



HHS Public Access

Author manuscript

Am J Prev Med. Author manuscript; available in PMC 2017 January 01.

Published in final edited form as:

Am J Prev Med. 2016 January ; 50(1): e15–e26. doi:10.1016/j.amepre.2015.06.008.

Influenza Vaccination Coverage Among People With High-Risk Conditions in the U.S.

Alissa C. O'Halloran, MSPH, Peng-jun Lu, MD, PhD, Walter W. Williams, MD, MPH, Carolyn B. Bridges, MD, and James A. Singleton, PhD

Immunization Services Division, National Center for Immunization and Respiratory Diseases, CDC, Atlanta, Georgia

Abstract

Introduction—During annual influenza epidemics, rates of serious illness and death are higher among those who have medical conditions, such as pulmonary disease, diabetes, or heart disease, which place them at increased risk of influenza complications. Annual influenza vaccination was recommended for people with high-risk conditions as early as 1960.

Methods—We analyzed 2012–2013 Behavioral Risk Factor Surveillance System data in 2014 to estimate national and state-specific influenza vaccination coverage among people aged 18–64 years with high-risk conditions. Prevalence ratios adjusted for demographic and access to care characteristics were calculated using logistic regression and predictive marginal models.

Results—Unadjusted influenza vaccination coverage was 45.4% among adults aged 18–64 years with at least one high-risk condition, compared with 32.9% among those with no high-risk conditions ($p < 0.05$). Among adults aged 18–64 years with multiple conditions (at least two high-risk conditions), vaccination coverage was 53.2%. Coverage was 43.9% for those with pulmonary diseases, 52.7% for those with diabetes, 48.1% for those with heart disease, and 45.0% for those with cancer. Individuals with high-risk conditions were more likely to receive an influenza vaccine than those with no high-risk conditions, even after controlling for demographic and access to care characteristics.

Conclusions—Despite ongoing influenza vaccination recommendations for adults with high-risk conditions, coverage was below the *Healthy People 2020* target; only about half were vaccinated. Primary care providers and subspecialists should ensure they routinely assess vaccination status every fall and winter and recommend vaccines to people with high-risk conditions.

Introduction

Almost half of U.S. adults have at least one chronic condition, and more than a quarter have multiple.¹ The number of Americans with chronic conditions is expected to increase by more than 1% each year through 2030.¹ During annual influenza epidemics, rates of serious

Address correspondence to: Alissa O'Halloran, MSPH, Immunization Services Division, National Center for Immunization and Respiratory Diseases, CDC, 1600 Clifton Road, NE, Mail Stop A 19, Atlanta GA 30333. idg3@cdc.gov..

No financial disclosures were reported by the authors of this paper.

illness and death are higher among those with medical conditions, such as pulmonary disease, diabetes, or heart disease, placing them at increased risk of influenza complications.^{2–5} Annual vaccination is the most effective way to prevent influenza infection and its complications.²

Annual influenza vaccination was recommended for individuals with high-risk conditions by the U.S. Public Health Service as early as 1960 and by the Advisory Committee on Immunization Practices (ACIP) prior to 2010.^{6,7} The ACIP has since recommended annual vaccination for all adults.^{2,8} However, vaccination coverage for adults with high-risk conditions was recently reported at 47%, well below a previous 90% *Healthy People 2020* target for high-risk adults and the current 70% target for all adults.^{9,10}

We used 2012–2013 Behavioral Risk Factor Surveillance System (BRFSS) data to examine national and state-specific influenza vaccination coverage among adults with select high-risk conditions.

Methods

Data from the 2012 and 2013 BRFSS were analyzed in 2014. The BRFSS is a continuous, population-based telephone survey conducted by state health departments in collaboration with CDC.¹¹ The median state BRFSS response rate was 47.0% for September–December 2012 and 45.6% for January–June 2013.

Respondents were asked if they received an influenza vaccine in the past 12 months and in which month and year. People with heart disease included respondents reporting ever being told they had a heart attack, angina, or coronary heart disease; those with pulmonary disease reported currently having asthma or ever told they had chronic obstructive pulmonary disease, emphysema, or chronic bronchitis; people with diabetes reported ever being told they had diabetes (excluding gestational diabetes); and those with cancer included respondents who reported ever being told they had cancers other than skin cancer.

We used Kaplan–Meier survival analysis to estimate cumulative influenza vaccination coverage during July 2012–May 2013 using September 2012–June 2013 interviews. Chi-square and *t*-tests were used to determine differences between groups with statistical significance set at $p < 0.05$. Logistic regression and predictive marginals were used where vaccination in the past 12 months was the outcome variable, and multicollinearity was assessed using condition indices. We used SAS-callable SUDAAN, version 9.3 to account for complex survey design, and results were weighted.

Results

Sample characteristics are reported in Table 1. Overall, unadjusted influenza vaccination coverage was significantly higher (45.4%) among adults with one or more high-risk condition than among those without high-risk conditions (32.9%) (Table 2). Coverage was 53.2% among adults with two or more conditions, 43.9% for those with pulmonary disease, 52.7% for those with diabetes, 48.1% for those with heart disease, and 45.0% for those with cancer. Adults with one or more high-risk condition had higher coverage than adults without

conditions in all subgroups (Table 2). For all groups, vaccination coverage was higher among older adults and those with an annual household income \geq \$75,000, medical insurance, a healthcare provider, a physical exam within the previous 12 months, and no cost barriers to seeing a doctor.

Even among adults with one or more high-risk condition who had health insurance or an exam during the previous 12 months, about half were unvaccinated (Table 2). People with one or more high-risk condition who reported poor or fair health, particularly those reporting heart or pulmonary disease, were more likely to be vaccinated than those who reported good or excellent health (Table 2).

Individuals with high-risk conditions were more likely to be vaccinated than those without high-risk conditions, even after controlling for demographic and access to care characteristics. Statistical testing found no multicollinearity. Adjusted prevalence ratios ranged from 1.1 to 1.4 (Table 3).

State-specific vaccination coverage varied widely for all groups. Among people with one or more high-risk condition, coverage ranged from 25.5% in Florida to 58.4% in Minnesota (Table 4). State estimates among individuals with one or more high-risk condition and those without high-risk conditions were correlated ($r = 0.77$, $p < 0.05$).

Discussion

People with high-risk conditions were more likely to be vaccinated than those without high-risk conditions after controlling for demographic and access to care variables, but coverage remains well below the *Healthy People 2020* target.¹⁰ Even among adults with multiple conditions, about half were vaccinated. The U.S. DHHS acknowledged growing health problems associated with multiple chronic conditions and developed a strategic framework for improving health and quality of life for individuals with multiple conditions.¹² Improving vaccination among this population will aid in addressing objectives in this framework, such as reducing hospitalizations and improving health outcomes.¹²

Our study found that coverage was higher among older adults, which has been previously observed.¹³ Older adults are more likely to have high-risk conditions and visit doctors, and healthcare providers might be more likely to recommend vaccination to them because they perceive greater influenza complication risks.¹⁴ Education and outreach efforts directed toward younger at-risk adults and availability of vaccination in work settings could improve coverage in younger adults.

In this report, individuals reporting access to care (e.g., having a healthcare provider or an exam in the past year) and insurance had higher coverage than those who did not. However, a substantial proportion of people with access to care or insurance were unvaccinated. In the 2001 Healthstyles survey, among those with high-risk conditions, the most common reason for not being vaccinated was not being offered or not knowing the vaccine was needed.¹⁵ Many people with high-risk conditions see subspecialists, but availability of influenza vaccine in subspecialty practices varies, and subspecialists are less likely to recommend

influenza vaccination than general practitioners.^{16,17} Subspecialists should routinely recommend and offer vaccinations or refer patients to a vaccinating provider.¹⁸

Vaccination coverage varied widely among states, which has been previously documented.¹³ Among states with respondents reporting one or more high-risk condition, none achieved 70% coverage. Only one state (Colorado) achieved 70% coverage among people reporting a specific condition (diabetes). We noted a correlation between state coverage among individuals with one or more high-risk condition and those without high-risk conditions, suggesting that state factors affect coverage in all groups. Variation in state coverage could be due to differing medical care delivery infrastructure, population norms, and effectiveness of state and local immunization programs among states.¹⁹

Limitations

The findings in this study are subject to at least three limitations. First, influenza vaccination and chronic health conditions were based on self-report and might be subject to recall bias. However, self-reported influenza vaccination among adults has been shown to be sensitive and specific.^{20–22} Second, not all high-risk conditions were ascertained, and some categorized as non-high risk could have had other conditions, perhaps diminishing the prevalence ratios comparing high risk to non-high risk. Finally, response rates were low, and nonresponse bias may remain even after weighting adjustments.

Conclusions

People with high-risk conditions are at an increased risk of influenza complications.^{23,24} Despite longstanding vaccination recommendations, coverage remains low. As the number of Americans with high-risk conditions continues to grow, increasing efforts to improve influenza vaccination will be important in reducing influenza-associated complications. Primary care providers and subspecialists should routinely offer influenza vaccine to individuals with high-risk conditions.²⁵

Acknowledgments

We thank Amparo Gonzalez-Feliciano for her important contributions to this study. The findings and conclusions in this presentation are those of the authors and do not necessarily represent the views of CDC.

References

1. Anderson, G. Chronic conditions: making the case for ongoing care. Robert Wood Johnson Foundation; Princeton (NJ): 2010. www.rwjf.org/content/dam/farm/reports/reports/2010/rwjf54583
2. Grohskopf LA, Olsen SJ, Sokolow LZ, et al. Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices (ACIP) - United States, 2014-15 Influenza Season. *MMWR Morb Mortal Wkly Rep.* 2014; 63(32):691–697. [PubMed: 25121712]
3. Barker WH, Mullooly JP. Impact of Epidemic Type a Influenza in a Defined Adult-Population. *Am J Epidemiol.* 1980; 112(6):798–813. [PubMed: 7457471]
4. Barker WH. Excess Pneumonia and Influenza Associated Hospitalization during Influenza Epidemics in the United-States, 1970-78. *Am J Public Health.* 1986; 76(7):761–765. <http://dx.doi.org/10.2105/AJPH.76.7.761>. [PubMed: 3717461]

5. Glezen WP. Serious Morbidity and Mortality Associated with Influenza Epidemics. *Epidemiol Rev.* 1982; 4:25–44. [PubMed: 6754408]
6. Burney LE. Influenza immunization. *Public Health Rep.* 1960; 75:944. <http://dx.doi.org/10.2307/4590965>. [PubMed: 19316369]
7. Fiore AE, Shay DK, Broder K, et al. Prevention and control of seasonal influenza with vaccines: recommendations of the Advisory Committee on Immunization Practices (ACIP), 2009. *MMWR Recomm Rep.* 2009; 58(RR-8):1–52. [PubMed: 19644442]
8. CDC. Prevention and control of influenza with vaccines: recommendations of the Advisory Committee on Immunization Practices (ACIP), 2010. *Morb Mortal Wkly Rep.* 2010; 59(RR-8):1–62.
9. CDC.. Flu Vaccination Coverage, United States, 2012-13 Influenza Season. 2013. www.cdc.gov/flu/fluview/coverage-1213estimates.htm
10. U.S. DHHS.. Immunization and infectious diseases. <http://www.healthypeople.gov/2020/topics-objectives/topic/immunization-and-infectious-diseases>
11. CDC.. Overview: BRFSS. 2012. www.cdc.gov/brfss/annual_data/annual_2012.html
12. Parekh AK, Goodman RA, Gordon C, Koh HK,HHS. Interagency Workgroup on Multiple Chronic Conditions. Managing multiple chronic conditions: a strategic framework for improving health outcomes and quality of life. *Public Health Rep.* 2011; 126(4):460–471. [PubMed: 21800741]
13. Lu PJ, Gonzalez-Feliciano A, Ding H, et al. Influenza A (H1N1) 2009 monovalent and seasonal influenza vaccination among adults 25 to 64 years of age with high-risk conditions--United States, 2010. *Am J Infect Control.* 2013; 41(8):702–709. <http://dx.doi.org/10.1016/j.ajic.2012.10.027>. [PubMed: 23419613]
14. Bridges CB, Winquist AG, Fukuda K, et al. Prevention and control of influenza: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep.* 2000; 49(RR-3):1–38. quiz CE1-7. [PubMed: 15580733]
15. Singleton JA, Wortley P, Lu PJ. Influenza vaccination of persons with cardiovascular disease in the United States. *Tex Heart Inst J.* 2004; 31(1):22–27. [PubMed: 15061622]
16. Davis MM, Wortley PM, Ndiaye SM, Woods MG, Clark SJ. National availability of influenza vaccine among medical subspecialty practices. *Am J Prev Med.* 2004; 26(4):307–310. <http://dx.doi.org/10.1016/j.amepre.2003.12.016>. [PubMed: 15110057]
17. Nichol KL, Zimmerman R. Generalist and subspecialist physicians' knowledge, attitudes, and practices regarding influenza and pneumococcal vaccinations for elderly and other high-risk patients: a nationwide survey. *Arch Intern Med.* 2001; 161(22):2702–2708. <http://dx.doi.org/10.1001/archinte.161.22.2702>. [PubMed: 11732935]
18. National Vaccine Advisory Committee. Recommendations from the National Vaccine Advisory committee: standards for adult immunization practice. *Public Health Rep.* 2014; 129(2):115–123. [PubMed: 24587544]
19. CDC. Interim results: state-specific seasonal influenza vaccination coverage - United States, August 2009-January 2010. *MMWR Morb Mortal Wkly Rep.* 2010; 59(16):477–484. [PubMed: 20431523]
20. Mac Donald R, Baken L, Nelson A, Nichol KL. Validation of self-report of influenza and pneumococcal vaccination status in elderly outpatients. *Am J Prev Med.* 1999; 16(3):173–177. [http://dx.doi.org/10.1016/S0749-3797\(98\)00159-7](http://dx.doi.org/10.1016/S0749-3797(98)00159-7). [PubMed: 10198654]
21. Zimmerman RK, Raymund M, Janosky JE, Nowalk MP, Fine MJ. Sensitivity and specificity of patient self-report of influenza and pneumococcal polysaccharide vaccinations among elderly outpatients in diverse patient care strata. *Vaccine.* 2003; 21(13-14):1486–1491. [http://dx.doi.org/10.1016/S0264-410X\(02\)00700-4](http://dx.doi.org/10.1016/S0264-410X(02)00700-4). [PubMed: 12615445]
22. Mangtani P, Shah A, Roberts JA. Validation of influenza and pneumococcal vaccine status in adults based on self-report. *Epidemiol Infect.* 2007; 135(1):139–143. <http://dx.doi.org/10.1017/S0950268806006479>. [PubMed: 16740194]
23. Gilca R, De Serres G, Boulianne N, et al. Risk factors for hospitalization and severe outcomes of 2009 pandemic H1N1 influenza in Quebec, Canada. *Influenza Other Respir Viruses.* 2011; 5(4): 247–255. <http://dx.doi.org/10.1111/j.1750-2659.2011.00204.x>. [PubMed: 21651735]

24. Warren-Gash C, Smeeth L, Hayward AC. Influenza as a trigger for acute myocardial infarction or death from cardiovascular disease: a systematic review. *Lancet Infect Dis.* 2009; 9(10):601–610. [http://dx.doi.org/10.1016/S1473-3099\(09\)70233-6](http://dx.doi.org/10.1016/S1473-3099(09)70233-6). [PubMed: 19778762]
25. Guide to Community Preventive Services. www.thecommunityguide.org/index.html

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 1
Sample Characteristics Among Adults 18-64 Years by High-Risk Condition, BRFSS 2012-2013

Characteristic	No high-risk conditions		1 high-risk condition ^a		2 high-risk conditions ^a		Pulmonary disease ^b		Diabetes		Heart disease ^c		Cancer ^d	
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Total (n=245,480)	180,839 (77.0)	64,641 (23.0)	14,258 (4.4)	33,611 (12.6)	22,213 (7.6)	12,321 (4.0)	13,697 (4.1)							
Age														
18-49 years	104,637 (73.0)	23,261 (50.5)*	3,156 (31.7)*	15,294 (60.7)*	5,490 (37.1)*	2,402 (29.5)*	3,695 (38.5)*							
50-64 years	76,202 (27.0)	41,380 (49.5)	11,102 (68.3)	18,317 (39.3)	16,723 (62.9)	9,919 (70.5)	10,002 (61.5)							
Sex														
Male	80,368 (51.4)	24,705 (43.7)*	5,255 (42.4)*	10,871 (38.1)*	9,701 (50.4)	6,648 (60.2)*	3,714 (29.0)*							
Female	100,471 (48.6)	39,936 (56.3)	9,003 (57.6)	22,740 (61.9)	12,512 (49.6)	5,673 (39.8)	9,983 (71.0)							
Race/ethnicity														
White, non-Hispanic	134,923 (61.7)	46,837 (63.2)*	10,136 (64.7)*	24,490 (64.8)*	14,667 (55.8)*	8,921 (63.9)*	10,934 (73.7)*							
Black, non-Hispanic	15,517 (11.7)	7,489 (14.5)	1,816 (15.6)	3,733 (15.1)	3,435 (16.6)	1,449 (14.7)	1,087 (9.7)							
Hispanic	14,898 (17.9)	4,528 (14.3)	914 (11.8)	2,225 (11.7)	1,983 (19.5)	763 (12.7)	642 (10.3)							
Asian, non-Hispanic	4,743 (4.5)	800 (2.3)	105 (1.1)	338 (1.9)	353 (2.6)	114 (2.2)	108 (1.4)							
American Indian/Alaska														
Native, non-Hispanic	2,713 (1.2)	1,489 (1.8)	405 (2.2)	772 (2.0)	639 (1.9)	338 (1.8)	268 (1.8)							
Other ^e	5,129 (3.0)	2,300 (3.9)	627 (4.5)	1,441 (4.4)	739 (3.6)	486 (4.7)	409 (3.1)							
Marital status														
Married or unmarried couple	109,953 (59.4)	33,983 (56.1)*	6,596 (52.6)*	16,228 (50.6)*	11,610 (58.5)*	6,273 (57.2)*	7,678 (62.6)*							
Divorced, widowed, or separated	32,082 (12.6)	19,135 (23.0)	5,640 (32.9)	10,257 (22.8)	7,037 (25.7)	4,553 (30.4)	4,318 (25.3)							
Never married	37,794 (28.0)	11,204 (20.8)	1,968 (14.5)	6,949 (26.6)	3,476 (15.9)	1,449 (12.4)	1,635 (12.2)							
Education level														
Less than high school	10,924 (10.4)	6,943 (14.9)*	2,169 (18.5)*	4,041 (14.7)*	2,821 (18.0)*	1,708 (18.9)*	1,091 (11.6)*							
High school graduate/GED	47,113 (33.9)	19,831 (36.6)	4,806 (39.4)	10,342 (36.4)	7,352 (38.8)	4,238 (39.2)	3,684 (34.1)							
Some college or technical school	50,225 (28.7)	19,300 (29.1)	4,356 (28.2)	10,203 (30.1)	6,481 (27.2)	3,664 (27.1)	4,238 (30.2)							
College graduate	72,005 (27.0)	18,383 (19.4)	2,891 (13.9)	8,924 (18.8)	5,493 (16.0)	2,682 (14.8)	4,653 (24.2)							
Employment														

Characteristic	No high-risk conditions		1 high-risk condition ^a		2 high-risk conditions ^a		Pulmonary disease ^b		Diabetes ^c		Heart disease ^c		Cancer ^d	
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Employed	51,606 (69.5)	12,914 (52.0)*	1,813 (33.3)*	6,279 (49.7)*	4,072 (49.3)*	1,915 (38.6)*	2,706 (50.5)*							
Unemployed	4,969 (8.7)	2,036 (10.4)	448 (10.2)	1,135 (11.4)	683 (9.9)	369 (10.0)	364 (7.8)							
Not in work force	15,039 (21.8)	10,254 (37.6)	3,368 (56.5)	5,584 (38.9)	4,056 (40.8)	2,654 (51.5)	2,221 (41.7)							
Income														
<\$20K	23,789 (18.8)	16,642 (30.3)*	5,371 (41.1)*	9,970 (33.1)*	6,314 (33.0)*	4,126 (38.1)*	2,994 (24.3)*							
\$20K-<\$50K	50,278 (32.9)	19,317 (33.2)	4,220 (32.7)	9,785 (32.7)	6,964 (35.1)	3,715 (32.0)	3,898 (31.5)							
\$50K-<\$75K	28,547 (15.5)	8,150 (13.4)	1,409 (11.7)	3,757 (12.8)	2,743 (12.8)	1,360 (11.9)	1,915 (15.2)							
\$75K+	58,925 (32.8)	13,505 (23.1)	1,649 (14.5)	6,209 (21.4)	3,759 (19.1)	1,924 (18.0)	3,449 (28.9)							
Perceived health														
Excellent or very good	114,305 (60.1)	18,701 (29.2)*	1,473 (10.3)*	10,122 (32.1)*	3,759 (16.4)*	2,062 (16.6)*	4,371 (31.4)*							
Good	49,880 (29.9)	21,656 (34.2)	3,824 (27.1)	10,305 (32.4)	7,780 (34.6)	3,532 (28.8)	4,319 (32.9)							
Fair	13,129 (8.4)	15,247 (24.1)	4,775 (34.7)	7,767 (22.6)	6,693 (32.0)	3,648 (30.6)	2,895 (21.3)							
Poor	3,139 (1.6)	8,798 (12.5)	4,110 (27.9)	5,300 (13.0)	3,892 (17.0)	3,017 (23.9)	2,045 (14.3)							
Have medical insurance														
Yes	150,704 (77.7)	54,576 (80.6)*	12,280 (84.1)*	28,007 (79.9)*	18,969 (81.7)*	10,411 (81.0)*	12,059 (85.6)*							
No	29,479 (22.3)	9,891 (19.4)	1,944 (15.9)	5,491 (20.1)	3,190 (18.3)	1,887 (19.0)	1,612 (14.4)							
Have personal health care provider														
Yes	139,240 (70.2)	56,829 (83.8)*	13,080 (89.8)*	28,807 (81.1)*	20,504 (89.1)*	10,967 (85.7)*	12,371 (88.2)*							
No	41,039 (29.8)	7,644 (16.2)	1,140 (10.2)	4,695 (18.9)	1,654 (10.9)	1,323 (14.3)	1,303 (11.8)							
Last general physical exam < 12m ago														
Yes	114,571 (62.0)	48,770 (74.5)*	11,559 (82.0)*	24,110 (70.5)*	18,526 (83.3)*	9,705 (78.7)*	10,437 (76.6)*							
No	62,175 (38.0)	14,600 (25.5)	2,394 (18.0)	8,780 (29.5)	3,266 (16.7)	2,385 (21.3)	2,985 (23.4)							
Unable to see doctor due to cost														
Yes	24,616 (16.8)	14,631 (25.9)*	3,994 (30.6)*	8,831 (29.3)*	4,812 (24.1)*	3,241 (29.9)*	2,669 (21.8)*							
No	155,885 (83.2)	49,826 (74.1)	10,211 (69.4)	24,668 (70.7)	17,325 (75.9)	9,045 (70.1)	10,999 (78.2)							

BRFSS, Behavioral Risk Factor Surveillance System

Note: Boldface indicates statistical significance ($p < 0.05$).

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

* $p < 0.05$ by chi-square test (comparing columns indicating the presence of any high risk condition versus no high-risk conditions).

^a Adults who reported having at least one or more than one of the following: asthma or chronic obstructive pulmonary disease (COPD), emphysema, or chronic bronchitis; diabetes; myocardial infarction, angina or coronary heart disease; or cancer (excluding skin cancer).

^b Includes adults reporting current asthma, chronic obstructive pulmonary disease, emphysema, or chronic bronchitis.

^c Includes adults reporting myocardial infarction, angina or coronary heart disease.

^d Excludes skin cancer.

^e "Other" race includes non-Hispanic native Hawaiian or other Pacific Islander, multiple race, or other.

Influenza Vaccination Coverage^a Among Adults 18-64 Years by Select Characteristics and High-Risk Condition, BRFSS 2012-2013

Table 2

Characteristic	No high-risk conditions		1 high-risk condition ^b		2 high-risk conditions ^b		Pulmonary disease ^c		Diabetes		Heart disease ^d		Cancer ^e	
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Total	32.9 (32.3, 33.5)	45.4 (44.3, 46.5)*	53.2 (50.7, 55.8)*	43.9 (42.3, 45.4)*	52.7 (50.7, 54.8)*	48.1 (45.4, 50.9)*	45.0 (42.8, 47.3)*							
Age														
18-49 years ^f	29.8 (29.0, 30.6)	38.1 (36.3, 39.9)*	46.6 (40.5, 53.1)*	37.1 (34.9, 39.4)*	45.8 (42.1, 49.7)*	42.3 (35.0, 50.5)*	34.4 (30.6, 38.6)*							
50-64 years	40.9 (40.0, 41.8)**	52.6 (51.2, 54.0)**	56.5 (53.9, 59.1)**	54.0 (52.1, 55.9)**	56.6 (54.3, 59.0)**	50.9 (48.2, 53.6)**	51.4 (48.8, 54.1)**							
Sex														
Male ^f	29.8 (28.9, 30.8)	43.2 (41.4, 45.0)*	54.3 (49.9, 58.8)*	40.1 (37.3, 43.0)*	50.6 (47.9, 53.5)*	47.2 (43.3, 51.3)*	46.4 (42.4, 50.6)*							
Female	36.1 (35.3, 37.0)**	47.1 (45.6, 48.5)**	52.5 (49.6, 55.4)*	46.2 (44.4, 48.0)**	54.6 (51.7, 57.6)*	49.5 (46.0, 53.2)*	44.4 (41.8, 47.1)*							
Race/ethnicity														
White, non-Hispanic ^f	34.9 (34.3, 35.5)	46.2 (45.0, 47.4)*	54.5 (51.5, 57.6)*	45.1 (43.4, 46.8)*	54.4 (52.4, 56.5)*	48.9 (45.7, 52.2)*	46.2 (43.9, 48.5)*							
Black, non-Hispanic	28.6 (26.7, 30.7)**	43.5 (40.1, 47.1)*	49.9 (43.7, 56.6)*	41.1 (36.4, 46.3)*	48.4 (44.0, 53.1)**	50.1 (42.6, 58.2)*	41.0 (34.3, 48.5)*							
Hispanic	28.2 (26.2, 30.4)**	45.0 (40.8, 49.4)*	52.6 (43.2, 62.6)*	40.8 (35.4, 46.8)*	53.9 (47.0, 61.2)*	43.8 (34.8, 53.9)*	40.5 (31.2, 51.4)*							
Asian, non-Hispanic	41.7 (37.6, 46.2)**	53.0 (43.5, 63.1)*	63.5 (40.8, 85.6)	50.8 (36.7, 66.7)	52.2 (40.1, 65.6)	59.5 (34.3, 85.6)	59.1 (35.6, 83.8)							
American Indian/Alaska Native, non-Hispanic	33.9 (29.2, 39.3)	46.0 (38.6, 54.1)*	52.2 (37.8, 68.2)*	45.1 (36.6, 54.5)*	56.4 (43.9, 69.6)*	42.5 (27.9, 60.8)	46.1 (30.7, 64.8)							
Other ^g	30.6 (26.8, 34.9)**	42.8 (36.9, 49.3)*	61.1 (52.0, 70.2)*	46.7 (39.4, 54.6)*	44.2 (34.0, 55.8)*	43.2 (32.7, 55.5)*	54.9 (42.8, 67.8)*							
Marital status														
Married or unmarried couple ^f	36.7 (35.9, 37.5)	47.3 (45.8, 48.7)*	55.2 (51.9, 58.6)*	46.3 (44.2, 48.5)*	53.4 (51.0, 55.9)*	49.9 (46.5, 53.4)*	46.3 (43.5, 49.3)*							
Divorced, widowed, or separated	30.4 (29.1, 31.7)**	47.2 (44.7, 49.7)*	50.3 (46.9, 53.8)**	47.2 (44.5, 49.9)*	54.1 (49.3, 59.0)*	45.1 (41.3, 49.0)*	43.0 (38.9, 47.3)*							
Never married	25.7 (24.4, 27.1)**	38.3 (35.7, 41.1)**	52.1 (43.6, 61.3)*	36.3 (33.1, 39.9)**	47.8 (43.0, 52.9)**	46.8 (36.5, 58.4)*	42.3 (36.0, 49.3)*							
Education level														
Less than high school ^f	25.3 (23.0, 27.8)	42.3 (38.6, 46.3)*	47.7 (42.1, 53.6)*	41.6 (37.7, 45.8)*	51.6 (44.9, 58.7)*	38.0 (32.1, 44.6)*	41.1 (34.2, 48.9)*							

Characteristic	No high-risk conditions		1 high-risk condition ^b		2 high-risk conditions ^b		Pulmonary disease ^c		Diabetes		Heart disease ^d		Cancer ^e	
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
High school graduate/GED	28.3 (27.1, 29.6)**	42.6 (40.6, 44.7)*	53.5 (48.9, 58.2)*	41.6 (38.7, 44.7)*	49.0 (45.9, 52.3)*	48.8 (44.0, 53.9)***	42.3 (37.9, 46.8)***							
Some college or technical school	32.0 (30.9, 33.1)**	45.1 (43.2, 47.0)*	54.2 (50.1, 58.4)*	42.6 (40.0, 45.2)*	55.1 (51.9, 58.3)*	51.0 (46.5, 55.6)***	42.3 (38.7, 46.0)***							
College graduate	42.1 (41.2, 43.1)**	53.1 (51.2, 55.0)***	58.9 (54.1, 63.7)***	51.6 (49.0, 54.3)***	58.5 (55.2, 61.8)*	54.8 (49.1, 60.6)***	53.7 (50.1, 57.5)***							
Employment														
Employed ^f	28.2 (27.1, 29.3)	35.8 (33.4, 38.3)*	46.5 (39.1, 54.6)*	34.0 (30.9, 37.4)*	44.2 (39.3, 49.6)*	37.4 (30.9, 44.7)*	34.0 (29.0, 39.6)*							
Unemployed	15.4 (13.0, 18.2)**	25.3 (20.4, 31.1)***	27.7 (19.7, 38.1)***	22.6 (16.8, 30.1)***	33.1 (24.7, 43.3)***	28.2 (16.0, 46.6)	24.4 (16.3, 35.5)							
Not in work force	25.4 (23.3, 27.6)**	41.3 (38.5, 44.2)***	49.8 (45.2, 54.7)*	41.4 (37.6, 45.3)***	47.9 (43.5, 52.6)*	46.9 (41.6, 52.6)***	43.2 (36.9, 50.4)***							
Income														
<\$20K ^f	26.0 (24.4, 27.7)	42.5 (40.2, 44.9)*	49.6 (45.9, 53.4)*	42.4 (39.5, 45.4)*	50.1 (46.0, 54.3)*	43.6 (39.4, 48.1)*	38.6 (34.1, 43.5)*							
\$20K-<\$50K	28.8 (27.6, 30.1)**	42.9 (40.8, 45.0)*	53.3 (49.5, 57.2)*	41.0 (38.4, 43.8)*	51.3 (47.4, 55.3)*	47.6 (43.6, 51.8)*	42.3 (38.0, 46.9)*							
\$50K-<\$75K	33.5 (32.1, 34.9)**	46.7 (43.7, 49.8)***	54.6 (47.2, 62.2)*	42.2 (38.1, 46.6)*	57.1 (52.1, 62.3)***	49.7 (42.6, 57.3)*	47.3 (40.9, 54.1)***							
\$75K+	41.7 (40.6, 42.7)**	51.2 (49.1, 53.4)***	59.5 (52.6, 66.6)***	50.8 (47.6, 54.0)***	57.1 (53.0, 61.1)***	52.7 (45.9, 59.8)***	50.1 (46.2, 54.2)***							
Perceived health														
Excellent or very good ^f	34.6 (33.8, 35.4)	43.8 (42.0, 45.7)*	53.5 (46.7, 60.5)*	41.3 (38.9, 43.8)*	54.6 (50.1, 59.2)*	41.2 (35.9, 47.0)*	47.3 (43.6, 51.1)*							
Good	30.3 (29.2, 31.5)**	42.7 (40.9, 44.5)*	50.3 (46.0, 54.7)*	40.1 (37.7, 42.6)*	51.2 (48.1, 54.3)*	42.1 (37.7, 46.8)*	42.0 (38.0, 46.3)*							
Fair	29.2 (26.7, 31.8)**	47.8 (45.1, 50.5)***	55.7 (50.4, 61.1)*	48.9 (44.8, 53.2)***	51.0 (47.4, 54.8)*	54.2 (48.0, 60.6)***	44.5 (40.1, 49.1)*							
Poor	36.6 (32.3, 41.3)**	51.6 (48.1, 55.3)***	54.1 (50.0, 58.3)*	50.5 (47.0, 54.1)***	57.4 (51.7, 63.2)*	53.2 (48.1, 58.3)***	47.8 (41.6, 54.4)*							
Have medical insurance														
Yes ^f	37.5 (36.8, 38.3)	49.5 (48.2, 50.8)*	58.0 (55.2, 60.8)*	48.3 (46.6, 50.1)*	56.0 (53.7, 58.3)*	53.6 (50.4, 56.8)*	48.8 (46.4, 51.2)*							
No	16.5 (15.4, 17.7)**	27.6 (25.3, 30.1)***	29.0 (24.5, 34.0)***	26.0 (23.0, 29.2)***	36.7 (32.3, 41.5)***	24.0 (19.8, 29.0)***	22.5 (17.1, 29.3)**							
Have personal health care provider														
Yes ^f	38.7 (38.0, 39.5)	49.4 (48.2, 50.7)*	55.8 (53.1, 58.4)*	48.7 (47.0, 50.5)*	54.9 (52.7, 57.1)*	52.3 (49.3, 55.3)*	47.8 (45.5, 50.1)*							
No	19.1 (18.0, 20.1)**	24.0 (21.6, 26.7)***	30.7 (24.0, 38.6)***	22.4 (19.6, 25.4)***	33.5 (27.6, 40.2)***	22.9 (17.8, 29.3)**	24.1 (17.0, 33.3)***							

Characteristic	No high-risk conditions % (95% CI)	1 high-risk condition ^b % (95% CI)	2 high-risk conditions ^b % (95% CI)	Pulmonary disease ^c % (95% CI)	Diabetes % (95% CI)	Heart disease ^d % (95% CI)	Cancer ^e % (95% CI)
Last general physical exam < 12m ago							
Yes ^f	40.8 (40.0, 41.7)	51.1 (49.7, 52.5) [*]	56.8 (53.9, 59.8) [*]	50.7 (48.7, 52.6) [*]	56.0 (53.7, 58.3) [*]	53.7 (50.4, 57.0) [*]	49.3 (46.6, 52.0) [*]
No	20.6 (19.9, 21.4) ^{**}	29.8 (27.9, 31.8) ^{***}	39.8 (35.1, 44.9) ^{***}	29.0 (26.5, 31.7) ^{***}	36.9 (32.8, 41.2) ^{***}	30.5 (25.9, 35.7) ^{***}	32.6 (29.1, 36.6) ^{***}
Unable to see doctor due to cost							
Yes ^f	21.5 (20.2, 23.0)	34.5 (32.4, 36.8) [*]	40.1 (36.5, 44.0) [*]	34.4 (31.6, 37.4) [*]	41.1 (37.6, 44.7) [*]	36.0 (31.9, 40.4) [*]	35.1 (29.8, 41.0) [*]
No	35.1 (34.4, 35.8) ^{**}	49.0 (47.7, 50.3) ^{***}	58.7 (55.6, 61.8) ^{***}	47.6 (45.8, 49.4) ^{***}	56.3 (53.9, 58.8) ^{***}	52.9 (49.5, 56.4) ^{***}	47.8 (45.3, 50.2) ^{***}

BREFFS, Behavioral Risk Factor Surveillance System

Note: Boldface indicates statistical significance ($p < 0.05$).

* $p < 0.05$ by t-test (comparing columns indicating the presence of any high-risk condition versus no high-risk conditions).

** $p < 0.05$ by t-test when compared to reference group within column.

^a Estimates are based on interviews conducted during September 2012 through June 2013 and vaccination received during July 2012 through May 2013.

^b Adults who reported having at least one or more than one of the following: asthma, diabetes, myocardial infarction, angina or coronary heart disease, chronic obstructive pulmonary disease (COPD), emphysema or chronic bronchitis, or cancer (excluding skin cancer).

^c Includes adults reporting current asthma, chronic obstructive pulmonary disease, emphysema, or chronic bronchitis.

^d Includes adults reporting myocardial infarction, angina or coronary heart disease.

^e Excludes skin cancer.

^f Reference group.

^g "Other" race includes non-Hispanic native Hawaiian or other Pacific Islander, multiple race, or other.

Multivariable Logistic Regression of Adults 18-64 Years by High-Risk Condition, BRFSS 2012-2013

Table 3

	Adjusted prevalence ratio ^b	95% CI
1 high-risk condition ^c	1.2	1.2-1.3
2 high-risk conditions ^c	1.4	1.3-1.5
Pulmonary disease ^d	1.2	1.2-1.3
Diabetes	1.4	1.3-1.5
Heart disease ^e	1.3	1.2-1.4
Cancer ^f	1.1	1.0-1.2

BRFSS, Behavioral Risk Factor Surveillance System

^a Separate regression models were run for each risk group for a total of 7 individual models. The outcome variable is receipt of influenza vaccination in the past 12 months.

^b Adjusted prevalence ratio with "no high-risk condition" as the reference group. The model adjusted for age (continuous), sex, race/ethnicity, marital status, education level, employment status, income, perceived health, having medical insurance, having personal health care provider, having a physical exam less than 12 months ago, unable to see a doctor due to cost.

^c Adults who reported having at least one or more than one of the following: asthma, diabetes, myocardial infarction, angina or coronary heart disease, chronic obstructive pulmonary disease (COPD), emphysema or chronic bronchitis, or cancer (excluding skin cancer).

^d Includes adults reporting current asthma, chronic obstructive pulmonary disease, emphysema, or chronic bronchitis.

^e Includes adults reporting myocardial infarction, angina or coronary heart disease.

^f Excludes skin cancer.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 4
Influenza Vaccination Coverage Among Adults 18-64 Years by State and High-Risk Condition, BRFSS 2012-2013

State	No high-risk conditions		1 high-risk condition [†]		2 high-risk conditions [‡]		Pulmonary disease ^c		Diabetes		Heart disease ^d		Cancer ^e	
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Minnesota	42.2 (40.1, 44.3)	58.4 (54.0, 62.9)	55.6 (46.5, 65.2)	57.0 (51.6, 62.5)	65.8 (55.6, 75.8)	50.9 (41.9, 60.6)	53.6 (45.9, 61.7)							
Maine	34.7 (32.4, 37.1)	57.3 (52.7, 61.9)	66.5 (57.6, 75.2)	56.9 (50.8, 63.1)	66.0 (57.8, 74.1)	60.4 (50.1, 71.0)	54.7 (46.2, 63.6)							
North Carolina	37.4 (34.8, 40.1)	56.8 (50.9, 62.9)	62.1 (52.1, 72.2)	55.9 (47.0, 65.2)	64.1 (56.6, 71.5)	62.1 (51.7, 72.6)	50.3 (39.7, 61.9)							
South Dakota	45.9 (40.7, 51.6)	56.0 (46.6, 65.8)	64.7 (42.2, 86.2)	59.2 (46.6, 72.2)	65.2 (51.8, 78.3)	58.0 (34.6, 83.0)	35.1 (21.2, 54.3)							
Massachusetts	46.7 (44.3, 49.1)	55.0 (51.0, 59.2)	67.0 (57.5, 76.3)	53.5 (48.3, 58.9)	67.7 (60.6, 74.7)	65.0 (54.0, 75.8)	50.1 (41.7, 59.1)							
Iowa	40.8 (37.8, 43.8)	54.7 (49.6, 60.0)	62.1 (51.1, 73.2)	57.9 (50.1, 65.8)	53.8 (45.4, 62.7)	56.6 (46.1, 67.6)	55.8 (46.6, 65.4)							
Louisiana	34.0 (30.8, 37.6)	54.7 (48.0, 61.7)	64.3 (53.2, 75.3)	54.5 (44.2, 65.5)	58.1 (49.5, 67.0)	53.1 (40.1, 67.5)	65.5 (52.1, 78.5)							
Tennessee	39.2 (35.4, 43.2)	53.5 (47.7, 59.5)	65.4 (56.0, 74.7)	52.1 (43.2, 61.5)	65.8 (57.8, 73.7)	60.1 (49.9, 70.5)	47.8 (37.7, 59.1)							
Rhode Island	41.7 (37.4, 46.2)	53.4 (45.9, 61.3)	58.5 (47.1, 70.2)	51.8 (41.1, 63.3)	57.1 (45.7, 69.0)	49.6 (37.3, 63.5)	59.6 (47.0, 72.6)							
North Dakota	36.6 (34.0, 39.3)	53.1 (47.9, 58.5)	59.2 (47.5, 71.3)	52.6 (44.8, 60.8)	56.1 (47.6, 64.9)	56.8 (45.7, 68.5)	50.5 (40.6, 61.4)							
Vermont	37.7 (34.8, 40.8)	51.8 (46.7, 57.2)	62.5 (52.2, 72.8)	49.8 (43.1, 56.9)	62.9 (53.4, 72.4)	57.1 (45.2, 69.5)	53.2 (43.7, 63.3)							
Colorado	37.4 (35.5, 39.3)	51.5 (47.7, 55.4)	67.7 (57.7, 77.2)	47.6 (42.6, 52.8)	71.0 (63.4, 78.2)	58.8 (48.9, 69.0)	48.6 (41.3, 56.5)							
Nebraska	39.2 (37.0, 41.5)	51.2 (46.8, 55.7)	56.4 (46.6, 66.6)	47.1 (41.0, 53.7)	54.4 (46.7, 62.4)	54.8 (45.5, 64.7)	56.6 (48.8, 64.6)							
Oklahoma	34.7 (31.9, 37.6)	50.8 (44.5, 57.4)	56.3 (47.2, 65.9)	53.3 (43.2, 64.2)	56.2 (48.4, 64.2)	47.2 (37.9, 57.5)	45.2 (35.9, 55.6)							
Hawaii	42.8 (39.0, 46.8)	50.5 (44.0, 57.4)	70.1 (51.9, 86.2)	53.3 (44.4, 62.7)	68.8 (54.7, 81.9)	42.2 (29.2, 58.2)	39.9 (28.3, 54.1)							
Maryland	42.4 (39.5, 45.5)	50.1 (45.6, 54.8)	54.4 (43.7, 65.8)	46.4 (40.7, 52.6)	58.8 (51.3, 66.4)	51.8 (40.5, 64.1)	52.5 (40.3, 65.9)							
Washington	36.6 (34.4, 38.8)	49.4 (45.1, 53.9)	53.4 (43.5, 64.0)	46.6 (40.7, 53.0)	59.1 (51.3, 67.1)	52.7 (40.6, 66.0)	48.7 (41.5, 56.5)							
Montana	30.1 (27.6, 32.8)	49.2 (44.1, 54.7)	54.7 (43.8, 66.3)	45.9 (38.9, 53.7)	56.1 (47.3, 65.3)	54.5 (41.9, 68.1)	53.3 (43.0, 64.3)							
Delaware	37.7 (34.3, 41.4)	49.1 (43.9, 54.6)	63.7 (52.8, 74.6)	48.8 (41.5, 56.6)	60.9 (52.5, 69.3)	52.4 (41.1, 64.8)	46.5 (35.1, 59.4)							
Pennsylvania	30.5 (28.3, 32.9)	49.0 (43.0, 55.3)	60.4 (45.3, 75.9)	49.3 (39.6, 59.8)	54.4 (47.7, 61.5)	58.7 (42.3, 75.9)	45.8 (38.0, 54.4)							
Ohio	32.4 (30.2, 34.7)	48.7 (44.6, 53.0)	57.8 (49.6, 66.2)	47.3 (42.0, 52.9)	57.2 (50.0, 64.7)	52.6 (43.6, 62.2)	48.1 (39.3, 57.8)							
New Mexico	33.9 (31.0, 37.0)	48.7 (43.4, 54.3)	52.9 (40.4, 66.6)	52.8 (45.3, 60.8)	48.4 (39.4, 58.1)	44.2 (33.4, 56.7)	46.7 (36.3, 58.3)							
West Virginia	36.3 (33.4, 39.4)	48.5 (43.9, 53.3)	57.5 (49.1, 66.2)	44.4 (38.5, 50.7)	56.2 (47.3, 65.4)	58.1 (49.8, 66.7)	55.4 (44.8, 66.7)							
Alabama	34.6 (31.2, 38.3)	48.0 (42.7, 53.6)	56.0 (45.6, 67.0)	44.3 (37.1, 52.2)	56.2 (47.7, 65.0)	48.5 (37.7, 60.7)	59.8 (46.8, 73.2)							
Arkansas	33.5 (30.1, 37.1)	46.7 (40.9, 52.9)	54.4 (44.0, 65.6)	49.0 (40.5, 58.2)	52.4 (43.6, 61.9)	43.3 (33.1, 55.0)	45.0 (33.9, 57.9)							
Missouri	34.8 (31.3, 38.5)	46.7 (40.7, 53.1)	49.3 (36.8, 63.3)	43.5 (35.8, 51.9)	53.8 (41.9, 66.6)	41.6 (30.6, 54.8)	52.3 (41.3, 64.2)							

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

State	No high-risk conditions		1 high-risk condition [†]		2 high-risk conditions ^b		Pulmonary disease ^c		Diabetes		Heart disease ^d		Cancer ^e	
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
California	31.3 (28.7, 34.0)	46.6 (41.8, 51.6)	54.1 (43.8, 65.0)	42.9 (36.5, 49.8)	55.6 (47.5, 64.0)	41.3 (31.1, 53.4)	49.7 (39.9, 60.6)							
Utah	34.2 (31.3, 37.1)	46.0 (40.6, 51.7)	53.7 (41.8, 66.7)	41.3 (35.0, 48.3)	67.3 (55.6, 78.5)	46.3 (34.0, 60.6)	41.2 (31.1, 53.1)							
Virginia	39.1 (36.3, 42.1)	45.9 (41.8, 50.1)	54.4 (46.3, 62.9)	43.9 (38.5, 49.8)	54.8 (47.7, 62.1)	53.2 (44.4, 62.6)	43.5 (35.6, 52.3)							
Illinois	31.5 (27.5, 36.0)	45.8 (38.6, 53.7)	55.0 (41.6, 69.4)	45.8 (35.2, 57.9)	49.6 (39.1, 61.1)	47.3 (33.2, 63.8)	44.8 (32.0, 60.0)							
Connecticut	31.6 (28.7, 34.7)	44.8 (38.6, 51.5)	51.0 (38.4, 65.1)	42.1 (34.5, 50.6)	50.7 (41.3, 60.8)	48.7 (31.2, 69.7)	45.6 (35.4, 57.1)							
New Hampshire	39.2 (35.8, 42.9)	44.4 (38.7, 50.4)	55.0 (43.3, 67.5)	41.2 (33.5, 49.8)	52.1 (43.2, 61.6)	56.5 (43.6, 70.2)	45.7 (35.2, 57.7)							
New York	34.1 (31.3, 37.0)	44.2 (39.4, 49.3)	46.1 (36.8, 56.5)	44.3 (38.1, 51.0)	49.9 (40.6, 60.0)	40.2 (31.1, 50.7)	42.8 (34.0, 52.9)							
Kentucky	33.4 (30.8, 36.1)	44.0 (40.3, 48.0)	51.5 (44.1, 59.3)	42.4 (37.4, 47.8)	53.2 (46.5, 60.3)	43.6 (36.3, 51.6)	49.1 (40.9, 58.1)							
Kansas	30.5 (29.0, 32.0)	43.5 (40.6, 46.6)	59.8 (52.5, 67.2)	44.2 (40.2, 48.5)	51.8 (46.1, 57.7)	49.8 (41.5, 58.8)	42.4 (36.8, 48.5)							
Alaska	31.5 (28.0, 35.3)	43.1 (35.7, 51.2)	69.9 (52.1, 85.9)	43.9 (34.1, 55.1)	59.2 (45.4, 73.5)	47.8 (31.8, 67.0)	42.0 (27.7, 59.8)							
South Carolina	34.2 (31.1, 37.5)	42.4 (38.4, 46.6)	57.3 (48.7, 66.1)	39.1 (33.8, 44.9)	53.2 (46.8, 60.0)	51.8 (41.6, 62.8)	44.9 (36.0, 54.9)							
Texas	31.4 (28.5, 34.6)	42.2 (37.0, 47.9)	50.9 (39.7, 63.2)	43.6 (36.3, 51.6)	44.1 (36.1, 52.9)	55.0 (41.8, 69.2)	36.4 (27.3, 47.5)							
Wisconsin	29.5 (25.8, 33.5)	42.0 (34.6, 50.3)	48.9 (34.0, 66.2)	38.4 (28.4, 50.4)	51.6 (38.2, 66.5)	36.9 (23.8, 54.2)	48.8 (33.3, 66.9)							
Indiana	30.0 (27.9, 32.1)	41.9 (37.8, 46.1)	54.5 (47.2, 62.2)	40.9 (35.3, 47.2)	48.6 (42.6, 54.9)	51.4 (43.4, 60.0)	42.4 (34.1, 51.7)							
Michigan	28.6 (26.7, 30.7)	41.8 (38.4, 45.3)	54.6 (47.3, 62.3)	41.7 (37.2, 46.4)	51.5 (45.3, 58.0)	45.4 (38.1, 53.4)	42.7 (35.8, 50.4)							
Mississippi	29.9 (27.0, 33.1)	41.3 (35.8, 47.4)	46.0 (37.0, 56.0)	39.6 (32.5, 47.5)	45.2 (36.3, 55.1)	47.8 (36.1, 61.0)	41.6 (31.1, 54.1)							
Oregon	29.3 (26.6, 32.3)	41.2 (36.2, 46.6)	53.0 (42.7, 64.1)	39.5 (33.1, 46.7)	51.2 (42.1, 60.9)	48.8 (37.5, 61.5)	42.8 (33.3, 53.8)							
District of Columbia	38.1 (33.8, 42.8)	41.0 (32.2, 51.3)	44.9 (27.0, 67.7)	31.5 (22.7, 42.7)	67.3 (48.6, 84.7)	36.7 (23.1, 55.0)	45.4 (31.6, 61.8)							
New Jersey	31.1 (28.8, 33.5)	40.7 (36.1, 45.7)	42.9 (33.1, 54.2)	39.1 (32.8, 46.1)	51.4 (43.6, 59.7)	38.7 (30.3, 48.5)	33.3 (24.1, 44.7)							
Georgia	30.9 (28.3, 33.6)	39.3 (34.5, 44.5)	46.1 (36.4, 57.0)	36.2 (30.2, 42.9)	43.6 (35.8, 52.3)	41.6 (30.2, 55.3)	47.7 (37.1, 59.5)							
Nevada	29.8 (23.8, 37.0)	39.2 (32.1, 47.1)	58.3 (41.3, 76.2)	39.3 (29.0, 51.8)	50.4 (37.3, 65.1)	41.8 (29.1, 57.4)	30.6 (20.5, 44.1)							
Arizona	23.8 (20.5, 27.5)	39.0 (32.0, 46.9)	54.9 (40.9, 70.2)	38.1 (29.0, 48.8)	45.9 (34.1, 59.6)	39.3 (25.3, 57.5)	46.6 (34.6, 60.3)							
Idaho	27.8 (24.9, 31.0)	38.9 (33.2, 45.3)	46.0 (33.1, 61.1)	39.7 (31.8, 48.7)	38.4 (29.3, 49.3)	36.5 (24.2, 52.5)	43.8 (32.1, 57.5)							
Wyoming	29.3 (26.2, 32.8)	37.8 (32.4, 43.8)	35.2 (24.5, 48.9)	34.0 (26.9, 42.3)	52.1 (41.2, 63.9)	29.2 (19.8, 41.8)	31.3 (22.5, 42.4)							
Florida	21.8 (19.0, 25.0)	25.5 (21.2, 30.5)	26.4 (18.4, 37.0)	21.4 (16.4, 27.8)	34.4 (26.2, 44.4)	30.7 (21.0, 43.3)	19.5 (12.9, 28.8)							
Median	34.1	46.7	55.0	44.3	54.4	49.6	46.5							
Range	21.8-46.7	25.5-58.4	26.4-70.1	21.4-59.2	34.4-71.0	29.2-65.0	19.5-65.5							

^a Estimates are based on interviews conducted during September 2012 through June 2013 and vaccination received during July 2012 through May 2013. Estimates are sorted according from highest to lowest vaccination coverage among persons with 1 high risk condition.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

^b Adults who reported having at least one or more than one of the following: asthma, diabetes, myocardial infarction, angina or coronary heart disease, chronic obstructive pulmonary disease (COPD), emphysema or chronic bronchitis, or cancer (excluding skin cancer).

^c Includes adults reporting current asthma, chronic obstructive pulmonary disease, emphysema, or chronic bronchitis.

^d Includes adults reporting myocardial infarction, angina or coronary heart disease.

^e Excludes skin cancer.