

Disparities in Flu Vaccination Uptake by Ethnicity and Varying Demographics

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Abstract

Background: On average, approximately 50% of those eligible to get the flu vaccine in the United States receive it each year. This is significantly less than the goal of 70% vaccinated annually. Factors that may lead to individuals not getting the vaccine will be studied to increase vaccine uptake.

Method: The 2020 Behavioral Risk Factor Surveillance System was analyzed to determine flu vaccination uptake among demographic and socioeconomic factors, focusing on how race/ethnicity related to individuals receiving a vaccination. Chi-Squared tests were used to determine significance of individual factors, and adjusted odds ratios and logistic regression were used to determine the effects of all factors on getting the flu vaccination within the past year.

Results: Of the 298,487 participants included in the study, 53.07% received a flu vaccine within the past year, while 46.93% did not. Those aged 65 and older were the most likely to get the vaccine, while those 18-34 were the least likely. Individuals without a primary care doctor or health insurance were less likely to get the vaccine than those that did. Black individuals had the lowest likelihood of getting a flu vaccination compared to Whites, Hispanics, and individuals of other ethnicities.

Conclusions: Racial disparities in flu vaccination uptake still exist, even when adjusting for demographic and socioeconomic factors. While various demographic and socioeconomic factors do have a significant impact on individuals receiving the flu vaccine across all ethnicities, there needs to be more focus on increasing flu vaccination rates among Black individuals.

Disparities in Flu Vaccination Uptake by Ethnicity and Varying Demographics

INTRODUCTION

Influenza, also known as the flu, is a respiratory illness that infects hundreds of thousands of people across the United States every year. In most cases, these infections are mild, but in some the infection can worsen to the point of hospitalization, and in extreme cases, death. During the 2019-2020 flu season, the United States saw approximately 35 million symptomatic cases of the flu, 16 million medical visits due to the flu, 380,000 hospitalizations caused by more severe cases of the flu, and 20,000 flu-related deaths (CDC, 2021).

To protect people from severe cases of the flu, the flu vaccine is recommended for people 6 months of age and older (CDC, 2021). Historically, less than 50% of those eligible receive it each year. In 2010, the flu vaccination rate for U.S. adults was 40.5%, and since then has slightly risen every year with the flu vaccination rate for adults in the U.S. during the 2019-2020 flu season sitting at approximately 48.4% (CDC, 2020). This is still well below the goal of 70% of U.S. citizens being vaccinated each flu season introduced by Healthy People 2030, the nation's 10-year plan for addressing critical public health challenges (Healthy People 2030). There are many speculated reasons why individuals may refrain from getting a flu vaccine, including logistical reasons such as lack of access to the vaccine or not being able to afford a vaccination, as well as social and personal reasoning, such as a lack of trust in the vaccine's efficacy, fear of needles, feelings of not needing it, and many more.

Additionally, there is a large disparity between the flu vaccination rates across varying ethnicities. Black individuals had the lowest rate of flu vaccination during the 2019-2020 flu season at 45.6%, with Hispanic individuals coming in next at 46.6%, and individuals of other ethnicities (besides Black, Hispanic, and White ethnicities) sitting at 51.8% (CDC, 2021). White

individuals had the highest flu vaccine rate during the 2019-2020 flu season at 54.8%, which is well above the overall average for U.S. adults.

It is important to observe the disparities in flu vaccine uptake with respect to other demographic and socioeconomic factors. In the social climate of the country, it is apparent that there are racial disparities that expand further than just flu vaccine rates. In 2018, 21% and 15% of Black and Hispanic individuals, respectively, received a bachelor's degree or higher compared to 35% of White individuals (de Brey et al., 2019). Additionally, in 2019, the median family wealth of a White household was \$188,200, while the median family wealth for Black and Hispanic households were \$24,100 and \$36,100, respectively (Bhutta et al., 2020). Furthermore, in 2018, the unemployment rate for White individuals was 3.5% while the unemployment rate for Black and Hispanic individuals was 6.5% and 4.7%, respectively (Bureau of Labor Statistics, 2020). Thus, it follows that varying demographics need to be studied with how they relate to ethnicity and getting the flu vaccine. With the goal of reaching the 70% vaccination rate set by Healthy People 2030, knowing all aspects that play into an individual's decision to not get the vaccine will help aid in coming up with ways to get more people to receive it. It is vital to know if ethnicity is a significant contributing factor, or if it is rather the socioeconomic factors that are seen more predominantly in Black and Hispanic individuals compared to White individuals that cause people to not get the vaccine rather than an individual's ethnicity itself.

Prior research has been done on this topic, since this is a common issue that researchers are frequently trying to address. Many of these studies focus mainly on how individual factors relate to flu vaccination uptake. Demographic factors observed in these studies include age, gender, ethnicity, etc. It is widely accepted that these demographics do have an impact on flu vaccination rates (Lu et al., 2015). The nativity of an individual, meaning whether they were

born in the U.S. or outside the country, was also observed to influence receiving the flu vaccine (Jang & Kang, 2021). Other factors studied include income, marital status, education level, overall perception of vaccinations (Abbas et al., 2018), and English proficiency (Almario et al., 2016). All these factors were found to have an influence on vaccination uptake.

This study aims to observe how socioeconomic factors relating to common racial disparities influence flu vaccination rates. Previous studies used data that was 5-10 years old. In a social climate that changes as rapidly as it does, the conclusions that were made could potentially be outdated and inaccurate. This study aims to use the most recent Behavioral Risk Factor Surveillance System data from 2020 including individuals across the United States to obtain the most well-rounded, complete, and recent set of data to make conclusions about the effect ethnicity has on flu vaccination rates when all socioeconomic factors are accounted for.

METHODS

Data Collection

The 2020 Behavioral Risk Factor Surveillance System (BRFSS) data was analyzed. BRFSS is a national system of telephone surveys used to collect health-related data about U.S. adult residents (CDC, 2014). This survey includes residents from all 50 states and the District of Columbia, as well as U.S. territories Guam, Puerto Rico, and the Virgin Islands. Only adults aged 18 or older were surveyed, so the data is restricted to only information on adults in the U.S.

The question used as the dependent variable was “During the past 12 months, have you had either flu vaccine that was sprayed in your nose or flu shot injected into your arm?”, which had responses of “Yes”, “No”, “Don’t know/Not sure”, or “Refused”. Only the responses “Yes” and “No” were included in the analysis, which will allow for a distinct percentage of those that got the flu vaccine and those that did not. The exposure variable is the ethnicity of the individual,

categorized as “White”, “Black”, “Hispanic”, and “Other”. Any response from the individual when asked about their ethnicity that was not the former three ethnicities was included in the “Other” category.

Related factors included the individual’s age (18-34, 35-64, and 65+ years old), gender (Male vs. Female), residence location (Rural vs. Urban), education level (College Graduated, Some College, and High School or Less), employment status (Employed, Unemployed, and Retired), household income level (<\$25,000, \$25,000-\$50,000, and >\$50,000), having a chronic illness (Yes vs. No), having a primary doctor (Yes vs. No), and having health insurance (Yes vs. No). With regards to employment status, the term “unemployed” refers those out of work at the time of the survey being conducted, those that consider themselves homemakers, students that are not working, and those that are unable to work. Additionally, an answer of “Yes” for having a chronic illness includes having ever had a heart attack, having coronary heart disease, a stroke, asthma, various types of cancer, C.O.P.D., arthritis, kidney disease, or diabetes.

These variables are the demographic and socioeconomic factors that are being studied to see how they relate to an individual’s ethnicity, and how they may effect an individual’s decision to receive the flu vaccine. Any answers outside of the created categories are excluded from the data, and thus excluded from analysis. Once these observations with missing data were removed, 298,487 participants remained.

Analysis Methods

SAS was used to perform all data analysis. The Chi-Squared test was used to determine if individual factors are related to getting the flu vaccine in the past year, which will determine if the variable is included in the model, with a p-value of 0.05 or less being considered significant. Adjusted odds ratios were used to determine how factors are independently associated with

getting the flu vaccine after taking other variables into account. Additionally, logistic regression was used to determine the significance of race/ethnicity in an individual's decision to get the flu vaccine when adjusting for all factors included in the model, with a p-value of 0.05 or less being considered significant.

RESULTS

Overall, 401,958 individuals participated in the 2020 BRFSS survey. Of these participants, 298,487 were included in this study, after removing observations with missing data. The characteristics of these participants are described in Table 1. Roughly half of all participants were between the ages of 35 and 64, with approximately 17% between the ages of 18 and 34, and about 34% being 65 or older. Slightly more than half of participants were female at 53%, and most participants lived in urban area at 85%. In terms of education level, 31% completed high school or less, 28% completed some college, and 41% received a college degree or higher. Of all participants, 53% are employed, 18% are unemployed, and 29% are retired. Most participants have a household income of greater than \$50,000 annually at 54%. 55% of participants have been diagnosed with a chronic illness and 83% have a person they consider to be their primary care doctor. Additionally, 92% of participants have health insurance, while 8% do not. Most participants were White at 78%, followed by 7% being Hispanic, 7% being Black, and 8% being another ethnicity. Finally, 53% of participants say they have received a flu shot in the past year, and 47% say they have not.

Table 2 describes the factors associated with getting a flu vaccine in the past year. Out of all age groups, individuals 65 years old or older have the highest percentage of receiving a flu vaccination, while individuals between 18 and 34 years of age have the highest percentage of not receiving the vaccine. Females have a higher percentage of getting the flu vaccine than males.

Table 1. Descriptive Characteristics of Behavioral Risk Surveillance System Participants in the United States, 2020		
Characteristics	n = 298487	
	n	%
Age in Years		
18-34	50308	16.85%
35-64	148125	49.63%
65+	100054	33.52%
Sex		
Male	139908	46.87%
Female	158579	53.13%
Residence Type		
Urban	253732	85.01%
Rural	44755	14.99%
Education Level		
College Graduated	121934	40.85%
Some College	83805	28.08%
High School or Less	92748	31.07%
Employment Status		
Employed	159635	53.48%
Unemployed	53791	18.02%
Retired	85061	28.50%
Annual Household Income Level		
>\$50,000	162062	54.29%
\$25,000-\$50,000	69722	23.36%
<\$25,000	66703	22.35%
Have Chronic Illness		
Yes	164273	55.04%
No	134214	44.96%
Have Primary Doctor		
Yes	247636	82.96%
No	50851	17.04%
Have Insurance Coverage		
Yes	274799	92.06%
No	23688	7.94%
Race/Ethnicity		
White	232154	77.78%
Black	22249	7.45%
Hispanic	22546	7.22%
Other	21538	7.78%
Got Flu Shot in Last Year		
Yes	158403	53.07%
No	140084	46.93%

Those living in urban settings are more likely to get the vaccine than those in rural areas.

Individuals with a college degree or higher are most likely to get the flu vaccine, while those that completed high school or less are most likely to not receive the vaccine. Unemployed individuals have the lowest percentage of getting the flu vaccine with retired individuals having the highest percentage. As household income increases, the percentage of those receiving a flu vaccination also increases. Those with a chronic illness are more likely to get the flu vaccine than not get the vaccine. Additionally, individuals with a primary care doctor and individuals with health insurance are more likely to get the vaccine than those without each of these. Only White individuals have a higher percentage of getting the flu vaccine than not getting it.

Each of the variables included in the model were extremely significant, meaning they are related to receiving a flu vaccine in the past year. Table 2 also includes the p-value of the Chi-Squared test to test whether individual factors are associated with the dependent variable. Observe that all variables tested have a p-value of less than 0.0001, which is much less than the set p-value of 0.05. This means that all variables have a significant impact on the outcome of whether an individual gets a flu vaccine.

Table 3 depicts the adjusted odds ratios (AOR) of factors independently associated with getting a flu vaccine in the past year. Those aged 65 and older are 81% more likely to receive a flu vaccine than those aged 18-34 (AOR = 1.811), while individuals aged 35-64 have approximately the same likelihood as those 18-34 (AOR = 1.023). Females are approximately 23% more likely to get the flu vaccine than males (AOR = 1.228). Individuals living in a rural setting are 17% less likely to receive the flu vaccine than those in an urban area (AOR = 0.831). Those that receive some college education and those that received a high school degree or less are 36% and 45% less likely to receive the vaccine than those with a college degree or higher,

Table 2. Factors Associated with Getting Flu Vaccination in the Past 12 Months, among Adults in the United States, 2020			
Characteristics	Getting Flu Shot in Past 12 Months n=298487		
	Yes (%)	No (%)	p Value
Total	N	N	
Age in Years			
18-34	19425 (36.16%)	30883 (63.84%)	<.0001
35-64	69701 (43.89%)	78424 (56.11%)	
65+	69277 (68.05%)	30777 (31.95%)	
Sex			
Male	68647 (43.09%)	71261 (56.91%)	<.0001
Female	89756 (50.32%)	68823 (49.68%)	
Residence Type			
Urban	135719 (47.00%)	118013 (53.00%)	<.0001
Rural	22684 (43.11%)	22071 (56.89%)	
Education Level			
College Graduated	74672 (57.48%)	47262 (42.52%)	<.0001
Some College	42401 (45.54%)	41404 (54.46%)	
High School or Less	41330 (38.85%)	51418 (61.15%)	
Employment Status			
Employed	74921 (42.37%)	84714 (57.63%)	<.0001
Unemployed	24331 (40.71%)	29460 (59.29%)	
Retired	59151 (67.80%)	25910 (32.20%)	
Annual Household Income Level			
>\$50,000	92025 (51.07%)	70037 (48.93%)	<.0001
\$25,000-\$50,000	35868 (44.35%)	33854 (55.65%)	
<\$25,000	30510 (39.05%)	36193 (60.95%)	
Have Chronic Illness			
Yes	99350 (55.09%)	64923 (44.91%)	<.0001
No	59053 (39.33%)	75161 (60.67%)	
Have Primary Doctor			
Yes	144277 (52.92%)	103359 (47.08%)	<.0001
No	14126 (25.13%)	36725 (74.87%)	
Have Insurance Coverage			
Yes	153158 (50.16%)	121641 (49.84%)	<.0001
No	5245 (20.44%)	18443 (79.56%)	
Race/Ethnicity			
White	129710 (51.01%)	102444 (48.99%)	<.0001
Black	9605 (38.24%)	12644 (61.76%)	
Hispanic	8986 (35.72%)	13560 (64.28%)	
Other	10102 (48.04%)	11436 (51.96%)	

based on an AOR of 0.635 and 0.554, respectively. Retired individuals are 54% more likely to receive the vaccine compared to employed individuals (AOR = 1.543). Additionally, employed and unemployed individuals have about the same likelihood, with the AOR being 1.087 for unemployed compared to employed. Household incomes of \$25,000-\$50,000 as well as less than \$25,000 are 15% (AOR = 0.854) and 23% (AOR = 0.771) less likely, respectively, to get the flu vaccine than those with a household income of more than \$50,000. Furthermore, those without a chronic illness, without a primary care doctor, and without health insurance are less likely to get the flu vaccination than those with each of these, at 28% (AOR = 0.772), 52% (AOR = 0.479), and 47% (AOR = 0.525), respectively. Finally, White individuals and those of other ethnicities have similar chances of getting the flu vaccine (AOR = 1.038). Hispanics have only 8% less chance of receiving the vaccine compared to White individuals (AOR = 0.918), while Black individuals still have a significantly less chance of getting the vaccine at 31% (AOR = 0.687).

The results of the logistic regression show that there are only two factors that are not significant to the model: annual household income of \$25,000-\$50,000 and Hispanic individuals. This means that an annual household income of \$25,000-\$50,000 is not significant to influencing flu vaccination. Additionally, a Hispanic ethnicity is also not significant to effecting whether an individual receives the flu vaccine. The rest of the factors remain impactful in determining whether an individual will get the vaccine.

Table 3. Factors Independently Associated with Getting Flu Shot in Past 12 Months (Adjusted Odds Ratio), Among Adults in the United States, 2020			
Characteristics	Getting Flu Shot in Past 12 Months		
	AOR (%)		p-Value
Age in Years			
18-34	1.000	<i>reference</i>	
35-64	1.023	(0.975-1.074)	<.0001
65+	1.811	(1.688-1.944)	<.0001
Sex			
Male	1.000	<i>reference</i>	
Female	1.228	(1.182-1.276)	<.0001
County Type			
Urban	1.000	<i>reference</i>	
Rural	0.831	(0.791-0.873)	<.0001
Education Level			
College Graduated	1.000	<i>reference</i>	
Some College	0.635	(0.607-0.664)	<.0001
High School or Less	0.554	(0.529-0.581)	<.0001
Employment Status			
Employed	1.000	<i>reference</i>	
Unemployed	1.087	(1.030-1.147)	<.0001
Retired	1.543	(1.449-1.644)	<.0001
Annual Household Income Level			
>\$50,000	1.000	<i>reference</i>	
\$25,000-\$50,000	0.854	(0.813-0.896)	0.2418
<\$25,000	0.771	(0.728-0.817)	<.0001
Have Chronic Illness			
Yes	1.000	<i>reference</i>	
No	0.722	(0.693-0.751)	<.0001
Have Primary Doctor			
Yes	1.000	<i>reference</i>	
No	0.479	(0.454-0.506)	<.0001
Have Insurance Coverage			
Yes	1.000	<i>reference</i>	
No	0.525	(0.485-0.568)	<.0001
Race/Ethnicity			
White	1.000	<i>reference</i>	
Black	0.687	(0.647-0.730)	<.0001
Hispanic	0.918	(0.853-0.987)	0.4970
Other	1.038	(0.955-1.128)	<.0001

DISCUSSION

The Behavioral Risk Factor Surveillance System is an extremely powerful tool to gaining information and data on numerous public health issues. The fact that the survey is conducted nationwide allows for the most well-rounded and complete data for making accurate conclusions about different public health issues that arise in the U.S. However, there are some limitations to this data. All data collected is self-reported, which could easily lead to inaccurate results. Additionally, since this data is purely about public health issues, there are no questions regarding perception or feelings regarding vaccinations. This would give a better idea of individuals' feelings toward flu vaccinations, which could further explain low vaccine rates and vaccination disparities among varying factors. Still, this data allows for significant results and meaningful conclusions to be drawn that could be helpful to increasing vaccination rates.

All demographic and socioeconomic factors studied were independently associated with flu vaccination uptake. In general, the individuals that are the most likely to receive a flu vaccination are females, individuals 65 or older, those living in an urban area, those with higher education, retired individuals, those with a higher annual household income, those having a chronic illness of some kind, those with a primary care doctor, those with health insurance coverage, and White individuals.

When it comes to observing how each factor separately relates to the dependent variable of getting a flu vaccine in the past year, there are trends that certain factors follow. As age increases, the percentage of individuals getting the flu vaccine in the past year also increases, and the percentage of those not getting the flu vaccine decreases. Similarly, as the education level increases, the percentage of those getting the vaccine increases as well. Furthermore, as annual household income increases, so does the percentage of receiving the flu vaccine.

Additionally, there seems to be different factors that are related to each other. Individuals 65 and older are the most likely to be retired, which means that these two are related, which can be seen by the similar percentages between age 65+ and retired employment status in those getting the vaccine. The average age for individuals to retire is 65 for men and 62 for women, which further confirms the relation between these two factors (Rutledge, 2018). Similarly, those that don't have health insurance will be less likely to have a primary care doctor, which can again be seen by the similar percentage distributions between getting the vaccine or not getting it between the two factors. Having health insurance coverage increases the likelihood of having a person that an individual would consider their primary care doctor, and therefore not having health insurance will have the opposite effect on an individual having a primary care doctor (Smith, et al. 2017).

When observing the distribution of those receiving the flu vaccine between ethnicities, there is a clear discrepancy between the four categories of ethnicities. White individuals have the highest proportion of getting the vaccination, followed by those of other ethnicities, Black individuals, and finally Hispanic individuals. Thus, Black and Hispanic individuals are the least likely to get the flu vaccine, whereas White individuals are the most likely to receive the vaccine, based purely on race/ethnicity.

However, it is important to adjust for the various demographic and socioeconomic factors included in the analysis because, as discussed previously, there is a clear disparity in these factors between ethnicities across the country. By adjusting for these factors, it puts all ethnicities on an even playing field to determine the likelihood of getting the vaccine. Interestingly, when the other factors are adjusted for, there still seems to be a large discrepancy between flu vaccination uptake between ethnicities. Now, the difference between White, Hispanic, and Other

individuals getting the vaccine has diminished, with all of their adjusted odds ratios being close to 1. The odds of Black individuals, however, remains extremely low. From this it follows that there does remain a racial disparity in flu vaccination uptake that cannot be explained by the variables included in the study.

CONCLUSIONS

Black individuals have the highest flu-related hospitalization rate, the highest flu-related ICU admission, and the highest flu-related in-hospital deaths compared to all other ethnicities over the past 10 flu seasons (CDC, 2021). This is concerning because, while other demographic and socioeconomic factors do have significant influence on flu vaccination rates across the U.S., ethnicity is still a large contributor in individuals choosing not to receive the flu vaccine, with Black individuals having the lowest flu vaccination uptake among all observed ethnicities. While some of the racial disparity in vaccination uptake can be explained by factors observed in this study, there are still factors that are contributing to this low vaccination uptake that cannot be explained within the scope of the study. Additional research on exact reasons individuals may not get a flu vaccination is necessary to discovering why there remains a disparity in uptake between Black individuals and individuals of all other ethnicities. With more research, better conclusions can be drawn as to why individuals choose not to get the vaccine. With more well-rounded and all-encompassing conclusions behind why individuals do not get the flu vaccine, the U.S. can create resources and programs to help increase vaccination rates in Black individuals in order to reach a vaccination rate of 70%, a goal set by Health People 2030.

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