Communicating H1N1 risk to university students: a regional cross-sectional survey-study

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Communicating H1N1 Risk to College Students: A Regional Cross-Sectional Survey Study

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Abstract

The purpose of this study was to assess university students’ self-reported knowledge, behavior, and behavioral intention regarding H1N1 influenza. Participants included students at a major university in the southwestern US. Data were collected in early spring 2010 through a 24-item self-administered survey. Outcome variables included knowledge, behavior and intention. A total of 483 students participated. Most reported trying to prevent H1N1 influenza though specific behaviors. Many lacked knowledge about symptoms and treatment; a few (10%) had been vaccinated; and half had no intention of getting vaccinated or practicing self-isolation. Gender and age were significantly associated with the three outcome variables. Intention was the most significant contributor to behavior \( t (1) = 3.34, p<.001 \). H1N1 influenza campaigns directed toward university students in the US should focus on undergraduate, male students, and revise their strategies regarding vaccination and self-isolation.

KEYWORDS: H1N1 pandemic, college students, knowledge, behavior, intention
INTRODUCTION

Despite the current low worldwide activity of 2009 H1N1 influenza in the northern hemisphere (World Health Organization, 2011a), H1N1 continues to be more of a problem for young and middle-aged adults (World Health Organization, 2011b). In 2009 and 2010, H1N1 represented a significant health threat both globally and in the United States (US). More than 214 countries reported laboratory-confirmed cases of H1N1 influenza in 2009, and over 18,170 deaths (World Health Organization, 2010). In the US, 41,821 confirmed influenza-associated hospitalizations and 2,117 deaths were reported in an 8-month period between August 2009 and April 2010 (Centers for Disease and Control and Prevention, 2010a). However, the estimations for non-confirmed cases were much higher. The Centers for Disease Control and Prevention estimated that between April 2009 and April 2010 there were up to 89 million cases of H1N1 influenza, with 403,000 hospitalizations and 18,300 H1N1-related deaths (Centers for Disease and Control and Prevention, 2010b).

During the 2010-11 flu season, the H1N1 virus circulated widely in the US (Centers for Disease Control and Prevention, 2011a). A recent report sponsored by the Association of State and Territorial Health Officials (ASTHO) pointed out that the 2009 H1N1 influenza pandemic had a considerable impact on college campuses across the country (Center for Infectious Disease Research and Policy, 2010).

Although current data indicate that we are now officially moving into a post-pandemic period, H1N1 will continue to be a serious health problem and surveillance efforts must continue (Centers for Disease Control and Prevention, 2011a). It is also important to explore the lessons learned and implement effective education and communication strategies to prevent the spread of H1N1 influenza. In this effort, CDC has provided guidance for specific populations and settings including Institutions of Higher Education (IHE), with the purpose of decreasing exposure to both regular seasonal flu and 2009 H1N1 flu while limiting the disruption of day-to-day activities typical of IHE. In the US, more than 20 million people, including students, faculty and staff attend 4,300 degree-granting post-secondary institutions (Centers for Disease and Control and Prevention, 2011b).

College students per se are not a group considered at higher risk for serious complications from flu. However, environments where people congregate and interact facilitate the spread of influenza and increase the risk of infection. Colds and influenza-like illnesses (ILIs) have been shown to be common among university students and associated with substantial illness in this population (Sobal and Loveland, 1982). Some studies have estimated an incidence of up to 20% of influenza-caused illnesses (Nichol et al., 2005), and up to 28% of ILIs among this population during influenza season (Nichol et al., 2008). Seasonal
influenza is a significant concern among colleges and universities not only due to the health impact, but also because of the burden it imposes on school performance (Nichol et al., 2003).

The US Department of Health and Human Services (HHS) and the CDC have developed tools and recommendations to assist colleges and universities in preparedness for and response to an influenza pandemic, including a communication toolkit (US Department of Health and Human Services, n.d). The CDC’s recommendations for IHE administrators during the 2009-2010 academic year included: encourage flu vaccination; suggest early treatment for people at higher risk for flu complications; facilitate use of respiratory etiquette and hand hygiene by students, faculty, and staff; and separate the sick and well as soon as possible (Centers for Disease and Control and Prevention, 2011b).

The response of IHE to federal agencies’ efforts to communicate the risks and prevent the spread of 2009 H1N1 influenza is not well known. However, the American College Health Association (ACHA) concluded that H1N1 constituted a significant risk for those in college settings (American College Health Association, 2010). A qualitative study by the University of Minnesota concluded that the response of the 12 large universities included in the study was coordinated and efficient. Authors emphasize the “process of planning” as a recommended preparedness approach for IHE against H1N1 influenza (Center for Infectious Disease Research and Policy, 2010). International studies have suggested that 2009 H1N1 influenza education campaigns on hand hygiene were effective among Korean university students (Park et al., 2010), and that more effective communication strategies should be implemented with this population regarding key prevention and control issues such as self-isolation (Van et al., 2010) and vaccination (Akan et al., 2010). Other studies suggested gender and age differences in H1N1 protective behaviors (Bish and Michie, 2010; Lau et al., 2010; Park et al., 20010), although the literature is not conclusive in this regard. Previous studies on HIV/AIDS with college students reported higher perception of risk among female college students, compared to men (Goldman and Harlow, 1993; McNair et al., 1998). However, a recent study did not find a significant difference between female and male students with respect to odds of receiving the H1N1 vaccine (Sunil and Zottarelli, 2011). Similarly, a study with Italian nursing and medical students found that age and gender did not influence H1N1 risk perception and vaccination attitude (Falato et al., 2011). On the other hand, a systematic review found that older age and male gender were two demographic factors associated with higher intentions and uptake of vaccination against pandemic influenza (Bish et al., 2011). This is an area of research that needs to be explored further.

In the US, there is a scarcity of literature on the impact of 2009 H1N1 influenza information and education campaigns on university students. The
The purpose of this study was to assess university students’ self-reported knowledge, behavior, and behavioral intention (outcome variables) regarding the 2009 H1N1 influenza. Both descriptive and inferential statistics were conducted. Differences across gender, age, and academic level were explored. Additionally, analyses were conducted to determine if knowledge and intention would predict participants’ behavior. A brief summary of key findings from this study was reported previously (Soto Mas et al., 2011). This paper describes the methods and procedures in detail and expands on the results and conclusions of the study.

METHODS

The study employed a cross-sectional, causal comparative research design. This design allows for the examination of potential explanatory factors, such as educational and social constructs, and their relationship to behavioral outcomes (Gall et al., 2007). Data were collected during January and February 2010.

Setting. The study was conducted in a major university in the southwestern US. The campus, with an enrollment in fall 2009 of more than 21,000 students, is located in HHS Surveillance Region 6, which includes Arkansas, Louisiana, New Mexico, Oklahoma, and Texas. More than 75% of the students are Hispanic.

Participants. Inclusion criteria included being at least 18 years old and currently enrolled at the university. Both males and females were included.

Sampling. A purposive sample approach was used to identify potential participants at central locations on campus, such as the university library and the student union. Survey administrators were instructed to identify settings that would facilitate the privacy of the participant while completing the survey.

Survey. The survey was developed for this study by the research team. It consisted of 24 items including demographic questions on gender, age, and academic level (undergraduate vs. graduate). Questions were based on the most relevant recommendations by federal agencies to IHE, including education about the H1N1 flu, prevention of infection, and management of illness. The knowledge scale included 5 performance items with categorical responses (“true,” “false,” “not sure”). The behavior and behavioral intention scales included three items each, using a “yes,” “no,” “not sure” response scale. These three scales, which represented the outcome variables for the study, allowed for the construction of a summated scale for each of the variables of interest. Prior to implementation, the survey was piloted with a small group of non-participating students in order to assess administration logistics and obtain comments on content, format, and
Data collection. Trained survey administrators, including graduate research assistants and researchers, approached each potential participant individually. Those who met the inclusion criteria and qualified were informed of the nature of the study and presented with the informed consent form prior to completing the survey. No financial incentive was provided.

Data management. Completed surveys were coded and responses entered for analysis into SPSS (Chicago, Ill, 2009), a statistical software database. Total scores were computed for the three scales of interest. For the knowledge scale, the score was generated by calculating the sum of all correct responses, with a range from 0 to 5 (according to the number of correct answers). For both behavior and behavioral intention the score was generated by calculating the sum of all desirable behaviors, with a range from 0 to 3 (according to the preferred/expected positive response). Total mean scores for the scales of interest were generated by calculating the overall mean percentage score of all correct responses.

Data analysis. Reliability analyses using Cronbach’s alpha were performed to determine internal consistency of scale scores on the scales of interest. Survey data analyses included frequencies, descriptive statistics, linear correlation, linear regression and multivariate analysis of variance. MANOVAS were conducted individually; combined analyses were not conducted due to imbalanced sample sizes between groups.

RESULTS

A total of 483 students completed the survey. Among participants, the majority were female (n=316; 65%), between 18 and 25 years of age (n = 348; 72%), undergraduate (n = 398; 82%), and had been in the university for two or more semesters (n = 365; 76%) (see Table 1 for key demographic characteristics of respondents).
Table 1. Demographic characteristics of respondents

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (n=480)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>165</td>
<td>34</td>
</tr>
<tr>
<td>Female</td>
<td>315</td>
<td>66</td>
</tr>
<tr>
<td>Age Group (n=477)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-25</td>
<td>347</td>
<td>73</td>
</tr>
<tr>
<td>&gt;25</td>
<td>130</td>
<td>27</td>
</tr>
<tr>
<td>Classification (n=478)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate</td>
<td>397</td>
<td>83</td>
</tr>
<tr>
<td>Graduate</td>
<td>81</td>
<td>17</td>
</tr>
</tbody>
</table>

*Percent of respondents

The reliability analyses indicated acceptable Cronbach’s alpha coefficients for two of the scales of interest: behavior (.83) and behavioral intention (.73). Knowledge yielded a moderately low coefficient (.41). This preliminary item analysis provided only exploratory information on the internal structure of the scales for this study. Further analyses with a larger sample size should be conducted to determine the latent structure of survey scales.

**Frequency distributions on key survey items.** Nearly half the participants incorrectly responded or were not sure whether symptoms for H1N1 flu and seasonal flu are different. Almost one-third incorrectly responded or were not sure whether H1N1 flu symptoms are more severe compared to seasonal flu, and whether there is a treatment for H1N1 flu. The majority of participants (n = 333; 69%) indicated taking “specific precautions” to prevent H1N1 influenza, including washing hands more often, covering the nose and mouth with a tissue when coughing or sneezing, and/or avoiding touching the eyes, nose, and mouth. However, only a meager 10% (n = 49) indicated that they had already been vaccinated for the H1N1 flu. Regarding behavioral intention, nearly half answered “yes” that they would go to class as usual if there were confirmed cases of H1N1 flu. More than half (n = 314; 66%) did not plan to get vaccinated for the H1N1 flu or were not sure.

**Descriptive statistics for study outcome variables.** Descriptive statistics across key demographic variables for the three dependent variables of interest are included in Table 2. Cross tabulations were made on gender, age group and academic level across the three outcome variables of knowledge, behavior and intention.
Table 2. Descriptive statistics across selected demographic variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Knowledge</th>
<th>Behavior</th>
<th>Intention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>Gender (n = 480)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>60.0</td>
<td>23.9</td>
<td>61.2</td>
</tr>
<tr>
<td>Female</td>
<td>60.5</td>
<td>21.3</td>
<td>72.6</td>
</tr>
<tr>
<td>Mean Difference</td>
<td>.5</td>
<td>11.4*</td>
<td>5.7*</td>
</tr>
<tr>
<td>Age Group (n = 477)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-25</td>
<td>59.2</td>
<td>23.0</td>
<td>64.3</td>
</tr>
<tr>
<td>&gt;25</td>
<td>62.3</td>
<td>19.6</td>
<td>79.0</td>
</tr>
<tr>
<td>Mean Difference</td>
<td>3.1</td>
<td>14.7*</td>
<td>7.0*</td>
</tr>
<tr>
<td>Academic Level (n = 478)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate</td>
<td>59.8</td>
<td>22.5</td>
<td>68.2</td>
</tr>
<tr>
<td>Graduate</td>
<td>63.2</td>
<td>20.3</td>
<td>68.0</td>
</tr>
<tr>
<td>Mean Difference</td>
<td>3.4</td>
<td>.2</td>
<td>2.5</td>
</tr>
</tbody>
</table>

*Significant difference

**Correlational analysis.** The correlational analysis found small but significant intercorrelations among the three outcome variables (range .08 between knowledge and behavior \((p = .072)\); and .16 between intention and behavior \((p = .001)\). These observed results justify the use of multivariate analyses on these related outcome variables rather than separate and independent univariate analysis of variance (ANOVA) tests.

**Tests of significance.** Significance tests were conducted to determine gender differences across the three outcome variables. The homogeneity of variance-covariance matrix was inspected by using tests at the multivariate and univariate levels. At the multivariate level, Box’s test indicated no violations, while Levene’s test results indicated that the assumption was met for both knowledge and behavior, with a slight violation of the assumption for intention. Because of these findings, it was determined that the Wilk’s Lambda test was more appropriate due to its robustness and insensitive nature to this type of assumption’s violation. A statistically significant difference for gender was found across all three outcome variables. The combined outcome variables were significantly affected by gender \([F (3,476) = 3.86, \ p < .01]\). However, the effect size was calculated at less than 1%, indicating a small association between the gender scores and the combined outcome variables. Despite the small effect size for gender, univariate level analyses were conducted to examine any meaningful differences across all outcome variables. The results of the follow-up ANOVAs yielded significant differences across gender for the variables behavior \([F (1,478) = 6.86, \ p < .01]\).
and intention [F (1,478) = 4.86, \( p < .05 \)]. No significant gender difference was detected for the variable knowledge. Compared to their male counterpart, the female group reported more than 11 points mean difference for behavior, and almost six point mean difference for intention.

Similar to the gender variable, multivariate and univariate tests for homogeneity of variance were conducted with Box’s test, yielding a slight violation and Levene’s test indicated a small violation to the assumption for the behavior and intention variables. Because of these findings, Pillai’s test was used. A statistically significant difference for the two age groups (18-25 and >25) was found across all three outcome variables. The combined outcome variables were significantly affected by the two levels of age [F (3,473) = 6.25, \( p < .001 \)]. However, the results reflected a small association between the age group scores and the combined outcome variables (effect size less than 4%). Univariate level analyses revealed statistically significant mean differences across age for behavior [F (1,475) = 13.4, \( p < .01 \)] and intention [F (1,475) = 6.3, \( p < .05 \)], but not for knowledge. For mean differences across gender and age on the outcome variables, see Table 2.

**Academic level.** Finally, similar analyses were conducted for academic level (undergraduate vs. graduate) of the participants and no statistically significant difference was found at any academic level across the three outcome variables. These two groups responded very similarly to the survey questions. See Table 2 for descriptive data.

**Predictive analysis.** A multiple regression analysis was conducted to determine the level of contribution by the knowledge and intention variables on behavior. The results indicated that intention was a better significant contributor to behavior \([t (1) = 3.34, \ p < .001]\) while knowledge was not. However, the amount of variance explained by both predictors (knowledge and intention) was less than 3%.

**DISCUSSION**

To the best of our knowledge the present study was the first of its kind in characterizing the knowledge, behavior, and behavioral intent of US college students regarding 2009 H1N1 influenza. As occurred on many campuses across the US, the university where this study took place established an H1N1 flu task force in the spring 2009 in response to the threat of the disease. Posters, flyers, and email messages were widely distributed to students, faculty, and staff. The student government association also established an H1N1 special committee “to help spread information on how to prevent the spread of the seasonal flu and
H1N1 flu,” and raised funds to purchase and distribute t-shirts, hand sanitizers, and educational materials (Campus Bulleting, 2009). Key messages included recommendations for vaccination, good hygiene, identification of symptoms, and management of illness, particularly staying home and avoiding contact with other students in the case of symptoms or illness, which are consistent with the CDC’s recommendations for IHE (Centers for Disease and Control and Prevention, 2011b). These activities continued throughout the fall 2009 semester.

The purpose of this study was to assess students’ self-reported knowledge, behavior, and behavioral intention regarding 2009 H1N1 influenza. A total of 483 students completed the survey, which is consistent with sample size criteria for survey studies. For populations larger than 5,000 a sample size of 400 would be adequate (Gay et al., 2008). Additionally, the inclusion of 10 to 20 participants per survey item is generally recommended (Gay et al., 2008). The present study met both sample size criteria. Participant demographics, including age and academic level (undergraduate vs. graduate) reflect the university’s student population; females were overrepresented in the sample (35% vs. 65%). The majority had been at the university during the spring and fall 2009, which suggests that most participants would have been exposed to H1N1 2009 information and education efforts, given that data were collected in early spring 2010.

In general, the results of this study indicate that the majority of participants lacked knowledge regarding symptoms and treatment but practiced recommended health habits and hygiene to avoid the spread of H1N1 influenza virus. Previous studies on infectious disease knowledge among US college students have been inconclusive. Some found very low levels of knowledge and understanding about HPV infection (Sandfort and Pleasant, 2009; Yacobi et al., 1999) and low to moderate levels of knowledge regarding HIV among medical students (McDaniel et al., 1995). However, others concluded that students were well informed about AIDS and how to avoid HIV infection (Thurman and Franklin, 1990). International studies on 2009 H1N1 influenza concluded that public education campaigns were successful in increasing Korean university students’ knowledge regarding preventive measures such as hand washing (Park et al., 2010).

On the other key behaviors emphasized in education materials, only a very small percentage had been vaccinated, had intention to receive the vaccine, or would practice self-isolation in case of symptoms or illness. These results are consistent with previous international studies on the recent H1N1 influenza outbreak, which found that university students practiced recommended behaviors related to hygiene (Akan et al., 2010) but not to self-isolation (Park et al., 2010) and vaccination (Van et al., 2010).
Regarding student characteristics, this study found that female and older participants scored higher on both behavior and behavioral intention; while no strong score differences were detected in knowledge. Again these findings are consistent with previous international studies, which found a positive association between being female and older and the adoption of protective behaviors during the 2009 H1N1 pandemic (Bish and Michie, 2010; Lau et al., 2010; Park et al., 2010).

Finally, the influence of knowledge and intention on behavior has been discussed in the literature. Most studies have found that knowledge alone is not a good predictor of behavior (Bandura, 1990; Becker, 1990; Maticka-Tyndale 1991). However, knowledge may be a key element of the behavior change process given that increasing people’s knowledge of the threat of illness creates the preconditions for change (Bandura, 1990). The literature on college students is inconclusive. While some studies found significant association between knowledge and sexual behavior change among male students (Carroll, 1991), other studies on infectious disease found that a moderate to high knowledge level of AIDS may not be a predictor of safe sexual behavior practices (Gray and Saracino, 1989). As regards intention, the Theory of Reasoned Action and Theory of Planned Behavior (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975) place behavioral intention as a strong precursor of behavior. This study found that intention, but not knowledge, was a significant predictor of behavior. This result must be interpreted cautiously since the amount of variance explained by these two predictors was very small (<3%).

LIMITATIONS

This study is exploratory in nature. Results should be interpreted with caution since they may apply only to university students with demographic characteristics similar to those who participated in the study, e.g. Hispanic students at this particular university. The study was cross-sectional and did not determine if respondents’ intentions were carried out. The study also did not examine whether students who had actually been ill from influenza responded differently. Additionally, the study was conducted in just one university in the southwest, which may not be representative of the general US university student population. Other limitations relate to the validity and reliability of the instrument, which should be refined further and tested to meet psychometric standards. A low score of Cronbach’s alpha coefficient suggests that some questions in the knowledge section could be revised. Finally, the responses were self-reported, which may tend to reflect the individual idiosyncrasies (perceptions) of only those who chose to participate.
CONCLUSIONS

H1N1 influenza campaigns directed toward university students in the US should revise their strategies regarding vaccination and self-isolation. An increase in dissemination efforts towards younger, male students may be beneficial. Campaigns seem to have been more successful in communicating the importance of hygiene, as well as on differences between regular and H1N1 influenza, or facts about symptoms. Regarding vaccination, campaigns may have to more aggressively address system-based factors such as accessibility and convenience; economic factors such as cost; and personal factors such as fear of pain and discomfort. On the issue of self-isolation, an array of issues may influence students’ decision to protect themselves through isolation, including interpersonal, academic, environmental, and social factors.

The lack of literature on US college students and 2009 H1N1 influenza makes it difficult to make comparisons regarding the results of this study, and highlights the need for similar studies at the local, regional and national levels. Since universities and colleges are considered critical to health promotion efforts related to infectious outbreaks, including H1N1 influenza, research should be conducted to further explore the factors that are associated with students’ preventive behaviors. Further studies should consider expanding the sampling to include: more than one academic period in order to capture a broader college student population (e.g. include fall and spring semesters); a more balanced gender distribution; and a broader age range (e.g. young, middle, and older age). Additionally studies should include follow-up questions that further explore the key findings of this study (e.g. questions regarding why participants state that they plan not to be vaccinated).

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