

How Influenza Vaccination Rate Variation Could Inform Pandemic-Era Vaccination Efforts



J Gen Intern Med 35(11):3401–3
DOI: 10.1007/s11606-020-06129-x
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INTRODUCTION

With the coronavirus disease 2019 (COVID-19) pandemic persisting and an influenza season looming, preparing a public health strategy to approach herd immunity to influenza is critical to preserving health care capacity and saving lives. Influenza led to 45 million symptomatic cases and 61,000 deaths in the 2017–2018 season, but under half of US adults and two-thirds of children are vaccinated.^{1, 2} The Centers for Disease Control and Prevention (CDC) recommends all persons 6 months of age or older without contraindications receive the influenza vaccine annually, especially those at higher risk for complications (e.g., older age, underlying medical conditions).² Expanding upon earlier research on influenza vaccination disparities in 2011–2012,³ we use 2018 data to provide updated vaccination rates and identify rate variations informative to public health efforts to control influenza transmission and develop an outreach strategy for COVID-19 and other pandemic-related vaccination.

METHODS

We analyzed rates of self-reported influenza vaccination in the last 12 months recorded in the 2018 wave of the Behavioral Risk Factor Surveillance System (BRFSS), an annual national survey of 400,000+ US adults conducted by the CDC and state health departments. The 2018 data capture vaccinations for late 2017–2018 and early 2018–2019 influenza seasons. We report vaccination rates nationally and by state, age, race, sex, annual household income, chronic condition, health insurance (yes/no), and personal doctor (yes/no) subgroups weighted by BRFSS survey weights for national representativeness. Chronic conditions were defined from self-reports if respondents were ever told they had a heart attack, angina or coronary heart disease, asthma, any cancer other than skin cancer, chronic obstructive pulmonary disorder or emphysema or chronic bronchitis, arthritis, kidney disease, or diabetes. Multivariable logistic

regression was used to test for independent associations between factors of interest and odds of having received vaccination.

RESULTS

Data on influenza vaccination were available for 95.3% of 437,436 BRFSS respondents. Nationally, an estimated 33.2% of adults were vaccinated. Vaccination rates were higher among older, white and Asian, female, and higher income adults and those with chronic conditions (Table 1). In multivariable regression, these factors were all independently associated with higher odds of vaccination (Table 1). Ages 75+ had three times higher adjusted odds of vaccination than ages 18–24. Black and Native American adults both had 17% lower odds of vaccination than white adults. Having health insurance and having a personal doctor were both independently associated with two times greater odds of being vaccinated. Comparing states, there was variation in weighted vaccination rates ranging from 26.4% in Texas to 44.2% in the District of Columbia (Fig. 1).

DISCUSSION

Only one-third of US adults received the influenza vaccination in 2018. Several demographic factors including male sex, Black and Native American races, and uninsured status predicted lower rates. In contrast, factors that elevate risk of complications, such as older age and underlying medical conditions, predicted higher rates. Still, no subgroup exceeded a 60% vaccination rate, far short of the 80% that is considered sufficient to reach herd immunity and the US government's Healthy People goal.⁴ States with lower vaccination rates might especially benefit from more intensive public health interventions.

The higher influenza vaccination rate in those with a personal doctor highlights the essential role primary care practices could play in facilitating vaccination. Prior research has identified patient outreach, clinician reminders, and financial incentives as promising clinical interventions to improve vaccination rates.⁵ Primary care visits could also provide opportunities to address commonly cited concerns about side effects, effectiveness, and vaccine-acquired infection in the 41% of Americans not intending to get vaccinated.⁶

Policy action is also worth consideration. Higher vaccination in insured adults suggests that reducing uninsurance

Received June 22, 2020

Accepted August 10, 2020

Published online August 28, 2020

Table 1 Rates of Influenza Vaccination Nationally and Stratified by Subgroups (n = 416,935)

Characteristic	No. vaccinated	Unweighted % vaccinated	Weighted % vaccinated	Adj. odds ratio (SE) ^c	p value
National	164092	39.4	33.2	—	—
Age groups ^a					
18–24	5537	22.6	21.6	Ref	
25–34	10602	24.1	22.5	1.01 (0.04)	0.725
35–44	13,500	27.6	25.2	1.02 (0.04)	0.530
45–54	18,612	30.5	28.9	1.12 (0.04)	0.004
55–64	33,669	39.3	38.4	1.61 (0.06)	< 0.001
65–74	43,598	51.2	51.0	2.48 (0.09)	< 0.001
75+	35,974	59.3	58.3	3.38 (0.14)	< 0.001
Race/Ethnicity					
White	131632	41.5	36.1	Ref	
Black	11494	33.9	27.8	0.83 (0.02)	< 0.001
Asian	3815	38.3	38.3	1.54 (0.08)	< 0.001
American Indian/Alaskan Native	2833	35.6	29.3	0.83 (0.05)	0.003
Hispanic	10036	28.9	25.3	1.05 (0.03)	0.120
Other race	4282	31.7	28.5	0.88 (0.04)	0.004
Sex ^a					
Male	68986	36.7	30.7	Ref	
Female	94820	41.6	35.7	1.17 (0.02)	< 0.001
Household income ^a					
<\$15,000	11351	33.9	29.6	Ref	
<\$25,000	19934	35.7	29.6	0.99 (0.03)	0.767
<\$35,000	13766	37.7	30.7	0.99 (0.04)	0.765
<\$50,000	18537	38.5	31.5	1.01 (0.04)	0.728
\$50,000 or more	73760	41.8	36.0	1.32 (0.04)	< 0.001
Chronic conditions ^b					
0	58055	31.6	26.8	Ref	
1	51193	41.9	36.3	1.16 (0.02)	< 0.001
2	28967	48.0	43.1	1.30 (0.03)	< 0.001
3	14336	50.7	47.2	1.42 (0.05)	< 0.001
4+	11255	52.7	52.1	1.71 (0.07)	< 0.001
Insurance status ^a					
Uninsured	5224	16.1	14.0	Ref	
Insured	156809	41.6	36.0	1.97 (0.07)	< 0.001
Personal doctor					
No	13068	19.4	16.4	Ref	
Yes	148495	43.6	38.3	1.91 (0.05)	< 0.001

^aNumber of don't know, refused, or missing: age groups (7291), race/ethnicity (0), sex (894), income (76118), insurance status (1958), personal doctor or health care provider (2746)

^bSome observations had data for only some chronic conditions: missing all (23), missing at least one condition (9475). Missing data were treated as 0 (no) in the summation of chronic conditions calculation

^cMultivariable logistic regression (n = 390,000) of whether a respondent had the influenza vaccination in the last 12 months (0/1) adjusted for state, age group, race/ethnicity, sex, household income category, number of chronic conditions, insurance status, and having at least one personal doctor or healthcare provider. Model excluded observations with unknown/refused/missing values for the included variables. Coefficients for states are not shown. SE, standard error

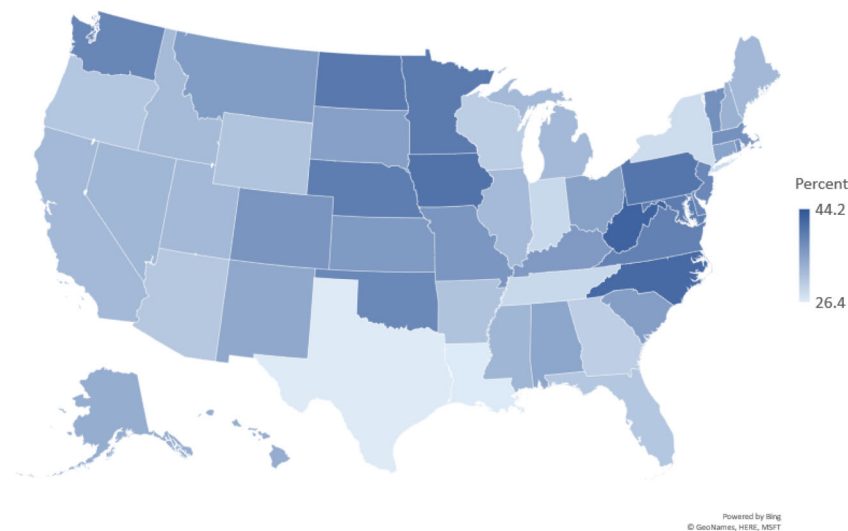


Fig. 1 Rates of influenza vaccination by US state weighted by BRFSS survey weights. The values for each state are available upon request.

could, by increasing access to care, improve vaccination rates. Offering vaccinations at no out-of-pocket cost would eliminate the financial barrier for the uninsured especially. Pharmacies, including those inside supermarkets, could be incentivized to play larger roles in influenza vaccination. The concurrent COVID-19 pandemic also raises the issue of whether vaccination for influenza, COVID-19 (when a vaccine becomes available), or both should be mandated. While a federal mandate may be difficult politically, private organizations like colleges and employers could condition service utilization or employment on vaccination. Public health agencies might partner with community organizations in underserved communities to ensure culturally and linguistically appropriate outreach.

A persistently low influenza vaccination rate will have serious implications on health care capacity and mortality in the looming influenza season with a coinciding COVID-19 pandemic. These data inform where public health agencies and health care providers might focus resources towards reaching both higher and lower risk groups to bring the US closer to herd immunity.

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Compliance with Ethical Standards: Conflict of Interest
The authors have no conflicts of interest to report.

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