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Original Research

Social Media Usage and Influenza Beliefs, Risk Perceptions and Behavioral Intentions Among Students at a University in Southeastern US

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ABSTRACT

Background: To document social media usage for the retrieval of health information among college students; and to understand the beliefs, risk perceptions and behavioral intentions among participants who retrieved CDC influenza information via social media.

Methods: We conducted an online survey to a convenience sample of students at a university in Southeastern United States during Spring 2015. The survey was self-administered and every matriculating student received an electronic invitation to participate at least once.

Results: A total of 930 students completed the online survey. Most participants (n=905, 97.3%) reported that they had used a social networking site in the previous 12 months. However, only one-third (n=317, 34.1%) reported that they used social networking sites to read CDC health information or messages. Nearly one-fifth of participants (n=172, 18.5%) reported reading CDC influenza information during the 2014-15 influenza season. Among the subset of readers of CDC influenza information during the 2014-15 influenza season (N=153), 77 (50.99%) reported that it was likely they would get the influenza vaccine in the next 12 months. Women reported stronger risk perceptions and behavioral intentions than men. Blacks/African Americans reported more negative influenza-related beliefs and weaker risk perceptions compared to Whites.

Conclusions: While social media penetration is high among university students in Southeastern US, only a minority of survey participants retrieved CDC influenza information via social media. Among these individuals, about half reported that they intended to vaccinate against influenza. Further research is needed to enhance CDC social media penetration among college students.

Keywords: Cross-sectional studies, health communication, health education, social media, surveys and questionnaires
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INTRODUCTION

Health information seeking in the digital age is a complex task for online consumers. One of the major problems associated with the rapid, unregulated proliferation of digital health information is information quality. Even though leading health agencies, such as the Centers for Disease Control and Prevention (CDC) have developed guidelines for developing quality online health information, digital information producers do not always adhere to these requirements. Consequently, the quality of online digital health information is not uniform. This prevailing public health problem has prompted a national recommendation in the Healthy People 2020 document to use health communication strategies and health information technology to enhance consumer access to reliable population health information (United States Department of Health and Human Services, 2016).

Most online communications research to date has focused on enhancing consumer access to information on traditional web sites for middle-aged and older adults. However, given the growing popularity of newer digital communication platforms, such as social media (also known as social network sites, such as Twitter and Facebook) among young adults ages 18- 29 (Pew Research Center, 2015; White, Fu, & Benson, 2013), public health practitioners need to develop approaches for capturing consumer communications that occur through this new medium (Parvanta & Parvanta, 2011).

Young adult social media users in the United States are a large and growing group. According to a recent Pew

Research Center report (2015), the most commonly used social media platforms among these individuals include: Facebook (82%), Instagram (55%), Pinterest (37%), and Twitter (32%) (Pew Research Center, 2015). Research suggests there is an evolution in the topics that social media consumers are discussing with their network members. Dominant social topics such as natural disasters, political opinions, and family/personal issues are beginning to be associated with personal health-related issues that can have epidemiologic surveillance potential. While there are estimates on how adults compartmentalize general Internet use for social and health-related purposes, data on how young social media users partition their social/health communication is largely unknown. Understanding more about the health-related social media use of young adults is an important first step in developing appropriate social media communication surveillance programs. Behavioral theory may assist us to better understand what behavioral impact social media health communication may have on their audience, and what may be the drivers behind their behavior. This will assist health agencies, such as CDC, to better formulate their communication strategies, and understand what they see in their social media communication surveillance.

Researchers have explored the usefulness of social media for health promotion on issues such as HIV prevention (Taggart, Grewe, Conserve, Gliwa, & Roman Isler, 2015), and studied how information pertinent to healthy behaviors (e.g., physical exercises) (Zhang et al., 2013) and unhealthy behaviors (e.g., substance abuse) (Krauss et al., 2015) are communicated online via social media. Exploring how social media can be used to improve health issues that impact young adults should be a national priority (Prybutok & Ryan, 2015) because these "digital natives" (Joiner et al., 2013) are quite familiar with sharing their thoughts, opinions and experiences with others through what is known as "electronic word-of-mouth" (Zhang et al., 2013). However, little is known about their information retrieval from public health agencies through social media pertinent to influenza and influenza vaccine. A recent study (Kang et al., 2017) investigated the contents and sentiment of vaccine-related web articles that were most frequently linked in tweets. It was found that while pro-vaccine web articles focused on communicating health risks and benefits, anti-vaccine web articles focused on organizational bodies, such as the CDC, and were commonly framed around skepticism and distrust of government organizations that are responsible for public health and health communication. Such finding highlights the importance of the credibility of sources of online health information. Thus, an important first step toward advancing research in this area is to better understand how young adults retrieve information about influenza vaccination, and in particular the beliefs, risk perceptions and behavioral intentions pertaining to influenza vaccination, among those who retrieved official health information via social media.

Since CDC uses social media to deliver public health information to social media users about public health (Centers for Disease Control and Prevention, 2017), and since it is an important and credible source of health information across the US, we conducted a descriptive pilot study of students' social media usage at a rural state university in the Southeastern US. Our research questions are:

(a) What are the self-reported social media usage pertinent to health information?
(b) Among self-reported recipients of information from the CDC, what were their beliefs, risk perceptions and behavioral intentions about influenza?

METHODS

Institutional Review Board Approval

Approval to conduct the research was obtained from the Institutional Review Board of the Principal investigator's university (H15216).

Participants

All students who were registered in Spring 2015 (N=18,949) (Georgia Southern University, 2015) were invited to participate via (a) an invitation embedded in a university-wide newsletter, and (b) an invitation that was shown in each student's university email / online service portal. These methods ensured that each student received our invitation to participate. Participation was entirely voluntary. Participants provided informed consent electronically at the beginning of the survey. Among students who completed the survey and were willing to provide an email address for contact, four were randomly selected to receive an Amazon.com® gift card of US$25.

Survey instruments

This is a cross-sectional study. Our 20-item questionnaire was developed in Fall 2014. The questionnaire was based on a questionnaire that was previously used on the same campus in Spring 2014 for a survey conducted by the authors (unpublished manuscript). Questions on beliefs and risk perceptions (5 questions each) were adapted from a CDC internet panel survey from the 2011-12 influenza season (Lu et al., 2013). The questionnaire was electronically self-administered from March 9 to April 12, 2015, via a university-provided online survey platform (Qualtrics) through which data collected was secured on the university's server.

All participants were asked to answer questions pertaining to social media use. Only students who answered "Yes" to the question, "During the current flu season (December 2014 to March 2015), have you read flu-related information posted by CDC on a Social Networking Site?" were asked to complete the subsequent parts of the survey with questions on beliefs, risk perceptions, behavioral intentions and demographics.

Statistical analysis

Frequencies and percentages were summarized for all answers to each survey question. To examine differences in overall beliefs (B score), risk perceptions (RP score) and behavioral intentions (I score) among sub-groups of students, we coded the answers to each question assuming

equal distances between adjacent answers and calculated the sums of B, RP and I scores, respectively. In detail, for the B and RP scores, we coded our responses as -2 (Strongly Disagree), -1 (Disagree), 0 (Neutral), 1 (Agree), and 2 (Strongly Agree). For the I score, we coded our responses as -1 (Unlikely), 0 (Neither unlikely nor likely), and 1 (Likely). We dropped Question B4 (Table 3) from our calculation of the B score, as the questions' direction is the opposite of all other belief questions, which, if included, may give biased results. The sums of B, RP and I scores were the primary outcomes for the analysis afterwards and they all considered as continuous. The range of possible scores for B would be -8 to 8, RP -10 to 10, and I -10 to 10.

Pairwise Pearson correlations were calculated for the sums of B, RP, I scores, and age. Additionally, the sums of B, RP, I scores were compared among sub-groups of students depending on their demographical characteristics (Table 2). T-test (with Satterthwaite adjustment for cases of un-equal variances) was used for group variables with two levels (e.g., sex = Male or Female). For group variables with more than two levels (e.g., level of education = Freshman, Sophomore, Junior, Senior or Graduate), one-way ANOVA F test was used to see if any of the group level is significantly different from the others, and if it was the case, pairwise comparisons were done by a pairwise t-test. For all statistical tests, if the frequency of some levels were comparatively too low (i.e., <10%), we combined similar levels into one group. All statistical analyses were performed in SAS 9.4 (SAS Institute, Cary, NC).

RESULTS

A total of 930 students participated in the survey (response rate, 4.91%). Most (n = 905, 97.3%) reported that in the past 12 months, they had used a social networking site. However, only 34.1% (n=317) reported that they had ever read any CDC health information on any of the social networking sites they used (Table 1).

Table 1. Self-reported social media use and health information among college students in a rural state university in the Southeastern US

Questions	Count (%)
1. In the past 12 months have you used a Social Networking Site (such as Facebook, Twitter, LinkedIn, Pinterest, Google Plus, Tumblr, or Flickr)?	
Yes	905 (97.3)
No	19 (2.0)
2. Which Social Networking Site do you have an account with? Please choose all that apply.	
Facebook	883 (94.9)
Twitter	578 (62.2)
LinkedIn	309 (33.2)
Pinterest	521 (56.0)
Google Plus	383 (41.2)
Tumblr	269 (28.9)
Flickr	21 (2.3)
3. In the past 12 months, which Social Networking Site have you used the most?	
Facebook	542 (58.3)
Twitter	195 (21.0)
LinkedIn	13 (1.4)
Pinterest	81 (8.7)
Google Plus	18 (1.9)
Tumblr	55 (5.9)
Flickr	1 (0.1)
4. Have you ever heard of the Centers for Disease Control and Prevention (CDC)?	
Yes	874 (94.0)
No	39 (4.2)
5. Which of the following is the logo for the Centers for Disease Control and Prevention (CDC)?	
Correct logo chosen	728 (78.3)
6. Have you ever read health information from the Centers for Disease Control and Prevention (CDC) on any of the Social Networking Sites that you use?	
Yes	317 (34.1)
No (If "no" is selected, then skip to the end of survey)	505 (54.3)
I don't know	91 (9.8)
7. In the past 12 months, how often have you read health information from the CDC	

Questions	Count (%)
on a Social Networking Site? (Data reported here were from participants who answered "Yes" to the previous question. N=315)	
Everyday	5 (1.6)
At least one time in one week	35 (11.1)
At least one time in one month	113 (35.9)
At least one time in one year	114 (36.2)
I don't know	39 (12.4)
Other	9 (2.9)
8. During the current flu season (December 2014 to March 2015), have you read flu-related information posted by CDC on a Social Networking Site?	
Yes	172 (18.5)
No (If "no" is selected, then skip to the end of the survey)	186 (20.0)
I don't know	50 (5.4)
9. During the current flu season (December 2014 to March 2015), how often did you read flu-related information posted by CDC on a Social Networking Site? (Data reported were from participants who answered Yes to the previous question. N=159)	
Everyday	3 (1.9)
At least one time in one week	25 (15.7)
At least one time in one month	56 (35.2)
At least one time in the flu season	60 (37.7)
I don't know	2 (1.3)
Other (reading during an epidemic, and not usually read)	13 (8.2)

Among the 159 participants who consistently affirmed that they had read CDC health information on social media in the past 12 months and had read CDC influenza information on social media in the influenza season, 52.8% (n=84) reported that they read CDC influenza information at least once in a month or more frequently.

Tables 2 presented the demographic data of the 153 participants who reported that they had read CDC influenza information on social media. The survey had 159 participants, however six of whom provided consistent positive answers to Questions 6 and 8 in Table 1 and did not provide answers to any questions listed in Table 3. We therefore had N=153. Table 3 listed survey results of those participants on beliefs, risk perceptions, behavioral intentions about influenza: about half of them (77, 50.99%) reported that they would likely receive an influenza vaccine in the next 12 months.

Table 2. Demographics of survey participants who read influenza information posted by CDC on a Social Networking Site that they used during the 2014-15 influenza season*

Characteristic	Number (%)
Gender	
Male	40 (26.14)
Female	113 (73.86)
Age	Mean=22.967; range: 17-59
Current level of university education	
Freshman	18 (11.76)
Sophomore	28 (18.30)
Junior	45 (29.41)
Senior	22 (14.38)
Graduate Student	40 (26.14)
Race	
White	89 (58.17)
Black or African American	47 (30.72)
Asian	8 (5.23)
Native Hawaiian or Other Pacific Islander	1 (0.65)
American Indian or Alaska Native	2 (1.31)
Multiracial	0 (0)
Others	6 (3.92)
Ethnicity†	
A Hispanic or Latino	3 (1.99)
Not a Hispanic or Latino	148 (98.01)

Characteristic	Number (%)
Influenza vaccination location in the past year	
College or school	5 (3.27)
Doctor's office	62 (40.52)
Hospital, emergency department	34 (22.22)
Clinic, health center, or other medical place	19 (12.42)
Health department	3 (1.96)
Pharmacy	10 (6.54)
Workplace	3 (1.96)
Senior or community center	12 (7.84)
Other (forget, national guard, and home)	5 (3.27)

* Six of the 159 participants who provided consistent positive answers to Questions 6 and 8 in Table 1 did not provide answers to any questions listed in Table 3. We therefore had N=153.

† There were two missing data points. Therefore, the denominator for the percentage reported is 151.

Table 3. Responses of survey participants who read influenza information posted by CDC on a Social Networking Site that they used during the 2014-15 influenza season for their risk perceptions, beliefs, and behavioral intentions*

Questions	Answers (%)				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
RP1. I am at risk of getting flu.	9 (5.88)	17 (11.11)	32 (20.92)	67 (43.79)	28 (18.30)
RP2. People around me are at risk of getting flu.	5 (3.27)	13 (8.50)	19 (12.42)	84 (54.90)	32 (20.90)
RP3. Flu is a serious threat to my health.	6 (3.92)	20 (13.07)	26 (16.99)	66 (43.14)	35 (22.88)
RP4. If I get a flu shot, people around me will be better protected from flu.	8 (5.23)	26 (16.99)	31 (20.26)	51 (33.33)	37 (24.18)
RP5. Flu shot is safe.	3 (1.96)	11 (7.19)	39 (25.49)	56 (36.60)	44 (28.76)
B1. Flu is more serious than a bad cold.	2 (1.31)	5 (3.27)	14 (9.15)	60 (39.22)	72 (47.06)
B2. Flu virus is transmitted by coughing and sneezing. †	1 (0.66)	5 (3.29)	13 (8.55)	77 (50.66)	56 (36.84)
B3. People with flu can transmit the virus before they experience symptoms.	2 (1.31)	2 (1.31)	14 (9.15)	75 (49.02)	60 (39.22)
B4. The flu shot may cause some people to get influenza.	20 (13.07)	30 (19.61)	30 (19.61)	51 (33.33)	22 (14.38)
B5. You can get vaccinated for flu without an injection.	5 (3.27)	23 (15.03)	34 (22.22)	48 (31.37)	43 (28.10)
Question	**Unlikely**		**Neutral**		**Likely**
I1. How likely is it that you will share with others any flu-related information that you read from the CDC in the next 12 months?	24 (15.89)		85 (56.29)		42 (27.81)
I2. How likely is it that you will recommend others to share any flu-related information that they read from the CDC in the next 12 months? ‡	32 (26.30)		83 (55.33)		35 (23.33)
I3. How likely is it that you will get the flu shot in the next 12 months?	42 (27.81)		32 (21.19)		77 (50.99)
I4. How likely is it that you will recommend others to get the flu shot in the next 12 months? §	33 (22.15)		46 (30.87)		70 (46.98)

Question	Unlikely	Neutral	Likely
I5. During the flu season (December 2014 to March 2015), how likely is it that you will wash your hands a lot? ‡	4 (2.67)	20 (13.33)	126 (84.00)
I6. During the flu season (December 2014 to March 2015), how likely is it that you will recommend others to wash their hands a lot? ‡	10 (6.67)	41 (27.33)	99 (66.00)
I7. During the flu season (December 2014 to March 2015), how likely is it that you will wear a mask? ‡	108 (72.00)	28 (18.67)	14 (9.33)
I8. During the flu season (December 2014 to March 2015), how likely is it that you will recommend others to wear a mask?	108 (71.52)	27 (17.88)	16 (10.60)
I9. During the flu season (December 2014 to March 2015), how likely is it that you will take antiviral medications if you are exposed to or caring for someone with the flu?	37 (24.50)	71 (47.02)	43 (28.48)
I10. During the flu season (December 2014 to March 2015), how likely is it that you will recommend others to take antiviral medications if they are exposed to or caring for someone with the flu?	37 (24.50)	71 (47.02)	43 (28.48)

*Six of the 159 participants who provided consistent positive answers to Questions 6 and 8 in Table 1 did not provide answers to any risk perception or belief questions listed in Table 3. We therefore had N=153 for RB and B sections. Eight of the 159 participants who provided consistent positive answers to Questions 6 and 8 in Table 1 did not provide answers to any behavioral intention questions listed in Table 3. We therefore had N=151 for I section.

†There was one missing data point and the row sum was 152.

‡There was one missing data point and the row sum was 150.

§There were two missing data points and the row sum was 149.

The mean score for B is 4.35 (n = 153, s.d. = 2.55; max. 8, min. -8), RP, 3.44 (n =153, s.d. = 3.93; max. 10, min. -10), and I, 0.86 (n = 151, s.d. = 4.29; max. 10, min. -10). The pairwise Pearson correlations between B, RP and I scores were all positive (B and RP, $r = 0.57$, $p < 0.01$; B and I, $r = 0.30$, $p < 0.01$; RP and I, $r = 0.41$, $p < 0.01$). No significant correlation was observed between age and the individual B, RP and I scores.

Women's beliefs (B score = 4.45) in the scientific statements provided in the questionnaire was more positive than men's (B = 4.03) but the difference was not statistically significant (p=0.44). Women reported a stronger risk perception (RP score = 3.90) than men (RP = 2.18) (p=0.04), and a more positive behavioral intention (I score) ($p < 0.01$).

Compared to students who self-identified as Whites, those who identified as Blacks/African Americans and "All others" had significantly weaker beliefs in the scientific statements provided in the questionnaire (B scores: Whites: 4.98; Blacks/African Americans: 3.43, $p < 0.01$; All others: 3.47, p=0.02). Blacks/African Americans possess significantly weaker risk perceptions (RP score = 1.83) compared to Whites (4.26, $p < 0.01$) but there were no significant differences among racial groups in behavioral intentions (I score).

There was no difference between the B scores and RP scores of participants at different levels of university education. However, we found that sophomore (I score = -0.96) undergraduates had more negative behavioral intentions than junior undergraduates (I score = 1.70) and graduate students (I score = 1.55) (p=0.01 and p=0.02 respectively).

The self-reported locations of receiving influenza vaccination were dichotomized into medical (Doctor's office; Hospital / emergency department; Clinic, health center, or other medical place; Health department) and others (College/School; Pharmacy; Workplace; Senior or community center; Other). Those who self-reported that they received the influenza vaccine in medical facilities had weaker beliefs than the others (B score: 4.03 vs 5.41, $p < 0.01$) and a weaker risk perception than the others (RP score: 3.06 vs 4.76, p=0.026), while the difference in behavioral intentions was not significant.

DISCUSSION

Social media has been advocated as the key to health information access for college students (Prybutok & Ryan, 2015). Our survey of 930 participants confirmed that most (n = 905, 97.3%) students in our sample reported they had used a social networking site in the preceding 12 months. However, only 172 (18.5%) participants reported that they have read CDC influenza information on a social networking site during the influenza season of December 2014 – March 2015. Among the 153 individuals who reported their frequency of reading CDC influenza information on social media during the 2014-15 influenza season and whose beliefs, risk perceptions, behavioral intentions and demographic data were available, 77 (50.99%) reported that they would likely receive an influenza vaccine in the next 12 months.

While adult annual vaccination against seasonal influenza has been recommended (Grohskopf et al., 2014), the vaccination coverage rate among American college students remains low. A 2009 survey of college students from eight universities in North Carolina reported a range of 14% to 30% coverage rate (Poehling, Blocker, Ip, Peters, & Wolfson, 2012). Given the high social media penetration among American college students (Pew Research Center, 2015), if we can harness it to promote influenza vaccine uptake, this will be a gain for public health (Dredze, Broniatowski, Smith, & Hilyard, 2015; Moorhead et al., 2013).

Our study had certain limitations. Ours was a convenience sample, although our recruitment methods assured that every matriculating student received an electronic invitation to participate at least once. We conceded that our response rate was low compared to some other studies. For example, a recent online survey on Human Papilloma Virus vaccination uptake in a university in Michigan has attained a response rate of 19% (192/1000) (Navalpakam, Dany, & Hajj Hussein, 2016). A study on preventive behaviors against pandemic influenza in 2009 in a university in Washington DC had a response rate of 17% (819/4900) (Katz, May, Sanza, Johnston, & Petinaux, 2012). However, some health-related surveys in university settings with high response rates generally considers a special population with certain restrictions, such as medical students (Afonso et al., 2017; Giri, Bangal, & Phalke, 2013), or the administration of the questionnaire was carried out during an event in which a large group of students were gathered (Kongnyuy et al., 2007), or they were recruited around a student healthcare center (Okafor, Hu, & Cook, 2015). The fact that we could reach 930 students was encouraging, even if our response rate was low given the large student body in our university (N=18,949) and the reality that we had to compete with students' attention in the university-wide newsletter and the notice in the online service portal. Furthermore, our university locates in a rural area in the Deep South while other studies were conducted in universities closer to metropolitan areas in the United States or other countries; our study does add knowledge to the literature. The fact that females are more likely to read CDC influenza information than males supports recent findings that significantly more female than male users left comments on CDC's Facebook page (Strekalova, 2016). We dropped question B4 for the B score calculation as the direction of that question does not synchronize with the other questions. In our survey, while we asked the participants whether they ever read health information from CDC on any of the social networking sites and how often they did so, future surveys can also ask explicitly on which social network sites that they read CDC health information. While CDC uses Instagram (Centers for Disease Control and Prevention), we did not include it in our list of social networking sites in the questionnaire. Given that this is a cross-sectional design, we could not assess risk perception or knowledge level that was prior to an individual's use of social media to receive health information. Another limitation in our questionnaire design was that we did not include prior experience including family history, or perceived benefits, risks or barriers of the preventive behavior of receiving the influenza vaccine. We also did not include questions pertinent to trust of the source of information. However, we did adapt our questionnaire items on beliefs and risk perceptions from a published CDC internet panel survey (Lu, et al., 2013).

CONCLUSIONS

Our survey in a rural state university in the Southeastern US highlighted the high penetration of social media among college students. However, fewer than one in five participants reported having accessed CDC influenza information via social media; among whom, only half of them intended to receive seasonal influenza vaccine. More research into improving CDC social media health communication among college students is warranted.

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