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Associations between 5-year Influenza Vaccination and Sociodemographic Factors and Healthcare Access among Arkansans

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Abstract

Despite wide availability, only 50.2% of the United States (US) adult population and 50.3% of adult Arkansans were vaccinated for influenza during the 2020–2021 influenza season. The proportion of the population vaccinated for influenza varies by age, sex, race/ethnicity, education, rural/urban residence, and income. However, measures of health care access have not been adequately investigated as predictors of influenza vaccination. Using a large, statewide random sample, this study examined 5-year influenza vaccination among Arkansans by sociodemographic characteristics (age, sex, race/ethnicity, education, rural/urban residence), general vaccine hesitancy, and health care access (having a primary care provider, having health insurance, forgoing healthcare due to cost, and frequency of doctor checkups). Older age, being female, being Hispanic, having a Bachelor's degree or higher, having a primary care physician, visiting a doctor for a checkup in the past two years, and lack of hesitancy towards vaccines were significant predictors of receiving influenza vaccination.

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Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Keywords

influenza vaccine; vaccine hesitancy; health care access; Hispanic

Introduction

Influenza affects (or infects) approximately 1 billion people worldwide annually [1]. The overall influenza burden during the 2018–2019 influenza season was 29 million infections, 380,000 influenza-related hospitalizations, and more than 28,000 deaths in the United States (US) [2]. The annual economic burden of influenza on the US health care system is estimated at 25.3 billion dollars [3]. The influenza vaccine provides protection against severe influenza-related illness and reduces the need for outpatient care, hospitalizations, and intensive care unit admissions [4].

The Healthy People 2020 target for influenza vaccination for adults was 70.0% [5]. Despite wide availability, only 50.2% of the US adult population and 50.3% of adult Arkansans were vaccinated against influenza during the 2020–2021 influenza season [4]. Existing literature shows the proportion of the population who are vaccinated against influenza varies by age, sex, race/ethnicity, education, rural/urban residence, and income. Those who are older, female, and living in urban areas and those who have a higher level of education and income are more likely to get the influenza vaccine [6]. There are documented disparities by race and ethnicity, with communities of color being less likely to receive the influenza vaccine [4, 6–9].

Several studies have examined associations between socio-demographic factors and influenza vaccination [4, 6–9]. However, few studies have examined associations between influenza vaccination and access to health care. The available studies have shown the positive influence of vaccine reminders and belief that the influenza vaccine is effective [10–12]. To our knowledge, no studies have examined the effect of health care access and of having a relationship with a primary care provider on 5-year influenza vaccination.

To fill this gap in the literature, this study undertook the following aims. First, the study examined 5-year influenza vaccination rates by socio-demographic characteristics (age, sex, education, rural/urban location, race/ethnicity) and general vaccine hesitancy. Based on prior literature, it was hypothesized older age, being female, having a higher education, and living in an urban location would be positively associated with influenza vaccination; minority race and general vaccine hesitancy were hypothesized to be negatively associated with influenza vaccination. Second, the study examined associations between health care access and influenza vaccination. It was hypothesized having health care insurance coverage, having one or more primary care provider(s), and having seen a provider for routine checkup within the past two years would be positively associated with influenza vaccination and that delayed care because of costs would be negatively associated with influenza vaccination.

Methods

Procedures

From July 12 to July 30, 2021, trained interviewers surveyed 1,500 Arkansas adults. Potential participants were contacted using random digit dialing of telephone landlines and cell phones. Oversampling procedures were used for Black/African-American and Hispanic residents. Spanish-speaking participants were interviewed by Spanish-speaking interviewers using a Spanish translation of the survey.

Inclusion criteria required participants to be 18 years of age or older and a current resident of Arkansas. The study was explained to potential participants, and verbal consent was obtained prior to survey administration. Participants could refuse to answer any question or state they did not know. Such response options were recorded when offered by the participant; however, they were not read aloud as survey question response options.

All study procedures were reviewed and approved by the institutional review board at the University of Arkansas for Medical Sciences (IRB # 262907).

Measures

Influenza Vaccine Uptake.—The dependent variable was an ordinal measure of five-year influenza vaccine uptake. To measure behavior related to influenza vaccination, participants were asked, “How many years in the past 5 years have you gotten a seasonal flu vaccine?” Response options included “never,” “1–2 years,” “3–4 years,” and “every year.”

General Vaccine Hesitancy.—Using an established measure of vaccine hesitancy from Quinn et al. (2019), participants were asked to report their hesitancy toward vaccines in general [13]. Participants were asked, “Overall, how hesitant are you about getting vaccinations?” Response options included “not at all hesitant,” “a little hesitant,” “somewhat hesitant,” and “very hesitant.” Responses of “a little hesitant,” “somewhat hesitant,” and “very hesitant” were combined for analyses (i.e., to compare those who are hesitant with those who are not hesitant).

Sociodemographic Characteristics.—Age, race, sex, education, marital or cohabitating status, and metro or non-metro location were captured. Age was estimated from participants’ reported year of birth. Sex is reported as either male or female. Although a third and fourth option of non-binary and self-identification were available, too few participants selected these options (n=3) to be included in the analysis. Participants reported their highest level of school completed. Responses were grouped into: high school or lower, some college/associates degree, and Bachelor’s degree or higher. Location was designated as metro or non-metro based on the county where the participant resided. Determination of location status was based on the US Department of Agriculture Rural-Urban Continuum Codes [14].

Health Care Access.—Health care access was measured using four survey items: (1) “Do you have any kind of health care coverage, including health insurance, prepaid plans, such as HMOs, government plans such as Medicare, or Indian Health Service?” (Yes/No); (2)

"Do you have one person you think of as your personal doctor or health care provider?" (Yes/No); (3) "About how long has it been since you last visited a doctor for a routine checkup?" Response options included: in the past year, in the past 2 years, in the past 5 years, 5 or more years ago, never. Due to potential changes in health care-seeking behaviors due to the COVID-19 pandemic, responses were collapsed into two categories: within the past 2 years and more than 2 years ago; and (4) "Was there a time in the past 12 months when you needed a doctor but could not see one because of the cost?" (Yes/No).

Statistical Analyses

Data were managed, cleaned, and analyzed using STATA 15.1 and SAS 9.4. No duplicate records were detected. Participants with incomplete responses (N=112; 7.4%) were omitted from the analyses. The most frequent patterns were those missing only a date of birth (N=36) and those missing only a response to the influenza vaccination question (N=17). Weights were generated using ranking ratio estimation to ensure the sample was representative of the Arkansas 2019 census estimates for age (18–29, 30–39, 40–49, 50–59, 60–69, 70–79, 80+), sex (male, female), and race/ethnicity (non-Hispanic White, non-Hispanic Black, non-Hispanic other or multiracial, and Hispanic any race). We present results of weighted descriptive statistics and ordinal logistic regression. Prior to running the ordinal logistic regression, tests of multicollinearity among the predictor variables were conducted using two procedures. First, we ran a spearman rank correlation for all predictors. No correlation among the predictors was near the threshold of 0.8, with the highest at 0.40. Second, we ran multicollinearity diagnostics including variance inflation factor (VIF) and tolerance (TOL). Since these options are not available in ordinal regression, an ordinary least squares regression was employed after dummy coding all categorical predictor variables. All variables had a VIF score far below the cutoff of 10.0, with the highest at 1.65, and all TOL scores were far above the threshold of 0.10, with the lowest at 0.61. The Brant test indicated the assumption of proportional odds was met (p=0.06), and a proportional odds model was employed.

Results

Descriptives

Table 1 provides weighted estimates of descriptive statistics for all variables included in the regression model for this study. Mean age was 48.5 (±19.0). Age was nearly evenly distributed across four groups, with those aged 60 and older representing the largest group (31.0%). Just over half of participants were female (51.1%), and nearly three-fourths were White (72.0%). More than one-third of participants reported having a Bachelor's degree or higher education (36.3%). Approximately half of participants were married or cohabitating (50.7%), and seven out of every 10 participants lived in metro (i.e., urban) areas (68.9%).

Among health care access variables, the large majority had healthcare coverage (88.4%), had a primary care physician (82.7%), did not have to forego healthcare due to cost (85.5%), and had a routine doctor checkup two years ago or more recently (83.6%). More than half of participants were not vaccine hesitant at all (55.0%). Slightly less than half elected to be

vaccinated against influenza every year over the past five years (46.9%); more than a quarter (28.6%) reported “never” receiving the influenza vaccine over the past five years.

Ordinal Logistic Regression

Table 2 provides the results of the ordinal regression analysis. Age, sex, race/ethnicity, education, primary care physician, doctor checkups, and general vaccine hesitancy were significant predictors of five-year influenza vaccination.

Sociodemographic Predictors.—Older participants (aged 60 and over) had 82% greater odds of being vaccinated more years than those aged 18–29 (OR=1.82; CI=1.31, 2.52). However, participants between 30 and 44 years of age had 28% lower odds of being vaccinated more years than the youngest group of participants (OR=0.72; CI=0.52, 0.98). Females had 42% greater odds than males to be vaccinated against influenza a greater number of years (OR=1.42; CI=1.15, 1.75), Hispanic participants had 72% higher odds than White participants (OR=1.72; CI=1.13, 2.60), and those with a Bachelor’s degree or higher had nearly 60% higher odds than participants with a high school diploma or lower to be vaccinated against influenza a greater number of years (OR=1.58; CI=1.21, 2.07).

Health Care Access Predictors.—Participants with a primary care physician and those who had visited the doctor in the last two years had over twice the odds of those without a primary care physician (OR=2.28; CI=1.67, 3.10) and those who had not seen a doctor in the past two years (OR=2.22; CI=1.61, 3.06) to be vaccinated against influenza for a greater number of years.

General Vaccine Hesitancy.—Participants who expressed no hesitancy to vaccines had over three times the odds to be vaccinated against influenza for a greater number of years compared with those who expressed any level of hesitancy (OR=3.10; CI=2.50, 3.84).

Discussion

This study examined 5-year influenza vaccination by sociodemographic characteristics, health care access, and general vaccine hesitancy. The first hypothesis was partially supported. Older age, female, and higher education were positively associated with 5-year influenza vaccination. General vaccine hesitancy was negatively associated with 5-year influenza vaccination. These results are consistent with prior literature, which have shown similar associations [4, 6–8]. Rural/urban residence was not associated with influenza vaccination, which is in contrast with literature finding negative associations between rural location and influenza vaccine receipt [15, 16]; however, literature regarding rural/urban residence has been mixed with some studies showing null associations [17] or even higher vaccination receipt in rural locations [8].

While race/ethnicity was significantly associated with influenza vaccine receipt, it was not in the direction hypothesized. Hispanic respondents had greater odds of influenza vaccination compared to non-Hispanic White respondents. This finding is in contrast with most past literature which has shown Black and Hispanic community members are less likely to receive the influenza vaccine [4, 6, 18–23]. These findings are encouraging

and may demonstrate Arkansas' efforts to reduce vaccination disparities are succeeding. However, Hispanic residents of Arkansas are a diverse group, and there may be within-group variation among them (e.g., across language) that could further differentiate their vaccination behavior.

The second hypothesis was partially supported. Having a primary care provider and having seen a provider for routine checkup in the past two years were positively associated with influenza vaccination. However, there were no significant associations with having health care insurance coverage or for delayed care due to costs. These findings suggest a relationship with a health care provider may be more influential to vaccine uptake than costs of care. These findings are consistent with emerging literature documenting the importance of health care provider relationships and health care provider conversations for other vaccines including human papillomavirus [24–26] and COVID-19 [24–26].

Strengths and Limitations

The study is strengthened by the use of a large, diverse, random sample with data collection in both English and Spanish. The study was conducted only in Arkansas, and Arkansas is more rural, more impoverished, and less educated compared to many states in the US [27]. Therefore, the results may not be representative of the US population. The study may be limited by self-reported data, which could be affected by recall or social desirability bias. However, the accuracy of self-reported influenza vaccination has been documented at >90% [28, 29]. The vaccine hesitancy measure, though established in the literature, includes responses that all have hesitant in the language which might have produced an anchoring effect [13]. The study used cross-sectional data, which does not allow for causal analysis. Further, we did not collect information on the preferred language each survey was completed in, limiting our ability to examine how language might further differentiate vaccination behavior. Despite these limitations, this study makes a significant contribution to the literature as one of the first studies to examine health care access as a predictor of influenza vaccine receipt and one of the first studies to document the association between having a primary care provider and routine checkups with receipt of an influenza vaccination.

Conclusion

This study adds to the literature by documenting the importance of the relationship between a primary care provider and a patient. Demonstrating the value of the physician-patient relationship on vaccine uptake has important implications for the successful implementation of public health measures. Further research is needed to characterize this relationship between primary care providers and vaccine uptake. Results from this study can be used to guide future research and interventions with a focus on improved access to primary care.

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Highlights

- Large random sample study examined 5-year influenza vaccination among Arkansans
- Hispanic respondents were two times more likely to report an influenza vaccination
- Having a primary care physician was a significant predictor of influenza vaccination
- Doctor’s checkup was a significant predictor of influenza vaccination

Table 1.

Weighted Descriptive Statistics – Sociodemographic Characteristics, Health Access Measures, Vaccine Hesitancy, and Influenza Vaccination (N=1500)

	%
Age Group	
18–34	20.8
35–44	25.3
45–59	23.0
60+	31.0
Sex	
Male	48.9
Female	51.1
Race	
White	72.0
Black/African American	15.4
Hispanic	7.4
Multiracial	2.0
Other	3.2
Education	
HS Degree/GED or lower	30.8
Some college/Associates degree	32.9
Bachelor’s degree or higher	36.3
Relationship Status	
Married/Cohabitating	50.7
Unmarried/Single	49.3
Location	
Metro (urban)	68.9
Non-metro (rural)	31.1
Health Coverage	
Yes	88.4
No	11.6
Primary Care Provider	
Yes	82.7
No	17.3
No Care Due to Cost	
No	85.5
Yes	14.5
Routine Doctor Checkup	
In the past 2 years or less	83.6
More than 2 years ago	16.4
General Vaccine Hesitancy	
Not at all hesitant	55.0

	%
A little hesitant to very hesitant	45.0
5-Year Influenza Vaccination	
Never	28.6
1–2 years	13.3
3–4 years	11.2
Every year	46.9

Note: HS=high school; GED=graduate equivalency degree.

Percentages may not total 100 due to rounding.

Table 2.

Weighted Ordinal Logistic Regression – Five-Year Influenza Vaccination (N=1388)

	B	SE	p	OR (95%CI)
Age				
60+	0.60	0.167	**<0.001**	1.82 (1.31, 2.52)
45–59	−0.02	0.168	0.928	0.99 (0.71, 1.37)
30–44	−0.34	0.161	**0.036**	0.72 (0.52, 0.98)
18–29	-	-	-	-
Sex				
Female	0.35	0.107	**0.001**	1.42 (1.15, 1.75)
Male	-	-	-	-
Race				
Black/AA	0.04	0.150	0.766	1.05 (0.78, 1.40)
Hispanic	0.54	0.217	**0.001**	1.72 (1.13, 2.60)
Multiracial	−0.42	0.384	0.272	0.66 (0.31, 1.39)
Other	−0.06	0.297	0.852	0.93 (0.52, 1.65)
White	-	-	-	-
Education				
Bachelor's degree or higher	0.46	0.136	**0.001**	1.58 (1.21, 2.07)
Some college/Associates degree	−0.007	0.133	0.960	0.99 (0.77, 1.29)
HS diploma/GED or lower	-	-	-	-
Marital Status				
Married/Cohabitating	0.08	0.110	0.471	1.08 (0.87, 1.34)
Unmarried/Single	-	-	-	-
Location				
Non-metro (rural)	0.14	0.116	0.230	1.15 (0.92, 1.44)
Metro (urban)	-	-	-	-
Health Coverage				
Yes	−0.28	0.174	0.113	0.76 (0.54, 1.07)
No	-	-	-	-
Primary Care Physician				
Yes	0.82	0.158	**<0.001**	2.28 (1.67, 3.10)
No	-	-	-	-
No Medical Care Due to Cost				
Yes	0.02	0.157	0.903	1.02 (0.75, 1.39)
No	-	-	-	-
Doctor Checkup				
2 years or less	0.80	0.164	**<0.001**	2.22 (1.61, 3.06)
More than 2 years	-	-	-	-
General Vaccine Hesitant				
Not hesitant at all	1.13	0.110	**<0.001**	3.10 (2.50, 3.84)
A little to very hesitant	-	-	-	-

Note: AA=African American; HS=high school; GED=graduate equivalency degree; B=Beta coefficient; SE=standard error; OR=odds ratio; CI=confidence interval.

Bold indicates statistical significance.