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Abstract
Objectives: 1) Assess participants' perceptions of severity, risk, and susceptibility to the novel H1N1 influenza virus and/or vaccine, vaccine benefits and barriers, and cues to action and 2) Identify predictors of participants' intention to receive the novel H1N1 vaccine.
Design: Cross-sectional, descriptive study
Setting: Local grocery store chain and university in the central Virginia area
Participants: Convenience sample of adult college students and grocery store patrons
Intervention: Participants filled out an anonymous, self-administered questionnaire based upon the Health Belief Model.
Main Outcome Measures: Participants' predictors of intention to receive the novel H1N1 vaccine
Results: A total of 664 participants completed a questionnaire. The majority of participants were aged 25-64 years old (66.9%). The majority were female (69.1%), Caucasian (73.7%), and felt at risk for getting sick from the virus (70.3%). Most disagreed that they would die from the virus (68.0%). Participants received novel H1N1 vaccine recommendations from their physicians (28.2%), pharmacists (20.7%), and nurses (16.1%). The majority intended to receive the H1N1 vaccine (58.1%). Participants were significantly more likely to intend to receive the H1N1 vaccine if they had lower scores on the perceived vaccine barriers domain (OR= 0.57, CI: 0.35-0.93). Physicians' recommendations (OR=0.26, CI: 0.11-0.62) and 2008 seasonal flu vaccination (OR=0.45, CI: 0.24-0.83) were significant predictors of intention to receive the H1N1 vaccine.
Conclusions: Most participants felt at risk for getting the novel H1N1 virus and intended to receive the novel H1N1 vaccine. Educating patients about vaccine benefits and increasing healthcare professionals' vaccine recommendations may increase vaccination rates in future pandemics.

Introduction

The novel (2009) H1N1 influenza virus was first detected in the US in April 2009. By June 2009 the World Health Organization declared that the virus had reached pandemic status. The illness associated with the novel H1N1 influenza virus varied from mild (fever, muscle aches, and nausea) to severe (hospitalizations and deaths).[1] Data from July 2009 revealed approximately 37,000 cases in the US with a disproportionate number of cases in persons who were younger than 25 years old.[1] Similar to seasonal influenza, pregnant women, those with pre-existing chronic disease states such as diabetes, asthma, heart disease, and kidney disease, and persons 65 years or older were at an increased risk of complications.[1] In response to the pandemic, a novel H1N1 vaccine was developed. The initial target groups for receipt of the novel H1N1 vaccine were pregnant women, household contacts and caregivers for children < 6 months old, healthcare and emergency services personnel, all people from 6 months to 24 years old, and people ages 25-64 years old with pre-existing disease states that place them at risk for influenza complications.[2]

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At the onset and during the pandemic, media coverage about the novel H1N1 influenza pandemic was widespread. However, little was known about perceptions of the novel H1N1 influenza virus in the United States and intention to receive its vaccine. Setbon and Raude analyzed responses from a telephone administered questionnaire in France which investigated participants' perceptions of risk and illness related to the H1N1 virus, attitudes and worldviews about the pandemic, sociodemographics, seasonal influenza vaccine history, and intention to receive the novel H1N1 influenza vaccine. Approximately 60% of the 1,001 respondents intended to receive the novel H1N1 vaccine. Significant predictors of intention to vaccinate included previous receipt of a seasonal flu vaccine, feelings of worry related to H1N1, age > 60 years, perceived risk, and belief in conspiracy theories.[3] Similarly, in a telephone administered survey conducted in Hong Kong, investigators examined factors related to acceptability of the H1N1 vaccine. A significant predictor of intention to receive the novel H1N1 vaccine was prior seasonal influenza vaccine history. In addition, recommendations from family members were a significant predictor at all three H1N1 vaccine price levels. Perceived side effects was only significant for the lowest cost H1N1 vaccine, whereas, friends receiving the H1N1 vaccine was a significant predictor of intent only for the lowest and middle H1N1 cost scenarios.[4]

Our study investigated participants' perceptions of the novel H1N1 influenza virus and identified factors that impacted intention to receive the novel H1N1 vaccine. This study was conducted prior to the novel H1N1 influenza vaccine being available in the community pharmacy setting. Information gained from this study about participants' perceptions can be used by healthcare professionals in future influenza pandemic education and awareness campaigns.

Objectives

The objectives of this study were to: assess participants' perceptions and attitudes about the severity, susceptibility, and risk of the novel H1N1 influenza virus and the novel H1N1 influenza vaccine, evaluate participants' perceived benefits of and barriers to novel H1N1 influenza vaccination, identify participants' cues to action, and determine the relationship between demographic and attitudinal variables and participants' intention to receive novel H1N1 influenza vaccination.

Methods

Design and Sample

This was a cross-sectional study conducted at Ukrop's Super Markets, Inc. in the Central Virginia area and at Virginia Commonwealth University (VCU), Monroe Park Academic Campus, Richmond, Virginia. Adults ≥ 18 years of age were eligible to participate in the study. College students were targeted at VCU for participation due to many cases of the novel H1N1 influenza virus being observed in those less than 25 years old.[2] Given that those < 25 years old were considered a high-risk group for contracting the H1N1 virus, college students were purposely targeted at a University because the authors were concerned about obtaining participants in this age group at a grocery store. A convenience sample was utilized in both settings due to its accessible, inexpensive, and timely means of implementation.[5]

Theoretical Framework

The Health Belief Model (HBM) was the theoretical framework used in this study. The HBM is used to examine patient motivations for adapting a health-related behavior and used in assessing health-behavior interventions. The HBM includes six key domains which influence health behaviors: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action and self-efficacy. Perceived susceptibility addresses patient's beliefs about their risk for getting a condition; whereas perceived severity relates to the patient's concerns about the seriousness of a condition or illness. Perceived benefits are related to the outcomes of a certain behavior to reduce their susceptibility to or severity of an illness. Perceived barriers identify patient's concerns or negative beliefs about a health behavior. Cues to action are strategies or information sources that promote adoption of a behavior. Self-efficacy measures the patient's confidence to adopt a behavior or take action, e.g. accepting an immunization.[6] The HBM has been used extensively to study vaccination beliefs and behaviors and in vaccination research to identify patient perceptions of disease and vaccination.[7-12] HBM domains used in this study include perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy.

Survey Instrument

A 36-item questionnaire was developed to assess the study objectives. It contained 27 questions based upon the HBM, 3 questions about participants' intention to receive the vaccine and intention to vaccinate their child, if applicable, and 6 demographic questions. The first portion of the questionnaire was separated into three 5-point Likert scaled (1 = strongly disagree to 5 = strongly agree) HBM groups: novel H1N1 influenza virus statements (7 items), novel H1N1 influenza vaccine statements (9 items), and general vaccine statements (3 items). The statements addressed participants' perceived susceptibility and severity of the novel H1N1 influenza virus and their perceived benefits and barriers to the novel H1N1 vaccination. Two checklist questions assessed participants'

cues to action (e.g., television, internet) about the novel H1N1 influenza virus and its vaccine. To identify other cues to action, six three-way (Yes/No/I don't know) questions assessed past seasonal influenza vaccination history (2 items) and healthcare professionals' recommendations to receive the novel H1N1 influenza vaccine (4 items). A four-point Likert scale (1 = very unlikely to 4 = very likely) was used for the two questions that directly asked participants about their intention to receive the novel H1N1 influenza vaccine and their intention to vaccinate their child, if applicable. Six demographic variables were collected: age, gender, race/ethnicity, estimated annual income, highest education level completed, and whether or not the participant fell into a high-risk influenza group. The survey contained no identifiable patient information. The questionnaire was pre-tested two times with pharmacists, student pharmacists, and Ukrop's patrons for readability, comprehension of instructions, and clarity. Based upon feedback from the pre-test, minor modifications regarding readability and clarity were made to the questionnaire. This research project was approved by the Institutional Review Board at Virginia Commonwealth University.

Data Collection

Ukrop's pharmacists, student pharmacists, and pharmacy technicians invited Ukrop's patrons to participate in the survey at the time of prescription pick-up/drop off, seasonal influenza vaccination, or while shopping in the grocery store. Patrons who agreed to participate received a copy of a cover letter and questionnaire and were instructed to return the completed questionnaire to the pharmacy staff. The researchers and student pharmacists distributed and administered the questionnaire to VCU students interested in participating in the study at the VCU University Student Commons. The questionnaire instructions defined the novel H1N1 influenza virus as: "The novel (new) H1N1 influenza virus is also known as "Swine Flu"." Data was collected during a two-week period in October 2009. Data collection was completed prior to the availability of the H1N1 influenza vaccine in the community pharmacy setting.

Participants were offered the opportunity to enter a raffle to win a gift card as an incentive for their time and participation in the survey. To protect participants' confidentiality, a separate form for raffle entry was used. The raffle drawing was conducted after data collection was completed and after all completed raffle entry forms had been collected. A total of ten $50 gift cards were awarded to the raffle winners.

Magenta for Office Forms Designer, Data Blocks (Version 5.05, Gainesville, GA), Remark Office OMR Data Center, Gravic, Inc. (Version 6.0.4, Malvern, PA) was the software used for survey design and data entry. All hard copies of the completed questionnaires and raffle entry forms were stored in one of the researcher's locked office. All scanned data was stored on a password protected computer.

Data Analysis

Descriptive statistics (mean, standard deviation, frequency) were used for all variables. The HBM-based statements were grouped according to domains (perceived susceptibility to the virus, perceived severity of the virus, perceived clinical barriers to vaccination, perceived access barriers to vaccination, perceived specific vaccine benefits, and perceived general vaccine benefits statements). Cronbach's alpha was calculated for the domains with three or more items and Pearson's correlation was used for the domain with two items to assess reliability. A scale mean was calculated for domains with an alpha coefficient or Pearson correlation > 0.5. Cues to action were divided into three groups: virus information sources, vaccine information sources, and healthcare professionals' recommendations. The number of cues to action for virus and vaccine information sources was summed to create an overall number of exposures to information for the two groups. The healthcare professionals' recommendations (physician, pharmacist, and nurse) were kept as separate variables. Logistic regression was used to assess the relationship between demographic variables, health belief model domains, and number of cues to action or recommendations with participants' intention to receive the novel H1N1 vaccine. For the logistic regression analysis, the variable intention to receive the novel H1N1 vaccine was dichotomized into a likely to vaccinate group (very likely and likely) or an unlikely to vaccinate group (very unlikely and unlikely). Race was collapsed into two categories Caucasian and Non-Caucasian due to a small number of participants in Non-Caucasian categories, and items in the perceived access barriers to vaccination domain were loaded into the model separately due to an alpha coefficient < 0.5. Age was grouped into three categories: < 25 years, 25-64 years, and ≥ 65 years. Age was categorized into these three levels to investigate if being in a high-risk age category (e.g. < 25 years for the H1N1 influenza virus and > 65 years old for the seasonal influenza virus) was a significant predictor of intent to receive the novel H1N1 vaccine. A variable was created to identify VCU students and Ukrop's patrons. For the healthcare professionals' recommendations, responses of' "I don't know" were categorized as missing and were not included in the data analysis. The statement, the novel H1N1 influenza vaccine is safe, was excluded from the perceived specific vaccine benefit domain due to poor correlation between the two domain items. Odds ratios and 95% confidence intervals are included. The *a priori* significance level was $p < 0.05$.

SAS/PC for Windows version 9.3 was used for data analysis (SAS Institute Inc., Cary, N.C.).

Results

Demographics and Seasonal Influenza Vaccine History

A total of 664 individuals completed a questionnaire. The majority of participants were Ukrop's patrons (86.3%). Most participants were aged 25-64 years old (66.9%). Approximately 69% of participants were female and the majority indicated Caucasian as their race/ethnicity (73.7 %). The most frequent estimated annual income reported was more than 55,000 (31.3%). Over 36% of the participants reported some college as their highest education level. The majority of participants were not a member of a high risk influenza group (52.9%) but had received a seasonal influenza vaccine prior to 2008 (75.0%) and in 2008 (57.6%). A summary of this information is presented in Table 1.

Demographics and Vaccination History as Predictors of Intention to Receive the Novel H1N1 Vaccine

The receipt of a seasonal influenza vaccine last year was a significant predictor of intention to receive the novel H1N1 influenza vaccine. Those who did not receive a seasonal influenza vaccine in 2008 were less likely to intend to receive a novel H1N1 influenza vaccine (OR=0.45, CI: 0.24-0.83). There were no other significant demographic predictor variables in relation to the participant's intention to receive the novel H1N1 vaccine (Table 3).

Health Belief Model Domains as Predictors of Intention to Receive the Novel H1N1 Vaccine

The scale means for the perceived severity and perceived susceptibility of the novel H1N1 virus domains were 3.02 (SD± 0.76) and 3.72 (SD ± 0.76), respectively. The scale mean for the perceived clinical barriers domain was 2.38 (SD ± 0.68). A summary of this information is presented in Table 2.

Participants who perceived lower clinical barriers were more likely to intend to receive the novel H1N1 vaccine (OR=0.57, CI: 0.35-0.93). Perceptions of susceptibility, severity, general vaccine benefits, and vaccine access barriers were not significant predictors of intention to vaccinate (Table 3).

Cues to Action as Predictors of Intention to Receive the Novel H1N1 Vaccine

Participants received novel H1N1 vaccine recommendations from their physicians (28.2%), pharmacists (20.7%), and nurses (16.1%) (Table 2). Physicians' recommendations to receive the novel H1N1 influenza vaccine were a significant predictor of intent to receive the vaccine. Those who did not receive a recommendation from their physician were less likely to intend to receive the H1N1 vaccine as compared to those who had received a physician's recommendation to receive the vaccine (OR=0.26, CI: 0.11-0.62) (Table 3). Other information sources about the novel H1N1 influenza virus and its vaccine and nurse or pharmacist recommendations were not found to be significant predictors of intent to receive the vaccine.

Discussion

One of the significant predictors for intention to receive the novel H1N1 vaccine in this study was receipt of a seasonal influenza vaccine in the 2008 influenza season. This has previously been reported in an internet-based survey of over 2,000 individuals in the United States in which 39.7% of the population was vaccinated against seasonal influenza. Researchers found that participants were twice as likely to intend to receive the novel H1N1 vaccine if they had received a seasonal influenza vaccine.[13] In our study, the proportion of participants who had a seasonal influenza vaccine prior to 2008 was 75%. In a study conducted in France, it was found that those with a history of a seasonal influenza vaccine were over 3.3 times more likely to intend to receive the novel H1N1 vaccine.[3] Similarly, Lau et al.'s study conducted in Hong Kong showed that those with a history of an influenza vaccination were 2.59 to 3.13 times more likely to intend to receive the novel H1N1 vaccine compared to those who had not.[4] In addition, a study in Sydney, Australia found that participants who had a history of seasonal influenza vaccination in either 2008 or 2009 were 2.7 times more likely to intend to receive the novel H1N1 influenza vaccine.[14] Interestingly, it was also reported that non-Caucasian ethnic groups were more willing to accept the H1N1 vaccine.[14] In our study, race/ethnicity was not a significant predictor of intention to vaccinate when Caucasian and Non-Caucasian groups were compared. These studies and our work indicate that those with a history of vaccination may be more likely to intend to receive a new vaccine in a pandemic situation. This may be due to the participant's comfort level or experience with vaccines, personal health beliefs, or previous experience with influenza and/or other disease. These results also suggest that targeting those without a vaccine history may increase vaccination rates by reaching out to a population that would be less likely to vaccinate during a pandemic.

We found that participants were more likely to intend to receive the novel H1N1 vaccine if a physician had recommended it. A study by Maurer and colleagues also found that healthcare professionals' recommendations to receive the novel H1N1 influenza vaccine were influential in the participant's decision to receive the H1N1 vaccine.[15] In other studies, it has been shown that a physician or nurse's recommendation to receive a seasonal influenza vaccine was significantly associated with the patient's intention or

acceptance of the vaccine.[9, 16, 17, 18] In our study, the overall number of healthcare professionals' recommendations to receive the novel H1N1 vaccine was low. Participants indicated that they received recommendations from their physicians (28.2%), pharmacists (20.7%), and nurses (16.1%). This signifies a need to target both patients and healthcare professionals with awareness and educational campaigns during a pandemic situation. Healthcare professionals should incorporate vaccine recommendations and education in their day-to-day activities during a pandemic.[19] Specifically, our study shows that a recommendation from a physician may positively impact the participant's intention to vaccinate. Efforts to increase physician's vaccine recommendations to patients should continue to be a focus of public health initiatives. Although not significant in our study, pharmacists can play many roles to increase vaccination rates and different roles should be further investigated for impact. For example, pharmacists can serve as an advocate for immunizations, administer vaccines, or invite other healthcare professionals to immunize patients at their practice site.[20] It has been shown that pharmacist-administered influenza vaccines have increased overall influenza vaccination rates.[21] Pharmacists' increasing role in public health issues, such as immunizations and disease prevention, continues to grow.[22,23] The pharmacist's role and impact on public health concerns should continue to be examined.

Another concern is how the media portrays both seasonal and influenza pandemics. Media coverage about the H1N1 virus was widespread during the early months of the pandemic. But in our study, other information sources, including the media, did not have a significant impact on participant's intention to accept the novel H1N1 vaccine. The impact of the media on intention to accept a pandemic vaccine warrants further research.

In our study, participant's perceived susceptibility to the novel H1N1 virus was not a significant predictor. Our results are consistent with Lau and colleagues' results for perceived susceptibility.[4] However, Seale and colleagues found that participants in their study who felt at risk were almost twice as likely to intend to accept the novel H1N1 vaccine.[14] In addition, Setbon and Raude identified that those who perceived a risk of contracting the novel H1N1 virus were 1.4 times more likely to intend to receive the novel H1N1 vaccine.[3] We did not find participant's perceived severity of the novel H1N1 virus to be a significant predictor of intent to accept the H1N1 vaccine. In contrast, a telephone survey of over 1,100 adults in Australia, found that participants were 1.8 times more likely to accept the novel H1N1 vaccine if the virus was perceived as severe as compared to mild.[24] Our results are supported by Lau and colleagues' study which found that perceived severity was not a significant predictor of novel 2009 H1N1 vaccine intention.[4]

A review of studies using the Health Belief Model theoretical framework found that for preventative health behaviors, such as influenza vaccination, the domains of perceived susceptibility, benefits, and barriers were predictive of health behaviors. The construct of perceived barriers was significant in all studies reviewed. However, perceived severity was not as strongly associated with preventative health behaviors.[25] In our study perceived clinical barriers, history of influenza vaccination in the previous year, and physician recommendations were significant predictors of intention to accept the novel H1N1 vaccine, whereas perceived susceptibility was not. The perceived clinical barriers domain, which included perceptions of novel H1N1 vaccine-related side-effects, sickness, pain, and death, in our study was significant. These four perceptions indicate key areas where health care professionals can educate patients about vaccine-related adverse events and address patient's concerns.

A physician-led strategy that would help increase influenza vaccine uptake could include improving the amount of vaccine recommendations and awareness along with education on vaccine benefits. Including an assessment of the community's perceived severity of the influenza virus, perceived benefits of immunizations, and perceived barriers to accepting vaccinations may be a key way to create a targeted and effective educational campaign. This educational campaign could take place at many points of patient care, including but not limited to hospital discharge protocols, point of medication dispensing in community pharmacies, consultant pharmacists' chart reviews in long-term care facilities, and during patient interactions in the ambulatory care setting. In addition, providing vaccines at areas of convenience, such as school-based immunizations, may help to increase the uptake of a pandemic vaccine.[18]

Limitations

One of the limitations of this study is that the researchers used a convenience sample to recruit participants; therefore selection bias is a concern. It is possible that those who participated had different views about H1N1 than those who did not participate. The generalizability of the results of this study to different races and ethnicities is also limited by this study's predominantly Caucasian (73.7%) participants. Also, patrons of Ukrop's supermarkets may view vaccines more favorably compared to other groups because Ukrop's Pharmacy has had a well-promoted and established immunization program including seasonal influenza for many years. This could be a reason for the majority (57.6%) of

participants receiving the 2008 seasonal influenza vaccine. Approximately 47.1% of participants in this study indicated that they were in a high risk influenza group. This may be due to the fact that the several of the respondents may have been patients picking up a prescription at the pharmacy and thus potentially in a high risk group. However, grocery store patrons were also approached to complete the survey. Also, the sampling of college age students on VCU academic campus potentially increased the number of participants who fell into one of the high risk novel H1N1 categories. Another factor limiting the generalizability of our results is that this study population reported a high estimated annual income, with our most common estimated income level reported being over $55,000. This may be considered similar to most household incomes of the central Virginia area in 2009; however, we are not sure if the participants responded with sole or household income to this question.[26] Also, we did not collect information on if the respondent had seen a healthcare provider since the start of the pandemic. This information would have been useful in assessing the healthcare professionals' recommendations to respondents about receiving the novel H1N1 vaccine.

Conclusion

In a group of grocery store or pharmacy patrons and students, most participants felt at risk for getting the novel H1N1 virus and intended to receive the novel H1N1 vaccine. Significant predictors of intention to receive the novel H1N1 vaccine include lower perceived clinical barriers, history of receiving the 2008 seasonal influenza vaccine, and physicians' recommendations. Educating patients about vaccine benefits and increasing healthcare professionals' vaccine recommendations may positively impact vaccination rates in future pandemics.

References

1. Centers for Disease Control and Prevention: Update on the epidemiology and clinical features of novel H1N1. Accessed at www.cdc.gov/vaccines/ed/ciinc/downloads/July_09/COCA-Provider_call_Jul09.ppt March 19, 2012.
2. Centers for Disease Control and Prevention: Novel H1N1 Vaccination Recommendations. Accessed at http://www.cdc.gov/h1n1flu/vaccination/acip.htm, February 27, 2011.
3. Setborn M, Raude J. Factors in vaccination intention against the pandemic influenza A/H1N1. Eur J Public Health. 2010;20:490-494.
4. Lau JTF, Yeung NCY, Choi KC, et al. Factors in association with acceptability of A/H1N1 vaccination during the influenza A/H1N1 pandemic phase in the Hong Kong general population. Vaccine. 2010; 28:4632-37.
5. Burns N, Grove SK. Sampling. In: Henderson L, Robertson R. Eds. The practice of nursing research: appraisal, synthesis, and generation of evidence. 6th ed. Saunders: St. Louis. 2009. 343-70.
6. Janz NK, Champion VL, Strecher VJ. The Health Belief Model. In: Glanz K, Rimer BK, Lewis FM, Eds. Health behavior and health education: theory, research, and practice. 3rd ed. Jossey-Bass: San Francisco. 2002. 45-66.
7. Marlow LAV, Waller J, Evans REC, et al. Predictors of interest in HPV vaccination: A study of British adolescents. Vaccine. 2009;27:2483-8.
8. Nexoe J, Kragstrup J, Sogaard J. Decision on influenza vaccination among the elderly a questionnaire study based on the Health Belief Model and the Multidimensional Locus of Control Theory. Scand J Prim Health Care. 1999; 17:105-10.
9. Lyn-Cook R, Halm EA, Wisnivesky JP. Determinants of adherence to influenza vaccination among inner-city adults with persistent asthma. Prim Care Resp J. 2007; 16(4):229-35.
10. Cummings KM, Jette AM, Brock BM, et al. Psychosocial determinants of immunization behavior in a swine influenza campaign. Medical Care.1979;17(6):639-49.
11. Chen JY, Fox SA, Cantrell CH, et al. Health disparities and prevention: racial/ethnic barriers to flu vaccinations. J Comm Health. 2007;32(1):5-20.
12. Lau JTF, Kim JH, Choi KC, et al. Changes in prevalence of influenza vaccination and strength of association of factors predicting influenza vaccination over time-results of two population-based surveys. Vaccine. 2007;25:8279-89.
13. Maurer J, Harris KM, Parker A, et al. Does receipt of seasonal influenza vaccine predict intention to receive novel H1N1 vaccine: Evidence from a nationally representative survey of U.S. adults. Vaccine. 2009;27:5732-4.
14. Seale H, Heywood AE, McLaws M-L, et al. Why do I need it? I am not at risk! Public perceptions towards the pandemic (H1N1) 2009 vaccine. BMC Infectious Diseases. 2010;10(99):1-9.
15. Maurer J, Uscher-Pines L, Harris KM. Awareness of government seasonal and 2009 H1N1 influenza vaccination recommendations among targeted US adults: The role of provider interactions. Am J Infect Control. 2010;38:489-90.
16. Nichol KL, Lofgren RP, Gapinski J. Influenza vaccination knowledge, attitudes, and behavior

among high-risk outpatients. Arch Intern Med. 1992;152:106-10.
17. Gallagher S, Povey R. Determinants of older adults' intentions to vaccinate against influenza: a theoretical application. J Pub Health. 2006;28:139-44.
18. Flood EM, Rousculp MD, Ryan KJ, et al. Parents' decision-making regarding vaccinating their children against influenza: A web-based survey. Clin Ther. 2010;32:1448-67.
19. Maurer J, Ushcer-Pines L, Harris KM. Perceived seriousness of seasonal and A(H1N1) influenzas, attitudes toward vaccination, and vaccine uptake among U.S. adults: Does the source of information matter? Prev Med. 2010;51:185-7.
20. Hogue MD, Grabenstein JD, Foster SL, et al. Pharmacist involvement with immunizations: A decade of Professional Advancement. J Am Pharm Assoc. 2006;46:168-82.
21. Steyer TE, Ragucci KR, Pearson WS, et al. The role of pharmacists in the delivery of influenza vaccinations. Vaccine. 2004;22:1001-6.
22. American Society of Health-System Pharmacists. ASHP Statement on the Role of Health-System Pharmacists in Public Health. Am J Health-Syst Pharm. 2008;65:462-7.
23. American Pharmacists Association and Academy of Managed Care Pharmacy. Pharmacist-provided immunization compensation and recognition: White paper summarizing APhA/AMCP stakeholder meeting J Am Pharm Assoc. 2011;51:704–12.
24. Eastwood K, Durrheim DN, Jones A, et al. Acceptance of pandemic (H1N1) 2009 influenza vaccination by the Australian public. MJA. 2010;192(1):33-6.
25. Janz NK, Becker MH: The Health Belief Model: A decade later. Health Educ Behav. 1984;11:1-47.
26. United States Department of Agriculture Economic Research Service: County-level unemployment and median household income for Virginia. Accessed at http://www.ers.usda.gov/data/unemployment/rdlist2.asp?st=va, February 27, 2011.

Table 1. Demographic and seasonal influenza vaccine history of survey participants

Items	n (%)
Age (n=620)	
< 25 years	124 (20.0)
25 - 64 years	415 (66.9)
≥ 65 years	81 (13.1)
Gender (n=657)	
Male	203 (30.9)
Female	454 (69.1)
Race/Ethnicity (n=632)	
Caucasian	466 (73.7)
African American	107 (16.9)
Hispanic	6 (1.0)
Asian/Pacific Islander	14 (2.2)
Native American	10 (1.6)
Other	29 (4.6)
Caucasian	466 (73.7)
Non-Caucasian	166 (26.3)
Estimated Annual Income (n=597)	
Less than $10,000	94 (15.8)
$10,001 to $25,000	86 (14.4)
$25,001 to $40,000	153 (25.6)
$40,001 to $55,000	77 (12.9)
More than $55,000	187 (31.3)
Highest Education Level (n=647)	
Some high school	27 (4.2)
High school or GED	145 (22.4)
Some college	236 (36.5)
Undergraduate degree	143 (22.1)
Graduate/professional degree	96 (14.8)
Member of High Risk Group (n=664)	
Yes	313 (47.1)
No	351 (52.9)
VCU student (n=664)	
Yes	91 (13.7)
No	573 (86.3)
History of a past seasonal influenza vaccine (n=652)	
Yes	489 (75.0)
No	163 (25.0)
History of a seasonal influenza vaccine last year (2008) (n=651)	
Yes	375 (57.6)
No	276 (42.4)

Table 2. Summary Health Belief Model responses of survey participants

Items	n (%)	Alpha	Range	Mean (SD)[a]
Perceived Severity of the Virus (n=637) *If I get the novel H1N1 influenza virus I will get sick.* *If I get the novel H1N1 influenza virus I will lose income.* *If I get the novel H1N1 influenza virus other members in my home will get sick.* *If I get the novel H1N1 influenza virus I will die.*	-	0.62	1 - 5	3.02 (±0.76)
Perceived Susceptibility to the Virus (n=656) *I am at risk for getting the novel H1N1 influenza virus.* *My family members are at risk for getting the novel H1N1 influenza virus.* *I feel knowledgeable about my risk of getting the novel H1N1 influenza virus.*	-	0.69	1 - 5	3.72 (±0.76)
Perceived Clinical Barriers to Vaccination (n=640) *I will have side effects from the novel H1N1 influenza vaccine.* *I will get sick from the novel H1N1 influenza vaccine.* *I will die from the novel H1N1 influenza vaccine.* *The novel H1N1 influenza vaccine will be painful.*	-	0.78	1 - 5	2.38 (±0.68)
Perceived Access Barriers to Vaccination	-	0.22	1 - 5	-
The novel H1N1 influenza vaccine will be expensive. (n=653)	-	-	-	2.53 (± 0.88)
It is inconvenient to get the novel H1N1 influenza vaccine. (n=657)	-	-	-	2.66 (± 1.12)
There is a shortage of the novel H1N1 influenza vaccine. (n=648)	-	-	-	3.83 (± 0.99)
Perceived Specific Vaccine Benefit *If I receive the novel H1N1 influenza vaccine, I will not get sick from the novel H1N1 influenza virus. (n=653)*	-	-	1 - 5	3.05 (± 0.92)
Perceived General Vaccine Benefits (n=658)[b] *Vaccines prevent disease.* *Vaccines are safe.*	-	-	1 - 5	3.76 (± 0.80)
Virus Information Sources (n=664)[c]	-	-	0 - 11	3.56 (± 2.15)
Vaccine Information Sources (n=664)[c]	-	-	0 - 11	3.45 (± 2.18)
Physician Recommendation (n=556)				
Yes	157 (28.2)			
No	399 (71.8)	-	-	-
Pharmacist Recommendation (n=546)				
Yes	113 (20.7)			
No	433 (79.3)	-	-	-
Nurse Recommendation (n=548)				
Yes	88 (16.1)			
No	460 (83.9)	-	-	-

[a]A scale mean was calculated for domains with an alpha coefficient or Pearson Correlation > 0.5.
[b]Pearson Correlation = 0.58
[c]Virus and vaccine information sources included telephone, internet, radio, newspaper, family member, friend, physician, pharmacist, nurse, other healthcare provider, and other. The number of virus and vaccine source exposures was summed to create an overall number of exposures to virus or vaccine information.

Table 3. Demographic, seasonal influenza vaccine history, and HBM attitudinal variables associated with intention to receive the novel H1N1 influenza vaccine

	Likelihood of Intention to Receive Vaccine (n = 360)[a,b]	
Items	**OR [95% CI]**	***p*-value**
Demographics		
Age (n=620)		0.12
< 25 years	0.27 [0.08 - 0.93]	0.04
25 - 64 years	1.0	
≥ 65 years	1.00 [0.37 - 2.74]	0.99
Gender (n=657)		
Male	1.0	
Female	1.51[0.84 - 2.71]	0.17
Race/Ethnicity (n=632)		
Caucasian	1.0	
Non-Caucasian	1.26 [0.66 - 2.41]	0.48
Estimated Annual Income (n=597)		0.20
Less than $10,000	4.38 [1.21 - 15.83]	0.02
$10,001 to $25,000	1.12 [0.46 - 2.75]	0.80
$25,001 to $40,000	1.0	
$40,001 to $55,000	0.95 [0.40 - 2.27]	0.91
More than $55,000	0.95 [0.47 - 1.91]	0.88
Highest Education Level (n=647)		0.06
Some high school	0.27 [0.07 - 1.12]	0.07
High school or GED	1.0	
Some college	0.44 [0.22 - 0.92]	0.03
Undergraduate degree	0.40 [0.17 - 0.91]	0.03
Graduate/professional degree	0.86 [0.34 - 2.18]	0.74
Member of High Risk Group (n=664)		
Yes	1.0	
No	0.85 [0.45 - 1.62]	0.63
VCU student (n=664)		
Yes	1.0	
No	1.03 [0.31 - 3.43]	0.96
Seasonal Influenza Vaccine History		
History of a past seasonal influenza vaccine (n=652)		
Yes	1.0	
No	0.64 [0.32 - 1.27]	0.20
History of a seasonal influenza vaccine last year (2008) (n=651)		
Yes	1.0	
No	0.45 [0.24 - 0.83]	0.01
Health Belief Model Domains		
Perceived Severity of the Virus (n=637)	1.24 [0.83 - 1.85]	0.30
If I get the novel H1N1 influenza virus I will get sick.		
If I get the novel H1N1 influenza virus I will lose income.		
If I get the novel H1N1 influenza virus other members in my home will get sick.		
If I get the novel H1N1 influenza virus I will die.		

Perceived Susceptibility to the Virus (n=656) *I am at risk for getting the novel H1N1 influenza virus.* *My family members are at risk for getting the novel H1N1 influenza virus.* *I feel knowledgeable about my risk of getting the novel H1N1 influenza virus.*	1.03 [0.68 - 1.54]	0.90
Perceived Clinical Barriers to Vaccination (n=640) *I will have side effects from the novel H1N1 influenza vaccine.* *I will get sick from the novel H1N1 influenza vaccine.* *I will die from the novel H1N1 influenza vaccine.* *The novel H1N1 influenza vaccine will be painful.*	0.57 [0.35 - 0.93]	0.02
Perceived Access Barriers to Vaccination		
The novel H1N1 influenza vaccine will be expensive. (n=653)	1.07 [0.77 - 1.50]	0.68
It is inconvenient to get the novel H1N1 influenza vaccine. (n=657)	0.94 [0.74 - 1.19]	0.62
There is a shortage of the novel H1N1 influenza vaccine. (n=648)	0.89 [0.67 - 1.19]	0.44
Perceived Specific Vaccine Benefit		
If I receive the novel H1N1 influenza vaccine, I will not get sick from the novel H1N1 influenza virus. (n=653)	1.25 [0.92 - 1.70]	0.16
Perceived General Vaccine Benefits (n=658) *Vaccines prevent disease.* *Vaccines are safe.*	1.42 [0.97 - 2.06]	0.07
Virus Information Sources (n=664)	0.92 [0.76 - 1.12]	0.42
Vaccine Information Sources (n=664)	1.15 [0.94 - 1.40]	0.17
Physician Recommendation (n=556)		
Yes	1.0	
No	0.26 [0.11 - 0.62]	0.002
Pharmacist Recommendation (n=546)		
Yes	1.0	
No	0.90 [0.39 - 2.05]	0.80
Nurse Recommendation (n=548)		
Yes	1.0	
No	0.84 [0.31 - 2.26]	0.73

[a]n = 360 due to missing responses
[b]Likelihood ratio for the model intention to receive vaccine; $\chi 2 = 111.22$, $p < 0.0001$.