INVESTIGATION OF VARIABLES ASSOCIATED WITH VACCINE ACCEPTANCE

By

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Abstract

The current study investigated the relationship between the Health Belief Model (HBM) framework, social variables, personality factors, and H1N1 flu vaccine acceptance. Four hundred thirty two undergraduate students completed online questionnaires that assessed vaccine acceptance, social and personality factors, and HBM categories in relation to the H1N1 vaccine (perceived susceptibility, perceived severity, perceived cost barriers, perceived general barriers, perceived benefits, knowledge, and engagement in preventative health behaviors). Participants were collected in two phases: during the H1N1 pandemic and the following flu season. Results showed that the HBM framework was found to be appropriate for identifying and distinguishing vaccine acceptors and nonacceptors. In addition, the HBM categories of cost barriers, general barriers, and benefits were found to be significantly related to H1N1 vaccine acceptance. Second, the opinion of family members about the H1N1 vaccine moderated the relationship between number of social ties and vaccine acceptance. Further, H1N1 vaccine acceptance was related to regular seasonal flu vaccine acceptance and regular physical examinations, but not aggregate scores of other preventative health behaviors. Finally, there was a difference in cost barriers and severity ratings but not in seasonal flu vaccine acceptance between the two phases of collection. Implications of this study include the investigation of H1N1 vaccine in a unique population and in two different forms of protection. More research is needed to investigate vaccine acceptance in future pandemics and in college populations.

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Investigation of Variables Associated with Vaccine Acceptance

The current state of vaccination in America is a very controversial topic due to the abundance of misinformation and strong emotional components tied to many of the debates. One of the strongest areas of ongoing controversy surrounding vaccination is the debate over the relationship between vaccinations and autism. In a study published in 1998, Wakefield and colleagues claimed that a number of children displayed autistic symptoms after receiving the Measles Mumps and Rubella (MMR) vaccine (Wakefield et al., 1998). Although the article has since been retracted, there has been continued debate over this relationship between vaccines and autism that has fueled various lawsuits (Sugarman, 2007) and wide variation in public beliefs regarding vaccination. While individual vaccination rates may not impact society, the vaccination of many people serves as a layer of protection for those not vaccinated by preventing the illness from being spread throughout the community, referred to as herd immunity (Anderson & May, 1985). Due to the strong emotionality now laden in vaccinations and widespread misinformation, there is even evidence that some illnesses formerly "defeated" by vaccination initiatives are now reoccurring because of a decrease in this herd immunity (Smith, Ellenberg, Bell, & Rubin, 2008). This resurgence of vaccine-preventable diseases raises the possibility of a serious public health problem and thus increases the importance of understanding why individuals do and do not get vaccinated.

In light of the vaccine debate and subsequent spread of vaccine-preventable illnesses, the resurgence of influenza epidemics is of particular concern. Three to four influenza pandemics occur every century, with variable time intervals between them. This variation makes predictions of future pandemics difficult. Over the past century, there have been three influenza pandemics: one in 1918, 1957-1958, and 1968 (Potter, 2001), with the latest pandemic occurring 2009-2010

(World Health Organization [WHO], 2009). This pattern suggests that influenza pandemics will continue to occur, making it important for people to get vaccinated against both seasonal and non-seasonal influenzas. In addition, it is important for researchers to better understand the psychological and behavioral barriers preventing immunization adherence and acceptance.

Previous studies have defined the construct of vaccine acceptance as having either received a vaccine or intending to receive a vaccine within a specified time period (Chor et al., 2009; Lau et al., 2009; Quinn, Kumar, Freimuth, Kidwell, & Musa, 2009). It is possible to increase vaccine acceptance through the implementation of adherence interventions (Nuño, Chowell, & Gumel, 2007; Vardavas, Breban, & Blower, 2007), but it is important to base these interventions on information gathered from vaccine acceptance studies in order to maximize their effectiveness.

Interventions to Improve Vaccine Adherence and Acceptance

As discussed above, there have been attempts to improve and better understand vaccination acceptance, especially focusing on at-risk populations (e.g., elderly, medical staff). One example of an attempt to better understand these behavioral patterns was done by Vardavas (2007) who showed via computational modeling that volunteer vaccination would reach critical values for prevention over one influenza season. Once these values have been reached, vaccination rates would then drop and rise again over future seasons in a cyclical manner opening the door for surges in infection rates. The same study found that vaccine incentive programs, such as offering free vaccinations for the subsequent years after an initial vaccination or offering free vaccinations for a whole family after one member pays for a vaccination, increase vaccination rates and decrease the possibility of epidemics. However, this was an inverse parabolic relationship with program timeline. For example, three year incentive programs

may be more successful than their longer counterparts because those in the shorter programs are more likely to re-enroll a few years after program completion because of re-infection. In comparison, those in long-term programs may be less likely to re-enroll after program completion because they are not re-infected for a number of years (Vardavas, et al., 2007).

The success of such vaccine-incentive programs, however, relies heavily on assumptions about individual vaccination behavior, such as adaptability, memory, self-interest, and not discussing vaccination decisions with others (Vardavas, et al., 2007). While these factors impact the results of this study heavily, they have not been investigated fully in other studies looking at vaccination behavior in the real world, making them another area of interest in vaccine acceptance.

Another computational model by Nuño and colleagues (2007) found that vaccination-only interventions were highly effective in controlling influenza pandemic related infections and hospitalizations, but this success depended heavily on the widespread coverage of a highly effective vaccine (i.e., assuming widespread acceptance). Further, the use of both vaccines and antiviral medications was found to be more effective than either vaccines or antiviral medications alone. This model highlights the importance of vaccine acceptance in controlling pandemic-level illnesses.

Aside from computational modeling, there have been a number of interventions that have attempted to increase vaccination acceptance in the real world, with many focusing on dissemination of information regarding the illness and subsequent vaccine (Bryant et al., 2004; Dempsey, Zimet, Davis, & Koutsky, 2006; Jacobson et al., 1999; Terry et al., 2002). One of these studies found that education-only interventions were not effective (Dempsey, et al., 2006), indicating that a focus on knowledge increase may not be enough. Overall, these findings

highlight the need for effective interventions based on detailed research identifying multiple factors related to vaccine acceptance.

H1N1: A Timely Example of Vaccine Acceptance

The recent Influenza A (H1N1) pandemic presents a unique opportunity to investigate the availability, perceptions and acceptance related to this specific vaccine. The 2009 H1N1 virus is a strain of influenza that was first detected in humans in April 2009 (CDC, 2010a). Originally referred to as the "swine flu" because of genetic similarities between this virus and influenza viruses that commonly occur in North American pigs, use of this name created confusion regarding the nature and transmission of H1N1 (CDC, 2010a). On June 11, 2009, the WHO declared the H1N1 outbreak to have reached a Phase 6 Pandemic alert, (WHO, 2009) resulting in between 43 and 89 million reported cases of H1N1 infection and 8,870-18,300 deaths (CDC, 2010b). The majority of these deaths occurred in the 18-64 year age range, an age range not typically associated with seasonal flu complications, perhaps due in part to the fact that this age group was not a target population for vaccination (CDC, 2010b). This unlikely age group for complications makes it important to understand the factors that predict acceptance in younger age groups not usually studied by researchers. In addition, the debate over the safety of vaccinations may impact H1N1 vaccination rates, especially among younger people who rely on parental approval for medical decisions and may be more susceptible to misinformation on the internet and from friends.

Further, due to the risks associated with H1N1 influenza, the current 2010-2011 seasonal influenza vaccine provides protection against the H1N1 influenza virus in addition to the seasonal virus (CDC, 2010c). Because of the combination of H1N1 and seasonal flu viruses

contained in the current vaccine, it is important to consider factors related to both strains when investigating influenza vaccine acceptance.

Definition of Vaccine Acceptance

A number of studies have investigated vaccine acceptance in relation to the seasonal flu (Blue & Valley, 2002; Chapman & Coups, 1999; Nexøe, Kragstrup, & Søgaard, 1999; Shahrabani, Benzion, & Yom Din, 2009), human papillomavirus (Hsu et al., 2009; Katz et al., 2009; Olshen, Woods, Austin, Luskin, & Bauchner, 2005), and Hepatitis B (Rhodes & Hergenrather, 2008) vaccination. However, reviewing vaccine acceptance studies can be difficult, as many studies define acceptance in different ways. Some studies define vaccine acceptance as *willingness* to receive a vaccine in the future (Chor, et al., 2009; Quinn, et al., 2009) while others define acceptance as how *likely* a person is to receive a vaccine in the future (Lau, et al., 2009). Finally, other studies have defined acceptance as actually having received the vaccine prior to answering the survey (Blue & Valley, 2002; Chapman & Coups, 1999; Nexøe, et al., 1999; Shahrabani, et al., 2009) or intending to receive the vaccine within a given time period (Shahrabani, et al., 2009). Due to the variance in defining vaccine acceptance, it is also possible that studies may be in fact measuring different constructs.

Health Belief Model and Other Factors Associated with Acceptance

A number of studies have investigated vaccine acceptance (Blue & Valley, 2002; Nexøe, et al., 1999; Reiter, Brewer, Gottlieb, McRee, & Smith, 2009; Rhodes & Hergenrather, 2008; Shahrabani, et al., 2009), using the Health Belief Model (HBM) for preventative medicine (Rosenstock, 1974) as a conceptual framework. In addition to vaccine acceptance, the HBM framework has also been used to understand intention to receive cancer screenings (Cyr, Dunnagan, & Haynes, 2010), engagement in risky sexual behavior (Downing-Matibag &

Geisinger, 2009), and healthy eating habits (Deshpande, Basil, & Basil, 2009). The HBM framework focuses on a person's perceived beliefs regarding susceptibility, severity, benefits, and barriers to better understand engagement in recommended preventative health behaviors (Cockburn, Fahey, & Sanson-Fisher, 1987; Rosenstock, 1974). These patterns of beliefs as well as other possible related factors that might influence vaccine acceptance are outlined below. They are discussed in terms of relevance to H1N1 influenza, H1N1 vaccination, and seasonal flu vaccination.

Perceived Susceptibility

All individuals have different perceptions of their chances of contracting certain illnesses, including H1N1 influenza. Those with lower perceived susceptibility ratings do not see themselves at high risk for contracting the illness, while those with high perceived susceptibility see themselves at high risk for contracting the illness (Shahrabani, et al., 2009).

Specifically, perceived susceptibility refers to an individual's sense of how susceptible they are to contracting an illness, such H1N1 or the seasonal influenza. For example, "I have an increased risk of getting the H1N1 flu" is a question that assesses an individual's perceived susceptibility of contracting H1N1, while questions such as, "I am more likely to get the flu than other people my age" is a question that assesses an individual's perceived susceptibility to contracting the seasonal influenza.

Perceived Severity

Individuals also have beliefs about the severity of difficulties created by contracting a particular illness, such as physical or financial difficulties (Shahrabani, et al., 2009). In relation to vaccine acceptance, this refers to an individual's sense of how much contracting a specific

illness would negatively impact their health and daily functioning, such as an inability to manage daily activities.

Perceived Benefits

This belief pattern refers to what the individual believes he or she will gain from engaging in the preventive health behavior, such vaccination (Shahrabani, et al., 2009). A common perceived benefit to receiving a vaccine is related to staying healthy because of the vaccine (Blue & Valley, 2002; Nexøe, et al., 1999; Reiter, et al., 2009; Shahrabani, et al., 2009). Regarding the H1N1 and seasonal flu vaccine, perceived benefits include belief that the H1N1 or seasonal flu vaccine is effective in protecting one's self from the particular influenza virus and general gains due to vaccine acceptance.

Perceived Barriers

This category refers to the barriers regarding engagement in the preventative health behavior that are perceived by an individual. Common barriers to vaccinations include cost, injection site pain, fear of needles, and inconvenience (Blue & Valley, 2002; Nexøe, et al., 1999; Shahrabani, et al., 2009) and are also relevant to specific vaccinations such as the H1N1 and seasonal flu vaccines. Cost has been shown to be an important barrier to vaccine acceptance, thus some studies assess cost barriers separately from other barriers (Boehner, Howe, Bernstein, & Rosenthal, 2003).

Knowledge

While not specifically an HBM category, knowledge of a particular illness such as H1N1 or seasonal influenza is often included in studies that use the HBM framework (Blue & Valley, 2002; Chor, et al., 2009; Olshen, et al., 2005; Shahrabani, et al., 2009). This might include knowledge of disease transmission, behaviors that protect an individual from contracting the

illness (i.e., frequent hand washing and limited contact with infected individuals), and the perception of negative consequences from vaccination, such as autism.

Health Motivation

Another category not explicit to the HBM framework, motivation and engagement in other health behaviors, is also commonly included in vaccine acceptance studies (Blue & Valley, 2002; Shahrabani, et al., 2009). It is believed that those individuals who engage in prophylactic health behaviors will be more likely to engage in other preventative health behaviors such as vaccine acceptance.

Overall, the components of the HBM give us a number of possible reasons why individuals may or may not get vaccinated against many illnesses, such as the H1N1 and seasonal influenzas. This provides useful information regarding which factors might be important when investigating influenza vaccine acceptance, especially the current seasonal vaccine that includes protection against the H1N1 virus.

HBM Vaccine Acceptance Studies

There have been a number of acceptance studies looking at seasonal flu vaccine (prior to H1N1 inclusion in the vaccine) acceptance using an HBM framework in a number of populations including health care workers, the elderly, and healthy adults.

Vaccine Acceptance among Health Care Workers

In a study by Shahrabani, Benzion, & Din (2009), factors associated with seasonal flu vaccine acceptance among nursing students and trainees in Israel were investigated. The researchers administered a Hebrew translation of an HBM questionnaire, specifically investigating perceived susceptibility, severity, benefits, barriers, and cues to action regarding the vaccine. Of the 299 nursing students/trainees surveyed, only 34.1% had received a seasonal

vaccine in the past. When comparing those that have received the seasonal flu vaccine in the past to those that had never received the vaccine, vaccinated nurses had significantly higher scores on all HBM categories (susceptibility, severity, benefits, and cues to action) except for barriers than the non-vaccinated nurses. This finding indicates that nurses who had been vaccinated felt they were at higher risk for the seasonal flu and that contracting the flu would create greater difficulties in their lives. In addition, the finding suggests that vaccinated nurses perceived more benefits associated with the vaccine and indicated more stimuli that serve as motivators for getting the vaccine, such as physician recommendation.

The researchers also found that vaccinated nurses had more knowledge regarding influenza and the vaccine, as well as higher levels of general health motivation and behaviors than non-vaccinated nurses. Moreover, when controlling for socio-demographic characteristics, a model containing all the HBM categories found that higher levels of perceived benefits and cues to action were related to increasing intention to receive the vaccine in the next 12 months, but no other HBM factors were found to be significantly related to intention. While this study found a number of HBM categories to be related to vaccine acceptance, this was investigated in nursing students and trainees only. These findings, therefore, may not be generalizable to licensed nurses or other healthcare workers.

Another study by Chor, et al. (2009) investigated acceptance of pre-pandemic H1N1 and H5N1 (avian) influenza vaccines among Hong Kong health care workers across two surveys. The first survey was given at a time when the WHO pandemic level for the H5N1 influenza was at phase three, a phase at which irregular cases or small clusters of the illness have been documented but the level of transmission is not enough for community level outbreak, and assessed acceptance of the H5N1 vaccine. The second survey was given when the WHO

pandemic alert level for the H1N1 influenza was at phase five, a phase at which human to human transmission has resulted in the virus spreading to at least two different countries, and assessed acceptance of both the H5N1 and H1N1 influenza vaccines.

When comparing H5N1 vaccine acceptance between the two surveys, there were no significant changes in the level of H5N1 vaccine acceptance despite the escalation in pandemic phase and the widespread transmission of the H1N1 virus. However, those that were willing to accept the H5N1 vaccine were more likely to accept the H1N1 vaccine. In addition, an analysis of the first survey found that having received the seasonal influenza vaccine the previous year, perceived risk, and perceived severity were significantly associated with a higher intention to receive the H5N1 vaccine when controlling for demographics and other factors such as age, job title, and job department, number of patient contact hours per week and years of work in health care settings. In the second survey, another analysis found that having received the seasonal flu vaccine was significantly related to H5N1 vaccine acceptance when controlling for demographics and the other factors listed above. Specifically, those who were accepting of the H5N1 vaccine in the first survey were four times more likely to have received the seasonal flu vaccine the previous year and over seven times more likely to have received the seasonal flu vaccine in the second survey. Also, in the first survey those that were accepting of the H5N1 vaccine were over twice as likely to have reported higher levels of perceived risk and severity regarding the H5N1 virus as those with lower ratings.

In the second survey, having received the seasonal flu vaccine the previous year and perceived risk of H1N1 infection were found to be significantly related to H1N1 vaccine acceptance when controlling for demographics and other variables. More specifically, those who were accepting of the H1N1 vaccine were over four times more likely to have received the

seasonal flu vaccine the previous year. In addition, acceptors were between two and four times as likely to have higher perceived risk of H1N1 virus infection as those with lower ratings.

While this study did investigate vaccine acceptance in a variety of healthcare professions, the authors did not control for job title or department. It is possible that specific HBM categories may be differentially related to vaccine acceptance among different job titles (i.e., doctors versus nurses) or department (i.e., medical versus administration).

Overall, these studies found that previous vaccination, increased perceived benefits, perceived risk, and increased knowledge about influenza and the vaccine to be significantly related to vaccine acceptance in healthcare workers. It is important to remember that such findings may not generalize to other populations, as healthcare workers have increased knowledge about, and access to vaccines. In addition, some healthcare workers are required to receive various vaccines, making associations between beliefs and vaccination less informative and predictive. Further, both studies assessed vaccine intention but did not assess whether or not the participants had actually received the vaccines. Finally, the study by Chor, et al. (2009) had a low response rate (50%), while the study by Shahrabani, Benzion, & Din (2009) did not provide response rates. It is possible that due to the nature of the studies, participant self-selection may have impacted the results.

Vaccine Acceptance among Healthy Adults

In a study by Chapman and Coups (1999), factors related to seasonal influenza vaccine acceptance were investigated in two different workplace settings. In the first study, vaccine acceptance was investigated among university employees that had access to free vaccines. Vaccine acceptors were recruited prior to receiving the vaccine at two different health centers, while non-acceptors were recruited through campus advertising. Thus, vaccine acceptance in this

study was defined as having received the seasonal flu vaccine from the university health center. In vaccinated employees, the researchers found vaccine acceptance to be positively correlated with perceived effectiveness of the vaccine and having received the vaccine the prior year. In addition, vaccine acceptance was negatively correlated with perceived likelihood of a negative vaccine reaction and chance locus of control, meaning they believed that factors due to chance were responsible for them contracting the flu.

In addition, the researchers found that baseline reports of perceived effectiveness of the vaccine and perceived likelihood of a reaction significantly predicted vaccine acceptance later that day when controlling for perceived susceptibility and severity reports; doctor, self, and chance locus of control; and estimations of other employee vaccine acceptors. Additionally, receiving the vaccine the previous year was found to be a significant predictor for receiving the vaccine when controlling for receiving the vaccine two years ago and having received dental, physical, and eye exams in the past two years. Finally, researchers examined whether baseline health and flu history (e.g., self reported health, flu symptoms, having previous flu occurrence or vaccination side effects) were correlated with acceptance, but none were significant.

The second study investigated vaccine acceptance among workers in a corporate workplace setting in which the vaccine was offered free of charge for one month. The researchers found that vaccine acceptance was positively correlated with having received the vaccine the prior year, perceived effectiveness of the vaccine, estimated percentage of co-workers receiving the vaccine, age, self locus of control, and physician locus of control. Additionally, in a separate analysis, vaccine acceptance was negatively correlated with perceived likelihood of a reaction to the vaccine and chance locus of control. Vaccine acceptance was also significantly predicted by baseline reports of perceived effectiveness of the vaccine, perceived

likelihood of a reaction, and estimated percentage of co-workers receiving the vaccine controlling for physician locus of control, self locus of control, and chance locus of control.

Additional analyses controlling for past vaccination and preventative health behaviors (e.g., dental, physical and eye exams) found past vaccination, but not engagement in other health behaviors, to be predictive. While the studies showed various HBM categories to be predictive of vaccine acceptance, both workplace settings provided the influenza vaccine free of charge at the workplace. This removes common vaccination barriers such as cost and inconvenience, and may make these results less generalizable to other populations.

A study by Blue and Valley (2002) also investigated seasonal influenza vaccine acceptance among healthy adult workers. Participants were university employees who were offered the vaccine free of charge during work hours on campus. The researchers found that of the 400 participants, 54.8% had received the vaccine and of these acceptors 93% received it from the workplace vaccination program. Those that did not receive the vaccine had lower perceived susceptibility to, and severity of the influenza virus when compared to vaccine acceptors. In addition, those that received the vaccine reported more perceived benefits than barriers while non-acceptors reported more barriers than benefits. An analysis investigating the predictive ability of the HBM model (including susceptibility, seriousness, benefits, barriers, knowledge, health motivation, and cues to action) showed that perceived benefits, perceived barriers, and cues to action significantly predicted having received the vaccine. More specifically, those that received the vaccine were more than four times as likely to perceive health benefits from the vaccine and more than three times as likely to have received the vaccine because of cues to action. In addition, a model containing only perceived benefits, barriers, and cues to action correctly classified 77% of individuals as either receiving or not receiving the vaccine. Of those

that did not receive the vaccine, the model correctly classified 65% as such and correctly classified 86.5% of those that did receive the vaccine. These results suggest that the HBM model was better at classifying participants who were accepting the vaccine rather than participants who were not accepting. Again, this study was conducted in a setting where employees were offered the vaccine free of charge in a convenient time and location. Thus, the results may overlook certain barriers to vaccination that arise in other populations such as cost and inconvenience. In addition, the response rate for this study was 51.8%, making it possible that selection-bias may have impacted the results.

Overall, findings on healthy adults to date suggest that the most important predictors of acceptance are perceived effectiveness of the vaccine, prior vaccination, and perceived benefits of the vaccine. In addition, perceived likelihood of negative vaccine reactions, as well as lower perceived susceptibility and severity ratings were related to vaccine refusal. As is evident from these studies, however, there is some disagreement over which factors have the strongest relationship to vaccine acceptance, as well as the predictive abilities of HBM models. Future studies are needed to closer examine how HBM factors differentially predict vaccine acceptance and refusal. Also, it is important to note the Chapman and Coups (1999) studies investigated vaccine acceptance in workers who had access to free vaccinations. The findings of these studies may not generalize to other workplace settings that do not offer vaccines free of charge. This sample of healthy adults differs from that of healthcare workers, in that this sample may have less knowledge regarding vaccination and less incentive to receive vaccinations.

Vaccine Acceptance among Older Adults

In a study by Nexoe, Kragstrup, and Sogaard (1999), vaccine acceptance was investigated among adults aged 65 and older. The researchers found that among the 1775

participants, 35% had received the seasonal influenza vaccine and thus were classified as accepting the vaccine. Further, respondents were classified into high-risk or low-risk for influenza complications. Those classified as high-risk rated themselves as having "poor" or "very poor" present health condition and/or endorsed suffering from a chronic medical condition and taking associated medications. Among those considered high-risk, 51% were vaccinated while 29% of those considered low-risk were vaccinated. In addition, a regression analysis showed that perceived benefits, perceived severity, physician advice to receive the vaccine, vaccination in previous flu seasons, and living in a city with campaigns for free vaccinations in elderly populations significantly predicted vaccine acceptance at a later time point after controlling for other HBM categories (perceived barriers and susceptibility), locus of control dimensions (internal, powerful others, and chance locus of control), and other possible predictors (i.e., being in the high-risk group, living in a nursing home, living with another person, age, gender). In addition, a separate analysis with only HBM categories correctly identified 76% of participants that received the vaccine and 82% of those that did not receive the vaccine. It is important to note that this study was conducted by random mailings and returned surveys may be self-selecting for those that received the vaccine because of increased interest in answering questions about the influenza vaccine, thus actual vaccination rates may be lower that reported in this study. In addition, inclusion in the high risk group was determined by participants' self-report of their health status and diagnosis of chronic health conditions. Thus, this variable seems to measure a person's perception of their health status, not their actual risk of influenza complications as determined by a health care professional.

Studies that investigate vaccine acceptability in older adult populations are especially important given that immune function decreases with increased age and that the elderly

populations are more likely to do die from vaccine-preventable illnesses in the United States (Gardner & Pabbaatireddy, 2004). In addition, while much research is devoted to childhood and adolescent immunization, vaccine-preventable deaths in the elderly outnumber those among children by a ratio of 1,000 to one (Gardner & Pabbaatireddy, 2004), highlighting a disparity in vaccine acceptance research. Given that few studies examine vaccine acceptance in this population, the findings of this study are especially critical in identifying factors related to the acceptance and refusal of potentially life-saving vaccines.

H1N1 Vaccine acceptance Prior to FDA Approval

In a study by Quinn, Kumar, Freidmuth, Kidwell, and Musa (2009), public willingness to accept a vaccine under emergency use during the 2009 H1N1 pandemic was investigated in a random sample from an online research panel of U.S. adults. The researchers found that 46% of the respondents reported being concerned about getting the H1N1 virus, while 75.3% reported it unlikely or very unlikely that H1N1 would affect their family, friends, or neighbors and 86% said it is unlikely or very unlikely that they themselves would contract H1N1. Sixty-three percent of the respondents said they would not be willing to accept a "new, but not yet approved vaccine," 28% were undecided, and 8.7% were willing to accept it. Factors positively related to vaccine acceptance included household income, education, and previous vaccination history. More specifically, higher income and education as well as previous vaccinations were related to higher acceptance ratings. However, 55.4% of people who indicated receiving the seasonal flu vaccine would still refuse the H1N1 vaccine. In addition, a majority of individuals who reported having a regular healthcare provider or health insurance would refuse the vaccine. Multinomial logistic regression analysis found that previous seasonal influenza vaccine acceptance and degree of worry about the offer of an unapproved vaccine was significantly related to H1N1 vaccine

acceptance when controlling for demographics (e.g., age, gender, race/ethnicity, income, and education), having a healthcare provider, having health insurance, worry about emergency use of an unapproved drug for the treatment of H1N1 (i.e., Tamiflu), and self-reported trust in government. More specifically, those that were willing to accept a H1N1 vaccine unapproved by the FDA were 3.37 times more likely to have received seasonal flu vaccines annually or most years, and reported lower levels of worry regarding the vaccine (OR = .11). It is important to remember, however, that this study investigated a participant's willingness to accept a H1N1 vaccine under Emergency Use Adminstration (EAU), not under normal conditions or normal regulations. Because of this, the findings may not generalize to later populations and study investigating vaccine acceptance not under EAU conditions.

A study by Lau, et al. (2009) investigated H1N1 vaccine acceptance among Hong Kong adult residents (age 18-60 years old) during the 2009 pandemic phase. Of the 301 participants, 45% reported being very likely to receive a free H1N1 vaccination and 55% reported being unlikely or unsure about receiving the vaccine. However, this intention to receive the vaccine decreased as the hypothetical cost of vaccination increased, indicating cost as a possible barrier. In addition, 39% believed the vaccination would be effective at preventing H1N1, while 27% and 16% believed the vaccination to be inconvenient and cause severe side effects, respectively.

About 51% of the respondents gave correct answers for all three questions assessing knowledge of H1N1 transmission. Thirty percent erroneously believed H1N1 to cause fatality in more than 1% of cases and compared to seasonal influenza, resulted in higher fatality rates, infectivity, and more severe bodily damage. These results show that respondents may have higher levels of perceived severity related to H1N1 than seasonal influenza. This study did not look at correlations or predictive ability of HBM factors to vaccine acceptance, but does give a

picture of beliefs and opinions of the general public during the H1N1 pandemic and can be used to develop more detailed vaccine acceptance studies for this specific vaccine.

To date, the studies that have investigated H1N1 specific vaccine acceptance prior to FDA approval show that a history of seasonal vaccination acceptance, household income, education, and self-reported degree of worry over a non-government approved vaccine were related to acceptance. In addition, it was shown that people had relatively low levels of knowledge about the H1N1 influenza and related virus. As H1N1 continues to be a concern and incorporated into current seasonal influenza vaccines, it is important to understand the unique contribution that beliefs about H1N1 play in routine vaccine acceptance.

Overall, these studies show that many of the HBM categories are related to, and may significantly predict influenza vaccine acceptance in a number of populations. Specifically, perceived benefits appear to be strongly related to influenza vaccine acceptance in a number of studies (Blue & Valley, 2002; Chapman & Coups, 1999; Nexøe, et al., 1999; Shahrabani, et al., 2009). In addition, the HBM category of perceived barriers has been found to be significantly related to H1N1 vaccine acceptance (Blue & Valley, 2002; Nexøe, et al., 1999; Quinn, et al., 2009), but to a lesser degree than benefits (Blue & Valley, 2002; Nexøe, et al., 1999).

Social Relationships and Vaccine Beliefs

In addition to the HBM categories, a number of studies have found correlations between social variables and engagement in preventative health behaviors, such as vaccine acceptance. One study found unmarried nurses to be significantly less likely to accept the seasonal influenza vaccine compared to married nurses (Shahrabani, et al., 2009). Another study found that living with another person, but not in a nursing home, predicted seasonal influenza vaccine acceptance

among older adults suggesting the type of social relationships may play a role in vaccine acceptance (Nexøe, et al., 1999).

In addition to social relationships at home, Chapman and Coups (1999) found that acceptance of the flu vaccine was positively related to the number of co-workers they believed to have already gotten vaccinated. This suggests a social model where people are more likely to get vaccinated if they believe others in their lives are also being vaccinated.

Further, studies have shown that relationships are generally associated with positive health behaviors aside from vaccination. More specifically, the prevalence of others that engage in health-compromising behaviors has been shown to be negatively correlated with engagement of health behaviors in adolescents. The presence of parents and friends as models for healthy behaviors is positively related to health-enhancing behaviors in the same population (Jessor, Turbin, & Costa, 1998). In addition, Lau and colleagues (1990) found that parental health beliefs and behaviors were significantly related to health behaviors in college students, and in some cases endured even after the student is no longer living in the house. It is important to remember, however, that these influences do not always involve healthy practices. For example, being part of a social network that promotes smoking may increase smoking behavior in a particular individual (Cohen, 2004). These studies suggest that social relationships may play a role in the acceptance or rejection of certain health behaviors, including vaccinations.

Relationship between Demographic Variables and Vaccine Acceptance

In addition to HBM factors and social relationships, some studies have found demographic variables to be significantly related to vaccine acceptance. In the second study conducted by Chapman and Coups (1999), a logistic regression with demographic variables found age to be significantly predictive of vaccine acceptance with older respondents being more

likely to accept the seasonal influenza vaccine. The study by Nexoe (1999) also found age to be a significant predictor of vaccine acceptance when part of a logistic regression model that included HBM categories (perceived barriers, benefits, and severity), living arrangements (living in a nursing home and living with another person), physician recommendation to receive vaccine, previous vaccination behavior, and location (i.e., living in an area with free vaccination programs). Specifically, the study found older respondents to be more likely to accept the influenza vaccination.

Further, a study by Quinn, et al. (2009) found ethnicity to be a significant predictor of vaccine acceptance. It was found that Hispanics were over three times more likely than Caucasians to accept the vaccine when controlling for other demographics (gender, age, ethnicity, income, education), health care status (having a healthcare provider, having health insurance), past vaccination behavior, worry about the vaccine, trust in government's handling of the H1N1 virus, and perceived personal consequences.

As only three studies that investigated influenza vaccine acceptance using the HBM framework found significant relationships with demographic variables, it is possible that demographics play less of a role in vaccine acceptance than other factors, such as HBM categories. It is important however, to note that many of the studies did not report whether demographics were significant, making it difficult to say that demographics are not significant predictors of vaccine acceptance.

Current Study

While there have been a number of studies that investigate acceptance in relation to a number of vaccines, there is a dearth of information regarding H1N1 vaccine acceptance. Due to the differences between this virus and others, such as age group at risk, death rates, and its rapid

spread across areas, it is important to investigate opinions about H1N1 and how these compare to the seasonal flu. These investigations and comparisons can aid in the development of vaccine intervention programs tailored to the specific issues related to H1N1 if differences between these illnesses exist.

In addition, this research is essential in the event of another H1N1 or other virus pandemic to aid in knowledge of which groups of individuals are less likely to get vaccinated and to better understand the reasons why. University campuses are an especially critical place to study this given that for H1N1, young individuals are especially likely to not only contract the virus but to also face critically dangerous consequences (CDC, 2010a). The unique situations of living and interacting in close quarters contribute to this population's increased risk of contracting viruses, such as H1N1 (Guh et al., 2011).

Although vaccine acceptance does not always predict whether someone will receive the vaccine, it is important to understand the reasons why individuals are more or less likely to be accepting of vaccines, such as the H1N1 and seasonal influenza vaccine. Information obtained through such acceptance studies can be used in future interventions to identify those HBM factors that put people at risk for not receiving vaccinations and provide information to help tailor these interventions for maximum benefit.

In addition, the large amount of media attention regarding the recent H1N1 outbreaks may affect people's acceptance of the H1N1 vaccine. It has been shown that unfavorable publicity can negatively affect a person's decision to have their children vaccinated (Pareek & Pattison, 2000). Further, it is important to understand opinions and acceptance of the H1N1 vaccine, as protection against this virus strain is now being included in the seasonal influenza vaccine. It is possible that including protection against H1N1 may change a person's current

seasonal vaccine acceptance, thus it is important to understand the unique contribution that the inclusion of H1N1 protection adds to seasonal flu vaccine acceptance.

Research has shown significant relationships between engagement in a variety of health behaviors and individual differences such as: personality traits (Booth-Kewley & Vickers, 1994), affect (Jones, O'Connor, Conner, McMillan, & Ferguson, 2007), optimism (McNicholas, 2002), and perceived stress (Ng & Jeffery, 2003). However, little research has been done to investigate the relationship between these factors and the specific health behavior of vaccination. Given the relationships between these factors and engagement in other health behaviors, it is important to understand whether or not these relationships exist in relation to a variety of preventative health behaviors, such as vaccine acceptance.

Hypotheses

The purpose of the present project is to investigate how different opinions and relationship factors influence one's acceptance of and intention to receive the H1N1 vaccine in a population of undergraduate college students. Specifically, the hypotheses of this study include:

1. Components of the HBM model will be significantly related to greater acceptance of the influenza vaccine (specifically the H1N1 vaccine and seasonal influenza vaccine that also provides protection against the H1N1 virus), with the most significant being perceived barriers (both cost and general) based on the findings of past studies showing these components to be related to vaccine acceptance. Further, acceptors will endorse higher benefit, severity, susceptibility, and health behavior ratings as well as lower cost and general barrier ratings compared to nonacceptors.
2. Higher reported number of social ties will be positively correlated with H1N1 vaccine acceptance as well as other protective health behaviors. However, this relationship

may be moderated by opinions about vaccination from a participant's family. Further, family opinions regarding the H1N1 vaccine will be more positive among acceptors than nonacceptors.

3. Engagement in higher levels of self-reported protective health behaviors will be significantly related to H1N1 vaccine acceptance. Particularly, previous seasonal influenza vaccine will be related to acceptance of the H1N1 vaccine.
4. Individual differences may play a role in vaccine acceptance. Exploratory analyses will be conducted to investigate these effects. For example, analyses will be conducted to investigate the unique roles that personality traits, affect, optimism, and stress play on vaccine acceptance, and whether or not these differences increase or decrease acceptance rates in the sample. In addition, these exploratory analyses will help to understand whether these individual differences help to explain H1N1 vaccine acceptance above and beyond the HBM framework.
5. Exploratory analyses will be conducted to investigate the differences in vaccination beliefs and acceptance between those who completed the study before and after the inclusion of H1N1 protection in the seasonal influenza vaccine.

Method

Participants

Four hundred thirty two undergraduate students from the University of Kansas were recruited for the study through the psychology department subject pool and were be each awarded class credit for their participation. Three hundred thirty one participants completed the survey during the H1N1 pandemic and answered questions regarding the H1N1 specific vaccine (hereafter referred to as collection one). One hundred one participants completed the survey the

following flu season and answered questions regarding the seasonal flu vaccine that contained H1N1 virus protection (hereafter referred to as collection two). The mean age of the sample was 19.33 years (SD = 1.66) and was 50.6% female. In addition, the sample was 80.1% Caucasian, the mean family income level was "between $75,000-$99,999," and 85% of participants identified at least one parent as having a white collar career. Overall, 21.3% of participants received the H1N1-specific vaccine. In addition, 32.7% of participants from collection two had received the seasonal flu vaccine that included H1N1 protection. When these two groups were combined, 24.8% of the overall sample received protection against the H1N1 influenza in either the form of the H1N1-speficic vaccine or the seasonal flu vaccine and were considered H1N1 vaccine acceptors.

Design and Procedure

Participants signed up for the study via the University of Kansas psychology department computerized interface (SONA System). Once they signed up, they were directed to an external secure online website housing the survey (www.surveymonkey.com). Once transferred to the external survey site, the participants were consented online regarding the nature of the study. Following their consent, participants answered a number of online questionnaires regarding demographics, mood measures, personality measures, opinions about the H1N1 vaccine, opinions about vaccines in general, and other health behaviors. Participants were granted class credit upon completion of the surveys.

Materials

Vaccine acceptance. H1N1 vaccine acceptance was assessed by asking participants the following questions: "Did you receive the H1N1-specific vaccine in the winter of 2009-2010 (i.e., the vaccine released that ONLY had H1N1 protection?") and "Did you get the seasonal flu

shot this year?" (i.e., winter 2010-2011 that included H1N1 virus protection). Participants who had received the H1N1 specific vaccine in 2009-2010 and those who had received the seasonal flu vaccine in 2010-2011 were coded as acceptors for the individual vaccines. These participants were combined and vaccine acceptance was defined as someone who had either received the H1N1 specific (2009-2010), seasonal flu with H1N1 protection (2010-2011), or both vaccines. See appendix for all questionnaires.

Health belief model questionnaire. The Health Belief Model (HBM) questionnaire is based on the HBM model for preventative medicine (Rosenstock, 1974), which has been used in a number of studies investigating intent and engagement in various health behaviors including influenza vaccination (Blue & Valley, 2002; Chapman & Coups, 1999; Chor, et al., 2009; Lau, et al., 2009; Nexøe, et al., 1999; Quinn, et al., 2009; Shahrabani, et al., 2009). The questions were developed from previous vaccine studies that used this model. The HBM questionnaire divides the HBM into seven different categories that affect a person's willingness to accept the H1N1 vaccine in collection one and the seasonal flu vaccine that included H1N1 virus protection in collection two: cost barriers, general barriers, perceived benefits of receiving the vaccine, perceived susceptibility of contracting H1N1/seasonal flu (depending on collection), perceived illness severity in case of contraction, knowledge of H1N1, knowledge of the seasonal flu (collection two only), knowledge of the H1N1 vaccine, knowledge of the seasonal flu vaccine (collection two only) and engagement in various health behaviors. The first portion of the scale assessing cost barriers ranges from one to five, with one indicating the participant is very unlikely to engage in the behavior and five indicating they are very likely to engage in the behavior. For the purposes of the current study, this category was reversed scored so that higher scores indicate higher barrier ratings and lower scores indicate lower barrier ratings. The second

portion of the scale assessing general barriers, perceived benefits, perceived susceptibility, perceived severity, knowledge, and health behaviors and ranges from one to five, with one indicating the participant strongly disagrees with the statement and five indicating they strongly agree. The third portion of the HBM scale assessing health behaviors (i.e., "I do things on my own to improve my health," "How often have you gotten the seasonal flu shot?", "How often do you visit a health care professional for physical exams in addition to visit related to illness?") ranges from one to five, with one indicating they never engage in the behavior and five indicating they engage in the behavior every year.

Health behavior questionnaire. The health behavior questionnaire was used to assess the participants' engagement in various health behavior activities such as drinking, smoking, as well as dental and sleep hygiene. The response options range from one to five, with one indicating a low frequency of engaging in the behavior and five indicating a high frequency. Items assessing engagement in alcohol and tobacco consumption were reverse coded, so that higher scores reflected lower engagement in these behaviors. These items were then summed so that a higher total score reflected more engagement in health behaviors. The health behaviors assessed and levels of engagement were based on measurements tools utilized in previous studies that investigated health behaviors in adults and adolescents (Berrigan, Dodd, Troiano, Krebs-Smith, & Barbash, 2003; Jessor, et al., 1998).

Personality scales. The Ten-Item Personality Inventory (TIPI) (Gosling, Rentfrow, & Swann, 2003) was used to assess personality traits based on the Five Factor Model (FFM). The TIPI divides personality traits into five subscales: extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience. The TIPI consists of two questions per subscale and the scale ranges from one to seven, with one indicating the participant disagrees strongly

with the statement and seven indicating they agree strongly. Subscales scores were calculated by summing the ratings for each personality trait of the corresponding subscale.

Affect. A shortened version of the Profile of Mood States (POMS) (McNair, Lorr, & Droppleman, 1981; Usala & Hertzog, 1989) were used to assess participant affect. The POMS divides affect into five subscales: anxiety, fatigue, depression, vigor, and well-being. The POMS consists of five questions per subscale and the scale ranges from zero to four, with zero indicating the trait is not at all accurate of the participant in general and four indicating that the trait is extremely accurate. Subscale scores are calculated by summing the ratings for each item of the corresponding subscale (anxiety $\alpha = .92$; fatigue $\alpha = .94$; depression $\alpha = .94$; vigor $\alpha = .88$; well-being $\alpha = .92$).

The Center for Epidemiological Studies-Depression Scale (CESD-10) (Andresen, Malmgren, Carter, & Patrick, 1994) was used to assess symptoms of depression. The response options range from zero to three, with zero indicating the symptom occurs rarely or none of the time and three indicating the symptom occurs most of the time. Total scores are calculated by summing all the items. Higher total scores indicate more endorsement of depressive symptoms ($\alpha = .79$).

Stress. The Perceived Stress Scale-Ten Item Version (PSS-10) (Cohen, Kamarck, & Mermelstein, 1983) was used to assess participants' perceived level of stress. The scale ranges from zero to four, with zero indicating the participant has never felt a certain way over the previous month and four indicating the participant has felt this way very often. Four of the items are scored in the positive direction. Once these four items are reverse-scored, higher overall total scores indicate a higher level of perceived stress ($\alpha = .84$-$.86$).

Optimism. Dispositional optimism was measured using the ten question Life Orientation Test-Revised (LOT-R) (Scheier, Carver, & Bridges, 1994). The scale ranges from zero to four, with zero indicating the participant strongly disagrees with the statement and four indicating the participant strongly agrees. Of the ten items, six are used to measure optimism with three of these items scored in a positive direction and three scored in a negative direction. Once the negative items are reversed scored, higher total LOT-R scores indicate higher levels of dispositional optimism ($\alpha = .78$).

Social relationships. A shortened version of the UCLA Loneliness Scale (UCLA-L) (Hays & DiMatteo, 1987; Russell, Peplau, & Cutrona, 1980) was used to assess loneliness and social isolation. The scale ranges from one to four, with a score of one indicating the participant has never felt like the statement and four indicating that they have often felt this way. After reverse scoring two items, higher total scores indicate higher levels of reported loneliness ($\alpha = .94$ for the original 20 item scale).

A modified version of the Social Network Inventory (Mod-SNI) (Cohen, et al., 1983) were used to assess participants' level of social interactions. The scale asks how many people the participant has contact with, and how close they feel to these people. Higher total scores indicate a more extensive social network. In addition, family social networks were assessed by totaling the four Mod-SNI questions related to family relationships.

To assess engagement in family conversations about the H1N1 vaccine, participants were asked if they had a conversation with family members about this vaccine. In addition, those that had this conversation were asked to rate the opinion of this conversation on a one to five scale, with higher scores indicating more positive conversations.

Statistical Procedure

To test the first hypothesis that the HBM framework was significantly associated with H1N1 vaccine acceptance, logistic regression analyses were conducted. Logistic regression is used to investigate the relationship between a dichotomous outcome variable and a set of independent variables (D.W. Hosmer & Lemeshow, 2000). This statistical technique has been used in a number of studies investigating engagement in health behaviors such as vaccine acceptance (Blue & Valley, 2002; Chapman & Coups, 1999; Nexøe, et al., 1999; Quinn, et al., 2009). Logistic regression provides odds ratios for each of the independent variables/covariates in the model that "approximates how much more likely it is for the outcome variable to be present" in participants that are accepting of the vaccine than those that are not accepting (D. W. Hosmer & Lemeshow, 2000, p. 50). In addition to odds ratios, logical regression provides goodness-of-fit statistics that measure the appropriateness of the proposed model for the given data. Specifically, goodness-of-fit statistics determine whether the model containing the covariates improves the fit of the model from a model containing only the constant (Pallant, 2007). Finally, logistic regression also provides pseudo-R^2 values that assess the amount of variation in the dichotomous dependent variable accounted for in the proposed model (Pallant, 2007). For this study, logistic regression allows for the testing of the applicability HBM framework in relation to vaccine acceptance as well as investigating the impact that specific HBM categories have on vaccine acceptance.

For the current study, the simultaneous method of entering variables (HBM categories) into the equation was used. Hierarchical methods were not used as there was no theoretical justification for one variable being more important to the model than another (Brace, Kemp, & Snegler, 2009). While there are a number of goodness-of-fit indices, the Pearson chi-square test

is one of the tests considered to be appropriate for estimating model fit and power when the sample is greater than 100 (D. W. Hosmer, Hosmer, Le Cessie, & Lemeshow, 1997) and was used to assess goodness-of-fit in the current study. Participants were coded as acceptors (receiving either the H1N1-specific vaccine or seasonal flu vaccine with H1N1 protection) or nonacceptors (not receiving either vaccine).

In addition to logistic regression, independent samples t-tests were conducted to investigate the differences in mean scores of the HBM categories between acceptors and nonacceptors. Paired samples t-tests were also conducted to investigate the differences in mean scores between different aspects of HBM categories.

To test the second hypothesis that social relationships will be significantly correlated H1N1 vaccine acceptance, bivariate correlations were conducted to examine the relationship between number of social ties, loneliness, vaccine acceptance, and engagement in other health behaviors. In addition, analyses were conducted to investigate the possible moderation effects of family opinions on these relationships. Specifically, an interaction term was created using total SNI scores and family conversation opinions (both variables were centered) and included in a logistic regression equation in addition to total SNI scores and family opinion ratings (with vaccine acceptance as the depended variable). For this hypothesis, a significant interaction term indicated a significant moderation effect. Finally, independent samples t-tests were conducted to investigate differences in family opinions between vaccine acceptors and nonacceptors.

To test the third hypothesis that higher engagement in preventative health behaviors will be related to H1N1 vaccine acceptance bivariate correlations were conducted. Specifically, correlations were conducted to examine the relationships between total HBQ scores, previous seasonal flu vaccine acceptance, regular physical examinations, and H1N1 vaccine acceptance.

To test the fourth hypothesis that individual differences may play a role in H1N1 vaccine acceptance, bivariate correlations were conducted between personality traits, affect, optimism, stress, and H1N1 vaccine acceptance.

Finally, to test the fifth hypothesis that there may be differences in beliefs between the two collection groups independent samples t-tests were conducted to investigate the differences in mean HBM category scores between the two groups. In addition, chi-square test tests of independence were conducted to investigate the relationship between seasonal vaccine acceptance and collection (i.e., whether time of collection was related to seasonal flu vaccine acceptance).

Results

Prior to conducting analyses regarding the five hypotheses, preliminary analyses were conducted to examine reasons for not receiving the H1N1 vaccine, mean scores of the HBM categories, and correlations between demographics and vaccine acceptance. The most common reasons for not getting the H1N1-specific vaccine were not having enough time to get it (43.1%), concern over side effects (11.1%), being opposed to vaccines in general (8.8%), cost (5.8%), and health concerns (2.1%). The most common reasons for not getting the seasonal flu vaccine that included H1N1 protection were not having enough time (28.7%), being opposed to vaccines in general (8.9%), cost (5.9%), and concern over side effects (2%).

In addition, mean scores for the HBM components were 3.44 (*SD* = 1.12) for cost barriers, 2.74 (*SD* = .66) for general barriers, 3.24 (*SD* = .77) for benefits, 2.22 (*SD* = .76) for susceptibility, 2.88 (*SD* = .61) for severity, 3.32 (*SD* = .76) for engagement in health behaviors, and 3.50 (*SD* = .76) for knowledge regarding the H1N1 flu virus, the H1N1 vaccine, and

vaccines in general (all HBM components were measured on a one to five scale). See Table 1 for correlations among the HBM components.

Table 1

Correlations between the HBM constructs

	Cost barriers	General barriers	Benefits	Susceptibility	Severity	Knowledge	Health behaviors
Cost barriers	1.00						
General barriers	.43**	1.00					
Benefits	-.41**	-.31**	1.00				
Susceptibility	-.22**	.03	.09	1.00			
Severity	-.17**	-.005	.22**	.45**	1.00		
Knowledge	-.13*	-.19**	.17**	.25**	-.01	1.00	
Health behaviors	-.28*	-.31**	.19**	-.003	.14**	.19**	1

* $p < .05$
** $p < .01$

When knowledge was divided into knowledge about the H1N1/seasonal flu virus and vaccines (both H1N1-specific and vaccines in general) the mean knowledge levels were 3.47 (*SD* = .47) for virus knowledge and 3.21 (*SD* = .54) for vaccine knowledge. A paired-samples t-test was then conducted to investigate the difference between knowledge about the virus and knowledge about vaccines. Results showed that there was a significant difference between participants level of knowledge about the virus and vaccines ($t(380) = 6.91$, $p < .001$) indicating that participants had greater knowledge about the H1N1 virus than vaccines.

When general barriers were divided into time and non-time (e.g., "The H1N1 vaccine has unpleasant side effects," "I am afraid of needles") barriers the mean time barrier ratings were 2.85 (*SD* = .05) and the mean non-time barrier ratings were 2.66 (*SD* = .04). A paired-samples t-test was conducted to investigate the difference between time and non-time barrier ratings.

Results showed that there was a significant difference between participants ratings of time and non-time barriers ($t(382) = 4.32$, $p < .001$) with higher time barrier than non-time barrier ratings.

In addition, bivariate correlations were conducted to investigate the relationships between demographic variables (age, sex, race, family income, and parental career) and H1N1 vaccine acceptance to determine whether these factors should be included in further analyses as covariates. No demographic variables were related to H1N1 vaccine acceptance and were thus not included in the logistic regression models.

Investigating the Role of the HBM Framework in H1N1 Vaccine Acceptance

A logistic regression analysis was conducted to investigate the relationship between the seven HBM categories and H1N1 vaccine acceptance. A test of the classification ability of the full model against a model containing only the constant was significant, indicating that the HBM reliably differentiated between acceptors and nonacceptors more than a model containing no HBM categories, $\chi^2(7, N = 359) = 128.84$, $p < .001$. In addition, 30-45% of variation in vaccine acceptance was explained by the model containing the HBM categories (Negelkerke's $R^2 = .452$; Cox & Snell $R^2 = .302$). Overall, correct identification was 84.1% (94.2% for nonacceptors and 48.8% for acceptors).

When looking at the individual HBM categories, cost barriers ($\beta = -.613$, $p < .001$, Exp(B) = .54), general barriers ($\beta = -1.82$, $p < .001$, Exp(B) = .162), and perceived benefits ($\beta = .521$, $p = .03$, Exp(B) = 1.68) were significantly related to H1N1 vaccine acceptance. Specifically, participants with higher cost and general barrier ratings were less likely to accept the H1N1 vaccine. In addition, as a participant's perceived benefits increased by one unit (e.g., their rating increased from "likely" to "very likely") participants were times 1.68 times more likely to be accepting of the H1N1 vaccine. See Table 2 for logistic regression information.

Table 2

Relationships between HBM categories and H1N1 Vaccine Acceptance

Variable	Regression Coefficient	S.E.	p-value	Odds ratio
Constant	1.81	1.996	.36	6.133
Cost barriers	-.61	.16	<.001	.54
General barriers	-1.82	.32	<.001	.16
Benefits	.52	.24	.03	1.68
Susceptibility	.15	.25	.55	1.16
Severity	-.12	.28	.68	.90
Knowledge	-.71	.40	.07	.49
Health behaviors	.22	.23	.34	1.24

Due to the significant differences between time and non-time barrier ratings a second logistic regression analysis was conducted containing cost barriers, time barriers, non-time barriers, benefits, susceptibility, severity, engagement in health behaviors, and knowledge about the virus and vaccines. The classification ability of this model versus a constant-only model was significant, $\chi^2(8, N = 359) = 140.83$, $p < .001$ suggesting that this form of the HBM reliably distinguished between acceptors and nonacceptors. In addition, correct identification using this model increased very slightly to an overall identification of 84.7% (95.2% of nonacceptors and 51.2% of acceptors) over the previous logistic regression. When looking at the individual HBM categories, cost barriers ($\beta = -.724$, $p < .001$, Exp(B) = .49), perceived benefits ($\beta = .702$, $p < .01$, Exp(B) = 2.02), and time barriers ($\beta = -1.278$, $p < .001$, Exp(B) = .278) were significantly related to H1N1 vaccine acceptance. Non-time barriers were not significantly related to H1N1 vaccine

acceptance (β = .702, p = .005, Exp(B) = 2.02), suggesting that the relationship between general barriers and vaccine acceptance in the original model was primarily due to time barriers. See Table 3 for logistic regression information.

Table 3

Relationships between HBM categories (General Barriers divided) and H1N1 Vaccine Acceptance

Variable	Regression Coefficient	S.E.	p-value	Odds ratio
Constant	-.12	2.13	.96	.888
Cost barriers	-.72	.17	<.001	.49
Time barriers	-1.28	.22	<.001	.278
Non-time barriers	-.31	.31	.33	.74
Benefits	.70	.25	.01	2.02
Susceptibility	.12	.26	.66	1.12
Severity	-.11	.28	.71	.90
Knowledge	-.55	.42	.19	.58
Health behaviors	.22	.23	.34	1.25

There was a significant difference in average ratings for cost barriers ($t(403) = -10.03$, $p < .001$), general barriers ($t(140.31) = -10.26$, $p < .001$), benefits ($t(378) = 5.48$, $p < .001$), and engagement in health behaviors ($t(391) = 5.17$, $p < .001$) between acceptors and nonacceptors, with acceptors endorsing lower cost and general barrier ratings and higher benefits and health behavior ratings (See Figure 1).

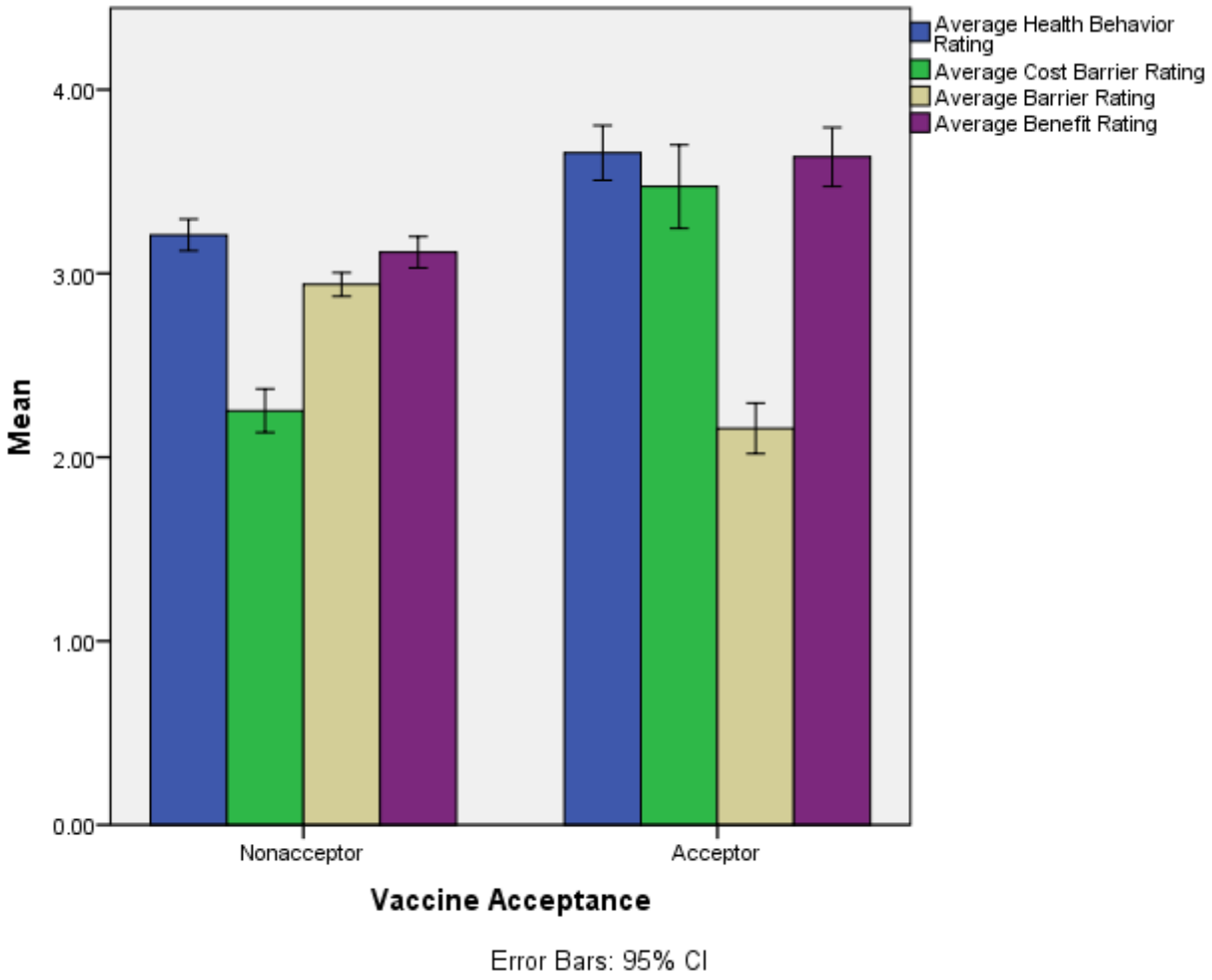

Figure 1. Average health barrier, cost barrier, general barrier, and benefit ratings between vaccine acceptors and nonacceptors.

Social Factors, H1N1 Vaccine Acceptance, and Other Health Behaviors

Neither loneliness (as measured by the UCLA-L; r = -.03, p = .50), nor level of social interaction (as measured by the Mod-SNI; r = .01, p = .89) were related to H1N1 vaccine acceptance. The interaction term containing the centered total SNI scores and family opinion ratings within the logistic regression was marginally significant (β = .25, p = .07), indicating that family opinion regarding the H1N1 vaccine (i.e., the valence of the conversation) moderates the relationship between number of social ties and vaccine acceptance. Specifically, those with

higher numbers of social roles showed a greater decrease in vaccine acceptance as the family conversation moved from positive valence to negative valence compared to those with lower numbers of social roles (see Figure 2). However, family opinion did not moderate the relationship between loneliness and vaccine acceptance (β = .02, p = .90). Contrary to the findings regarding H1N1 vaccine acceptance, engagement in preventative health behaviors (as measured by the HBQ) was related to number of social ties (r = .10, p = .06), and loneliness (r = -.17, p = .001). Specifically, higher endorsement of health behaviors was related to larger numbers of social ties and lower loneliness ratings.

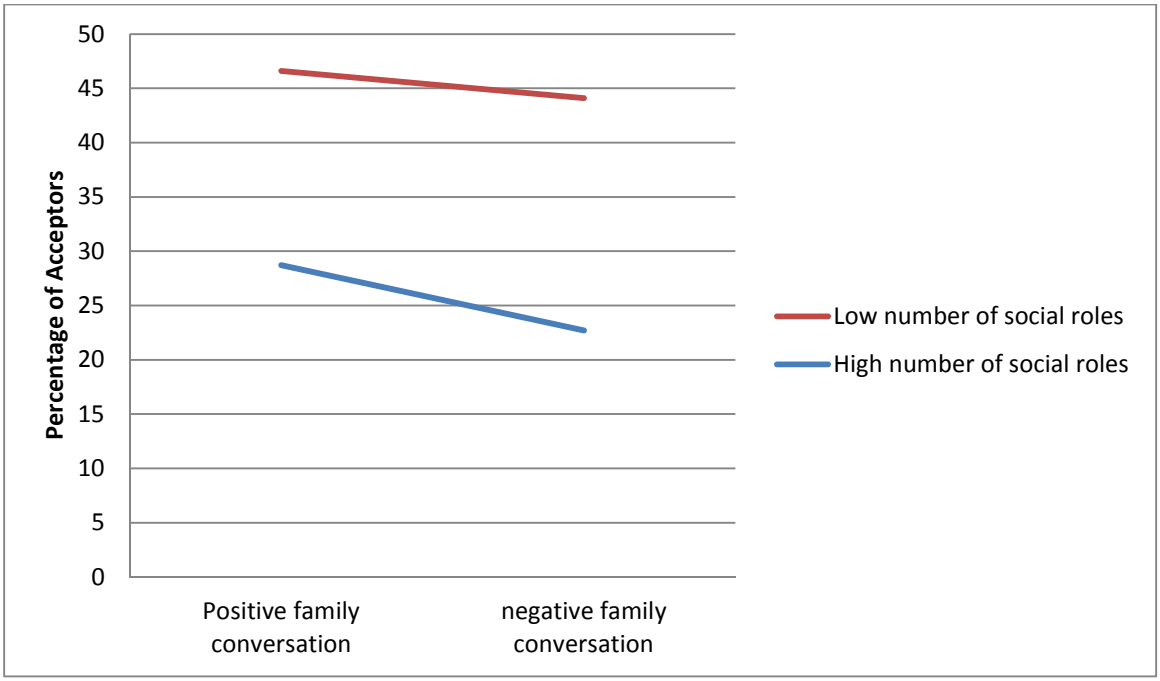

Figure 2. The moderation effect of family conversations about the H1N1 vaccine on the relationship between number of social roles and vaccine acceptance.

Having a family conversation regarding the H1N1 vaccine was not significantly related to H1N1 vaccine acceptance (r = .04, p = .45). However, the valence of this conversation was

significantly related to H1N1 vaccine acceptance ($r = .15$, $p = .004$), with a more positive opinion toward the vaccine being related to greater vaccine acceptance. In addition, acceptors had significantly more positive conversations about the H1N1 vaccine than nonacceptors ($t(351) = 2.46$, $p = .01$; see Figure 3

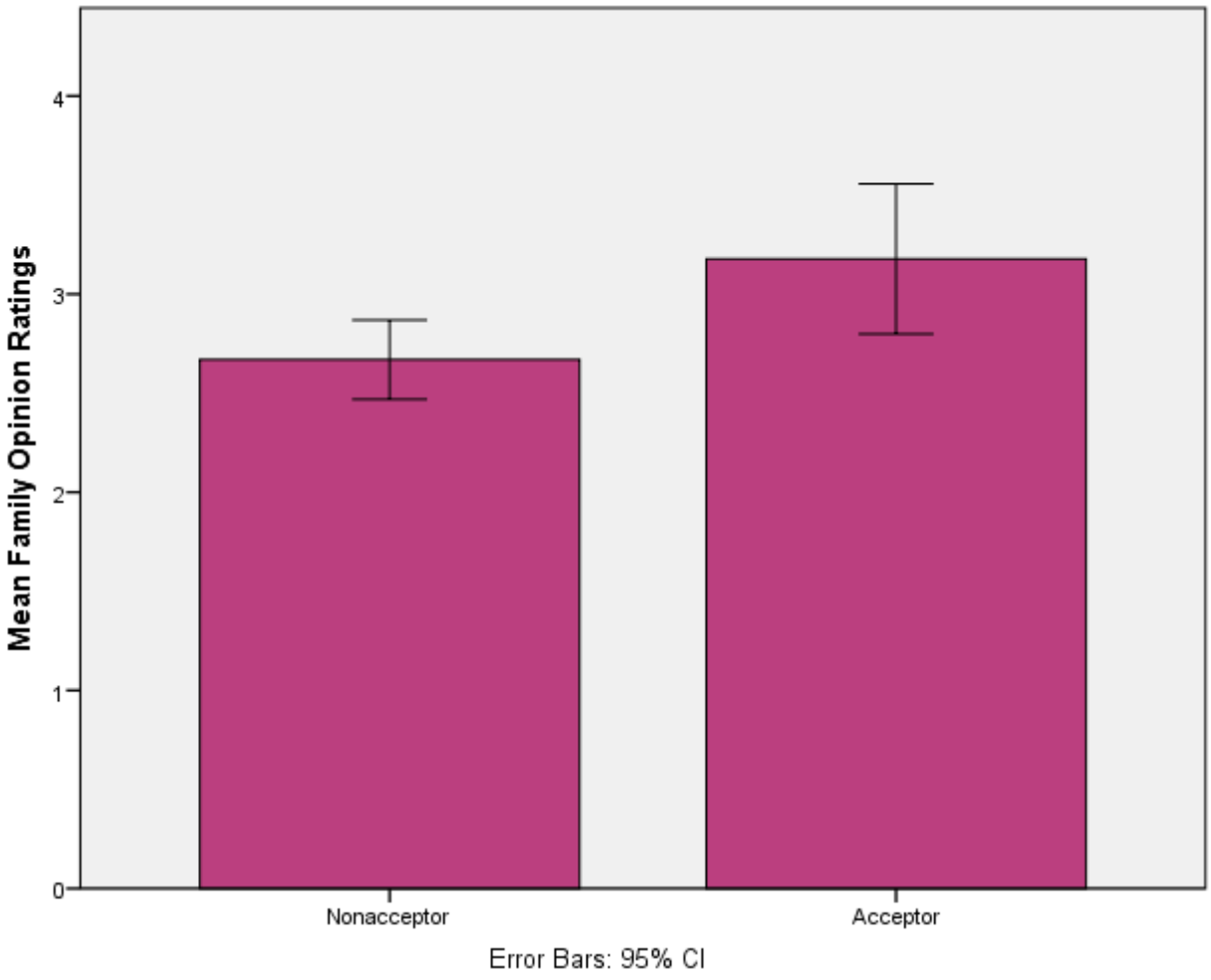

Figure 3. Mean family opinion ratings between vaccine acceptors and nonacceptors.

Further, having friends who were accepting of the H1N1 vaccine (either obtaining the H1N1-specific or seasonal vaccine that included H1N1 protection) was significantly related to H1N1 vaccine acceptance ($r = .19$, $p < .001$).

The Relationship between Engagement in Other Health Behaviors and H1N1 Vaccine Acceptance

Acceptance of the H1N1 vaccine was significantly related to receiving the seasonal flu vaccine on a regular basis ($r = .30$, $p < .001$) and getting regular physical examinations ($r = .18$, $p = .02$), as measured by the health behavior section of the HBM questionnaire. However, H1N1 vaccine acceptance was not related to total scores on the Health Behavior Questionnaire which assessed health behaviors aside from vaccine and physical examination acceptance ($r = .05$, $p = .28$).

Further, there was a significant difference in frequency of these two health behaviors between the two groups (seasonal flu vaccine: $t(181.10) = 6.49$, $p < .001$; physical examinations: $t(417) = 2.40$, $p = .02$), with H1N1 vaccine acceptors endorsing more frequent engagement in both seasonal flu vaccination and regular physical examinations (see Figure 4).

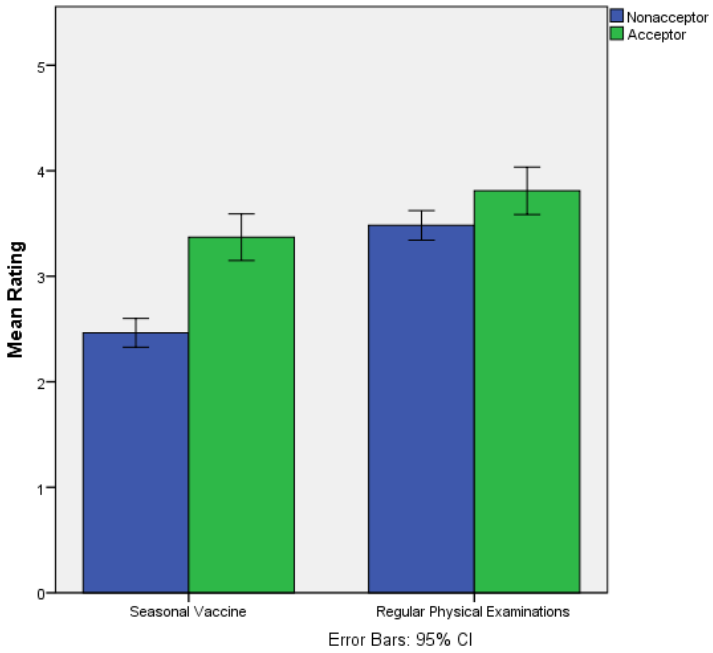

Figure 4. Mean engagement ratings for seasonal flu vaccine acceptance and regular physical examinations between vaccine acceptors and nonacceptors.

The Role of Individual Differences in H1N1 Vaccine Acceptance

None of the TIPI subscales were significantly related to vaccine acceptance (extraversion: $r = -.01$, $p = .90$; agreeableness: $r = -.03$, $p = .58$; conscientiousness: $r = .02$, $p = .63$; emotional stability: $r = .01$, $p = .83$; openness to experience: $r = .07$, $p = .19$). Similarly, there was no relationship between H1N1 vaccine acceptance and positive affect ($r = .05$, $p = .30$), negative affect ($r = -.001$, $p = .98$), depressive symptoms ($r = -.04$, $p = .48$), or optimism ($r = -.03$, $p = .55$). Finally, stress was also found to be uncorrelated with H1N1 vaccine acceptance ($r = .04$, $p = .38$).

Differences in Vaccination Beliefs and Acceptance between Collection One and Two

Because the HBM questionnaire for this study assessed beliefs about the H1N1 virus at time one and beliefs about the seasonal flu in time two, the goal of analyses investigating differences between the two groups was to assess differences in beliefs between these two viruses. Results showed that there was a significant difference in the mean rating scores for cost barriers ($t(404) = 2.39$, $p = .02$) and severity ($t(382) = 3.72$, $p < .001$) between the two groups with higher cost barrier being endorsed by participants in collection two (those that completed the questionnaire after the inclusion of H1N1 protection in the seasonal flu vaccine) and higher severity ratings being endorsed by participants in collection one. In addition, the difference in general barrier ratings between the two groups was marginally significant ($t(381) = 1.80$, $p = .08$) with participants in collection one having higher general barrier ratings. Further analyses showed that there was not a significant association between collection and seasonal flu vaccine acceptance (with Yates Continuity Correction, χ^2 (1, n = 428) = 2.53, $p = .11$, $\Phi = -.08$). Finally, analyses showed that there was a significant relationship between collection and gender (with Yates Continuity Correction, χ^2 (1, n = 431) = 39.37, $p < .001$, $\Phi = -.31$) with more female

participants in collection one and more male participants in collection two, but no relationship between collection and race (χ^2 (1, n = 432) = 6.81, p = .24, Φ = .13), family income level (χ^2 (1, n = 420) = 8.92, p = .06, Φ = -.15), or parent career (i.e., white collar or non-white collar; with Yates Continuity Correction, χ^2 (1, n = 402) = 0.00, p = 1.00, Φ = .01). There was also no difference in age between the two collections (t(380) = -1.57, p = .118).

Discussion

The current study investigated the role of the HBM framework, social factors, engagement in preventative health behaviors, and individual differences in the acceptance of the H1N1 flu vaccine in a sample of college students, a population not usually studied in vaccine acceptance studies. Some of the most common reasons for not receiving the H1N1-specific vaccine or seasonal flu vaccine that included H1N1 protection included not having enough time, concern over side effects, cost, and being opposed to vaccines in general. When dividing the knowledge category into knowledge about the H1N1 virus/vaccine and vaccines in general, participants had greater knowledge about the virus. It is possible that the increased media attention regarding H1N1 resulted in increased knowledge for this illness, while possibly leaving general vaccination knowledge unaltered. This difference in knowledge is important for health literacy programs so that additional information is provided about vaccines in general due to the lower levels of knowledge in this area. Further, when the general barrier category was divided into time and non-time barriers, participants had higher time barrier ratings. This indicates that time barriers are prevalent in this population and should be investigated further to aid in the development of interventions.

Results of logistic regressions suggest that the HBM framework is appropriate for identifying and distinguishing between acceptors and nonacceptors of the H1N1 specific vaccine

and seasonal flu vaccine that included H1N1 virus protection in a college sample. In addition, the HBM categories of cost barriers, general barriers, and benefits were found to be significantly related to H1N1 vaccine acceptance. These findings are consistent with other studies finding barriers (Blue & Valley, 2002; Nexøe, Kragstrup, & Søgaard, 1999; Quinn, Kumar, Freimuth, Kidwell, & Musa, 2009) and benefits (Blue & Valley, 2002; Chapman & Coups, 1999; Nexøe, et al., 1999; Shahrabani, Benzion, & Yom Din, 2009) to be significantly related to vaccine acceptance. When the role of general barriers was further investigated, barriers related to time were found to be significantly related to vaccine acceptance while non-time barriers were not. This finding implies that the aside from cost, time barriers appear to be an important factor in vaccine acceptance. While the current study was conducted on a college campus where participants had access to a number of vaccine clinics, time barriers were still a contributing factor in vaccine acceptance. This indicates that time barriers play a large role in vaccine acceptance and possibly other preventative health behaviors. This finding is interesting given that additional analyses showed that perceived stress was related to time barriers ($r = .14$, $p = .01$), but not vaccine acceptance. These findings suggest that the relationship between time barriers, stress, and vaccine acceptance is complex and should be investigated further. None of the studies reviewed that used the HBM framework to investigate H1N1 and seasonal flu vaccine acceptance divided general barriers in this way and thus may have overlooked the important role that time plays in vaccine acceptance. Further investigation of this specific barrier will aid understanding vaccine acceptance and in the development of future vaccine interventions and campaigns.

In terms of social factors, simply having a conversation with family members about the H1N1 vaccine was not related to vaccine acceptance; however, the more positive the

conversation was regarding the H1N1 vaccine was associated with vaccine acceptance. Further, those that were accepting of the vaccine reported higher (i.e., more positive) familial opinions about the H1N1 vaccine compared to nonacceptors. In addition, the opinions of family members regarding the H1N1 vaccine were found to moderate the relationship between number of social ties and vaccine acceptance. These results indicate that the opinions of family members may influence the health decisions made in this population, especially regarding vaccination. In addition, having friends that were accepting of the H1N1 vaccine was positively associated with H1N1 vaccine acceptance while the general number of social ties and feelings of loneliness were not. However, number of social ties and loneliness were correlated with other preventative health behaviors such as exercising, eating healthy foods, and washing hands. Specifically, higher number of social ties and lower feelings of loneliness were related to higher engagement in these health behaviors. These findings are consistent with other studies showing a relationship between social ties and engagement in various health behaviors (Jessor, Turbin, & Costa, 1998; Lau, Quadrel, & Hartman, 1990). Further, the current study's funding that the number of friends receiving the H1N1 vaccine being related to vaccine acceptance is consistent with a previous finding that the more coworkers a person perceived as being vaccinated was related to higher rates of vaccine acceptance (Chapman & Coups, 1999). The discrepancy between acceptance of vaccines and other preventative health behaviors in terms of social factors suggests that there is something unique about the social aspect of vaccinations. It appears that social factors related exclusively to the H1N1 vaccine were related to vaccine acceptance while more general social and factors and feelings of loneliness were not.

Regular acceptance of the seasonal flu vaccine and getting regular physical examinations were significantly related to H1N1 vaccine acceptance with H1N1 vaccine acceptors endorsing

more frequent engagement in these health behaviors. However, aggregate scores of various other health behaviors were not significantly related. These findings suggest that vaccination behavior and regular physical examination might be qualitatively different that other preventative health behaviors. It is possible that vaccination is different than other preventative health behaviors (such as brushing teeth, eating healthy, exercising, and wearing a seatbelt) in that it occurs less frequently and is not embedded in one's daily life and thus not considered a health habit. Further, the other preventative health behaviors assessed in this study are less time consuming and do not require a person to visit a health care provider. Perhaps the added barrier of inconvenience (in the form of going to a medical office or vaccination clinic) is one of the main differences between acceptance of vaccinations and other health behaviors. In addition, those that get regular physical exams might be reminded and encouraged to receive a flu vaccine whereas those who do not get exams do not receive this reminder. Finally, vaccination may involve pain while the other health behaviors do not. It is possible that the pain associated with vaccination is punishing and thus changes the relationship between vaccine acceptance and other preventative health behaviors.

When comparing average ratings for each of the HBM categories between those from collection one and collection two suggest that participants had higher cost and severity ratings regarding the H1N1-specific vaccine versus the seasonal flu vaccine that included H1N1 protection. Further analysis suggests that inclusion of H1N1 protection did not impact later seasonal flu vaccine (which included H1N1 protection) acceptance in this sample, however this effect size is relatively small. It appears that the media influence about the H1N1 virus did not impact seasonal flu vaccination acceptance in this sample. While the current study referred to the seasonal flu vaccine as containing H1N1 protection at collection two, it is possible that some

participants were unaware of this inclusion and that this accounted for the lack of difference. In addition, while people were made aware of this inclusion through literature available at times of vaccination the media coverage of H1N1 had subsided and was thus not as fresh in everyone's mind at the time. It is also possible that inclusion of H1N1 protection (a novel virus for many people) in the seasonal flu vaccine (a familiar virus and vaccine) somehow made H1N1 comparable to seasonal flu viruses thus reducing the fear related to the inclusion of H1N1 protection. Further, there was a difference in cost barrier, general barrier, and severity ratings between the two collection groups. These findings indicate that participants felt the seasonal flu was less severe than the H1N1 virus and that there were fewer barriers to receiving the seasonal flu vaccine, while there were more cost barriers regarding the seasonal flu vaccine. The availability of more seasonal flu vaccine clinics as well as free H1N1 vaccines for students with certain medical conditions in this sample was well as decreased media attention regarding H1N1 may account for some of these differences.

Limitations of this study include having two time points for data collection where H1N1 vaccination differed between specific and seasonal flu vaccines offering H1N1 protection. Due to this difference in time points, survey questions had to be adjusted to refer to the H1N1-specific vaccine or the seasonal flu vaccine that contained H1N1 virus protection. However, the inclusion of these two different time points provided the unique situation to examine the protection against a virus in two different vaccine forms. In addition, this population had access to both the H1N1 and seasonal flu vaccines at a reduced price on campus. While cost and time barriers were found to be significantly related to H1N1 vaccine acceptance, these relationships may have been affected by partial removal of these barriers. Also, this sample consisted mostly of Caucasian participants with relatively high SES statuses. It is possible that the homogeneity of

this sample may have blunted any other demographic effects that have been found in other samples and may impact the generalizability of these findings to other populations. Further, the current study utilized self-report measures and thus subject to report bias such as social desirability, problems with recall of past events, and current mood and emotions at time of survey completion. However, other studies have also used self-report measures thus their use in this study enables further comparison between studies. The implementation of online questionnaires, while convenient, may also have impacted the results. For example, participants' responses may have been influenced by time of day, location of survey completion (i.e., in a crowded library, alone at home), the technology used (i.e., laptop, tablet PC), and the person's technological literacy.

The current study provides many contributions to the flu vaccine acceptance literature. First, the study was conducted in college sample. This population is not usually identified as a high-risk population for seasonal flu complications, however they are considered to be at-risk for H1N1 complications (CDC, 2010b). Studying flu vaccine acceptance in this population helps to understand what factors play a role in acceptance in a population not historically targeted for vaccine interventions. While college students may not be as risk for seasonal flu complications, they are at risk for contracting many illnesses such as colds, influenza, and meningitis (Bruce et al., 2001; Nichol, Heilly, & Ehlinger, 2005) further making this population important to study regarding prevention of infectious diseases. It appears that the HBM framework is appropriate for investigating vaccine acceptance in college students in addition to healthcare professionals, working adults, and older adults. In addition, the HBM categories of cost barriers, general barrier, and benefits were related to vaccine acceptance, similar to other studies looking at different populations (Blue & Valley, 2002; Chapman & Coups, Nexøe, et al., 1999; Quinn, et

al., 2009; Shahrabani, et al., 2009). It appears that college students have similar opinions as other populations regarding vaccine acceptance when using the HBM framework, however this should be investigated in more detail such as dividing barriers into time and non-time barriers to examine any differences in this area.

Second, results showed that time barriers played a significant role in H1N1 vaccine acceptance in this study. It is possible that time barriers play a larger role than other barriers in vaccine acceptance, but this is not identified unless time barriers are investigated separately from other barriers. It is important for future vaccine campaigns to work at alleviating these time barriers in order to increase vaccine acceptance. Third, this study showed that H1N1 flu vaccine acceptance differed from other health behaviors in terms of social factors. This speaks to the importance of tailoring interventions and not using a "one size fits all" approach that utilize techniques used in other health interventions. Further, the finding that H1N1 vaccine acceptance was not related to other health behaviors shows the need for this specification in interventions.

Fourth, this study had the unique opportunity to investigate one virus at two different time points and with protection provided in two different forms. The lack of relationship between collection time and seasonal flu vaccine acceptance suggests that the increased media attention regarding H1N1 during the pandemic may not have impacted seasonal flu vaccination rates the following flu season. This finding is of particular interest as the rates of H1N1 specific vaccine acceptance (21.3%) was lower than seasonal flu vaccine (73.4%) across the two collections. Due to the differing acceptance rates between the H1N1 specific and seasonal flu vaccine, interventions used for seasonal flu vaccine may not be appropriate for pandemic flu strains. Additional research is needed to further examine the differences in beliefs regarding pandemic flu strains (such as H1N1) and the seasonal flu to help tailor interventions specific to the virus.

Due to the current seasonal flu vaccine's inclusion of H1N1 protection, future research should investigate the possible role that this addition plays in seasonal flu vaccine acceptance, especially in college samples. It is important to examine whether the findings of the current study generalize to other college samples and general populations. In addition, research on H1N1 vaccine acceptance will be helpful in understanding vaccine acceptance in future disease epidemics. Finally, further investigation is needed regarding the differences in social factors between acceptance of vaccinations and other preventative health behaviors.

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Appendix A

AGE: _____

E-mail address*_____

Demographics:

1. How old are you? _____years

2. Are you male or female? _____ male _____ female

3. How would you describe your primary racial or ethnic group?

_____(1) White, Caucasian

_____(2) Black, African-American

_____(3) Native American, Eskimo, Aleut

_____(4) Asian or Pacific Islander

_____(5) Hispanic, Latino

_____(6) Other specify _____

4. **Did you receive the H1N1 vaccine in 2009-2010?** ____ yes ____ no

a. If not, why? Check all that apply

_____ (1) Not enough time to get it

_____ (2) I am allergic to eggs

_____ (3) It costs too much

_____ (4) Health reasons, please specify: -

_____

_____ (5) Side effects

_____ (6) Other, please specify:

_____

b. **If yes, when: (date) _____**

where: _____

c. Do you have a health condition that requires you to have gotten the vaccine?

____ yes ____ no **If yes, please specify: _____**

5. **Did you get the seasonal flu shot this year?** ____ yes ____ no

a. If not, why? Check all that apply

_____ (1) Not enough time to get it

_____ (2) I am allergic to eggs

_____ (3) It costs too much

_____ (4) Health reasons, please specify:

_____

_____ (5) Side effects

_____ (6) Other, please specify:

_____

d. **If yes, when: (date) _____**

where: _____

6. **Please list all illnesses/diseases you have diagnosed with (i.e., cancer, autoimmune disease, diabetes, etc):**

_____

_____

_____

Appendix B

HBM Questionnaire for Collection One

For each statement, simply circle the number below the response which best reflects your likelihood to engage in the behavior or the extent to which you agree or disagree with each of the following statements. Be as honest as you can throughout, and try not to let your response to one item influence your response to other items. There are no right or wrong answers.

1. How likely would you be to get the H1N1 vaccine if it were free?

Very Unlikely	Likely	Maybe	Likely	Very Likely
1	2	3	4	5

2. How likely would you be to get the H1N1 vaccine if it cost $20?

Very Unlikely	Likely	Maybe	Likely	Very Likely
1	2	3	4	5

3. How likely would you be to get the H1N1 vaccine if it cost $21-$30?

Very Unlikely	Likely	Maybe	Likely	Very Likely
1	2	3	4	5

4. How likely would you be to get the H1N1 vaccine if it cost more than $30?

Very Unlikely	Likely	Maybe	Likely	Very Likely
1	2	3	4	5

5. I do not want to be vaccinated against H1N1.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

6. The H1N1 vaccine may have unpleasant side effects.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

7. In general, I am opposed to vaccines.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

8. It is too much trouble to get the H1N1 vaccine.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

9. The H1N1 vaccine is too expensive.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

10. I do not have time to get the H1N1 vaccine.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

11. Getting the H1N1 vaccine interferes with my daily activities.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

12. I am afraid of needles.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

13. The H1N1 vaccine is effective in protecting against the H1N1 virus.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

14. Getting the H1N1 vaccine will prevent me from getting the H1N1 virus.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

15. I have a lot to gain from getting the H1N1 vaccine.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

16. I have an increased risk of getting the H1N1 flu.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

17. I am concerned about the risk of falling seriously ill from the H1N1 flu.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

18. I get sick more easily than other people my age.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

19. I have a high risk of getting H1N1.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

20. I am more likely to get H1N1 than other people my age.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

21. H1N1 infections may lead to serious health problems.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

22. If I had H1N1, I would not be able to manage my daily activities.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

23. I am very worried about catching H1N1.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

24. Whenever I get sick, it seems to be serious.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

25. If I get H1N1, my job/school work would suffer.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

26. You can get H1N1from farm animals, such as pigs.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

27. You can get H1N1 from the H1N1 vaccine.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

28. Vaccines cause autism.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

29. Getting the seasonal flu vaccine will protect me from the H1N1 flu.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

30. Healthy people can still get the H1N1 flu.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

31. H1N1 is spread by droplets.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

32. H1N1 can be transmitted through toughing infected objects.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

33. H1N1 can be transmitted through contact with infected people.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

34. I do things on my own to improve my health (i.e., work out, eat healthy, take vitamins).

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

35. How often have you received the *seasonal* flu shot?

Never	Once	More than Once	Most Years	Every Year
1	2	3	4	5

36. How often do you visit a health care professional for physical examinations in addition to visits related to illness?

Never	Once	More than Once	Most Years	Every Year
1	2	3	4	5

Appendix C

HBM Questionnaire for Collection Two

Below are a series of questions regarding THIS YEAR'S SEASONAL FLU VACCINE (which includes 3 different flu viruses including the H1N1 virus [formerly called the "Swine Flu"]). For each statement, simply circle the number below the response which best reflects your likelihood to engage in the behavior or the extent to which you agree or disagree with each of the following statements. Be as honest as you can throughout, and try not to let your response to one item influence your response to other items. There are no right or wrong answers.

1. How likely would you be to get the 2010-2011 seasonal flu vaccine if it were free?

Very Unlikely	Likely	Maybe	Likely	Very Likely
1	2	3	4	5

2. How likely would you be to get the 2010-2011 seasonal flu vaccine if it were free for you?

Very Unlikely	Likely	Maybe	Likely	Very Likely
1	2	3	4	5

3. How likely would you be to get the 2010-2011 seasonal flu vaccine if it cost $20?

Very Unlikely	Likely	Maybe	Likely	Very Likely
1	2	3	4	5

4. How likely would you be to get the 2010-2011 seasonal flu vaccine if it cost $21-$30?

Very Unlikely	Likely	Maybe	Likely	Very Likely
1	2	3	4	5

5. How likely would you be to get the 2010-2011 seasonal flu vaccine if it cost more than $30?

Very Unlikely	Likely	Maybe	Likely	Very Likely
1	2	3	4	5

6. I do not want to be vaccinated against the 2010-2011 seasonal flu.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

7. The 2010-2011 seasonal flu vaccine may have unpleasant side effects.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

8. In general, I am opposed to vaccines.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

9. It is too much trouble to get the 2010-2011 seasonal flu vaccine.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

10. The 2010-2011 seasonal flu vaccine is too expensive.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

11. I do not have time to get the 2010-2011 seasonal flu vaccine.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

12. Getting the 2010-2011 seasonal flu vaccine interferes with my daily activities.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

13. I am afraid of needles.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

14. The 2010-2011 seasonal flu vaccine is effective in protecting against the seasonal flu virus.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

15. Getting the 2010-2011 seasonal flu vaccine will prevent me from getting the seasonal flu virus.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

16. I have a lot to gain from getting the 2010-2011 seasonal flu vaccine.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

17. I have an increased risk of getting the seasonal flu.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

18. I am concerned about the risk of falling seriously ill from the seasonal flu.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

19. I get sick more easily than other people my age.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

20. I have a high risk of getting the seasonal flu.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

21. I am more likely to get the seasonal flu than other people my age.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

22. Seasonal flu infections may lead to serious health problems.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

23. If I had the seasonal, I would not be able to manage my daily activities.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

24. I am very worried about catching the seasonal flu.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

25. Whenever I get sick, it seems to be serious.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

26. If I get the seasonal flu, my job/school work would suffer.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

27. You can get H1N1from farm animals, such as pigs.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

28. You can get the seasonal or H1N1 flu from the 2010-2011 seasonal flu vaccine.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

29. Vaccines cause autism.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

30. Getting the seasonal flu vaccine will protect me from the H1N1 flu.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

31. Healthy people can still get the seasonal flu.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

32. The seasonal flu is spread by droplets.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

33. The seasonal flu can be transmitted through toughing infected objects.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

34. The seasonal flu can be transmitted through contact with infected people.

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

35. I do things on my own to improve my health (i.e., work out, eat healthy, take vitamins).

Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	2	3	4	5

36. How often have you received the seasonal flu shot?

Never	Once	More than Once	Most Years	Every Year
1	2	3	4	5

37. How often do you visit a health care professional for physical examinations in addition to visits related to illness?

Never	Once	More than Once	Most Years	Every Year
1	2	3	4	5

Appendix D

LOT-R

Please indicate the extent to which you agree or disagree with each of the following statements. For each statement, simply circle the number below the response which best reflects how much you agree or disagree with the statement in terms of how closely it describes you as you generally are. Be as honest as you can throughout, and try not to let your response to one item influence your response to other items. There are no right or wrong answers.

1. In uncertain times, I usually expect the best.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	0	1	2	3	4
2. It's easy for me to relax.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	0	1	2	3	4
3. If something can wrong for me, it will.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	0	1	2	3	4
4. I'm always optimistic about my future.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	0	1	2	3	4
5. I enjoy my friends a lot.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	0	1	2	3	4
6. It's important for me to keep busy.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	0	1	2	3	4
7. I hardly ever expect things to go my way.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	0	1	2	3	4
8. I don't get upset too easily.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	0	1	2	3	4
9. I rarely count on good things happening to me.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	0	1	2	3	4
10. Overall, I expect more good things to happen to me than bad.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	0	1	2	3	4

Appendix E

Family Questionnaire

1. What does your MOTHER do (*include part-time and full-time employment)?*

_____ (1) blue collar job (does not require education)

_____ (2) blue collar manager

_____ (3) white collar job (work that requires formal education)

_____ (4) home maker

_____ (5) disabled

_____ (6) unemployed

_____ (7) retired

_____ (8) I don't know

2. What does your FATHER do (*include part-time and full-time employment)?*

_____ (1) blue collar job (does not require education)

_____ (2) blue collar manager

_____ (3) white collar job (work that requires formal education)

_____ (4) home maker

_____ (5) disabled

_____ (6) unemployed

_____ (7) retired

_____ (8) I don't know

3. What is the highest level of education completed by your <u>MOTHER</u>? (check one)

_____ (1) No formal education

_____ (2) Some schooling (less than high school diploma)

_____ (3) Grade 12/High school diploma/GED (General Education Diploma)

_____ (4) Vocational training school after high school

_____ (5) Some college/associate degree

_____ (6) College graduate (4 or 5 year program)

_____ (7) Master's degree (or other post-graduate training)

_____ (8) Doctoral degree (PhD., MD, EdD, DVM, DDS, JD, etc)

4. What is the highest level of education completed by your <u>FATHER</u>? (check one)

_____ (1) No formal education

_____ (2) Some schooling (less than high school diploma)

_____ (3) Grade 12/High school diploma/GED (General Education Diploma)

_____ (4) Vocational training school after high school

_____ (5) Some college/associate degree

_____ (6) College graduate (4 or 5 year program)

_____ (7) Master's degree (or other post-graduate training)

_____ (8) Doctoral degree (PhD., MD, EdD, DVM, DDS, JD, etc)

5. **Please estimate your annual family income (i.e., what both your parents make together) before taxes. (you can call your parents and ask if needed)**

_____ (1) Less than $10,000

_____ (2) $10,000 - $14,999

_____ (3) $15,000 - $19,999

_____ (4) $20,000 - $29,000

_____ (5) $30,000 - $39,999

_____ (6) $40,000 - $49,999

_____ (7) $50,000 - $59,999

_____ (8) $60,000 - $74,999

_____ (9) $75,000 - $99,999

_____ (10) $100,000 - $124,000

_____ (11) $125,000 - $149,000

_____ (12) $150,000 or more

6. **Are you supporting yourself through college?**

____ yes ____ no
If yes, how much money do you make per week? _____

Appendix F

PSS-10

Instructions: The questions in this scale ask you about your feelings and thoughts during *the last month*. In each case, please indicate *how often* you felt or thought a certain way.

1. In the last month, how often have you been upset because of something that happened unexpectedly?

___0=never ___1=almost never ___2=sometimes ___3=fairly often

___4=very often

2. In the last month, how often have you felt that you were unable to control the important things in your life?

___0=never ___1=almost never ___2=sometimes ___3=fairly often

___4=very often

3. In the last month, how often have you felt nervous and "stressed"?

___0=never ___1=almost never ___2=sometimes ___3=fairly often

___4=very often

4. In the last month, how often have you felt confident about your ability to handle your personal problems?

___0=never ___1=almost never ___2=sometimes ___3=fairly often

___4=very often

5. In the last month, how often have you felt that things were going your way?

___0=never ___1=almost never ___2=sometimes ___3=fairly often

___4=very often

6. In the last month, how often have you found that you could not cope with all the things that you had to do?

___0=never ___1=almost never ___2=sometimes ___3=fairly often

___4=very often

7. In the last month, how often have you been able to control irritations in your life?

___0=never ___1=almost never ___2=sometimes ___3=fairly often

___4=very often

8. In the last month, how often have you felt that you were on top of things?

___0=never ___1=almost never ___2=sometimes ___3=fairly often

___4=very often

9. In the last month, how often have you been angered because of things that were outside of your control?

___0=never ___1=almost never ___2=sometimes ___3=fairly often

___4=very often

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

___0=never ___1=almost never ___2=sometimes ___3=fairly often

___4=very often

Appendix G

Mod-SNI

Instructions: This questionnaire is concerned with how many people you see or talk to on a regular basis including family, friends, co-workers, neighbors, etc. Please read and answer each question carefully. *Answer the follow-up questions where appropriate.*

1. Are either of your parents living?

____ (0) neither ____ (1) mother only ____ (2) father only ____ (3) both

1a. Do you see or talk on the phone to either of your parents at least once every 2 weeks?

____ (0) neither ____ (1) mother only ____ (2) father only ____ (3) both

2. How many relatives (other than your parents) do you feel close to?

____0 ____1 ____2 ____3 ____4 ____5 ____6 ____7 or more

2a. How many of these relatives do you see or talk to on the phone at least once every 2 weeks?

____0 ____1 ____2 ____3 ____4 ____5 ____6 ____7 or more

3. How many close friends do you have? (meaning people that you feel at ease with, can talk to about private matters, and can call on for help)

____0 ____1 ____2 ____3 ____4 ____5 ____6 ____7 or more

3a. How many of these friends do you see or talk to at least once every 2 weeks?

____0 ____1 ____2 ____3 ____4 ____5 ____6 ____7 or more

4. Do you belong to a church, temple, or other religious group? _____ no _____ yes

4a. How many members of your church or religious group do you talk to at least once every 2 weeks? (This includes at group meetings and services.)

____0 ____1 ____2 ____3 ____4 ____5 ____6 ____7 or more

5. How many fellow students or teachers do you talk to at least once every 2 weeks? (This includes at class meetings.)

____0 ____1 ____2 ____3 ____4 ____5 ____6 ____7 or more

6. Are you currently employed? ___ no ___ yes

6a. How many people at work do you talk to at least once every 2 weeks?

____0 ____1 ____2 ____3 ____4 ____5 ____6 ____7 or more

7. How many of your neighbors do you visit or talk to at least once every 2 weeks?

____0 ____1 ____2 ____3 ____4 ____5 ____6 ____7 or more

8. Are you currently involved in regular volunteer work? _____ no _____ yes

8a. How many people involved in this volunteer work do you talk to about volunteering-related issues at least once every 2 weeks?

____0 ____1 ____2 ____3 ____4 ____5 ____6 ____7 or more

9. Do you belong to any groups in which you talk to one or more members of the group about group-related issues at least once every 2 weeks? _____ no _____ yes

Consider those groups in which you talk to a fellow group member at least once every 2 weeks. Please provide the following information for each such group: the name or type of group and the <u>total</u> number of members in that group that you talk to at least once every 2 weeks.

Group	Total number of group members that you talk to at least once every 2 weeks
1.	
2.	
3.	

Appendix H

POMS

Instructions: Below is a list of common human traits. For each trait, circle the response that best indicates how accurately that trait describes you. Describe yourself as you see yourself at the present time, not as you wish to be in the future. Describe yourself as you are generally or typically, as compared with other persons you know of the same sex and roughly the same age.

For each trait, circle the number that best indicates how accurately that trait describes you as you typically are. Choose from the following alternatives:

0=Not at All Accurate 1=A Little Accurate 2=Moderately Accurate 3=Quite a Bit Accurate 4=Extremely Accurate

Sluggish	**0**	**1**	**2**	**3**	**4**	**sad**	**0**	**1**	**2**	**3**	**4**
happy	**0**	**1**	**2**	**3**	**4**	**frightened**	**0**	**1**	**2**	**3**	**4**
hostile	**0**	**1**	**2**	**3**	**4**	**sleepy**	**0**	**1**	**2**	**3**	**4**
at ease	**0**	**1**	**2**	**3**	**4**	**calm**	**0**	**1**	**2**	**3**	**4**
unhappy	**0**	**1**	**2**	**3**	**4**	**afraid**	**0**	**1**	**2**	**3**	**4**
full of pep	**0**	**1**	**2**	**3**	**4**	**angry**	**0**	**1**	**2**	**3**	**4**
fearful	**0**	**1**	**2**	**3**	**4**	**lively**	**0**	**1**	**2**	**3**	**4**
tired	**0**	**1**	**2**	**3**	**4**	**tense**	**0**	**1**	**2**	**3**	**4**
on edge	**0**	**1**	**2**	**3**	**4**	**cheerful**	**0**	**1**	**2**	**3**	**4**
energetic	**0**	**1**	**2**	**3**	**4**	**fatigued**	**0**	**1**	**2**	**3**	**4**
depressed	**0**	**1**	**2**	**3**	**4**	**relaxed**	**0**	**1**	**2**	**3**	**4**
nervous	**0**	**1**	**2**	**3**	**4**	**resentful**	**0**	**1**	**2**	**3**	**4**
pleased	**0**	**1**	**2**	**3**	**4**						

Appendix I

UCLA-L

Instructions: Please indicate how often you have felt the way described in each statement.

1. I lack companionship.

____1=never felt this way ___2=rarely felt this way ___3=sometimes felt this way ___4=often felt this way

2. There is no one I can turn to.

____1=never felt this way ___2=rarely felt this way ___3=sometimes felt this way ___4=often felt this way

3. I am an outgoing person.

____1=never felt this way ___2=rarely felt this way ___3=sometimes felt this way ___4=often felt this way

4. I feel left out.

____1=never felt this way ___2=rarely felt this way ___3=sometimes felt this way ___4=often felt this way

5. I feel isolated from others.

____1=never felt this way ___2=rarely felt this way ___3=sometimes felt this way ___4=often felt this way

6. I can find companionship when I want it.

____1=never felt this way ___2=rarely felt this way ___3=sometimes felt this way ___4=often felt this way

7. I am unhappy being so withdrawn.

____1=never felt this way ___2=rarely felt this way ___3=sometimes felt this way ___4=often felt this way

8. People are around me but not with me.

____1=never felt this way ___2=rarely felt this way ___3=sometimes felt this way ___4=often felt this way

Appendix J

CESD-10

Instructions: Please read a list of the ways you may have felt or behaved recently. For each statement, please indicate how often you have felt this way during the *past week*.

1. I was bothered by things that don't usually bother me.

Rarely or none of the time (less than 1 day)	Some of the time (1-2 days)	Occasionally (3-4 days)	Most of the time (5-7 days)

2. I had trouble keeping my mind on what I was doing.

Rarely or none of the time (less than 1 day)	Some of the time (1-2 days)	Occasionally (3-4 days)	Most of the time (5-7 days)

3. I felt depressed.

Rarely or none of the time (less than 1 day)	Some of the time (1-2 days)	Occasionally (3-4 days)	Most of the time (5-7 days)

4. I felt that everything I did was an effort.

Rarely or none of the time (less than 1 day)	Some of the time (1-2 days)	Occasionally (3-4 days)	Most of the time (5-7 days)

5. I felt hopeful about the future.

Rarely or none of the time (less than 1 day)	Some of the time (1-2 days)	Occasionally (3-4 days)	Most of the time (5-7 days)

6. I felt fearful.

Rarely or none of the time (less than 1 day)	Some of the time (1-2 days)	Occasionally (3-4 days)	Most of the time (5-7 days)

7. My sleep was restless.

Rarely or none of the time (less than 1 day)	Some of the time (1-2 days)	Occasionally (3-4 days)	Most of the time (5-7 days)

8. I was happy.

Rarely or none of the time (less than 1 day)	Some of the time (1-2 days)	Occasionally (3-4 days)	Most of the time (5-7 days)

9. I felt lonely.

Rarely or none of the time (less than 1 day)	Some of the time (1-2 days)	Occasionally (3-4 days)	Most of the time (5-7 days)

10. I could not get "going".

Rarely or none of the time (less than 1 day)	Some of the time (1-2 days)	Occasionally (3-4 days)	Most of the time (5-7 days)

Appendix K

TIPI

Here are a number of personality traits that may or may not apply to you. Please write a number next to each statement to indicate the extent to which *you agree or disagree with that statement.* You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

I see myself as:

1. Extraverted, enthusiastic

Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

2. Critical, quarrelsome

Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

3. Dependable, self-disciplined

Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

4. Anxious, easily upset

Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

5. Open to new experiences, complex

Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

6. Reserved, quiet

Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

7. Sympathetic, warm

Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

8. Disorganized, careless

Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

9. Calm, emotionally stable

Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

10. Conventional, uncreative

Disagree strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

Appendix L

Health Behavior Questionnaire

1. Think back over the last two weeks. How many times have you had five or more drinks at a sitting?

0	1-2	3-5	6-9	10 or more

2. What is the average number of drinks you consume in a week?

0	1-2	3-5	6-9	10 or more

3. How often do you smoke?

Rarely or none of the time	Some of the time	Occasionally	Often	Always or most of the time

4. How often do you smoke cigarettes or chew tobacco per week?

0	1-2 times per week	3-5 times per week	6-9 times per week	10 or more times per week

5. How often do you floss per week?

Never	Once or twice a week	3-5 times a week	Once every day	More than once a day

6. How often do you brush your teeth a week?

Never	Once or twice a week	3-5 times a week	Once every day	More than once a day

7. How often do you wash your hands after using the restroom?

Rarely or none of the time	Some of the time	Occasionally	Often	Always or most of the time

8. How often do you wash your hands before eating?

Rarely or none of the time	Some of the time	Occasionally	Often	Always or most of the time

9. How often do you try to eat healthy foods (i.e., fruits and vegetables, low fat, etc)?

Rarely or none of the time	Some of the time	Occasionally	Often	Always or most of the time

10. How often do you wear a seatbelt when you are riding in a vehicle?

Rarely or none of the time	Some of the time	Occasionally	Often	Always or most of the time

11. On average, how often do you use illicit drugs (i.e., marijuana, cocaine, etc.)?

Rarely or none of the time	Some of the time	Occasionally	Often	Always or most of the time

12. During your life, how many times have you used prescription medication such as pain killers, anti-anxiety medication, sleeping pills, appetite suppressants, etc. without a doctor's prescription?

0 times	1-10 times	11-20 times	21-30 time	More than 30 times

13. On average, how often do you exercise per week (i.e., exercises for muscle tone, increasing heart rate for at least 20 mins)?

0 times a week	1 time a week	2 times a week	3 times a week	4+ times a week

14. When you rode your bicycle in the past 12 months, how often did you wear a helmet?

Haven't rode in the past 12 months	Rarely or none of the time	Some of the time	Occasionally	Often	Always or most of the time