HHS Public Access

Author manuscript

Vaccine. Author manuscript; available in PMC 2023 November 17.

Published in final edited form as:

Vaccine. 2018 November 26; 36(49): 7556–7561. doi:10.1016/j.vaccine.2018.10.049.

Social media use and influenza vaccine uptake among White and African American adults

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Abstract

Influenza vaccination rates in the U.S. remain low at 41% among adults over 18 years according to the Centers for Disease Control and Prevention's 2016 data. Reasons for the low rate vary and include factors such as risk perception, vaccine hesitancy, and access to health care. This cross-sectional study sought to examine the relationship between social media use and influenza vaccine uptake among a sample of White and African Americans over 18 years of age. Using bivariate, and unadjusted and adjusted logistic regression tests, this study examined the relationship among social media use, social media as a source of health information, and influenza vaccination status in 2015. Our results indicate that users of Twitter (OR4.41, 95%CI: 1.43–13.60) and Facebook (OR 1.66, 95%CI: 1.01–2.72) as sources of health information were more likely to be vaccinated in comparison to users who do not use Twitter or Facebook as a source of health information. These findings have implications for the potential of using social media platforms to disseminate influenza vaccine information and encourage users to get vaccinated annually.

Keywords

Twitter; Facebook; Health information sources; Digital health

1. Introduction

Influenza vaccination rates remain low in the U.S. at 41% among adults over 18 [1]. The low vaccination rate is a concern, given the 600,000 influenza-related hospitalizations during

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the 2016–2017 influenza season, and estimated 12,000–56,000 influenza-related deaths from 2011 to 2013 in the U.S. [2,3]. Elderly populations are more likely to have influenza-related complications as seen in hospitalization rates in 2018 (per 100,000): 457.9 (65+), 114 (50–64), and 30.9 (18–49) [4]. Influenza vaccination rates in 2017 were low among the 18–49 (30.6%) and 50–64 age groups (40.6%), and slightly higher among 65 and older Americans (56.6%) [5]. These low vaccination rates result from various factors, including access to health care, perceptions of risk from both the disease and the vaccine, trust, social norms, and beliefs regarding the efficacy of vaccine [6–9]. For example, some believe their immune systems are strong enough to withstand an influenza infection or that getting sick with influenza is a minor inconvenience [10,11]. Compounding these barriers is a small, but vocal anti-vaccine movement, which has made false claims regarding the safety and side effects of vaccines [10,12]. Because of inaccurate information about vaccines, some Americans are forgoing critical vaccines for themselves and in some cases, their children [13,14].

Several studies on influenza vaccination have examined barriers, such as beliefs and risk, but few have examined the relationship between social media use and influenza vaccination rates. Given the large amount of health information on the Internet, some of which is accurate and some that is not, it is critical for public health researchers to evaluate the relationship between Internet activity and vaccine behavior. Prior research estimates that 72% of Americans trust health information on the Internet and 75% accept at face value what they read on the Internet [13].

Of interest are social media platforms, such as Facebook and Twitter, which allow users to interact with each other through posts and messages. Facebook allows users to share personal information about themselves, which can be public or private depending on privacy settings [15]. Twitters users may share a brief bio, but there are character limits to messages they can post, which can also be shared privately or publicly [15]. Facebook is the most popular social media site among U.S. adults, with 68% stating they have an account, in comparison to 21% of adults with a Twitter account [16]. The age of users varies between the two social media platforms – the majority of adults with Twitter accounts are between the ages of 18–29 (40%), whereas there is a wide age range among adults with Facebook accounts (18–29: 81%, 30–49: 78%, 50–64: 65%, 65 and up: 41%) [16]. Both Facebook (63%) and Twitter (63%) users obtain news from these social media platforms, but Twitter users are more likely than Facebook users to follow breaking news [17]. Other differences in use include Twitter users viewing a greater mix of news topics than Facebook users, and Facebook users accessing more health-related content than Twitter users [17].

Research on social media use and the influenza vaccine indicate the growing influence of social media as a source of information on the influenza vaccine [18,19]. The appeal of social media as a news source has been attributed to the “direct, unfiltered, and up-to-date” nature of information on these platforms [20]. Existing research on social media has focused on evaluating vaccine and influenza-related content on social media platforms [21], which indicate some health content is accurate and sourced from verified sites, such as government health agencies, but some content is inaccurate [22,23]. For example, the majority of Twitter messages related to vaccines were sourced from reputable sources and only 13% of Tweets were anti-vaccine [24]. A study evaluating Twitter messages in the U.K. during

the 2009 H1N1 pandemic found that most Tweets were obtained from government health agencies [23]. Another study of parents in South Korea found that 15.3% reported obtaining information on the influenza vaccine from social media sites [18].

These studies highlight the importance of social media as a source of influenza-related health information. However, there is a gap in the existing literature on the relationship between social media use and influenza vaccine uptake. This study seeks to fill this gap by assessing social media use and influenza vaccination behavior, and to determine if there are differences by social media platform. Specifically, we sought to answer the following research questions: (1) What is the relationship between social media use, defined as having a social media account and/or using social media as a source of influenza health-related information, and influenza vaccine uptake? (2) What is the relationship between the importance of social media in the decision-making process and influenza vaccine uptake?

2. Methods

This study used data collected by GfK Custom Research, LLC, an international research firm, which surveyed non-institutionalized U.S. adults over 18 years of age. Data were collected from March to April 2015 [8]. GfK used address-based sampling methods to obtain a representative national sample for GfK's online panel, mailing recruitment invitations to postal addresses and following up with calls to landlines to achieve a large, representative sample [25]. Participants received the online survey via email and received $5 if they completed the survey.

The survey instrument was developed based on qualitative data, involving 28 semi-structured interviews and 9 focus group discussions (n = 90) with White and African American participants. Furthermore, 16 cognitive interviews were conducted to test and refine survey questions. Qualitative research was focused on exploring broad themes related to influenza vaccine uptake and racial disparities. In that research we learned sources of information on influenza vaccination varied widely and chose to incorporate survey items to assess different information sources [8,11]. The final survey included questions about influenza vaccination status, knowledge questions about how the influenza vaccine works, use of social media, beliefs regarding prevention and treatment of influenza, among other influenza-related topics.

3. Measures

Table 1 includes information on independent, outcome, and covariate variables.

4. Analysis

Data were weighted to account for geographic and demographic distribution of the U.S. population over 18 based on the 2014 Population Survey, including age, education level, household income, sex, and race of participants [26]. All analyses were weighted to be nationally representative of White and African American adults over 18.

First, chi-square tests were conducted to examine the associations among influenza vaccine behavior, social media use, and influenza knowledge. In the second step, we ran logistic regression models in which influenza vaccine behavior was regressed on social media use. Next, we added the covariate variable, influenza knowledge, to the model. In the fourth step, we added demographic variables, including age, household income, education, race, sex, and health insurance status to the model. In the final model, we tested the interaction between age and social media use on vaccine uptake.

5. Results

5.1. Sample

A total of 838 White and 819 African Americans were surveyed for this study. 168 surveys were removed because of missing responses and validity issues bringing the final sample size to 1475.

Weighted descriptive statistics for each variable are detailed in Table 2. Demographic characteristics of the sample show that 94.64% has some form of health insurance. The majority of participants have completed some college or higher degree (62.70%). 86.20% are White, and 13.80% are African American. 51.20% of participants did not get the influenza vaccine in 2015.

We examined demographic differences in those who use social media for health information and those who do not. Overall, Facebook users (61.83%) greatly out number Twitter users (15.42%) in the sample. Twitter users are 85.81% White, 52.56% are female, 33.46% are between the ages of 18–29, and most have completed college or a higher degree (46.96%). The majority of Facebook users are White (87.26%), 58.85% are female, and 34.32% have completed college or a higher degree. The age of Facebook users is more evenly distributed than Twitter users: 22.90% are 18–29, 23.48% 30–44, 26.49% 45–59, and 27.13% 60+. Participants, who do not have a Twitter account, are White (86.27%), female (52.63%), and over the age of 45 (64.27%). The education levels of participants without Twitter accounts varied (some college: 30.01%, college degree or higher: 29.68%). Participants without Facebook accounts are White (84.50%), male (57.46%), and over 45 (69.89%). Education levels among participants without a Facebook account varied as well (less than high school degree: 7.46%%, high school: 35.08%, some college: 28.30%, college or higher: 29.16%).

Not unexpectedly, the majority of participants who use Twitter as a source of health information are White (78.78%), female (77.23%), and between the ages of 30–44 (39.10%). Participants, who use Facebook as a source of health information, are similar in that 87.26% are White, 67.92% are female, and 31.99% are between the ages of 30–44. As for those who use social media as a source of health information, Twitter users' annual household incomes vary (19.65% $0–29 K, 26.72% $30–59 K, 26.96% $60–124 K, 26.67% $125 K+), whereas 40% of Facebook users earn $60–124 K. Overall, 42.23% of Twitter users and 37.5% of Facebook users, who seek out health information on social media, have completed an undergraduate or higher degree. Participants, who do not use Twitter as a source of health information, are White (86.32%), female (52.23%), and over the age of 45 (60.23%). Most completed some college (30.65%) or an undergraduate or

higher degree (32.19%), and earn an annual household income of $60–124 K (39.25%). Among participants, who do not use Facebook as a source of health information, most are White (86.54%), female (50.87%), over 45 (61.65%), completed some college (30.13%) or undergraduate or higher degree (31.76%), and earn $60–124 K annually (39.69%).

Our first research question examines the relationship between social media use, defined as having a social media account and/or using social media as a source of influenza health-related information, and influenza vaccine uptake. Additionally, we examined the relationship between the importance of social media in the decision-making process and influenza vaccine uptake. Table 3 details bivariate associations among study variables. Chi-square tests indicate associations between influenza vaccine uptake and Twitter as a source of health information ($p < .01$), Facebook as a source of health information ($p < .01$), and influenza knowledge ($p < .001$). Twitter use was associated with Twitter as a source of health information ($p < .001$), Facebook use ($p < .001$), Facebook as a source of health information ($p < .001$), and social media importance ($p < .001$). Twitter as a source of health information was related to Facebook use ($p < .001$), Facebook as source of health information ($p < .001$), and social media importance ($p < .001$). Other significant relationships include Facebook use with Facebook as a source of health information ($p < .001$) and social media importance ($p < .001$). Facebook as a source of health information was associated with social media importance ($p < .001$) and influenza knowledge ($p < .05$). The importance of social media in the decision to get the influenza vaccine was associated with influenza knowledge ($p < .001$).

5.2. Odds Ratio

Results from the 3 logistic regression models are reported in Table 4. Findings from Model 1 indicate that participants who use Twitter as a source of health information (OR 4.41, 95% CI: 1.43–13.60) are more likely to be vaccinated, as do respondents who use Facebook as a source of health information (OR 1.66, 95%CI: 1.01–2.72) in comparison to participants who do not use Twitter or Facebook as a source of health information. Twitter users (OR 0.66, 95%CI: 0.44-0.99) were less likely to be vaccinated than non-Twitter users.

In Model 2, we added the covariate variable, influenza knowledge, which resulted in the odds ratio for Twitter as a source of health information increasing (OR 5.44, 95%CI: 1.85–16.01); however, Facebook as a source of health information was no longer significant. Twitter users remained less likely to be vaccinated (OR 0.57, 95%CI: 0.37–0.87). Higher influenza knowledge increased the odds of being vaccinated (OR 1.90, 95%CI: 1.66–2.19) in comparison to participants with low influenza vaccine knowledge. The odds of being vaccinated increased by 1.92 as knowledge of the influenza vaccine increased for each additional correct response.

Demographic variables added to Model 3 included health insurance, race, age, sex, education, and household income. Participants who use Twitter as a source of health information were more likely to be vaccinated (OR 4.94, 95%CI: 1.61–15.18), but this relationship was not found for Facebook users who seek health information. Participants with health insurance were more likely to be vaccinated (OR 2.57, 95%CI: 1.23–5.34) in comparison to participants without insurance. Age was a predictor for vaccine behavior in

that participants under 60 years of age (18–29 OR 0.40, 95%CI: 0.26–0.61, 30–44 OR 0.34, 95%CI: 0.22–0.53, 45–59 OR 0.52, 95%CI: 0.37–0.74) were less likely to be vaccinated when compared to 60 and older participants. Household income, race, sex, and educational level were not significant predictors for influenza vaccination status. The importance of social media in the decision-making process was not a significant predictor for influenza vaccine uptake in Models 1 through 3.

In our final model, we tested the interaction between age and social media use on vaccine uptake because these variables were significant predictors in our previous model. Interaction results for participants between the ages of 18–59 were not significant (See Table 5).

7. Discussion

Our findings from this study suggest that social media use, specifically Twitter and Facebook as sources of health information, are predictors for influenza vaccination behavior. Given the small percentage of participants, who use Twitter or Facebook as a source of health information, we might not expect these variables to be significant, but the odds ratios were significant and large. Twitter as a source of health information remained significant across all 3 models, but the significance of Facebook as a source of health information was only significant in Model 1, suggesting that influenza knowledge and demographic variables are masking the influence of Facebook as a source of health information. Users of Facebook as a source of health information may be more likely to get vaccinated. Respondents' perceived importance of social media in the decision-making process was not a significant predictor for influenza vaccine uptake. One possible explanation for these results may be that individuals interested in staying healthy follow health-related news on social media platforms, and their motivation to stay informed may contribute to higher vaccination rates in combination or separately from their use of social media as a source of health information. These findings may also reflect the complex factors that affect decision-making, such as social norms, patient-provider relationships, and risk perception [11].

Twitter use was only significant in Models 1 and 2, and Facebook use was not significant in any of the models. Not surprisingly, these results indicate that social media use alone may not influence vaccination status. Influenza knowledge was a significant predictor for vaccine uptake, increasing the odds of being vaccinated as influenza-specific knowledge increased among participants, as found in other published research from this project [8]. Health insurance was a significant predictor of vaccine uptake, which confirms previous studies that access to health care contributes to health promoting behaviors [7]. Participants younger than 60 years of age were less likely to be vaccinated in comparison to 60 and older participants, which is consistent with the literature [26]. Sex, race, education, income, and gender were not significant predictors for vaccine behavior in Model 3, but from previous analysis of these data, we know that race is a significant predictor of influenza vaccine uptake [8]. The social media variables in this model may be masking the effect of race and other demographic variables.

This is the first study, to our knowledge, to assess the relationship between social media use and influenza vaccine uptake. These findings have implications for the use of social

media platforms to promote and disseminate information on the influenza vaccine, given user engagement with health content on these platforms. We encourage future studies on social media use and vaccine behavior to determine why and how social media accounts may influence influenza vaccination. For example, future research may pursue greater depth in asking participants which types of health-related social media accounts they follow, their motivation for following health-related social media accounts, and if and how the health content conveyed through these social media accounts influences their decision-making process concerning the influenza vaccine. Given our results, we also recommend that future studies examine the relationship between social media and uptake of other vaccines.

A limitation of this study is that it is cross-sectional and does not assess the role of social media use over time. Furthermore, we did not ask participants how they engage with health information on social media, and therefore, we are unable to determine which types of accounts (e.g. health agency or other) were accessed. A limitation of the interaction analysis is that the sample was small for certain age groups, which decreases our power to detect significant differences in the interaction between age and social media use in regard to influenza vaccine uptake.

8. Conclusion

These findings suggest that health information disseminated through social media platforms may shape vaccine uptake. Further research is needed to assess the association between social media use and vaccination, and the potential of social media platforms to promote health behaviors. Public health campaigns on social media platforms may have the potential to increase influenza vaccination rates, and prevent influenza-related hospitalizations and deaths.

Acknowledgement

This research was supported by the Center of Excellence in Race, Ethnicity and Health Disparities Research (NIH-NIMHD: P20MD006737; PIs, Quinn and Thomas).

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Table 1

Survey measures.

Concept/variable	Type of Index & # of items	Questions	Response categories
Independent			
Twitter Use	1 Question	1. Do you have a Twitter account?	No or Yes (0 or 1)
Twitter - Health Information	Collapsed Response of 3 Questions	1. Do you use Twitter to follow or like health agencies or health-related organizations? 2. Do you use Twitter to follow flu or other illness outbreaks? 3. Do you use Twitter to get information about vaccines?	No or Yes (0 or 1)
Facebook Use	1 Question	Do you have a Facebook account?	No or Yes (0 or 1)
Facebook - Health Information	Collapsed Response of 3 Questions	1. Do you use Facebook to follow or like health agencies or health-related organizations? 2. Do you use Facebook to follow flu or other illness outbreaks? 3. Do you use Facebook to get information about vaccines?	No or Yes (0 or 1)
Social Media Importance	1 Question	1. When it comes to deciding whether or not to get vaccinated for flu, how important is the information you get on Facebook and/or Twitter?	Not at all important or a little bit important (0) - Extremely important or fairly important (1)
Covariate			
Influenza knowledge	Sum of Correct Responses (0–7)	1. The flu vaccine helps stimulate a natural immune response? 2. A flu vaccine will protect you from the flu for many years? 3. The flu vaccine does not include all the types of flu circulating in the US this year? 4. Flu vaccines must be tested and approved every year? 5. Flu vaccines change every year because the type of flu virus change all the time? 6. Even if the flu vaccine does not contain all types of virus going around it can still help reduce the seriousness and length of time I am sick if I get the flu? 7. The flu vaccine this year is less effective than most years?	True or False
Outcome: Vaccine behavior	1 Question	1. Did you get a flu vaccine this season?	No or Yes (0 or 1)

Table 2

Socio-Demographic Characteristics, Flu Behavior, and Social Media Use of Study Sample N = 1475 (unweighted), N = 1490 (weighted).

	N	%		N	%
Race			**Twitter Use**		
White American	1284	86.20	Yes	229	15.42
African American	205	13.80	No	1260	84.58
Age			**Twitter as Health Information Source**		
18–29	280	18.85			
30–44	317	21.31	Yes	23	1.56
45–59	423	28.39	No	1467	98.44
60+	468	31.44			
			Facebook Use		
Sex			Yes	921	61.83
Male	706	47.38	No	568	38.17
Female	784	52.62			
			Facebook as Health Information Source		
Education					
Less than high school	115	7.77	Yes	152	10.26
High School	440	29.53	No	1337	89.74
Some College	452	30.35			
College or Higher	482	32.35	**Social Media Importance**		
			Yes	32	2.17
Household Income			No	1458	97.83
$0-$29,999	308	20.72			
30,000–59,999	358	24.08	**Influenza Knowledge**		
60,000–124,999	582	39.06	7	521	34.98
125,000+	240	16.14	6	515	34.58
			5	292	19.62
Health Insurance			4	100	6.77
Yes	1410	94.64	3	31	2.10
No	79	5.36	2	17	1.16

	N	%		N	%
			1	11	0.79
Influenza Vaccine Status					
Got Vaccine	727	48.80			
Did Not Get Vaccine	763	51.20			

Note: All numbers and percentages are weighted.

Table 3

Weighted Chi-square Matrix of Influenza Vaccine Behavior, Social Media Use, and Flu Knowledge.

	Influenza Vaccine	Twitter Use	Twitter Health	Facebook Use	Facebook Health	Social Media - Important	Influenza Knowledge
Influenza vaccine	1.00						
Twitter use	3.14	1.00					
Twitter health	8.1**	129.7***	1.00				
Facebook use	1.34	103.1***	13.8***	1.00			
Facebook health	7.49**	60.1***	123.7***	105.1***	1.00		
Social media - Important	0.06	28.2***	43.0***	18***	87.9***	1.00	
Influenza knowledge	151.4***	12.3	4.6	6.4	12.9*	56.3***	1.00

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 4

Weighted Odds Ratio for Influenza Vaccine Behavior.

	Model I		Model II		Model III	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Twitter use	0.66*	0.44–0.99	0.57**	0.37–0.87	0.69	0.44–1.10
Twitter health	4.41**	1.43–13.6	5.44**	1.85–16.01	4.94**	1.61–15.18
Facebook use	0.85	0.64–1.13	0.81	0.60–1.09	0.84	0.61–1.15
Facebook health	1.66*	1.01–2.72	1.43	0.86–2.36	1.62	0.96–2.72
Social media importance	0.85	0.35–2.06	1.88	0.67–5.22	2.10	0.69–6.36
Influenza knowledge			1.90***	1.66–2.19	1.84***	1.58–2.13
Health insurance					2.57**	1.23–5.34
Race					0.93	0.70–1.24
18–29					0.40***	0.26–0.61
30–44					0.34***	0.22–0.53
45–59					0.52**	0.37–0.74
60+					Reference	
Less than HS					Reference	
High school					1.05	0.54–2.03
Some college					1.25	0.63–2.48
College or Higher					1.31	0.65–2.62
$0-$29,999					Reference	
$30,000–$59,999					0.96	0.63–1.44
$60,000–$124,999					1.07	0.72–1.61
$125,000+					1.14	0.66–1.85
Sex					1.10	82–1.47

*p < .05.

**p < .01.

***p < .001.

Table 5

Weighted Odds Ratio for Interaction between Age & Social Media Use on Influenza Vaccine Behavior.

	18–29		30–44		45–59	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Twitter use	2.46	0.68–8.83	1.82	0.49–6.69	2.09	0.57–7.61
Twitter health	4.66	0.40–54.05	5.00	0.37–66.02	4.82	0.35–64.71
Facebook use	0.84	0.32–2.22	1.75	0.71–4.26	1.24	0.60–2.59
Facebook health	0.59	0.11–3.08	0.27	0.05–1.38	0.21	0.04–1.01