.03)	1.10 (1.04,1.16)[b]	1.12 (1.05,1.20)[b]	1.08 (1.00,1.16)[b]	1.17 (1.09,1.26)[b]	1.13 (1.05,1.21)[b]	1.31 (1.19,1.44)[b]
Race/ethnicity							
Hispanic	0.98 (0.94,1.01)	0.95 (0.89,1.02)	0.93 (0.85,1.02)	0.83 (0.75,0.93)[b]	0.80 (0.72,0.89)[b]	0.87 (0.79,0.96)[b]	0.88 (0.79,0.99)[b]
Non-Hispanic white	ref	ref	ref	ref	ref	ref	ref
Non-Hispanic black	0.98 (0.95,1.00)	0.98 (0.92,1.04)	0.99 (0.92,1.07)	0.89 (0.81,0.97)[b]	0.94 (0.86,1.02)	0.95 (0.87,1.02)	0.93 (0.84,1.03)
Other	0.99 (0.96,1.02)	0.99 (0.94,1.05)	1.02 (0.96,1.10)	0.98 (0.91,1.06)	0.98 (0.91,1.05)	1.00 (0.93,1.07)	0.98 (0.89,1.07)
Marital status							
Married or unmarried couple	ref	ref	ref	ref	ref	ref	ref
Divorced, widowed, or separated	1.01 (0.98,1.04)	1.06 (0.98,1.15)	1.01 (0.92,1.11)	0.99 (0.91,1.09)	1.07 (0.97,1.18)	1.00 (0.92,1.09)	1.01 (0.90,1.14)
Never married	0.99 (0.96,1.03)	1.04 (0.95,1.14)	1.01 (0.91,1.13)	0.90 (0.79,1.02)	0.98 (0.86,1.11)	0.96 (0.87,1.07)	1.05 (0.91,1.21)
Education level							
≤high school	ref	ref	ref	ref	ref	ref	ref

Characteristic	Disease awareness						
	Influenza Prevalence ratio (adjusted)[a]	**Pneumonia Prevalence ratio (adjusted)[a]**	**Hepatitis B Prevalence ratio (adjusted)[a]**	**Tetanus Prevalence ratio (adjusted)[a]**	**Pertussis Prevalence ratio (adjusted)[a]**	**Shingles Prevalence ratio (adjusted)[a]**	**HPV Prevalence ratio (adjusted)[a]**
Some college or technical school	1.02 (0.99,1.05)	1.06 (0.99,1.13)	1.05 (0.96,1.15)	1.07 (0.97,1.18)	1.08 (0.98,1.19)	1.02 (0.93,1.12)	1.12 (0.99,1.26)
College graduate or higher education	1.03 (1.00,1.06)[b]	1.06 (0.99,1.13)	1.11 (1.03,1.20)[b]	1.09 (1.00,1.19)[b]	1.11 (1.02,1.21)[b]	1.07 (0.99,1.15)	1.22 (1.10,1.35)[b]
Employment							
Employed	ref	ref	ref	ref	ref	ref	ref
Unemployed	0.99 (0.94,1.04)	0.97 (0.87,1.08)	0.94 (0.81,1.08)	0.95 (0.83,1.09)	0.96 (0.84,1.09)	0.92 (0.80,1.05)	0.95 (0.80,1.13)
Not in work force	1.03 (1.01,1.05)[b]	1.05 (0.99,1.12)	1.05 (0.98,1.13)	0.98 (0.90,1.07)	1.03 (0.95,1.12)	1.02 (0.94,1.09)	0.99 (0.90,1.09)
Annual household income							
<$25,000	ref	ref	ref	ref	ref	ref	ref
$25,000–$74,999	1.00 (0.97,1.04)	1.01 (0.94,1.08)	0.99 (0.91,1.08)	1.04 (0.94,1.14)	0.97 (0.89,1.05)	0.98 (0.91,1.07)	0.91 (0.81,1.02)
≥$75,000	1.01 (0.98,1.05)	0.99 (0.91,1.07)	0.92 (0.83,1.02)	0.95 (0.84,1.06)	0.91 (0.83,1.01)	0.92 (0.84,1.02)	0.91 (0.80,1.03)
Region							
Northeast	ref	ref	ref	ref	ref	ref	ref
Midwest	1.01 (0.97,1.06)	0.98 (0.91,1.05)	0.93 (0.85,1.02)	0.97 (0.87,1.07)	0.97 (0.88,1.08)	0.99 (0.90,1.09)	1.06 (0.93,1.20)
South	1.02 (0.98,1.05)	0.96 (0.90,1.02)	0.90 (0.84,0.98)[b]	0.92 (0.84,1.01)	0.95 (0.86,1.03)	0.94 (0.86,1.02)	0.95 (0.84,1.07)
West	1.03 (0.99,1.06)	0.97 (0.91,1.04)	0.91 (0.84,1.00)[b]	0.95 (0.86,1.05)	1.00 (0.91,1.09)	0.96 (0.88,1.06)	0.98 (0.86,1.12)
Metropolitan Statistical Area							
Yes	ref	ref	ref	ref	ref	ref	ref
No	1.04 (1.02,1.05)[b]	1.03 (0.96,1.10)	1.03 (0.94,1.12)	1.04 (0.94,1.14)	1.07 (0.98,1.17)	1.04 (0.95,1.13)	1.03 (0.92,1.17)
Persons with medical conditions[c]							
Yes	1.01 (0.99,1.03)	1.05 (0.99,1.11)	1.06 (0.99,1.14)	1.09 (1.01,1.17)[b]	1.12 (1.04,1.21)[b]	1.09 (1.02,1.17)[b]	0.93 (0.85,1.03)
No	ref	ref	ref	ref	ref	ref	ref
Health-care personnel[d]							
Yes	0.98 (0.93,1.03)	0.96 (0.87,1.05)	0.96 (0.84,1.09)	0.98 (0.86,1.13)	1.00 (0.87,1.14)	0.99 (0.88,1.11)	1.16 (1.02,1.31)[b]
No	ref	ref	ref	ref	ref	ref	ref
Health insurance							
Private	0.99 (0.96,1.02)	1.04 (0.90,1.19)	1.16 (0.93,1.45)	1.12 (0.90,1.39)	1.06 (0.88,1.29)	1.06 (0.89,1.27)	1.17 (0.91,1.49)

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Characteristic	Disease awareness						
	Influenza Prevalence ratio (adjusted)[a]	**Pneumonia Prevalence ratio (adjusted)[a]**	**Hepatitis B Prevalence ratio (adjusted)[a]**	**Tetanus Prevalence ratio (adjusted)[a]**	**Pertussis Prevalence ratio (adjusted)[a]**	**Shingles Prevalence ratio (adjusted)[a]**	**HPV Prevalence ratio (adjusted)[a]**
Public only	0.99 (0.95,1.02)	1.06 (0.92,1.21)	1.23 (0.99,1.53)[b]	1.15 (0.93,1.43)	1.08 (0.89,1.30)	1.08 (0.90,1.29)	1.08 (0.84,1.39)
None	ref	ref	ref	ref	ref	ref	ref
Provider visit for health care in the past 12 months							
Yes	1.00 (0.96,1.05)	1.04 (0.91,1.19)	0.99 (0.85,1.14)	1.05 (0.88,1.25)	0.98 (0.85,1.12)	1.01 (0.87,1.16)	0.98 (0.80,1.18)
No	ref	ref	ref	ref	ref	ref	ref
Unable to receive vaccine due to cost in the past 12 months							
Yes	0.99 (0.94,1.04)	1.05 (0.96,1.15)	0.97 (0.82,1.16)	0.92 (0.75,1.14)	1.00 (0.84,1.18)	1.00 (0.85,1.17)	1.16 (0.98,1.37)
No	ref	ref	ref	ref	ref	ref	ref
Unable to receive vaccine because insurance did not cover in the past 12 months							
Yes	1.01 (0.97,1.05)	0.93 (0.79,1.09)	0.91 (0.75,1.11)	0.98 (0.81,1.19)	0.90 (0.72,1.13)	0.92 (0.75,1.12)	0.76 (0.56,1.04)
No	ref	ref	ref	ref	ref	ref	ref
Living with a child <18 years							
Yes	1.02 (0.99,1.04)	1.02 (0.97,1.08)	1.06 (0.99,1.14)	1.00 (0.93,1.09)	1.04 (0.97,1.12)	1.01 (0.94,1.08)	1.20 (1.11,1.30)[b]
No	ref	ref	ref	ref	ref	ref	ref

[a] Multivariable model includes all variables listed in the table.

[b] $p < 0.05$ by T test compared to reference level.

[c] Currently have one or more chronic medical conditions (a doctor, nurse, or other medical professional ever said that you have at least one of the following): lung or breathing problem (e.g., asthma or other chronic lung problem), any kind of liver condition, any kind of kidney condition, or any kind of heart condition (other than high blood pressure), diabetes or sugar diabetes (other than during pregnancy); and respond that still have that condition/those conditions), or currently have weakened immune system (a doctor, nurse, or other medical professional ever said that you have a weakened immune system, and still have that condition).

[d] Volunteered or worked in a hospital, medical clinic, doctor's office, dentist's office, nursing home, pharmacy, or some other health-care facility in the past 12 months.

Table 6

Multivariable-adjusted associations of demographic, health, health care employment, and health care access characteristics with awareness of selected vaccines among adults aged ≥19 years participating in an Internet panel survey on vaccination assessment and recommendations by providers at healthcare visits, United States, February–March 2015.

	Vaccine awareness					
Characteristic	**Influenza Prevalence ratio (adjusted)[a]**	**Pneumonia Prevalence ratio (adjusted)[a]**	**Hepatitis B Prevalence ratio (adjusted)[a]**	**Td or Tdap Prevalence ratio (adjusted)[a]**	**Shingles Prevalence ratio (adjusted)[a]**	**HPV ratio (adjusted)[a]**
Age						
19–26 years	NA	NA	NA	NA	NA	1.18 (1.02,1.35)[b]
≥27 years	NA	NA	NA	NA	NA	ref
19–49 years	ref	ref	ref	ref	NA	NA
50–64 years	1.02 (0.99,1.05)	1.14 (1.04,1.25)[b]	0.95 (0.86,1.05)	0.96 (0.91,1.00)	NA	NA
≥65 years	1.03 (1.00,1.07)	1.29 (1.16,1.44)[b]	0.85 (0.73,1.00)[b]	0.93 (0.87,1.00)[b]	NA	NA
19–59 years	NA	NA	NA	NA	ref	NA
≥60 years	NA	NA	NA	NA	1.20 (1.07,1.33)[b]	NA
Sex						
Male	ref	ref	ref	ref	ref	ref
Female	0.99 (0.97,1.02)	1.06 (0.99,1.15)	1.14 (1.04,1.24)[b]	1.04 (1.00,1.09)[b]	1.16 (1.06,1.28)[b]	1.31 (1.18,1.45)[b]
Race/ethnicity						
Hispanic	0.99 (0.96,1.03)	0.85 (0.76,0.95)[b]	0.91 (0.81,1.03)	0.92 (0.87,0.98)[b]	0.80 (0.70,0.92)[b]	0.92 (0.81,1.04)
Non-Hispanic white	ref	ref	ref	ref	ref	ref
Non-Hispanic black	1.00 (0.97,1.03)	0.91 (0.83,1.01)	1.03 (0.93,1.13)	0.85 (0.80,0.91)[b]	0.89 (0.80,1.00)[b]	0.88 (0.79,0.99)[b]
Other	1.02 (0.99,1.05)	0.94 (0.86,1.03)	1.05 (0.96,1.15)	0.94 (0.90,1.00)[b]	0.91 (0.82,1.01)	0.95 (0.85,1.05)
Marital status						
Married or unmarried couple	ref	ref	ref	ref	ref	ref
Divorced, widowed, or separated	0.99 (0.96,1.01)	1.03 (0.92,1.15)	1.03 (0.92,1.17)	0.99 (0.95,1.03)	1.03 (0.91,1.18)	1.02 (0.90,1.15)
Never married	0.95 (0.90,1.00)	0.94 (0.82,1.08)	1.01 (0.86,1.18)	0.88 (0.82,0.95)[b]	0.85 (0.71,1.01)[b]	1.00 (0.85,1.18)
Education level						
≤high school	ref	ref	ref	ref	ref	ref

Characteristic	Vaccine awareness					
	Influenza Prevalence ratio (adjusted)[a]	**Pneumonia Prevalence ratio (adjusted)[a]**	**Hepatitis B Prevalence ratio (adjusted)[a]**	**Td or Tdap Prevalence ratio (adjusted)[a]**	**Shingles Prevalence ratio (adjusted)[a]**	**HPV ratio (adjusted)[a]**
Some college or technical school	0.99 (0.95,1.03)	0.96 (0.86,1.06)	0.95 (0.84,1.08)	1.03 (0.97,1.08)	0.99 (0.86,1.13)	1.13 (0.99,1.29)
College graduate or higher education	1.00 (0.97,1.03)	1.04 (0.95,1.13)	1.11 (1.00,1.23)[b]	1.10 (1.05,1.15)[b]	1.14 (1.02,1.26)[b]	1.25 (1.12,1.40)[b]
Employment						
Employed	ref	ref	ref	ref	ref	ref
Unemployed	0.98 (0.93,1.04)	1.10 (0.96,1.26)	0.94 (0.78,1.15)	0.99 (0.92,1.08)	0.90 (0.74,1.09)	0.90 (0.75,1.09)
Not in work force	1.00 (0.97,1.03)	1.11 (1.01,1.22)[b]	1.08 (0.97,1.19)	1.02 (0.98,1.07)	1.02 (0.91,1.13)	0.95 (0.85,1.05)
Annual household income						
<$25,000	ref	ref	ref	ref	ref	ref
$25,000–$74,999	1.03 (0.98,1.08)	1.01 (0.90,1.14)	1.03 (0.90,1.18)	1.04 (0.98,1.10)	1.01 (0.88,1.16)	0.95 (0.83,1.09)
≥$75,000	1.01 (0.96,1.07)	0.97 (0.85,1.11)	1.01 (0.87,1.18)	1.01 (0.94,1.09)	0.98 (0.84,1.15)	0.99 (0.85,1.16)
Region						
Northeast	ref	ref	ref	ref	ref	ref
Midwest	1.00 (0.95,1.04)	0.89 (0.80,1.00)	0.99 (0.87,1.13)	0.99 (0.92,1.06)	0.92 (0.80,1.06)	0.88 (0.77,1.01)
South	1.01 (0.97,1.04)	0.91 (0.83,1.00)	0.92 (0.82,1.04)	1.00 (0.94,1.06)	0.97 (0.86,1.09)	0.86 (0.76,0.97)[b]
West	1.01 (0.97,1.05)	0.84 (0.75,0.94)[b]	0.96 (0.85,1.09)	1.02 (0.96,1.08)	0.96 (0.84,1.10)	0.87 (0.76,0.99)[b]
Metropolitan Statistical Area						
Yes	ref	ref	ref	ref	ref	ref
No	1.01 (0.97,1.04)	0.98 (0.87,1.09)	0.94 (0.83,1.07)	1.00 (0.94,1.06)	0.94 (0.82,1.08)	0.89 (0.77,1.03)
Persons with medical conditions[c]						
Yes	1.02 (0.99,1.04)	1.20 (1.10,1.30)[b]	1.00 (0.90,1.10)	1.04 (1.00,1.09)[b]	1.05 (0.95,1.16)	0.91 (0.82,1.01)
No	ref	ref	ref	ref	ref	ref
Health-care personnel[d]						
Yes	1.01 (0.97,1.06)	1.16 (1.05,1.29)[b]	1.23 (1.11,1.37)[b]	1.05 (0.99,1.12)	1.17 (1.04,1.32)[b]	1.28 (1.13,1.44)[b]
No	ref	ref	ref	ref	ref	ref
Health insurance						
Private	0.99 (0.93,1.06)	1.02 (0.85,1.21)	1.20 (0.93,1.55)	1.07 (0.95,1.21)	1.22 (0.92,1.62)	1.11 (0.89,1.39)
Public only	1.00 (0.94,1.05)	0.98 (0.81,1.18)	1.23 (0.95,1.59)	1.05 (0.93,1.18)	1.26 (0.95,1.68)	1.12 (0.89,1.40)

Characteristic	Vaccine awareness					
	Influenza Prevalence ratio (adjusted)[a]	**Pneumonia Prevalence ratio (adjusted)[a]**	**Hepatitis B Prevalence ratio (adjusted)[a]**	**Td or Tdap Prevalence ratio (adjusted)[a]**	**Shingles Prevalence ratio (adjusted)[a]**	**HPV ratio (adjusted)[a]**
None	ref	ref	ref	ref	ref	ref
Provider visit for health care in the past 12 months						
Yes	1.00 (0.95,1.06)	1.06 (0.89,1.27)	1.02 (0.84,1.23)	0.98 (0.91,1.05)	1.08 (0.87,1.35)	0.98 (0.80,1.21)
No	ref	ref	ref	ref	ref	ref
Unable to receive vaccine due to cost in the past 12 months						
Yes	0.99 (0.92,1.07)	1.19 (1.04,1.36)[b]	1.15 (0.96,1.37)	0.91 (0.78,1.07)	1.11 (0.89,1.38)	1.26 (1.06,1.49)[b]
No	ref	ref	ref	ref	ref	ref
Unable to receive vaccine because insurance did not cover in the past 12 months						
Yes	1.03 (1.00,1.06)	0.79 (0.60,1.04)	0.60 (0.40,0.92)[b]	1.03 (0.95,1.12)	1.05 (0.80,1.36)	0.86 (0.63,1.17)
No	ref	ref	ref	ref	ref	ref
Living with a child <18 years						
Yes	1.00 (0.97,1.03)	1.02 (0.94,1.11)	1.06 (0.95,1.17)	1.00 (0.96,1.05)	0.92 (0.82,1.02)	1.20 (1.09,1.32)[b]
No	ref	ref	ref	ref	ref	ref

[a] Multivariable model includes all variables listed in the table.

[b] $p < 0.05$ by *T* test compared to reference level.

[c] Currently have one or more chronic medical conditions (a doctor, nurse, or other medical professional ever said that you have at least one of the following): lung or breathing problem (e.g., asthma or other chronic lung problem), any kind of liver condition, any kind of kidney condition, or any kind of heart condition (other than high blood pressure), diabetes or sugar diabetes (other than during pregnancy); and respond that still have that condition/those conditions), or currently have weakened immune system (a doctor, nurse, or other medical professional ever said that you have a weakened immune system, and still have that condition).

[d] Volunteered or worked in a hospital, medical clinic, doctor's office, dentist's office, nursing home, pharmacy, or some other health-care facility in the past 12 months.