

Received: 2008.12.22  
Accepted: 2009.09.31  
Published: 2010.02.01

## Factors and barriers influencing influenza vaccination among students at Brigham Young University

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Source of support: College of Health and Human Performance, Brigham Young University

<p><b>Background:</b></p> <p><b>Material/Methods:</b></p> <p><b>Results:</b></p> <p><b>Conclusions:</b></p> <p><b>key words:</b></p>	<p><b>Summary</b></p> <p>To identify the prevalence of influenza vaccination and factors associated with vaccination among students at Brigham Young University.</p> <p>A Cross-sectional survey of seven general education classes, size 30 to 200 students each, was conducted the week of November 25, 2007. A 34 item paper-pencil questionnaire was administered, taking 5–10 minutes to complete. The response rate was 90%, with 421 completed surveys.</p> <p>Prevalence of influenza vaccination was 12% in the current influenza season. Influenza vaccination was significantly influenced by place of work, frequency of being around children, place of residence, and selected area of academic study. Students that received the influenza vaccination were more motivated by perceived severity of influenza than by perceived risk of contracting the illness. Physicians or nurses were the most influential at encouraging influenza vaccination, followed by parents, then the university or student health center, and then the media. The percentage of students that received influenza vaccination information from physicians or nurses was 14%, from parents was 15%, from the student health center was 25%, and from the general media was 45%.</p> <p>Influenza vaccination is low among college students, but impacted by perceived severity of the illness, place of employment or residence, and who encourages influenza vaccination.</p> <p><b>influenza vaccination • health education • students</b></p>
<p><b>Full-text PDF:</b></p> <p><b>Word count:</b></p> <p><b>Tables:</b></p> <p><b>Figures:</b></p> <p><b>References:</b></p> <p><b>Author's address:</b></p>	<p><a href="http://www.medscimonit.com/fulltxt.php?ICID=878348">http://www.medscimonit.com/fulltxt.php?ICID=878348</a></p> <p>2647</p> <p>4</p> <p>–</p> <p>22</p> <p>Ray Merrill, Health Science, 221-A Richards Building, Provo, Utah 84602, U.S.A., e-mail: ray_merrill@byu.edu</p>

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## BACKGROUND

Influenza affects between 5% and 20% of the United States population each year, with over 200,000 people hospitalized and 36,000 dying as a result [1]. Several studies have shown the efficacy of the influenza vaccine at reducing the risk of becoming ill with influenza or of transmitting the disease to others [2–5]. The Centers for Disease Control and Prevention (CDC) indicates that the single best way to protect against influenza is to get vaccinated each year [6]. The primary type of vaccine is an inactivated vaccine (TIV), containing a killed virus strain, which is administered intramuscularly. In the United States, the influenza shot is approved for use among individuals 6 months of age and older, and among both healthy people and those with chronic medical conditions. A live, attenuated influenza (LAIV) vaccine is also available in a nasal-spray, approved for use in healthy, non-pregnant people 2–49 years of age.

Although people at high risk for complications from influenza (i.e., children, pregnant women, seniors, people with certain chronic medical conditions, and people who work in nursing facilities) should be vaccinated each year, vaccination is also important for other segments of the population. While many students do not fall into one of the target groups for annual vaccination, the Advisory Committee on Immunization Practices recommends that students or other persons in institutional settings such as in residence halls or correctional facilities should be encouraged to receive the vaccine in order to minimize morbidity [7]. In particular, the burden of influenza on college students can be substantial. Of 3,249 college students at the University of Minnesota in 2002–2003, 91% had at least one upper respiratory illness (83% colds and 37% influenza-like illness). As a result, there were 6,023 bed-days, 4,263 missed school days, 3,175 missed work days, and 45,219 days of illness. About 28% with an upper respiratory illness did poorly on a test and above 46% did poorly on a class assignment. Those with influenza-like illness compared with a cold experienced significantly greater impact on missed school days and performance on tests and assignments [8]. Research has also shown that rooms in residence halls are prime locations for transmitting influenza [9].

In 2007, approximately 22% of college aged students 18–29 years of age in the United States received TIV [10]. In contrast, over 70% of those aged 65 years or older received TIV. Slightly more than 1% of those aged 18 years or older received LAIV. Hence, there is considerable potential for increased utilization of influenza vaccination and decreased burden of influenza among the 16 million college students in the US [11].

This study will explore the prevalence of influenza vaccination and factors that influence influenza vaccination among students at a large private university.

## MATERIAL AND METHODS

Participants were sampled from 30,847 undergraduate students at Brigham Young University, a private school sponsored by the Church of Jesus Christ of Latter-day Saints. The school is located in Provo, Utah, USA. The study was conducted during National Influenza Vaccination Week,

November 26 through December 2, 2007. A representative sample of seven general education classes, size 30 to 200 students, was selected. In early November, instructors were contacted for permission to administer a 34 item questionnaire, taking 5–10 minutes to complete. Where permission was obtained, students were invited to complete a short anonymous survey about influenza vaccination. They were told that their participation was strictly voluntary and was not related to their class. A paper-and-pencil version of the questionnaire was administered at the beginning of their class and there was no compensation for student participation. The response rate was above 90%, with 421 completed surveys. The data were then entered into a spreadsheet using double-entry, with discrepancies resolved by referring to the original questionnaires.

The survey consisted of 34 questions associated with influenza and the influenza vaccination. The first section consisted of three questions dealing with current knowledge of and practices regarding influenza vaccination. The second section asked six questions assessing general knowledge about the flu, including its symptoms and risks. The third section consisted of five questions assessing beliefs concerning potential danger of the influenza and where students may have received encouragement to get the influenza vaccine. Questions in each of the first three sections were multiple-choice. The fourth section was for those who had not received the influenza vaccine and consisted of eight questions that asked why they did not receive it; participants ranked each of these on a 1 to 5 Likert scale. The final section consisted of 12 demographic questions. In addition, an informed consent form accompanied the survey, which included a statement about the general purpose of the study. Participants were informed that participation was voluntary and that personal identifying information was not being requested. The study was approved by the Institutional Review Board at Brigham Young University on November 25, 2007.

The questionnaire was developed from a pilot study of 380 students in 2006, administered at Brigham Young University and also at Utah Valley State College, a large, nearby public college. The questionnaire used in the pilot study was designed to obtain an understanding of students' general knowledge and attitudes about pertussis and the perceived importance of being vaccinated. The questionnaire was administered in general education health classes, and the data was recorded and analyzed. The pilot study was approved by the Brigham Young University IRB on December 7, 2006 and the Utah Valley State College IRB on February 28, 2007. The pilot questionnaire was refined for both face and content validity. The content was then adapted to target influenza vaccination. In addition, two focus groups were held with approximately ten students in each. Students provided feedback for improving the clarity and content of the instrument.

Frequency distributions and cross-tabulations were used to perform descriptive assessments of the data. Rate ratios were derived to assess differential levels of influenza vaccination by selected variables. Ninety-five percent confidence intervals were derived for the rate ratios to indicate significance (if they do not overlap 1) and precision. Stepwise logistic regression was used to identify which beliefs regarding influenza were associated with receiving influenza

**Table 1.** Influenza vaccination according to selected variables.

	Received the influenza vaccination this season		Incidence rate per 100	Rate ratio	95% CI
	Yes (n=52)	No (n=369)			
Gender					
Male (44%)	18	165	9.8	1.00	–
Female (56%)	31	203	13.2	1.35	0.8, 2.3
Work or volunteer in a health care facility					
No (92%)	34	349	8.9	1.00	–
Yes (8%)	15	19	44.1	4.97	3.0, 8.2
Class year in school					
Freshman (16%)	7	59	10.6	1.00	–
Sophomore (52%)	24	193	11.1	1.04	0.5, 2.3
Junior (19%)	7	71	9.0	0.85	0.3, 2.3
Senior (13%)	11	45	19.6	1.85	0.8, 4.5
Do you live on- or off-campus?					
On-campus (16%)	3	64	4.5	1.00	–
Off-campus (84%)	46	304	13.1	2.94	1.0, 9.2
Do you live with your parents?					
No (94%)	41	349	10.5	1.00	–
Yes (6%)	8	19	29.6	2.82	1.5, 5.4
Are you married?					
No (86%)	38	319	10.6	1.00	–
Yes (14%)	11	49	18.3	1.72	0.9, 3.2
Are you around children on a regular basis?					
No (81%)	34	305	10.0	1.00	–
Yes (19%)	15	62	19.5	1.94	1.1, 3.4
Nursing Major					
No (96%)	42	356	10.6	1.00	–
Yes (4%)	7	10	41.2	3.90	2.1, 7.4

vaccination. Analyses were performed using SAS version 9.1 (SAS Institute Inc., Cary, NC, USA, 2003). Statistical significance was based on the 0.05 level.

**RESULTS**

Study participants had a mean age of 20.9 (SD=3.8), ranging from 18 to 58. The number who received the influenza vaccination this season is presented according to selected variables in Table 1. Those who work or volunteer in a health care facility; live off campus; live with parents; are around children on a regular; or are nursing students were significantly more likely to get the influenza vaccination. Influenza vaccination prevalence was initially compared across several academic majors (data not shown). Because vaccination prevalence proportions were statistically similar, with the exception of nursing, the students' academic majors were classified as "nursing" or "other." Gender, age, marital status, and year in school were not significantly associated with receiving the influenza vaccination.

In a stepwise logistic regression model where getting the influenza vaccination this season was the dependent variable and the independent variables were responses (on a Likert scale) to selected statements: (e.g., "The flu is a major health

**Table 2.** Knowledge about influenza and its symptoms.

	No.	%
Influenza is a respiratory virus?		
Yes	217	52
No	68	16
Unsure	136	32
Common Symptoms of influenza are?		
<i>Fever</i>	399	95
<i>Dry skin</i>	87	21
<i>Nausea</i>	325	78
<i>Runny/stuffy nose</i>	316	76
<i>Swollen hands and feet</i>	94	23
<i>Headache</i>	350	84
<i>Diarrhea</i>	187	45
<i>Sore throat</i>	298	71
<i>Excessive tiredness</i>	346	83
<i>Muscle aches</i>	356	85

Correct answers are italicized.

concern in Utah County," "I am at risk of contracting the flu," "The flu can be dangerous or fatal to me," and "The



**Table 3.** Level of agreement with statements about influenza vaccination

	No.	%	Scale Response	
			Mean	SD
Vaccines are too expensive for me right now				
Agree/Strongly agree	136	37	2.99	1.08
Disagree/Strongly disagree	232	63		
I do not have time to get a flu vaccination				
Agree/Strongly agree	134	36	2.97	1.13
Disagree/Strongly disagree	235	64		
I believe that as a result of the flu shot I may actually get the flu				
Agree/Strongly agree	106	29	2.67	1.14
Disagree/Strongly disagree	263	71		
I do not know where to receive a flu vaccination				
Agree/Strongly agree	89	24	2.38	1.16
Disagree/Strongly disagree	279	76		
I do not believe I am in danger of contracting the flu				
Agree/Strongly agree	59	16	2.52	0.89
Disagree/Strongly disagree	309	84		
I believe that vaccines may have dangerous side effects				
Agree/Strongly agree	57	16	2.50	0.95
Disagree/Strongly disagree	310	84		
I was not informed that flu vaccines might be important				
Agree/Strongly agree	53	14	2.40	0.94
Disagree/Strongly disagree	315	86		

These questions were only asked of students who had not received the influenza vaccination this season.

flu can be dangerous or fatal to young children or the elderly”), the only variable found to significantly influence getting the flu vaccination this season was “The flu can be dangerous or fatal to me.” Specifically, 18% strongly agreed, 33% agreed, and 63% were neutral, disagreed, or strongly disagreed that “the flu can be dangerous or fatal to me.” For those who strongly agreed, agreed, or otherwise, 28%, 16%, and 9% received the influenza vaccination, respectively (MH Chi-square (1) = 8.2,  $P=0.0042$ ).

Responses to selected questions regarding knowledge about influenza are presented in Table 2. Approximately 52% correctly identified influenza as a respiratory virus and tended to correctly identify the signs and symptoms of influenza. There was no significant association between response to these questions and participation in influenza vaccination in the current season.

Levels of agreement with statements for not getting the influenza vaccination among those who had not received or were not sure they would receive the influenza vaccination this season are presented in Table 3. On a scale from 1 (strongly disagree) to 5 (strongly agree), average responses tended to range between neutral and disagree. The item with the

highest level of agreement was “vaccines are too expensive for me right now,” which had an average score of 2.99 (neutral). The item with the lowest level of agreement was “I do not know where to receive a flu vaccination,” which had an average score of 2.38 (disagree). These responses did not significantly differ between males and females or across age.

Information and/or encouragement about influenza vaccination were received through various sources, including: their personal physician or nurse; parents; the student health center; or television, billboards, flyers, and advertisements. The percentage of students that indicated receiving such information from these sources in the last year was 14%, 15%, 25%, and 45%, respectively. The association between receiving the influenza vaccination this season and selected sources of information about vaccination are presented in Table 4. A personal physician or nurse was the most effective at promoting the influenza vaccination, followed by parents, the university or student health center, and finally the media.

## DISCUSSION

This study explored the prevalence of influenza vaccination among students at Brigham Young University. It also

**Table 4.** Influenza vaccination according to selected source of information or encouragement.

Received information about or been encouraged to receive the influenza vaccination from any of the following sources in the past year	Influenza vaccination this season		Incidence rate per 100	Rate ratio	95% CI
	Yes (n=52)	No (n=369)			
Personal physician or nurse?					
No	26	336	7.2	1.00	–
Yes	26	32	44.8	6.24	3.9, 10.0
Parents?					
No	19	295	6.1	1.00	–
Yes	33	74	30.8	5.10	3.0, 8.6
Student health center?					
No	39	320	10.9	1.00	–
Yes	13	49	21.0	1.93	1.1, 3.4
Television, billboard, flyer, advertisement, etc?					
No	34	196	14.8	1.00	–
Yes	18	173	9.4	0.64	0.4, 1.1

explored motivating factors and barriers that influence influenza vaccination. Only 12% of the students assessed received the influenza vaccination this season. This percent was lower than the self-reported 18% of college aged students, ages 18–24 years in the United States [10]. Yet students were closer to or above this percentage if they worked or volunteered in a health care facility, lived off campus, lived with parents, were around children on a regular basis, or were students in the nursing college.

It is believed that vaccination was higher among students spending time in health care facilities, including students training to be nurses, because individuals in these settings are often encouraged, if not required, to receive influenza vaccination. Further, many nursing students volunteer in influenza vaccination clinics, and receive free influenza vaccinations. Individuals who are often around children are also highly encouraged to receive influenza vaccination. In addition, students who live at home may have experienced higher levels of influenza vaccination because, as this study shows, parents are effective at encouraging influenza vaccination.

Although the majority of students surveyed were able to identify the signs and symptoms of influenza, only about half knew that influenza was a respiratory virus. There was no significant association between response to these questions and participation in influenza vaccination. This result is consistent with studies showing that knowledge of behaviors that promote good health do not necessarily translate to good health practices [12–14].

The Health Belief Model, a cognitive-motivation model, states that beyond knowledge about good health practices, health actions are often motivated by perceived susceptibility to illness, perceived consequences or seriousness of the illness, belief that recommended action is appropriate or efficacious to reduce risk, and belief that the benefits

of action outweigh the costs [15–17]. In the current study, the perceived personal risk of getting the flu was not associated with getting the influenza vaccination in the multiple logistic regression model, but those who thought the flu could be dangerous or possibly fatal for them were significantly more likely to get the influenza vaccination. Hence, when the consequences of flu are perceived to be less dangerous, perceived susceptibility to the illness appear to be less important as an explanation for motivating behavior.

In assessing reasons for not getting the influenza vaccination, expense had the highest level of agreement for not receiving the influenza vaccination, while not knowing where to receive the vaccination had the lowest level of agreement. None of the reasons included in the survey received more than 37% agreement/strong agreement. Students tended to be neutral or disagree with the selected items for not getting the influenza vaccination. Thus, making the vaccination free or eliminating other barriers will likely not substantially increase the rate of getting the influenza vaccination.

Another study assessed reasons for not getting the influenza vaccination, finding that those who were unsure whether the vaccine could cause illness or were unsure of the efficacy of the vaccination were significantly less likely to obtain the influenza vaccination [18].

Information and/or encouragement about influenza vaccination is often disseminated through a personal physician or nurse; the student health center; parents; or television, billboards, flyers, and advertisements. Although a personal physician or nurse was the most effective at promoting influenza vaccination, followed by parents, the university or student health center, and then the media, the percentage of students receiving information/encouragement about the influenza vaccination from these sources in the last year was 14%, 15%, 25%, and 45%, respectively. One study showed that seniors were 50% more likely to be vaccinated when



well informed about risks and efficacy, even if they were incorrectly informed about dangers [18]. Several studies have identified the efficacy of physician/nurse counseling at promoting behavior change [14,19–22].

Some study limitations need mention. First, only half of the faculty approached gave permission to administer the survey. However, within classes in which consent was obtained, all students were invited to participate, with a response rate of approximately 90%. Second, a self-reported questionnaire was used where students may not have answered certain items accurately. A tendency is to overestimate participation in activities such as vaccination. However, because the survey was anonymous and sensitive issues were not considered in the questionnaire, we assume minimal self-reporting bias. Finally, the survey was administered at the beginning of class in all but one of the classes. Those who did not participate tended to be late for class, with insufficient time to complete it. Although bias may exist if those who were late were different than those who were not, such differences are expected to be minimal.

## CONCLUSIONS

Although college students can be considered as high risk candidates for influenza, relatively few receive the influenza vaccination. However, students working in a health care facility, associating with children on a regular basis, majoring in nursing, or living with parents were significantly more likely to receive the influenza vaccination. On a five point scale from strongly disagree to strongly agree, students tended to be neutral or disagree with the selected items for not getting the influenza vaccination, such as with the statements “vaccines are too expensive for me right now” or “I do not have time to get a flu vaccination.” Hence, making the vaccination free or eliminating other barriers will likely not substantially increase the rate of getting the influenza vaccination. However, the students that received the influenza vaccination appeared to be more motivated by perceived severity of the disease than by perceived risk of contracting the illness. In addition, direct communication with a physician or nurse has the greatest potential for influencing receipt of the influenza vaccination followed by communication with parents and then the student health center. The media are less effective.

On the basis of these results, communication strategies aimed at the perceived severity of influenza are needed. Information should be communicated that stresses the consequences of influenza that are relevant to students such as missing class, missing work, and missing social and other important activities. The results of this study further show communication through a physician or nurse would have the biggest effect on increasing influenza vaccination among college students. However, a one-on-one session with a doctor or nurse may not be feasible. Hence, school health centers and media outlets may wish to use quotes, interview clips, or pictures of physicians or nurses as they convey information about influenza vaccination to students.

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