MARYWOOD UNIVERSITY
Interdisciplinary Ph.D. in Human Development

FACTORS INFLUENCING SEASONAL INFLUENZA VACCINATION UPTAKE RATE AMONG UNDERGRADUATE COLLEGE STUDENTS IN SCRANTON, PENNSYLVANIA

by

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List of Abbreviations

- CDC Center for Disease Control
- CI Confidence Interval
- HBM Health Belief Model
- ILL Influenza-like Illness
- IPEDS Integrated Postsecondary Education Data System
- OR Odds Ratio
- PA Pennsylvania
- SES Socio-Economic Status
- USDHHS United States Department of Health and Human Services
- WHO World Health Organization

Abstract

College students who do not get vaccinated annually for influenza have the potential to spread the influenza virus to other students. The purpose of this study was to determine if a significant relationship existed between the vaccination status of college students and their knowledge of influenza; their perceived risk of the disease; and, their perceived benefit from receipt of the vaccine. The theoretical basis used in this study was the Health Belief Model, which predicts that a person will take steps to impact her/his health status if s/he believes that s/he is: susceptible to the disease; the disease is severe; action would reduce susceptibility; benefits of the action outweighs risks; and, the action is easy to complete. In this cross-sectional study, 5,589 undergraduate students from two universities in Scranton, Pennsylvania were asked to participate in an online survey to examine influenza vaccine uptake rate, knowledge, risk of disease, and benefit of immunization. From an initial 827 students (14.8%) whom responded to the survey, 226 (27.3%) were excluded from the analysis. From the remaining 601 participants, 229 (38.1%) reported receiving the seasonal influenza vaccine during the 2013-2014 influenza season. Results of the analysis generated a logistic regression model that found only perceived benefit to be a significant ($p < .001$) predictor of vaccination in 79.6% of the cases, but vaccination was 3.01 times more likely for every point increase in perceived vaccine benefit score. Additional logistic regression analysis found that living arrangement, age, and degree major also predicted vaccination status at $p < .05$ level in 62.4% of cases. Results suggest vaccine uptake among college students may be increased if barriers are reduced and health benefits of immunization are communicated.

Keywords: Influenza, vaccine uptake rate, college students, predictors of behavior

Chapter 1: Introduction

Influenza is a respiratory disease that can affect the general population including healthy college-age students who tend to experience high morbidity from influenza and influenza-like illnesses (Carrat et al., 2008). Currently there is limited scientific research that describes the seasonal influenza vaccination uptake rate and influenza vaccine perceptions of college students aged 18 to 24 years. A healthy individual can develop clinical influenza once the virus is introduced into his/her respiratory tract via contact with saliva or other respiratory secretions from an infected individual (Carrat et al., 2008). Once an individual is infected, the influenza virus will attach itself to, and replicate within, the epithelial cells of the upper and lower respiratory tract (Carrat et al., 2008). The process of virus replication causes damage to the respiratory tract lining resulting in symptoms of fever, coughing, and general weakness in the infected individual (Carrat et al., 2008). In the United States, influenza disease virulence can vary greatly from year to year with 5 – 20% of residents contracting the flu virus in any given year (Seasonal flu, 2014).

Research has suggested that university outbreaks of influenza and influenza-like illnesses can be severe with the highest incidence rate affecting nearly half of the campus' student population in a given year (Poehling, Blocker, Ip, Peters, & Wolfson, 2012). It has also been reported that unvaccinated college students tend to experience high morbidity from influenza and influenza-like illnesses, up to eight days or more of illness associated with an increase in health care use, school absenteeism, and lower academic performance (Nichol et al., 2010). It is possible that the high morbidity rates experienced on college campuses can be reduced by a higher rate of inoculation with the influenza vaccine prior to an outbreak (Nichol et al., 2010). Although influenza vaccine acceptance rate among adults 18 years of age and older is on an upward trend (28.0% to 36.2% between 2007 and 2011), the rate is nowhere near the goal of 80% compliance set by the United States Department of Health and Human Services (USDHHS) (Annuziata, Rak, Buono, DiBonaventura, and Krishnarajah, 2012; Immunization and infectious disease objective IID-12.5, 2013). Increasing the uptake rate of seasonal influenza vaccination among college-age students will contribute to the 80% compliance goal of the USDHHS and protect this population from a preventable illness that can negatively impact their academic performance.

In general, researchers agree that vaccinations have reduced substantially human disease, permanent injuries, and deaths worldwide (Andre et al., 2008). Vaccine utilization controls disease through eradication and local elimination of the disease, protects the unvaccinated population from the spread of disease through herd immunity, and prevents other diseases (e.g., pneumonia) that proliferate in sickly populations from spreading (Andre et al., 2008). Furthermore, there are many societal benefits to vaccine utilizations including the seasonal influenza vaccine, such as: health care savings; increased life expectancy; enhanced ability for society members to travel with protection from vaccine preventable diseases; and, continued stimulus into the economy (Andre et al., 2008).

Similar to other vaccines, the seasonal influenza vaccine is the purposeful introduction of a dead or attenuated form of a disease-causing pathogen into a person to generate an immune response that will protect the individual in the event that s/he came in contact with a live form of the pathogen later on (Murphy, Travers, & Walport, 2007).

This type of medical technology began in the late 18th century when Edward Jenner, a scientist, observed that milkmaids who had previously recovered from a mild disease of cowpox, were protected against the much deadlier disease small pox (Murphy et al., 2007). Since then, vaccines have played an important role in society's medical history and have been instrumental in preventing millions of people from contracting harmful and deadly diseases (Murphy et al., 2007). The practice of immunizing individuals against certain diseases early in life to prevent adulthood diseases, such as small pox and polio, is now routine preventative practice.

More effective university policies that promote seasonal influenza vaccination among students will assist the USDHHS in reaching its goal of 80% seasonal influenza vaccination compliance among healthy adults (Immunization and infectious disease objective IID-12.5, 2013). This research study was designed to investigate the uptake rate of the seasonal influenza vaccine and the factors that influence that rate among undergraduate college students 18 to 24 years of age in Scranton, Pennsylvania (PA). The overall goal of this study was to provide new research information to universities and colleges that may shape campus policies and immunization programs to increase the uptake rate of the seasonal influenza vaccine among students and reduce the incidence of season influenza on campuses.

Statement of the Problem

Research related to the seasonal influenza vaccination uptake rate and predictors of influenza immunization among undergraduate college students aged 18 to 24 years is limited. Researchers have documented outbreaks of influenza on college campuses where prevalence of influenza-like illness ranged from 9 – 48% among students (Guh et al., 2011; Iulliano et al., 2009; Nichol, D'Heilly, & Ehlinger, 2005; Poehling et al., 2012). Although hospitalization of adults with influenza is low among healthy individuals 5 to 49 years of age, there is still a great burden for outpatient care attributed to influenza disease (Poehling et al., 2012). The burden of outpatient treatment coupled with the potential for a high incidence rate of influenza-like illness among college students requires campus administrators to promote the immunization of students with the seasonal influenza vaccine. The lack of research of predictors of influenza vaccine uptake rate among college students has led to ineffective policy creation at universities as indicated by documented uptake rates less than half of the USDHHS goal of 80% compliance.

Purpose of the Study

The purpose of this cross-sectional quantitative study was to determine the perceptions of seasonal influenza vaccination among college students aged 18 to 24 years at two universities located in Scranton, PA. The research attempted to determine the predictors of the seasonal influenza vaccination uptake rate among students related to their: knowledge about the influenza vaccine and disease; perceived risks of contracting influenza disease; and, perceived benefits of the influenza vaccine. Additionally, this study intended to identify the perceived barriers reported by college-aged students that did not receive the influenza vaccine. The dependent variable for the study was the seasonal influenza immunization status of undergraduate college students aged 18 to 24 years enrolled full-time (12 or more credits) at two four-year institutions located in Scranton, PA: Marywood University and the University of Scranton. The independent variables included: the self-reported indicators of knowledge about the influenza vaccine and disease; perceived risks of contracting influenza disease; and, perceived benefits of receiving the influenza vaccine.

Theoretical Framework in Health Promotion

The theoretical framework for this study was based upon the Health Belief Model (HBM), which stipulates that an individual's perception of the threat of a health problem and the appraisal of recommended behaviors for preventing or managing the problem determines personal action (McKenzie, Neiger, & Thackeray, 2009). There are five concepts included in the HBM: perceived susceptibility; perceived severity; perceived benefits; cue to action; and, self-efficacy (McKenzie et al., 2009). The HBM predicts that a person will take steps to impact their health status if s/he believe that: s/he is susceptible to the condition and will be exposed; the condition has severe consequences; taking action would reduce his or her susceptibility to the disease; any benefit of taking action far outweigh the cost of action; and, s/he is confident that s/he will be able to perform the action successfully. Researchers use the concepts within the HBM to better describe an individual’s behavior, which in turn can be used to develop policies that influence health decisions through more meaningful interventions.

Based on the HBM it was theorized for this study that a greater than 80% uptake rate of the seasonal influenza vaccine will not occur in college students at Marywood University and the University of Scranton because the perceived barriers will exceed the perceived benefits. For example, a student may conclude that the influenza vaccine only works for a few strains of the influenza virus, so there is still the chance that s\he will get the flu. Additionally, a student may justify not getting the seasonal influenza immunization based on misinformation such as that the vaccine causes disease. In this example, the student refused immunization, because the benefits of being immunized were too low to overcome the perceived barrier, i.e. only protecting against a few strains or the vaccine potentially causing disease.

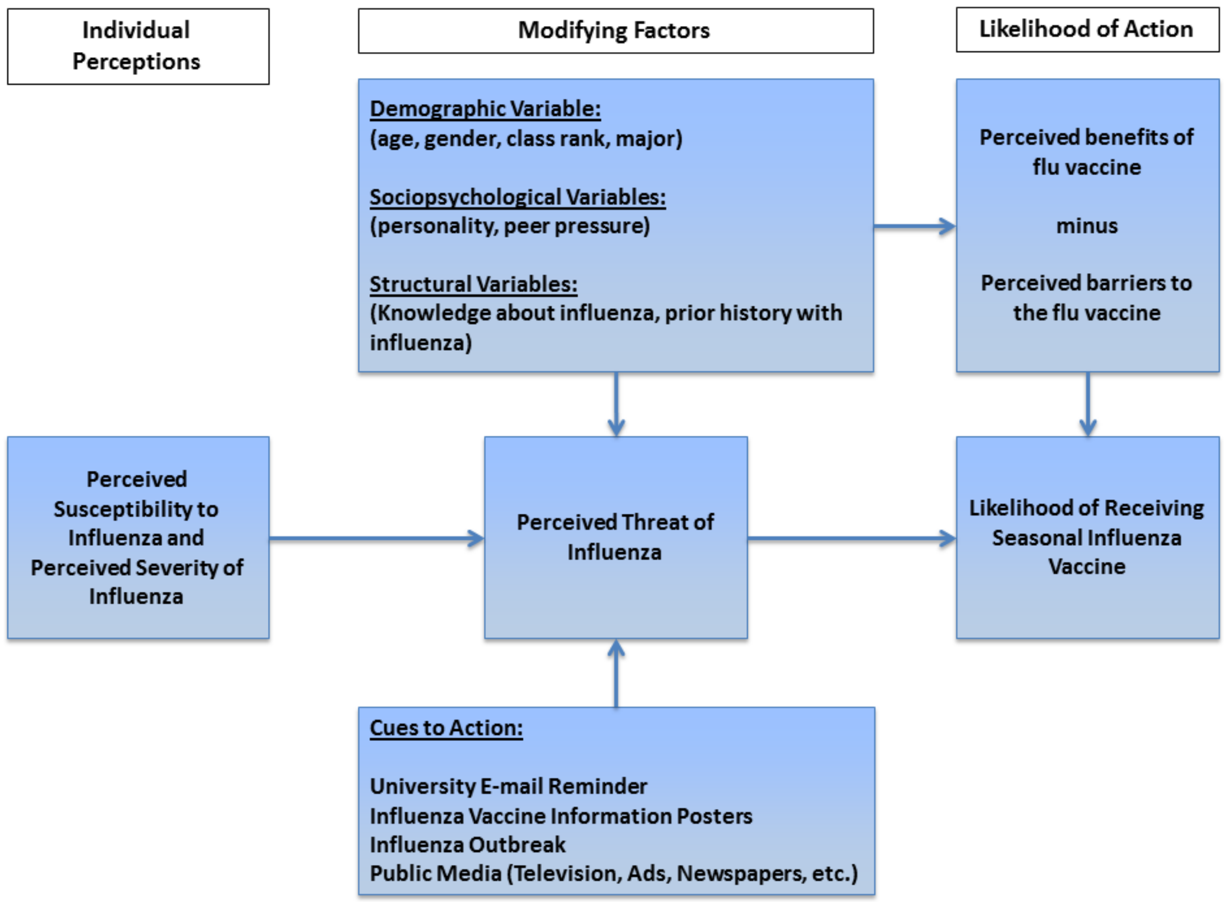

Figure 1.1. Diagram of the Health Belief Model as it relates to seasonal influenza vaccine uptake rate in college-age students in a four-year undergraduate program.

Therefore, aligned with the HBM, this research study: described the 2013-2014 seasonal influenza vaccine uptake rate among full-time college-aged students at two universities located in Scranton, PA to compare to the goal set by USDHHS; examined if: knowledge of influenza disease and vaccine; perceived risk of disease; and, perceived benefit of immunization are predictors of vaccination; and described barriers reported by the unvaccinated study population.

Research Questions

This study had two main research questions, with three sub-questions related to the first research question.

Question 1

Are knowledge, perceived risk, and perceived benefit valid predictors that influence the seasonal influenza vaccine uptake rate among full-time undergraduate college students aged 18 to 24 years at two universities in Scranton, PA?

Sub-question 1. Is there a significant difference between the participants' knowledge of influenza disease and / or the participants' knowledge of the influenza vaccine and the influenza vaccine uptake rate among the students?

Sub-question 2. Is there a significant statistical difference between the perceived risk of contracting influenza disease and the influenza vaccine uptake rate among the students?

Sub-question 3. Is there a significant statistical difference between the perceived benefits of receiving the influenza vaccine and the influenza vaccine uptake rate among the students?

Question 2

What are the reported barriers to receiving the influenza vaccination among students who did not receive the vaccination?

Hypotheses

Null hypothesis 1 (H_o)

Knowledge, perceived risk, and perceived benefit are not valid predictors that influence the seasonal influenza vaccine uptake rate among the students.

Alternative Hypothesis 1 (H_1)

Knowledge, perceived risk, and perceived benefit are valid predictors that influence the seasonal influenza vaccine uptake rate among the students.

Null hypothesis 2 (H_o)

There is no significant difference between the participants' knowledge of influenza disease and / or the participants' knowledge of the influenza vaccine and the influenza vaccine uptake rate among the students.

Alternative Hypothesis 2 (H_1)

There is a significant difference between the participants' knowledge of influenza disease and / or the participants' knowledge of the influenza vaccine and the influenza vaccine uptake rate among the students.

Null hypothesis 3 (H_o)

There is no significant difference between the perceived risk of contracting influenza disease and the influenza vaccine uptake rate among the students.

Alternative Hypothesis 3 (H_1)

There is a significant difference between the perceived risk of contracting influenza disease and the influenza vaccine uptake rate among the students.

Null hypothesis 4 (H_o)

There is no significant difference between the perceived benefits of receiving the influenza vaccine and the influenza vaccine uptake rate among the students.

Alternative Hypothesis 4 (H_1)

There is a significant difference between the perceived benefits of receiving the influenza vaccine and the influenza vaccine uptake rate among the students.

Definition of Terms

"Year" Status

The "year" status of an undergraduate student is freshman, sophomore, junior, or senior and is based on the number of credit hours earned toward a bachelor's degree in any major field of study. A freshman is any college student who has earned less than 30.0 credit hours, a sophomore is a student who has earned between 30.0 and 59.0 credit hours, a junior is a student who has earned between 60.0 and 89.0 credit hours, and a senior is a student who has earned 90.0 or more credit hours.

College Student

A male or female individual between the age of 18 and 24 years old as of July 1, 2013 enrolled full-time (a minimum of 12.0 credit hours) in an undergraduate degree granting institution within either of two Scranton, PA universities during the 2014 – 2015 academic semester.

Knowledge

The understanding of influenza disease and the seasonal influenza vaccine by the participant in this study is the operational definition of knowledge.

Major of Study

The main focus of study for a college student is one of the following categories: science, health professional, humanities, psychology, business, or education. However, an optional "other" category will be provided for any major of study not included.

Perceived Benefit

The belief of the participant that the seasonal influenza vaccine provides more benefit when received by an individual than when not received.

Perceived Risk (Disease)

The belief of the participant that contracting influenza disease would be more harmful than receiving the influenza vaccine as a preventative measure.

Perceived Risk (Vaccine)

The belief of the participant that the seasonal influenza vaccine causes more harm when given to an individual than when not given.

Perceived Barrier

The belief of the participant that becoming immunized with the seasonal influenza vaccine is difficult due to individual concerns or environmental factors.

Seasonal Influenza Vaccine

Any influenza vaccine formulation recommended by the World Health Organization for the Northern Hemisphere in February 2013 that consists of one or more of the following strains (World Health Organization, 2013):

- A/California/7/2009 (H1N1)pdm09-like virus (Trivalent and Quadrivalent formulation)
- A(H3N2) virus antigenically like the cell-propagated prototype virus A/Victoria/361/2011 (Trivalent and Quadrivalent formulation)
- B/Massachusetts/2/2012-like virus (Trivalent and Quadrivalent formulation)
- B/Brisbane/60/2008-like virus (Quadrivalent formulation only)

Vaccination

Friis and Sellers (2009) define vaccination as a "Procedure in which a vaccine (a preparation that contains a killed or weakened pathogen) is introduced into the body to invoke an immune response against a disease-causing microbe such as a virus or bacterium."

Vaccine Uptake Rate

The number of college students that received the seasonal influenza vaccine divided by the total number of college students within the surveyed institution expressed as a percentage.

Delimitations

This study had several identifiable delimitations. First, participants of this research study only consisted of undergraduate students enrolled full-time at two universities located in Scranton, PA. College students outside of these two schools enrolled part-time, i.e. less than 12.0 credits, and those obtaining a graduate degree were excluded. Second, this research study only used data received from respondents via an electronic survey, which may have excluded any college student who does not regularly check his or her e-mail. Finally, this research population includes only male and female individuals between the ages of 18 and 24 years old as of July 1, 2013. Students under the age of 18 years old as of July 1, 2013 and students older than 24 years old as of July 1, 2013 were excluded. Therefore, results from this study will not be generalizable to the greater population.

Limitations

This research study had four identifiable limitations. First, this quantitative study used self-reported data that was not independently verified. Second, this quantitative study used data from college students enrolled at two universities in Scranton, PA and therefore did not produce results generalizable to the national adult population. Third, college students are representative of individuals who are currently seeking higher education, so the population for this study does not include individuals outside of the college setting. Fourth, this study only used data from a single influenza season and differences between vaccine formulations and other factors associated with alternate influenza seasons were not examined.

Assumptions

This study was framed by certain assumptions. First, it was assumed that each participant's response to the survey was an honest and accurate report of his or her demographic characteristics, thoughts about the seasonal influenza vaccine, and whether or not s/he has received the vaccine. It was also assumed that the students surveyed had basic knowledge of the seasonal influenza vaccine. The researcher also assumed that college students had an opinion about the safety, effectiveness, and cost of seasonal influenza vaccine. Research regarding influenza vaccine attitudes and beliefs as predictors of vaccine uptake rate outside of the college setting was used as a basis for this research study, and it was assumed that it was generalizable to the college student.

Chapter 2: Review of the Literature

Disease outbreak on a close contact college campus should be a very serious concern for school administrators and finding ways to reduce the chance of outbreak through disease prophylactics or effective school policies can reduce the spread of the disease across a campus community. College students tend to experience high morbidity from influenza and influenza-like illness and tend to experience up to eight days or more of illness (Nichol et al., 2010). Outbreaks of influenza and influenza-like illness have been severe with an incidence as high as 48% in a given academic year (Poehling et al., 2012). Students infected with influenza experience an increase in health care use, absenteeism, and lower academic performance. This impact could be reduced through an increase in influenza vaccine uptake rate among college-age students (Nichol et al., 2010).

This research study was informed through a comprehensive review of the literature. This review will: explain the theory on health behavior being applied to the study; define a vaccine and provided general vaccine licensure information; review seasonal influenza vaccine clinical trial information; describe influenza disease among college students; overview the current uptake rate of the seasonal influenza vaccine among college students; and, outline barriers to seasonal influenza vaccination commonly cited.

Theoretical Basis for Study

As mentioned in Chapter One, the theoretical framework for this study was based on the health promotional theory the HBM. Researchers have used the HBM in similar influenza vaccine studies, specifically one designed to assess individuals' perceptions of severity, risk, and susceptibility to a novel influenza virus, vaccine benefits and barriers, and cues to action (Coe, Gatewood, Moczygemba, Goode, & Beckner, 2012). Coe Gatewood, Moczygemba, Goode, and Beckner (2012) used the HBM as the theoretical framework for a cross-sectional study targeting college students 18 to 24 years of age (n=664). Another research study aimed at determining the factors affecting a college student's intention to be vaccinated against A/H1N1 Influenza strain used the HBM as the theoretical framework (Teitler-Regev, Shahrabani, & Benzion, 2011). The results of this study fit within three of the HBM categories: perceived susceptibility; perceived severity; and, barriers to action (Teitler-Regev et al., 2011). These research studies and the intended design and purpose of this study make the HBM the best choice of all health promotion theories for framing the research questions and interpreting the results obtained.

Working Definition of a Vaccine

This study at its core focused on a college student's uptake rate, knowledge, and perceptions of the seasonal influenza vaccine. Therefore, providing a working definition of a vaccine is crucial for developing relevant study instrument questions and interpreting results of this study. Murphy et al. (2007) stated that a vaccination is the purposeful introduction of a dead or attenuated form of a disease causing pathogen into a person to generate an immune response that will protect the individual in the event s/he came in contact with a live form of the pathogen. In general, vaccines can be considered either a *single component vaccine* (one dead or attenuated pathogenic agent), or a *combination vaccine* (two or more dead or attenuated pathogenic agents for one or more diseases), (Murphy et al., 2007'). The seasonal influenza vaccine specifically is defined as a vaccine against influenza that typically contains a mixture of strains of influenza virus cultured in chick embryos (Influenza Vaccine, 2014). The vaccine can be injectable and contain formaldehyde-inactivated influenza viruses, or is delivered as a nasal spray and contain live attenuated influenza viruses (Influenza Vaccine, 2014).

Vaccines are designed to be effective prophylactics of disease, and the seasonal influenza vaccine is not an exception. Unfortunately there will always be health risks (pain at the injection site, rash, and fever) associated with vaccination that may overshadow the intended health benefit of disease prevention (Caniza et al., 2012). A primary goal of the pharmaceutical industry is to minimize these risks before the product can be licensed for public use (Campos-Outcalt, 2009). Pharmaceutical companies that manufacture vaccines, including the seasonal influenza vaccine, must demonstrate their safety and effectiveness in preventing the target disease in the focus population before approval by the Food and Drug Administration (FDA) via a defined licensure process (Andre et al., 2008). Understanding how vaccines like the seasonal influenza vaccine are licensed ensures that the ultimate goal of this research study (provide information to increase influenza vaccine compliance among college students) is a worthwhile goal.

Vaccine Licensure

In the United States, any vaccine product to be used for human treatment must be approved by the FDA via an extensive application and approval process that can take up to 10 years (Philipson & Sun, 2008). The information that the FDA will use in order to grant or deny a vaccine licensure comes from clinical trials performed by the manufacturer of the product (Philipson & Sun, 2008). Vaccine clinical trials are typically designed to evaluate the safety and immunogenicity (effectiveness) of a vaccine product to ensure health risks to a patient are minimized (Philipson & Sun, 2008). Although these vaccine clinical trials can be considered a risky experiment with potentially lethal consequences, years of research and development are intended to lessen the chance of problems over the lifetime of the vaccine (Sammons, 2009). Once the FDA has reviewed all data provided by the vaccine manufacturer, a decision will be made to approve or deny the product to be licensed for use in the general population (Philipson & Sun, 2008). If the FDA concludes that the safety and immunogenicity data generated are sufficient to ensure public safety, then licensure is granted and the vaccine manufacturer can begin to promote its product for use in the medical community (Philipson & Sun, 2008). The licensure process for biologics (like vaccines) and other drugs helps to provide documented oversight of pharmaceutical companies' development and testing of very profitable products, so the intended benefits of these products outweigh the risk for the patient. Mandatory clinical trials designed to measure safety (level of risk) and effectiveness (level of benefit) is the mechanism used to provide information during the licensure process. A review of clinical trials specifically designed to test both of these attributes can help to separate facts from misconceptions.

Seasonal Influenza Vaccine Safety and Effectiveness

Review of current literature indicates that safety and efficacy (i.e. effectiveness) vaccine clinical trials most relevant to this research study population of college students 18 to 24 years old encompass healthy adult populations 18 to 49 years old. No college student specific vaccine clinical trial was identified, since members of this population are considered healthy adults.

A double-blind, placebo-controlled, phase three clinical trial within the United States designed to test the efficacy, safety and immunogenicity of a vero-cell-culture derived trivalent influenza vaccine analyzed 7,236 participants (n = 3,619 for vaccine and n = 3,617 for placebo) (Barrett et al., 2011). The study recruited participants 18 to 49 years, which resulted in a vaccine group with a median age of 31 years and a placebo group with a median age of 30 years. The overall efficacy for this cell-culture based vaccine was nearly 79% (Barrett et al., 2011). This vaccine was also well received with no treatment-related serious adverse events (Barrett et al., 2011). Any adverse events reported were mild (Barrett et al., 2011). The protection of this vero-cell-culture based trivalent influenza vaccine was similar to the protection of the traditional egg-based seasonal influenza vaccine (Barrett et al., 2011). This particular study found a cell-based seasonal influenza vaccine to be both safe and effective when compared to the traditional seasonal influenza vaccine.

Another study by Belsh et al. (2007) examined the immunogenicity of the seasonal influenza vaccine by comparing the most common routes of vaccine administration, either intradermal (ID) or intramuscular (IM). The antibody response of participants (N = 209) with a mean age of 30 years was similar regardless of the route of administration or the dosage used (Belsh et al., 2007). However, the local inflammatory response was more severe in the intradermal vaccine when compared to the intramuscular vaccine showing evidence of strong effect of route (ID vs. IM) after being adjusted for antigen dosage; $p < .001$ by an exact test of association between route and moderate or greater maximum severity (Belsh et al., 2007). This result of a similar immunogenic response regardless of administration route was found in other research studies as well (Frenck et al., 2011).

A study by Frenck et al. (2011) attempted to determine if reduced doses of trivalent inactivated seasonal influenza vaccine administered via the intradermal route generated a similar immune response and safety profile to the conventional intramuscular route administered trivalent inactivated seasonal influenza vaccine. These researchers concluded that reduced doses of the trivalent inactivated seasonal influenza vaccine administered by the intradermal route produced comparable results to that of the conventional intramuscular route administered trivalent inactivated seasonal influenza vaccine (Fenck et al., 2011). Greater than 97% of participants (*N* = 1,592) had a post-vaccination haemagglutinin inhibition geometric mean titer (HAI GMT) of ≥ 1:40 for all four strains (Frenck et al., 2011). Similar to the conclusion of the Belsh et al. (2007) study, this study found that the adverse reaction for localized swelling was higher for the intradermally administered vaccine when compared to the intramuscularly given vaccine with up to 87% of participants that received the intradermal vaccine (348/400) reporting adverse reactions at the injection site versus 52% (206/398) for the intramuscular administered vaccine group (Frenck et al., 2011).

Although side effects of the seasonal vaccine can be considered mild for college students, efficacy can vary with the types of seasonal influenza vaccines, such as live-attenuated or inactivated. The meta-analysis of 30 controlled trials was performed in an attempt to estimate the efficacy of seasonal influenza vaccination in both children and non-elderly adults (DiazGranados, Denis, & Plotkin, 2012). Inactivated seasonal influenza vaccines performed better in non-elderly adults than a live-attenuated seasonal influenza vaccine did; 59% versus 39% based on this systematic review with a total of 101 analyses and 88,468 participants (DiazGranados et al., 2012). Overall, influenza vaccines are efficacious, resulting in 55% to 78% of participants receiving immunogenic benefit from vaccination, but estimates are dependent on several variables including: vaccine type; age of patient; match between wild type strains and vaccine strains; influenza type; and, methods of case ascertainment (DiazGranados et al., 2012).

The summation of results for the aforementioned safety and efficacy clinical trials points to the seasonal influenza vaccination being highly effective (beneficial) and very safe (low risk) for college students aged 18 to 24 years. Therefore, promotion of seasonal influenza vaccine uptake rate among this population is a worthwhile endeavor.

Influenza and Influenza-Like Illness Among College Students

Influenza-like illness and its negative impact on students of a university is the motivators for performing this research study. Several studies found in the literature review emphasized this negative impact. One such study by Nasi, Bosse, and Hayney (2009) pointed out the importance of influenza vaccination among college students because this population tends to have a decreased immune function compared to other healthy adults due to life style changes that occur during college years. College students tend to have poorer nutrition, less sleep, and increased stress from coursework demands (Nasi, Bosse, & Hayney, 2009). Nasi et al. (2009) recommend that pharmacists work with students and college health services to increase the rate of influenza immunization among college students. The unique environment of college students makes seasonal influenza vaccine promotion that much more important compared to other adults.

A study by Mullins et al. (2011) evaluated university students (*N* = 60) with influenza-like illness (ILL) to determine if symptom severity, duration, or missed days of school varied according to cause of illness. Students reporting illness to a university health clinic completed a baseline survey and were tested for influenza virus infection; 85% of the 60 respondents completed a follow-up survey (Mullins et al., 2011). Students were tested for influenza virus via viral culture, polymerase chain reaction, and respiratory virus immunofluorescence assay to assure proper identification of illness cause (Mullins et al., 2011). Viral testing confirmed that 63% of students (*N* = 38) were infected with influenza virus (Mullins et al., 2011). However, there was no difference in the severity of symptoms, duration of illness, and amount of time missed from school or work for students infected with the influenza virus and students infected with some other pathogen causing influenza-like illness (Mullins et al., 2011). Although the sample size of the Mullins et al. (2011) study was small, it demonstrated that the influenza virus causes most cases of influenza-like illness. Therefore, preventing the influenza infection through prophylactic methods such as the influenza vaccine can limit most of the negative consequences of influenza-like illness.

Another study aimed to determine how much of a negative impact influenza-like illness has on college students. A cohort study was performed to study the impact of colds and influenza-like illness on university students (Nichol et al., 2005). A baseline survey was provided to 4,919 volunteers in October 2002, with 3,249 of those volunteers completing all follow-up monthly surveys from November 2002 through April 2003 (Nichol et al., 2005). Information about colds and influenza-like illness was obtained via online surveys about types of illness, missed school days, and self-reported performance on school assignments impacted by illness (Nichol et al., 2005). Ninety-one percent of participants (*N* = 3,249) reported some type of upper respiratory illness, which resulted in 6,023 bed days, 4,263 missed school days, and 45,219 overall days of illness (Nichol et al., 2005). Nearly 30% of participants reported doing poorly on a test, and almost half (46.3%) reported doing poorly on an assignment (Nichol et al., 2005). The researchers concluded that colds and influenza-like illnesses were not only common, but also were associated with high morbidity among college students (Nichol et al., 2005).

Another ongoing serial cohort study has demonstrated that colds and influenza-like illnesses are commonplace among college students and are associated with high morbidity including school and work absences, lowered school performance, and significantly higher health care utilization (Nichol, D'Heilly, & Enlinger, 2006). This high morbidity can be reduced through influenza vaccination as indicated by current research. For example a study representing four influenza season cohorts (*N* = 12,795) was designed to determine the effectiveness of influenza immunization against influenza-like illness as well as the impact of influenza-like illness on health care usage and school performance among college students (Nichol, D'Heilly, & Ehlinger, 2008). Influenza vaccination was associated with a reduction in influenza-like illness (OR = 0.70, 95% CI, 0.56 - 0.89), which in turn required less health care usage, and better school performance (Nichol et al., 2008). Based on the Nichol et al. (2008) study, influenza vaccination helps to reduce the negative impact of influenza-like illness on a campus by reducing the prevalence of sick students.

For varied reasons, universities appear to be reluctant to require a student to get a flu vaccine, so universities should focus on campaigns to increase student awareness of the impact of acquiring influenza diseases and the benefit of getting the vaccine. This type of campaign would increase the amount of influenza vaccine uptake rate. The prevalence of influenza outbreaks at colleges and universities indicates that there is a some probability for college students to become ill from the influenza virus, which should make immunization among students more appealing.

Prevalence of Influenza Outbreaks at Colleges and Universities

Several research studies have documented influenza virus outbreaks and the factors associated with the spread of disease on college or university campuses. This was most evident during the various outbreaks of the pandemic Influenza A virus strain during the 2008-09 influenza season. One such outbreak of the novel pandemic influenza A H1N1 virus occurred after a social event at the U.S. Air Force Academy among their 1,376 basic cadet trainees (Witkop et al., 2009). The ill students tested positive for the H1N1 influenza A virus by real-time reverse transcriptase-polymerase chain reaction (Witkop et al., 2009). There were 134 confirmed case of influenza with an additional 33 suspected cases of the novel pandemic H1N1 infection between June and July 2009, an 11/100-infection rate (Witkop et al., 2009). Fever, cough, and a sore throat were the symptoms most commonly reported (Witkop et al., 2009).

A review of health records and the results from a survey assessing influenza-like illness of students, staff, and faculty at a large public university in Delaware was examined after a different pandemic influenza A (pH1N1) virus infection outbreak (Iuliano et al., 2009). Those records indicated a sharp increase in visits for influenza-like illness, with 1,080 visits for ILI of the 1,430 student visits recorded (Iuliano et al., 2009). Of the nearly 30,000 students, faculty and staff, 30% responded to the survey (n = 7450).

Influenza-like illness was reported by 604 students (10%) and 73 faculty / staff (5%), (Iuliano et al., 2009). Individuals that received the seasonal influenza vaccine were no more protected from the pandemic influenza strain than individuals that did not receive the influenza vaccine since the vaccine was not formulated for this particular serotype protection (Iuliano et al., 2009). This pandemic influenza strain (pH1N1) spread through the University of Delaware community quickly and caused a sharp and distinct rise in illness during a two-week period (Iuliano et al., 2009).

Another study by Guh et al. (2011) intended to investigate the same outbreak of the 2009 Pandemic Influenza A (H1N1) virus strain at public university in Delaware during the spring of 2009 in order to identify the factors associated with the transmission of the disease. A survey of 6,049 participants showed that 567 (9%) of respondents reported having influenza-like illness. Contact with a student whether studying with him/her or caring for him/her was a predictor for influenza-like illness with adjusted risk ratios of 1.29 (95% CI, 1.01 - 1.65) and 1.51 (95% CI, 1.14 – 2.01) respectively (Guh et al., 2011). The researchers recommended that self-protection measures should be promoted to help reduce the spread of the influenza virus and influenza-like illness (Guh et al., 2011).

Vaccination Uptake Rates Among College Students

Research also has been completed to describe the actual rates of influenza vaccine uptake rate among college students, as well as what factors predict acceptance of the seasonal influenza vaccine. The Merrill and Beard (2010) study found a self-reported influenza vaccination uptake rate of 20% (n = 37,041) for individuals aged 18 to 49 years. However, the influenza vaccination uptake rate may be lower than this estimate based on a cross-sectional study performed in 2007 that had a self-reported influenza immunization rate of 12% (n = 421) among students at Brigham Young University (Merrill et al., 2010). The following section will discuss some of these research studies.

A study at the University of Michigan focused on the immunization status of students to identify which factors predict the acceptance of the seasonal influenza vaccine. In this study, a group of resident students (N = 845) at the university completed a baseline survey regarding influenza disease prevention and immunization status along with demographic information (Uddin et al., 2010). Of the 845 eligible participants, information from 826 students indicated a 17.3% compliance rate (Uddin et al., 2010). A participant was more likely to receive the vaccine if his/her parents were college educated (OR 3.48, 95% CI 1.33 - 9.12), if they received the vaccine in the previous influenza season (OR 16.38, 95% CI 9.28 - 28.91), or if the student spoke to health professional about the risk of contracting influenza (OR 2.95, 95% CI 1.42 - 6.13), (Uddin et al., 2010). Uddin et al. (2010) found that the socio-economic status (SES) of students was significantly linked to vaccination status, but noted that the majority of students were considered high SES, i.e. having one or more parent with a college degree. Therefore, the researchers identified the potential for targeting low SES students as a means to increase influenza vaccine uptake rate among college students (Uddin et al., 2010).

Another study attempted to describe the vaccination rates among college students attending eight different universities in North Carolina (Poehling et al., 2012). During the Fall of 2009, 4,090 college students responded to a web-based survey regarding their seasonal influenza vaccination status along with demographics and other variables (campus activities, parental education, and e-mail usage), (Poehling et al., 2012). Among the eight universities, 14% to 30% of the students (*N* = 4,090) reported having received the seasonal influenza vaccine resulting in an overall 20% uptake rate (Poehling et al., 2012). Factors that predicted the rate included being a freshman attending a private university, having a college-educated parent, and participating in academic clubs/societies in a mixed effects statistical model (Poehling et al., 2012). The study by Poehling and colleagues is germane to this study in that it focused on seasonal influenza vaccine. However, studies related to pandemic influenza vaccination acceptance among college students can also provide great insight into what predictors the vaccination behavior of this population.

Shortly after the 2009 influenza A (H1N1) pandemic, 529 students were surveyed within a university vaccination clinic or on campus in an attempt to determine the student utilization of the vaccination clinic (Sunil & Zottarelli, 2011). Age and living in a residence hall were the two statistically significant demographic characteristics which indicated that older students and residents were more likely to receive the vaccine then students younger and those not living on campus (Sunil & Zottarelli, 2011). The probability of getting vaccinated was higher (1.77) if a student knew someone who had been sick from the H1N1 virus and was among students that had a family member or friend who received the vaccine (2.29), (Sunil & Zottarelli, 2011).

Another study surveyed future health care workers (students in pre-professional health care fields) at a medical college in the United Kingdom (Blank et al., 2010). A 23 question cross-sectional survey based on the HBM was designed to determine a student's vaccination status and assess his or her beliefs; perceived severity; perceived susceptibility; perceived barriers; and, perceived benefits (Blank et al., 2010).

Researchers received 519 usable responses, which equated to a high participation rate (94.4%), (Blank et al., 2010). Blank et al. (2010) reported the seasonal influenza vaccine uptake rate of the study population as 8.2% for the 2007-2008 season. Students were divided into a pre-clinical (students that had not had patient contact) and clinical (students with patient contact) for analysis (Blank et al., 2010). Students correctly identified knowledge about influenza mortality (77.2%), its complications (74.4%), and infectivity (94%); however this was not identified as a statistically significant predictor of vaccination status (Blank et al., 2010). Blank et al. (2010) concluded that despite good knowledge, unawareness of immunization eligibility and apathy toward vaccination contributed to a low vaccination uptake rate among these students.

Although the national influenza vaccine acceptance rate among adults 18 years of age and older is on an upward trend (28.0% to 36.2% between 2007 and 2011), the rate is nowhere near the goal of 80% compliance described in *Healthy People 2020* (Annuziata et al., 2012; Immunization and infectious disease objective IID-12.5, 2013). The reason for such a low acceptance rate of influenza vaccination among young adults may be that the perceived barriers of vaccination outweigh the perceived benefits.

Barriers to Vaccination Uptake Rates Among College Students

Represented in two online experiments, researchers investigated how information related to vaccine risk translated into vaccine uptake rate by using varied messages of risk (Betsch & Sachse, 2013). The results of this study (*n* = 115) suggested that messages of no risk lead to a higher perceived vaccination risk when compared to messages of some risk (Betsch & Sachse, 2013). Therefore, reducing the overall perception of risk can be more effective using moderate cautionary statements rather than strong statements of no risk (Betsch & Sachse, 2013).

Previous studies have suggested that college students are incapable of appropriately determining their risk level for contracting influenza and most likely will not seek an influenza vaccination on their own (Ramsey & Marczinski, 2011). A survey of undergraduates at Northern Kentucky University was conducted to assess the students' perceived risk of contracting H1N1 influenza and the students' opinions about the flu vaccine (Ramsey & Marczinski, 2011). Of the participants that responded to the survey (n = 514) less than 16% stated that they were planning to receive the H1N1 influenza vaccine (Ramsey & Marczinski, 2011). The main reasons reported for refusing the vaccination included the belief that the vaccine was unsafe or ineffective, concerns of side effects, and a general perception of good health with little risk of getting the H1N1 flu (Ramsey & Marczinski, 2011). The main reasons reported for accepting the vaccine included: a doctor's recommendation; having previously received the seasonal influenza vaccine; and, being at a higher risk of contracting influenza (Ramsey & Marczinski, 2011).

College students from a large mid-western university were invited to take an online survey intended to examine the reasons for low pandemic H1N1 vaccine acceptance among US college undergraduates (Ravert, Fu, & Zimet, 2012). Of 296 students, 15.2% reported having accepted the pandemic H1N1 influenza vaccine (Ravert et al., 2012). In this mixed methods study, students were more likely to accept the pandemic H1N1 vaccine if they reported previous seasonal influenza vaccination acceptance (OR 1.77, 95% CI 1.32 - 2.38, $p < .05$) and perceived the H1N1 vaccine was efficacious (OR 2.40, 95% CI 1.29 - 4.45, $p < .05$), (Ravert et al., 2012). Qualitative coding revealed that the concern for safety, severity of the disease, dislike of medical procedures, vaccine efficacy, and susceptibility to the H1N1 disease were the most common reasons cited when determining vaccine acceptance (Ravert et al., 2012).

A cross-sectional study survey of seven general education classes ranging in size from 30 to 200 students attempted to identify the prevalence of influenza vaccination and factors associated with the uptake rate of the vaccination among students at Brigham Young University (Merrill et al., 2010). Stepwise logistic regression used to assess statements as factors associated with influenza vaccine acceptance only found significance (MH chi-square (1) = 8.2, $p = 0.0042$) in students that stated the flu can be dangerous or fatal to them personally (Merrill et al., 2010). Students that reported not receiving the seasonal influenza vaccine showed the highest level of agreement (2.99) related to the vaccine being expensive, and the lowest level of agreement (2.38) related to the student not knowing where to get vaccinated (Merrill et al., 2010).

A study conducted by Shropshire, Brent-Hotchkiss, and Andrews (2013) attempted to detail the effectiveness of a mass media campaign in increasing college student influenza vaccine uptake rate. A survey was administered to 721 students at a large southern university between September 2011 and January 2012 to assess if the flu clinic's media campaign influenced the student's decision to be vaccinated (Shropshire, Brent-Hotchkiss, & Andrews, 2013). Self-reported results from 35% of surveyed participants ($N = 721$) indicated that the mass media campaign was a moderate to strong influence on the students' decision to vaccinate when the mass media campaign was accompanied by forms and other literature (Shropshire et al., 2013). This conclusion was not statistically tested meaning further research would be necessary to support this claim (Shropshire et al., 2013). Furthermore, there was a very noteworthy increase of 30% in influenza vaccine uptake rate in the Fall 2011 flu clinic (*N* = 889) over the previous year's flu clinic (*N* = 695) (Shropshire et al., 2013). The researches attributed this increase to the overall approach of the mass media campaign in 2011 over the "flyer's only" advertisement in the previous year (Shropshire et al., 2013).

Research has shown that the decision to be vaccinated is strongly related to emotional factors and is independent of objective criteria (Wroe, Turner, & Salkovskis, 2004). Emotional reactions associated with the perceived chance of encountering adverse side effects from a medicine or regret if a child gets the disease because of a decision not to vaccinate are examples of these emotional factors (Wroe et al., 2004). The research of Wroe et al. (2004) shows that omission bias, the view that a harmful action is worse than no action, plays a major role in the decision whether or not to immunize a child (Wroe et al., 2004). In the simplest terms, parents tend to weigh the risks of vaccinating versus risks of not vaccinating a child when ultimately deciding to immunize their child (Wroe et al., 2004). Although the Wroe et al. (2014) study involved parental decision-making, it highlights the importance that the emotions of an individual will have on determining immunization uptake. Some researchers agree with the conclusion that individuals (parents) can make decisions for emotional reasons over rational decisions (Weinstein et al., 2007).

Weinstein et al. (2007) surveyed students on a college campus (*n* = 428) in the months prior to the availability of the annual influenza vaccine, and again early the following year to assess uptake rate. The survey was designed to determine an individual's perceived risk of getting influenza; his or her perceived seriousness of the influenza disease; his or her level of anticipated regret if s/he did not get vaccinated; and, whether or not s/he believed there was a potential of getting influenza from the vaccine (Weinstein et al., 2007). The researchers found that the anticipation of regret if one does not become vaccinated and subsequently becomes ill proved to be a powerful predictor ($r = 0.45$, $p < .001$) of behavior (Weinstein et al., 2007). Additionally, it was noted that the belief influenza vaccines cause influenza was held by educated individuals, so practitioners must always be vigilant in debunking myths surrounding immunizations regardless of a patient's education level (Weinstein et al., 2007). Weinstein et al. (2007) suggests that a person's feelings about risk are better predictors of behavior than thoughts about risks and supports the findings of the Wroe et al. (2004) study. The Weinstein et al. (2007) study and the Wroe et al. (2004) study are relevant to this study and the determination of whether risk perceptions are predictors of vaccine compliance will be tested.

A study by Ali, Khakoo, Fisher, and Hobbs (2007) examined the proportion of health profession students immunized during a university influenza immunization campaign that offered free vaccinations. The researchers asked attendees to complete a survey during the campaign; 90% (1,348 / 1,498) responded. Of the study population, 721 (53%) medical and nursing students made up the majority (36% / 260 and 18% / 130). The proportion of immunizations to student population was 61% (260 / 424) for medical students and 22% (130 / 573) for nursing students. However, this study did not analyze the uptake rate of students since some students may have already been immunized outside the campaign.

A meta-analysis was conducted to examine the relationship between risk perceptions and behavior as reported in publications (Brewer et al., 2007). Nearly 16,000 studies were reviewed, but only 34 met the inclusion criteria for the meta-analysis (Brewer et al., 2007). Bivariate association between vaccination of adults and perceived likelihood, susceptibility, or severity was performed (Brewer et al., 2007). Vaccination behavior was found to be predicted by risk likelihood, susceptibility, and severity at the $p < .05$ level (Brewer et al., 2007). Brewer et al. (2007) concluded that risk perceptions should remain core concepts in health behavior theories.

An economic model for analyzing an individual's decision to be immunized against influenza has been developed, which can be applied to other pediatric vaccines (Shahrabani, Gafni, & Ben-Zion, 2008). This model uses a behavioral economic approach as a way to predict low rates of vaccination, but has proven unsuccessful due to other variables that lowered rates beyond the prediction (Shahrabani et al., 2008). Similar to the Wroe et al. (2004) study, the developers of this tool describe these variables as subjective and include worries about pain and the inconvenience of having to be vaccinated (Shahrabani et al., 2008). If researchers understand all factors affecting an individual's decision to be vaccinated, policy to prevent the burden of treatment costs and economic losses caused by the disease in society can be better designed (Shahrabani et al., 2008). Although vaccinations offered at a lower price to consumers help to increase immunization rates, they alone are not sufficient to convince individuals to be vaccinated if other barriers, such as inconvenience are high (Shahrabani et al., 2008). Economists recommend that efforts should be made to reduce all barriers to a level that is unaffected by cost as a means to increase vaccination rates (Shahrabani et al., 2008). This model is of potential value, but has not been proven to date.

In summary, the barriers to vaccination for some college students may include the belief that the seasonal influenza vaccine is expensive, unsafe, or ineffective (Ramsey & Marczinski, 2011; Ravert et al., 2012; Shahrabani et al., 2008). For other college students, a general perception of good health with little risk of getting the flu may deter them from seeking immunization (Ramsey & Marczinski, 2011). Shahrabani et al. (2008) found students reporting inconvenience of getting the vaccine as a barrier sufficient enough for them to be non-compliant with influenza immunization. However, if a college student felt that the flu disease can be dangerous or fatal to him or her personally, then this perception of risk could compel the student to becoming immunized (Merrill et al., 2010; Weinstein et al., 2007; Wroe et al., 2004). Some experts suggest that moderate cautionary statements about the influenza vaccine can persuade individuals to become vaccinated (Betsch & Sachse, 2013). However, the foremost reasons reported for accepting the seasonal influenza vaccine included a doctor's recommendation; previous receipts of the vaccine; being at higher risk for contracting influenza; and, the impact of pro-vaccination mass media campaigns (Ramsey & Marczinski, 2011; Shropshire et al., 2013).

This review described the theory on health behavior being applied to this research study; defined a vaccine; explained general vaccine licensure information; reviewed seasonal influenza vaccine clinical trial information; described influenza disease among college students; described the current acceptance of the seasonal influenza vaccine among college students; and, explained barriers to seasonal influenza vaccination commonly cited within publications. The results of this study outlined in Chapter One will be interpreted based on this review to determine the perceptions of seasonal flu vaccination among college students aged 18 – 24 years enrolled in two universities located in Scranton, PA. The potential for a high incidence rate of influenza-like illness among college students should mandate that administrators find innovative ways to encourage a higher rate of immunization of students with the seasonal influenza vaccine. The overall results from this study, interpreted based on this comprehensive literature review, will provide information useful for those administrators to enhance or incorporate new influenza immunization campaigns.

Chapter 3: Methodology

Research Design and Question

The purpose of this study was to investigate if a statistically significant relationship existed between influenza vaccine uptake rate and the participants' knowledge about the influenza vaccine and disease; perceived risk of contracting influenza disease; and, perceived benefits of the influenza vaccine of undergraduate college students aged 18 to 24 years currently enrolled at one of two four-year universities in Scranton, PA. This study also attempted to describe the barriers reported by the unvaccinated portion of the participants. This study utilized a cross-sectional design to collect data via an electronic survey administered through the secure survey Internet site *Survey Monkey*.

The dependent variable, influenza vaccine uptake rate, is a dichotomous variable that describes whether a participant has or has not received the seasonal influenza vaccine. The independent variables of this study include: the participants' knowledge about the influenza vaccine and disease; perceived risk of contracting influenza disease; and, perceived benefits of the influenza vaccine.

Sample

Information about the population for each university was obtained from the Integrated Postsecondary Education Data System (IPEDS) database provided by the United States Department of Education Institute of Education Sciences National Center for Education Statistics via http://nces.ed.gov/ipeds/. Data released in 2012 from IPEDS for Marywood University reports an undergraduate population of full-time students to be 2,107 (638 or 30.3% male and 1,469 or 69.7% female) with 90% of that population being

24 years of age or younger providing a potential participant pool of 1,896. The 2012 released data from IPEDS for the University of Scranton reports an undergraduate population of full-time students to be 3,847 (1,735 or 45.1% male and 2,112 or 54.9% female) with 96% of that population being 24 years of age or younger providing a potential participant pool of 3,693. Based on this information, the potential participant pool when combined from both universities is 5,589 (2,240 or 40.0% male and 3,349 or 60.0% female) undergraduate students enrolled full-time who are between 18 and 24 years of age.

Participants in this study included any male or female undergraduate college student between the age of 18 and 24 years as of July 1, 2013 attending either of the two higher education institutions (Marywood University or the University of Scranton) in Scranton, PA who reported being full-time (at least 12.0 credits) for either semester of 2014 – 2015 academic year that had fully completed the internet survey. Anyone who did not meet the criteria was excluded. Demographic data was collected to assess age, current university, class rank, and enrollment status to determine eligibility. Study participants were identified through the student directories of the universities. Permission to use the directory was obtained from the Vice President of Student Affairs at each of the participating universities (Appendix A and Appendix B). An approved electronic mail message was delivered to students identified as undergraduates based on the institution directory containing a web link to the electronic survey (Appendix C). All participants were presented with a participation letter summarizing the study, what they would be asked to do, and how they can opt out at any time (Appendix D). The web-based survey was sent during the Fall 2014 semester and was accessible to the participant pool for six weeks (42 consecutive days) controlled via the secure survey hosting website *Survey Monkey*. Follow-up e-mails to encourage participants to complete the survey were sent out at one and three week intervals for Marywood University students. A single follow-up e-mail reminder was sent out at three weeks for the University of Scranton students. The initial e-mail sent out to Marywood students garnered a low participation rate, so an adjustment was made to the e-mail subject read initially by students. This brought attention to a participation incentive, 15 $20.00 gift cards. The response rate improved, and only one e-mail reminder was sent after the adjustment. The procedure to collect data from participants was single-staged sampling. Participants that fit the inclusion criteria became part of the sample. The goal was to obtain an adequate sample of the total population (N = 5,589) with a confidence interval of +/- 5% and confidence level of 95%, which resulted in the sample size goal of 360 responses from both universities. A total population sample size of 601 respondents was achieved.

The Instrument

A 26-question survey was used to collect data on student demographics, knowledge, perceived risk of influenza disease, perceived benefit of immunization, vaccine uptake rate for the 2013-2014 influenza vaccine, and perceived barriers by the unvaccinated population. The instrument was modified from Merrill et al. (2010) and the CDC (Seasonal Influenza, 2013) to be applicable to the studied population. *Survey Monkey* was use to administer the internet-based survey to the student population at both universities via mass e-mail distribution.

The instrument included in Appendix E was developed for this study after a suitable instrument could not be identified in the literature. A review of the survey instrument was performed by an independent expert as documented in Appendix F.

The first section captured demographic information through prepopulated multiple-choice selections. Participants were asked their age as of July 1, 2013; their gender; the university they currently attend; how many credits they are enrolled in; their area of study; their class rank; their living situation; the education level of their parent(s); and, their ethnicity. The option for the participant to enter a major of study not listed was available and was categorized as "other" for data analysis. This section also asked if the participant had received information about the influenza vaccine or if s/he had been encouraged to receive the influenza vaccine in the past year from one of several sources. The information sources listed in this question were a personal physician or nurse, parents, student health center, advertisements, or peers and were modified from Merrill et al. (2010). The final question of the first section asked if the participant is allergic to the influenza vaccine or has another exclusionary medical condition.

The second section asked about the participant's general influenza disease and vaccine knowledge. This section asked the participant if s/he believed "Influenza is a respiratory virus" by selection yes, no, or not sure. The participant was then asked to determine if items on a list of symptoms are considered common for influenza via true and false selection. These first two questions were derived from the study done by Merrill et al. (2010). The final question of this section asked the participant to indicate whether statements are true or false about the influenza vaccine, developed from information contained from the Center for Disease Control's description of Seasonal Influenza misconceptions (Seasonal Influenza, 2013).

The third section asked the participant to evaluate a series of statement regarding his/her perceived risk of contracting influenza disease. Statements included: "if you do not get vaccinated, you will get the flu"; "the flu is a dangerous disease for a college student to have"; and, "the flu can severely disrupt your semester, and impact your grades" and were measured via a four-point Likert scale responses from strongly disagree to strongly agree.

The fourth section asked the participant to answer three multiple-choice questions regarding his/her perceived benefit of the influenza vaccine. The first question asked how often the participant has been vaccinated with the option of choosing annually, every few years, rarely, or never. The next two questions allowed the respondent to answer "yes", "no", or "I don't know" and asked if the participant felt the "flu vaccine is worth getting" and if s/he felt "the flu vaccine is effective in preventing the flu".

The fifth section asked if the participant had received the flu vaccine between July 1, 2013 and June 30, 2014. If the participant answered "yes", the next questions were from the sixth section. If the participant answered "no", the next questions were from the seventh section. If the participant answered, "I don't know", the survey was completed.

The sixth section inquired about information related to the influenza vaccination received by participants that reported receiving the influenza vaccine through prepopulated multiple-choice answers. Questions were asked about when the person received the vaccine, what type of vaccine (injection or spray), where the vaccine was administered, and if the participants specifically went to the administration site for the vaccine. The option for the participant to enter an alternate for the location where the vaccine was administered was available and was categorized upon data analysis depending on response.

The seventh and final section gathered information about participants that reported not having received the vaccine. This section provided a list of statements as potential reasons the participant did not get the flu vaccination, and asked the participant to provide a responded to each statement. The participant had the opportunity to rate each statement based on a four-point scale with the choices: Strongly Disagree; Disagree; Agree; and, Strongly Agree. The participant was asked to evaluate the following statements about the influenza vaccine that were derived from the Merrill et al. study (2010).

- Vaccines are too expensive for me right now
- I do not have time to get a flu vaccination
- I believe that as a result of the flu shot I may actually get the flu
- I do not know where to receive a flu vaccination
- I do not believe I am in danger of contracting the flu
- I believe that vaccines may have dangerous side effects
- I was not informed that flu vaccines might be important
- I do not believe the flu vaccine works to prevent the flu

A focus group was conducted to assess the readability and comprehension of the survey instrument used in this research study. During the first Summer 2014 semester at Marywood University, a pilot study was given to undergraduate students enrolled in the introduction to business course, *BUS123, Management and Career Options*. In this course there were seven undergraduate students (four females and three males) who were asked to read through the survey and point out any misunderstandings or hard to read questions. Readability and comprehension was determined to be adequate based on the feedback received (one typographical error in question 15 and all questions understood). It should be noted that a second pilot group was attempted; however the researcher was unable to coordinate with the course instructor in time before the actual study participant recruitment period began.

Data Collection Method

Undergraduate college students from Marywood University and the University of Scranton in Scranton, PA were invited to participate in a confidential, self-administered web-based survey during the Fall 2014 semester with access granted for a period of six weeks. An e-mail message was sent out to all undergraduate students during this time, with a link to the survey was hosted through *Survey Monkey*. The survey was designed to capture all responses based on the survey design in Appendix E.

The data from the survey was downloaded to the primary investigator's secure personal computer and entered into IBM SPSS statistical software for quantitative analysis. The data download and entry was handled and viewed only by the primary researcher and members of the research committee to ensure data security. All information contained within the dataset was stored on a removable flash drive and stored securely in a locked fireproof cabinet when not being analyzed to ensure confidentiality of the participants. Data was analyzed immediately following the collection period. All data will be destroyed electronically via electronic deletion after a period of three years from the last date of collection (October 23, 2017).

The materials required included a secure flash drive with a storage capacity sufficient to store the electronic file or files from the survey data (16 Giga-bytes), a subscription to *Survey Monkey* online survey tool, and access to the IBM SPSS statistical analysis software program. Access to the survey-hosting site "Surveymonkey.com" was required during the months of August, September, October, and November 2014 to allow adequate time to develop and administer the survey. Additionally, a temporary one-year licensed copy of IBM SPSS version 22.0 Grad Pack software installed on an appropriate computer system was necessary for analysis of data collected.

Data Analysis

The research questions outlined in Chapter One were examined by supporting or rejecting the associated hypotheses of this study using quantitative statistical data analysis. Logistical regression was performed to determine if the independent variables (knowledge, perceived risk of disease, or perceived benefit of vaccination) are predictors of the dependent variable (influenza vaccine uptake rate in undergraduate college students) in an attempt to answer research question one. Research sub-questions one and two were analyzed using an independent sample *t* test to test for differences between the independent variables (knowledge and perceived risk of disease) and the dependent variable (influenza vaccine uptake rate in undergraduate college students). Research sub-question three was analyzed using Mann-Whitney *U* test due to issues with normality that were unable to be transformed sufficiently. Further correlation analysis was done to determine if an expanded logistical regression was able to provide additional information. Scoring of the independent variables (knowledge, perceived risk of disease, perceived risk and benefit of vaccination, or perceived barriers) was based on the responses received.

A table regarding the scoring applied to the survey instrument can be found in Appendix G. The coding scheme applied to the dataset when entered into the statistical software can be found in Appendix H. The independent variable of knowledge was scored by valuating the correct answer to questions 13, 14, and 15 at one point each for a total of 20 points possible. The independent variable of risk of disease was scored by summating the responses to the three statements within question 16. A response of strongly agree was scored as four points, agree as three points, disagree as two points, and strongly disagree as one point. The higher the point total (12 points at the most) was equated to higher perception of risk. The independent variable of vaccination benefit and risk was scored by valuating the responses to questions 17, 18, 19, and 26. Question 17 had four possible responses (annually, every few years, rarely, and never) and was scored from zero to four respectively. Questions 18 and 19 had three possible responses (yes, no, or I don't know) and were scored as zero for yes or one for no or I don't know. The lower score (lowest possible is zero) equated to the highest perceived benefit of influenza vaccination.

Statistical Methodology

The overall study response was evaluated to determine which responses to exclude based on the criteria of this study. Responses were excluded from individuals that: were below 18 years of age or above 24 years of age; did not attend either university; were not full-time for at least one semester; were allergic to the vaccine; were not undergraduate students; had an unknown vaccination status; exited the survey early (incomplete response); and, had inconsistent responses that went against survey design (e.g., responses that went against survey logic flow). All analysis was performed with this study population (all responses less exclusions). The self-reported influenza vaccine uptake rate for the 2013-2014 season was calculated based on the number of participants that indicated being vaccinated compared to the study sample population expressed as a percentage. Descriptive statistics (frequency percentages) were used to represent information related to follow-up questions asked to individuals identifying themselves as having been immunized.

All participants were asked about their knowledge of influenza disease and the vaccine; their perceived risk of influenza disease; and, their perceived benefit of receiving the seasonal influenza immunization. Descriptive statistics (score minimum, score maximum, mean, and standard deviation) were calculated to evaluate the responses to each of these variables scored for analysis. Differences between the various demographic characteristics and the influenza vaccine uptake rate were examined using the Chi-Square test after the percentage of vaccine uptake rate was calculated for each group.

Forward logistic regression analysis was conducted on the study population to determine if knowledge, perceived risk, and perceived benefit are valid predictors. The significance of each predictor was tested with measure known as the ***Wald statistic*** using the associated significant value rather than a *t* test, as in multiple regression analysis (Merlter & Vannatta, 2010). Data screening was used to eliminate cases in which the Mahalanobis value exceeded the chi-square critical value based on degrees of freedom.

Multicollinearity was assessed to ensure tolerance of all variables (those exceeding 0.10) to ensure no impact on the analysis (Mertler & Vannatta, 2010).

To assess if there was a difference in each of the scored independent variables (knowledge, perceived risk, and perceived benefit) between those who were vaccinated and those who were unvaccinated, an independent samples *t* test was performed. For an independent samples *t* test to be performed, it is assumed that the sample distribution is normal and has homogeneity of variance (Mertler & Vannatta, 2010). Normality was assessed via a distribution histogram for the knowledge score. Homogeneity of variance was deemed acceptable based on the Levene's test for equality of variance showing a *p*-value > 0.05. An independent samples *t* test could not be used to assess if there was a difference in perceived benefit between those who were vaccinated and those who were unvaccinated after failure of normality or homogeneity of variance. A Mann-Whitney *U* test, the nonparametric equivalent of the independent samples *t* test was performed since there are no assumptions about the distribution of the sample and the dependent variable is nominal (Mertler & Vannatta, 2010).

Descriptive statistics (frequency percentages) were used to represent information related to follow-up questions asked to individuals identifying themselves as having not been immunized.

Additional statistical analysis (forward logistic regression) was performed to determine if demographic factors not specific to the research question could be used in a prediction model for student vaccination uptake rate. Transformation of variables was required to better fit a logistic regression analysis, by combining low frequency categories. Exact transformation will be discussed in the Supplemental Analysis section of Chapter Four. The significance of each predictor was tested with the *Wald statistic* using the associated significance value (Merlter & Vannatta, 2010). Data screening was used to eliminate cases in which the Mahalanobis value exceeds the chi-square critical value based on degrees of freedom. Multicollinearity was assessed to ensure that the tolerance of all variables exceeded 0.10, which indicated no impact on the analysis (Mertler & Vannatta, 2010). Forward logistic regression was conducted to determine which independent variables (age, gender, university affiliation, major of study, year at school, living status, parental education, and race) were predictors of student vaccination status (vaccinated or non-vaccinated). A second forward logistic regression was conducted to determine which independent variables within the knowledge score questions are predictors of student vaccination status (vaccinated or non-vaccinated). A third forward logistic regression was conducted to determine which independent variables within the risks of disease score questions are predictors of student vaccination status (vaccinated or non-vaccinated). A final forward logistic regression was conducted to determine which independent variables within the benefits of vaccine score questions are predictors of student vaccination status (vaccinated or non-vaccinated).

This research study was approved by the Exempt Review Committee of Marywood University and the Internal Review Board of the University of Scranton before any data was collected (Appendix I and Appendix J). The overall study was first proposed to and approved by a selected dissertation committee prior to submission to either institutional review board (Appendix K). All statistical analyses were performed using IBM SPSS version 22.0 with Grad Pack statistical software, and calculated using an alpha level set *a priori* at $p < 0.05$. Summarized exports of all statistical analyses presented in Chapter Four are provided in Appendix L.

Chapter 4: Results

This chapter will present the survey findings and the statistical analysis associated with the research questions from Chapter One. The study surveyed undergraduate students from two universities in Scranton, PA to determine what factors influenced student seasonal influenza immunization uptake rate. The purpose of this study was to determine if statistically significant differences were present between a respondent's vaccination status and his/her knowledge about the influenza vaccine and disease, perceived risks of contracting influenza disease, and perceived benefits of the influenza vaccine. Additionally, this study attempted to describe the perceived barriers reported by the college-aged students that did not receive the influenza vaccine. The results of this study can be used to develop more effective immunization campaigns at universities to help increase the seasonal influenza vaccination uptake rate among students and prevent the spread of the virus on college campuses.

This chapter is divided into three sections: Data Collection; Results; and, Summary. The data collection portion reviews details of the participant recruitment and survey distribution as well as the final sample demographics. The statistical analyses were performed using IBM SPSS Statistics (Version 22.0) and are explained and summarized within the results section. The summary section concludes this chapter with a synopsis of research questions and associated hypothesis; results of the statistical analysis; and, general findings.

Data Collection

Data was collected from Marywood University between September 3, 2014 and October 15, 2014 and from the University of Scranton between September 11, 2014 and

October 23, 2014. Approximately 5,589 students were invited to participate in the study; a total of 827 students responded for a response rate of 14.8%. One student entered the survey but did not answer a single question, and was therefore excluded from the response rate calculation. Upon review of the data collected, 226 respondents were excluded from the dataset for various reasons as presented in Table 4.1.

A total of 140 respondents were excluded for reporting an age of less than 17 years or greater than 24 years as of July 1, 2013. Among the remaining 687 respondents, another two reported they did not attend either university and seven reported as being enrolled part-time (less than 12.0 credits) for both the Fall 2014 and Spring 2015 semester. Another 10 respondents were excluded for reporting that they are unable to receive the influenza vaccine due to an allergy or other medical condition. Another 11 respondents were excluded for not fitting the undergraduate student requirement, reporting that they are considered graduate students. An additional 18 respondents were excluded after reporting they are unsure of their vaccination status during the 2013-2014 influenza season. A total of 37 respondents did not finish the survey indicating their intent to exit the study, and were therefore removed from the dataset. Finally, one respondent had inconsistent response data with information recorded for both the vaccine compliant and non-compliant portion of the survey. This should have been restricted from the logic function built within the survey that prohibited the answer of question 26 if a “yes” was recorded in question 20. A plausible explanation is that the respondent initially answered “no” to question 20, answered question 26, and then went back and changed his or her answer to “yes” for question 20 and answered the remaining question. After all exclusions were calculated, a total of 601 complete responses (10.8%) were used for the analysis presented in this chapter. There were no missing values for any one variable type. Since all questions were required to be completed, any missing value was considered the participant's intent to exit the survey and was therefore excluded.

Table 4.1

Response Rate and Exclusion Statistics

Item	Description	*N* Study Respondents
Initial Response		
	Enter Survey via e-mail hyperlink	828
	Did not answer any question	1
Less Exclusions		
	Age < 18 years old	133
	Age > 24 years old	7
	Does not attend Marywood or Scranton	2
	Not Full-time	7
	Allergic to vaccine or components	10
	5th year / Graduate students	11
	Vaccination status not known	18
	Incomplete responses	37
	Inconsistent response	1
Useable Dataset		
	Final total	601

Demographics and Sample Description

Demographic information for the student enrollment population of Marywood University and the University of Scranton are presented in Table 4.2. As explained in Chapter Three, the potential participant cohort from both universities was 5,589 (2,240 or 40% male and 3,349 or 60% female) undergraduate students enrolled full-time between 18 and 24 years of age. Furthermore, it was estimated that the population of Marywood was 30 % male and 70% female full-time undergraduate students and the University of Scranton cohort was 45% male and 55% female full-time undergraduate students. The

207 respondents from the Marywood population was: 37 (18%) males and 170 (82%) females. There were 394 respondents from the University of Scranton: 92 (23%) males and 302 (77%) females. The overall study population of 601 respondents included 129 males (21.5%) and 472 (78.5%) females. The study population had a mean age of 19.3 years.

Table 4.2

Demographic Characteristics of Study Population (N = 601) Separated by University

Characteristics	Marywood University	University of Scranton	*N* Study Respondents (%)
Age (Years)			
18	63	121	184 (30.6)
19	67	111	178 (29.6)
20	40	124	164 (27.3)
21	25	31	56 (9.3)
22	9	4	13 (2.2)
23	3	3	6 (1.0)
24	0	0	0 (0.0)
Gender			
Female	170	302	472 (78.5)
Male	37	92	129 (21.5)
Major			
Business	26	57	83 (13.8)
Education	18	12	30 (5.0)
Health Care	57	133	190 (31.6)
Humanities	24	19	43 (7.2)
Psychology	22	27	49 (8.2)
Science	19	110	129 (21.5)
Other - Varies	41	36	77 (12.8)
Class Year			
Freshman	19	29	48 (8.0)
Sophomore	51	83	134 (22.3)
Junior	77	126	203 (33.8)
Senior	60	156	216 (35.9)

Characteristics	Marywood University	University of Scranton	*N* Study Respondents (%)
Living			
Live on campus	103	244	347 (57.7)
Live with parents	52	52	104 (17.3)
Live off campus	52	98	150 (25.0)
Parental Education			
Never graduated high school	1	1	2 (0.3)
High School	43	48	91 (15.1)
Attended but never graduated college	21	39	60 (10.0)
Associate's / Technical degree	29	39	68 (11.3)
Bachelor's degree	65	141	206 (34.3)
Graduate degree	40	100	140 (23.3)
Professional / terminal degree	8	26	34 (5.7)
Ethnicity			
African American	2	3	5 (0.8)
Asian	6	20	26 (4.3)
Caucasian	181	335	516 (85.9)
Hispanic	9	13	22 (3.7)
Mixed Race	2	15	17 (2.8)
Prefer not to answer	7	8	15 (2.5)

Participants were asked if they received information regarding the seasonal influenza vaccine from several sources: doctor or nurse, parent, health center, media, or peers. The sources of the study population are presented in Table 4.3. Most study participants (67.2%) received information from media, while only 28.8% received information from peers.

Table 4.3

Identified Information Sources of Study Population (N = 601)

Information Source	*N* Study Respondents (%)
Doctor/Nurse	359 (59.7)
Parent	323 (53.7)
Health Center	278 (46.3)
Media	404 (67.2)

Information Source	*N* Study Respondents (%)
Peers	173 (28.8)

Results

The self-reported influenza vaccine uptake rate by the respondents for the 2013-2014 influenza season was 38.1%. The participants that responded "yes" (*n* = 229) were asked follow-up questions; the results of which are presented in Table 4.4. Most participants (90.4%) received the vaccine via an arm injection. Furthermore, a majority (67.2%) received the vaccination between October 2013 and December 2013. Nearly half (47.2%) were immunized at their personal physician's office, while a quarter (25.8%) received the immunization at a pharmacy. Finally, most respondents (78.6%) sought to be immunized, while 14.8% accepted the immunization in response to an offer from a health care provider while being treated for another reason.

Table 4.4

Vaccinated Population (N = 229) Data

Follow-up data obtained	*N* Study Respondents (%)
Date vaccinated	
Between July 2013 and September 2013	48 (21.0)
Between October 2013 and December 2013	154 (67.2)
Between January 2014 and March 2014	18 (7.9)
Between April 2014 and June 2014	9 (3.9)
Type	
Injectable	207 (90.4)
Spray, Drop, or Mist in the Nose	21 (9.2)
I Don't Know	1 (0.4)
Location	
City Clinic or Health Center (Not Affiliated with University)	8 (3.5)
Doctor's Office	108 (47.2)
Hospital	8 (3.5)

Follow-up data obtained	*N* Study Respondents (%)
Pharmacy	59 (25.8)
University Health Clinic	37 (16.2)
Work	7 (3.1)
Other (Home)	2 (0.8)
Reason for medical visit	
Get influenza vaccine	180 (78.6)
Offered while there for another reason	34 (14.8)
Asked for the vaccine while there for another reason	10 (4.4)
I Don't Know	5 (2.1)

All participants were asked about their knowledge of influenza disease and the vaccine; their perceived risk of influenza disease; and, their perceived benefit of receiving the seasonal influenza immunization. The responses to each of these variables were scored for analysis, descriptive statistics of which are displayed in Table 4.5. To assess participant knowledge about influenza disease and the influenza vaccine, respondents were asked to answer 20 knowledge questions. An overall score (0 – 20) was calculated. Analysis indicated a mean score of the 601 respondents of 16.2, an 80.2% (16.2 / 20) correct response rate by study participants. Scored responses to three questions to evaluate the participants' perceived risk of influenza spanned the full range of three to 12, with a mean score of 8.1 for the study population. Responses to three questions to evaluate the participants' perceived benefit of receiving the influenza vaccine asked about frequency of vaccination; usefulness of immunization; and, perceived effectiveness of the vaccine. Scores for perceived benefit of the vaccine also spanned the full range of zero to five, with a mean score of 2.8.

Differences between the various demographic characteristics and influenza vaccine uptake rate were examined using the chi-square test after the percentages of vaccine uptake rate was calculated for each group (Table 4.5). Age, university, gender, class year, parental education, and ethnicity were determined not to be significant factors in vaccine uptake rate. Chi-square analyses showed that major and living status however were significant factors in vaccine uptake rate. These factors will be analyzed in the ad hoc analysis portion of this chapter.

Table 4.5

Comparison of Demographic Characteristics to Influenza Vaccine Uptake Rate of Study Population (N = 601)

Demographic Characteristics	*N*	Vaccine Uptake Rate (%)	*p* value
Age (Years)			.093
18	184	37.0	
19	178	40.4	
20	164	43.3	
21	56	26.8	
22	13	15.4	
23	6	16.7	
24	0	0	
University			.063
Marywood University	207	32.9	
University of Scranton	394	40.9	
Gender			.153
Female	472	39.6	
Male	129	32.6	
Major**			.012
Business	83	27.7	
Education	30	40.0	
Health Care	190	48.4	
Humanities	43	27.9	
Psychology	49	30.6	
Science	129	38.8	
Other - Varies	77	28.6	
Class Year			.831
Freshman	48	35.4	

Demographic Characteristics	*N*	Vaccine Uptake Rate (%)	*p* value
Sophomore	134	35.8	
Junior	203	37.9	
Senior	216	40.3	
Living**			.010
Live on campus	347	42.9	
Live with parents	104	27.9	
Live off campus	150	34.0	
Parental Education			.073
Never graduated high school	2	0.0	
High School	91	29.7	
Attended but never graduated college	60	36.7	
Associate's / Technical degree	68	27.9	
Bachelor's degree	206	40.3	
Graduate degree	140	46.4	
Professional / terminal degree	34	38.2	
Ethnicity			.360
African American	5	0.0	
Asian	26	30.8	
Caucasian	516	38.6	
Hispanic	22	36.4	
Mixed Race	17	52.9	
Prefer not to answer	15	33.3	

** Statistical significance found at the 0.05 level.

Research Question Analysis

To determine whether knowledge, perceived risk, and perceived benefit predicted seasonal influenza vaccine uptake in students, forward logistic regression analysis was conducted on the dataset. Data screening led to the elimination of seven outliers for cases in which the Mahalanobis value exceeded the chi-square critical value of 16.266 based on a degrees of freedom of three. Tolerance of all variables exceeded 0.10, so multicollinearity was deemed as having no impact on the analysis. Regression results indicated that the overall model fit of one predictor (perceived benefit) was adequate (-2

Log Likelihood = 489.060) and was statistically reliable in distinguishing between vaccinated and unvaccinated respondents; (χ^2 (0) = 301.09, $p < .001$). The model correctly classified 79.6% of the respondents. Regression coefficients are presented in Table 4.6. Additionally, the odds ratio for this variable indicates that as the benefit score increases by one, respondents are 3.01 times more likely to be classified as being vaccinated against seasonal influenza.

Table 4.6

Logistic Regression for Influenza Vaccine Uptake Rate and Knowledge (N = 594)

	B	Wald	*df*	Sig.	Exp(B)
Benefit Score	1.10	157.37	1	.000	3.01
Constant	-4.15	141.18	1	.000	.02

Research sub-question 1 (*Is there a significant statistical difference between the participants' knowledge of influenza disease and / or the participants' knowledge of the influenza vaccine and the influenza vaccine uptake rate among full-time undergraduate college students aged 18 to 24 years at two universities in Scranton, PA?*) examined the difference between knowledge and influenza vaccine uptake rate. To assess whether there was a difference in knowledge between those who were vaccinated and those who were unvaccinated, an independent samples *t* test was performed. For an independent samples *t* test to be performed, it is assumed that the sample values are normally distributed and have homogeneity of variance (Mertler & Vannatta, 2010). Normality was assessed via a distribution histogram for the knowledge score and was deemed to be normally distributed. Homogeneity of variance was acceptable based on the Levene's test for equality of variance showing a *p*-value > 0.05 ($p = .67$). The independent sample *t* test comparing the mean knowledge scores of the vaccinated and unvaccinated group found no significant difference ($t(599) = 1.97$, $p = 0.05$). The mean knowledge score of the vaccinated population ($M = 16.36$, $SD = 1.87$) was not significantly different from the mean of unvaccinated population ($M = 16.05$, $SD = 1.83$).

Research sub-question 2 (*Is there a significant statistical difference between the perceived risk of contracting influenza disease and the influenza vaccine uptake rate among full-time undergraduate college students aged 18 to 24 years at two universities in Scranton, PA?)* examined the difference between perceived risk and influenza vaccine uptake rate. To assess if there was a difference in perceived risk between those who were vaccinated and those who were unvaccinated, an independent samples *t* test was performed. Normality was assessed via a distribution histogram for the perceived risk score and was deemed to be normally distributed. Homogeneity of variance was acceptable based on the Levene's test for equality of variance showing a p-value > 0.05 ($p = .85$). The independent sample *t* test comparing the mean perceived risk scores of the vaccinated and unvaccinated group found a significant difference between the mean of the two groups ($t(599) = 6.46$, $p < .001$). The mean perceived risk score of the vaccinated population ($M = 8.59$, $SD = 1.40$) was significantly different from the mean of unvaccinated population ($M = 7.83$, $SD = 1.39$).

Research sub-question 3 (*Is there a significant statistical difference between the perceived benefits of receiving the influenza vaccine and the influenza vaccine uptake rate among full-time undergraduate college students aged 18 to 24 years at two universities in Scranton, PA?)* examined the difference between perceived benefits of receiving the influenza vaccine and influenza vaccine uptake rate. To assess if there was a difference in perceived benefits of receiving the influenza vaccine between those who were vaccinated and those who were unvaccinated, a Mann-Whitney *U* test was performed. Normality was assessed via a distribution histogram for the benefit score and found to not be normally distributed. Additionally, homogeneity of variance was not acceptable based on the Levene's test for equality of variance showing an unacceptable *p*-value of < 0.05 ($p = .01$). The group was inversely transformed, but still failed Levene's test for equal variance showing a *p*-value < 0.05 ($p = .048$). An independent samples *t* test would have been the preferred methodology to assess this research sub-question, but would not have been appropriate since tests for normality and homogeneity failed (Mertler & Vannatta, 2010). Therefore, a Mann-Whitney *U* test, the nonparametric equivalent of the independent samples *t* test, was performed since there are no assumptions about the distribution of the sample and the dependent variable is nominal (Mertler & Vannatta, 2010). The Mann-Whitney *U* test was conducted to compare the prediction of vaccination status for respondents with varying levels of perceived vaccine benefit. A significant result was found. Respondents reporting having been vaccinated had a significantly higher perceived benefit score rank (*M* rank vaccinated = 442.70) than respondents reporting being unvaccinated (*M* rank unvaccinated = 213.77, $U = 10145.00$, $p < .001$).

To answer the second research question "*What are the perceived barriers to receiving the influenza vaccination and the influenza vaccine uptake rate among full-time undergraduate college students aged 18 to 24 years at two universities in Scranton, PA who did not receive the vaccination?",* descriptive statistics were used to assess the barrier questions asked to the unvaccinated portion of the population. The self-reported influenza vaccine non-compliance rate by respondents for the 2013-2014 influenza season was 61.9%. The participants that responded “no” (N=372) when asked if they received the influenza vaccine during the 2013-2014 season were asked a follow-up question to gather barrier information, results of which are presented in Table 4.7. The follow-up question presented eight statements and asked the participants to rate their opinion of each statement on a four-point scale from strongly disagree to strongly agree. The data was combined to determine a frequency of the unvaccinated population reporting agree or strongly agree to any statement. The highest percentage of participants (40.9%) reported that they believed the seasonal influenza vaccine may have dangerous side effects. Furthermore, more than a third of unvaccinated participants (33.9%, 34.9%, and 35.7%) reported that: they do not believe they are in danger of contracting the flu; they believe that they may actually get the flu from the immunization; and, they do not have time to get the flu vaccine. The lowest percentage of participants (13.2%) reported that they were not informed that flu vaccines might be important.

Table 4.7

Frequency of Barriers Reported for Not Getting the Influenza Vaccine (N = 372)

Barrier statement	*N* Reporting Agree / Strongly Agree (%)
Vaccines are too expensive for me right now	68 (18.3)
I do not have time to get a flu vaccination	133 (35.8)
I believe that as a result of the flu shot I may actually get the flu	130 (34.9)
I do not know where to receive a flu vaccination	52 (14.0)
I do not believe I am in danger of contracting the flu	126 (33.9)
I believe that vaccines may have dangerous side effects	152 (40.9)
I was not informed that flu vaccines might be important	49 (13.2)
I do not believe the flu vaccine works to prevent the flu	81 (21.8)

Supplemental Analysis

Ad hoc statistical analysis was performed to determine if demographic factors not specific to the research question could be used in a prediction model for student vaccination uptake rate. Transformation of several variables was required to better fit a logistic regression analysis, by combining low frequency categories. Ages 21, 22, and 23 were combined to a 21 and older age group with a frequency cumulative frequency of 75, which was a more substantial percentage (12.5%) when compared to ages 18, 19, and 20. Parental education level reported as no high school diploma (n = 2 or 0.3%) was combined with the high school graduates to create a new category where the lowest level of parental education is classified as *up to* a high school diploma. Race was found to be predominantly Caucasian (85.9%), so all minority races reported were combined into a single non-Caucasian race.

Forward logistic regression was conducted to determine which independent variables (age, gender, university affiliation, major of study, year at school, living status, parental education, and race) were predictors of student vaccination status (vaccinated or non-vaccinated). Data screening led to the elimination of eight outliers for cases in which the Mahalanobis value exceeded the chi-square critical value of 26.125 based on eight degrees of freedom at 0.999. Tolerance of all variables exceeded 0.10, so multicollinearity was deemed as having no impact on the analysis. Regression results indicated that the overall model fit of three predictors (major of study, living status, and age) was questionable (-2 Log Likelihood = 754.03) but was statistically reliable in predicting vaccination status (χ^2 (10) = 33.22, $p < .001$). The model correctly classified

62.4% of the cases. Regression coefficients are presented in Table 4.8. The *Wald* statistic values indicated that living on campus, living with parents, being 19 to 23 years of age, majoring in a health care field or majors identified via the "other" category predict vaccination status at $p < .05$ level.

Table 4.8

Logistic Regression for Influenza Vaccine Uptake Rate and Demographics (N = 593)

	B	Wald	*df*	Sig.	Exp(B)
Living Status					
Live on campus**	.57	4.90	1	.03	1.77
Live off campus	.06	.03	1	.85	1.06
Live with parents**		8.360	2	.02	
Age					
18 years old	.43	1.70	1	.19	1.54
19 years old**	.70	4.70	1	.03	2.02
20 years old**	.82	6.37	1	.01	2.28
21 – 23 years old**		7.90	3	.048	
Major of Study					
Business	.16	.21	1	.65	1.18
Education	.46	1.01	1	.32	1.59
Health Care**	.87	8.30	1	.004	2.38
Humanities	-.03	.003	1	.95	.98
Psychology	.15	.14	1	.71	1.17
Science	.42	1.74	1	.19	1.53
Other**		14.86	6	.02	
Constant	-1.86	19.34	1	.000	.16

** Statistical significance found at the 0.05 level.

Forward logistic regression was conducted to determine which independent variables within the 20 knowledge score questions were predictors of student vaccination status (vaccinated or non-vaccinated). Data screening led to the elimination of 42 outliers for cases in which the Mahalanobis value exceeded the chi-square critical value of 43.820 based on 19 degrees of freedom at 0.999. Tolerance of all variables exceeded 0.10, so multicollinearity was deemed as having no impact on the analysis. Regression results indicated that the overall model fit of 19 predictors (knowledge that the influenza virus is a respiratory virus, knowledge of nine flu symptoms, and knowledge of nine vaccine facts) was questionable (-2 Log Likelihood = 705.97) but was statistically reliable in predicting vaccination status (χ^2 (18) = 39.86, $p < .05$). The model correctly classified 61.9% of the cases. Regression coefficients are presented in Table 4.9. The *Wald* statistic values indicated that knowledge that the influenza virus is a respiratory virus, influenza is worse than the vaccine, and that the vaccine is needed annually predict vaccination status at $p < .05$ level.

Table 4.9

Logistic Regression for Influenza Vaccine Uptake Rate and Knowledge Questions (N = 559)

	B	Wald	*df*	Sig.	Exp(B)
Influenza is a respiratory virus**	-.32	5.98	1	.01	.73
<u>Common Symptoms of the flu are…</u>					
Dry Skin$^+$	.31	1.54	1	.22	1.36
Nausea	-.39	2.46	1	.12	.68
Nasal Congestion	.43	.64	1	.43	1.53
Swollen hands and feet$^+$	.01	.000	1	.98	1.01
Headache	-.35	.62	1	.43	.70
Diarrhea	-.17	.67	1	.41	.85
Sore Throat	.47	1.67	1	.20	1.59
Tired	.04	.002	1	.96	1.04
Muscle Aches	.26	.12	1	.73	1.30
<u>The influenza vaccine…</u>					
Causes disease	.16	.35	1	.55	1.17
Protects against all strains	-.14	.36	1	.55	.87
Can cause allergic reaction	.11	.06	1	.80	1.11
Is worse than flu**	-1.04	5.82	1	.02	.35
Is better to get later in season	.29	.68	1	.41	1.33
Is pointless after Thanksgiving	.05	.01	1	.93	1.05
Is not needed annually***	-1.00	11.23	1	.001	.37
Requires permission if pregnant	-.34	1.94	1	.16	.71
Protects against stomach flu	.22	.65	1	.42	1.25

Constant	-.25	.03	1	.86	.78

** Statistical significance found at the 0.05 level.
*** Statistical significance found at the 0.001 level
+ Not a common symptom of the flu

Forward logistic regression was conducted to determine which independent variables within the three risk of disease score questions predicted student vaccination status (vaccinated or non-vaccinated). Data screening led to the elimination of three outliers for cases in which the Mahalanobis value exceeded the chi-square critical value of 16.266 based on three degrees of freedom at 0.999. Tolerance of all variables exceeded 0.10, so multicollinearity was deemed as having no impact on the analysis. Regression results indicated that the overall model fit of three predictors (perception that the flu is dangerous for a student, perception that one will get the flu unless vaccinated, perception that the flu will disrupt the academic semester) was questionable (-2 Log Likelihood = 772.02) but was statistically reliable in predicting vaccination status (χ^2 (2) = 22.94, $p < .001$). The model correctly classified 63.5% of the cases. Regression coefficients are presented in Table 4.10. The *Wald* statistic values indicated that the perception that the flu is dangerous for a student and the perception that one will get the flu unless vaccinated predict vaccination status at $p < .05$ level. Additionally, students were more than twice as likely to be vaccinated if they felt the flu was dangerous (2.01 times more likely) or if they felt they would get the flu without immunization (2.41 times more likely).

Table 4.10

Logistic Regression for Influenza Vaccine Uptake Rate and Risk Questions (N = 598)

	B	Wald	*df*	Sig.	Exp(B)
The flu is dangerous for student**	.70	9.63	1	.002	2.01

Will get flu without vaccine***	.88	10.90	1	.001	2.41
The flu will disrupt semester	-.21	.30	1	.59	.81
Constant	-2.30	8.73	1	.003	.10

** Statistical significance found at the 0.05 level.
*** Statistical significance found at the 0.001 level

Forward logistic regression was conducted to determine which independent variables within the three benefit of vaccine score questions predicted student vaccination status (vaccinated or non-vaccinated). Data screening led to the elimination of no outliers for cases in which the Mahalanobis value exceeded the chi-square critical value of 16.266 based on three degrees of freedom at 0.999. Tolerance of all variables exceeded 0.10, so multicollinearity was deemed as having no impact on the analysis. The benefit of vaccine perception reported by students based on frequency of immunization was recoded to be dichotomous (Annually/Every few years or Rarely/Never). Regression results indicated that the overall model fit of all three predictors (frequency of vaccination, perceived usefulness of vaccination, and perceived effectiveness of vaccine) was adequate (-2 Log Likelihood = 548.03) and was statistically reliable in predicting vaccination status (χ^2 (2) = 250.78, $p < .001$). The model correctly classified 78.9% of the cases. Regression coefficients are presented in Table 4.11. The *Wald* statistic values indicated that the perceptions that the vaccination is useful and beneficial (based on frequency of immunization) are significant at a $p < .001$ level. Additionally, students were more than six times as likely (6.57 and 6.40) to be vaccinated if they felt the flu vaccine was beneficial and useful to them personally.

Table 4.11

Logistic Regression for Influenza Vaccine Uptake Rate and Benefit Questions (N = 601)

	B	Wald	*df*	Sig.	Exp(B)

Perceived benefit of vaccine***	1.882	47.401	1	.000	6.569
Perceived usefulness of vaccine***	1.857	36.537	1	.000	6.402
Perceived effectiveness of vaccine	.197	.465	1	.495	1.217
Constant	-5.018	108.772	1	.000	.007

*** Statistical significance found at the 0.001 level

Chapter 5: Discussion

This cross-sectional quantitative study examined the perceptions of seasonal influenza vaccination among full-time college students ages 18 to 24. Additionally, this study described the perceived barriers reported by those who were not immunized with the influenza vaccine during the 2013-2014 flu season. Previously published research of the seasonal influenza vaccination uptake rate and the predictors of influenza immunization among undergraduate college-aged students is limited. Specific research into the factors influencing seasonal influenza uptake rate was completed with undergraduate students from two small liberal arts universities located in Scranton, PA. The researcher plans to publish this work in the near future.

A 26-question online survey was used to collect data on student demographics, influenza vaccine knowledge, perceived risk of influenza disease, perceived benefit of immunization, vaccine uptake rate for the 2013-2014 influenza vaccine, and perceived barriers by the unvaccinated population. The online survey was administered during the Fall 2014 semester to students enrolled at Marywood University and the University of Scranton. A response rate of 14.8% was achieved from the potential participant population of 5,589 students. Elimination of students that did meet the inclusion criteria led to a final study sample size of 601, 10.8% of the overall population. The most current IPEDS data from Marywood University and the University of Scranton reported a Caucasian population of 77% and 79%, respectively. However for this study, 85.9% of the participants were self-identified as Caucasian. Additionally, 78.5% of respondents were female, which was higher than the expected proportion (60%) based on the combined IPEDS data reports.

Interpretation of Results

It was hypothesized that knowledge, perceived risk, and perceived benefit are valid predictors of the seasonal influenza vaccine uptake rate among full-time undergraduate college students aged 18 to 24 years at two liberal arts universities located in Scranton, PA. The study's results rejected the null hypothesis of this research question. All participants were asked questions about their knowledge of influenza disease and the vaccine; their perceived risk of influenza disease; and, their perceived benefit of receiving the seasonal influenza immunization. Logistic regression analysis indicated that perceived benefit of the vaccine was statistically reliable ($p < .001$) in distinguishing between vaccinated and unvaccinated respondents in 79.6% of the cases. Additionally, the odds ratio for this variable indicates that respondents were three times more likely to be vaccinated against seasonal influenza as the perceived benefit of the vaccine increased. This research was supported by the health promotion concept (HBM), which theorizes that an individual will seek out health care action (immunization) if the perceived benefit (staying healthy) is greater than the perceived risk (getting the flu).

The first research sub-question hypothesized a significant statistical difference between the participants' knowledge of influenza disease and / or the participants' knowledge of the influenza vaccine and the influenza vaccine uptake rate. This study's results accepted the null hypothesis of this sub-question. An independent samples *t* test found no statistical significance ($p = 0.050$) between the mean knowledge scores of the vaccinated and unvaccinated group. However, it is worth noting that the results showed the mean probabilities of the two groups were different and were *at* and not *less than* the probably limit of 0.05. Knowledge alone was not found to be a valid predictor of vaccination status, which supported the findings of one previous study (Blank et al., 2010).

The second sub-question hypothesized that there was a significant statistical difference between the perceived risk of contracting influenza disease and the influenza vaccine uptake rate. The results of this study rejected the null hypothesis of this research sub-question. An independent samples *t* test found statistical significance ($p < .001$) between the mean perceived risk of disease scores of the vaccinated and unvaccinated group. The data indicated that the perceived risk of disease was a valid predictor of vaccination status, which supported the findings of another previous study (Brewer et al., 2007).

The final research sub-question hypothesized that a significant statistical difference would exist between the perceived benefits of receiving the influenza vaccine and the influenza vaccine uptake rate. The results, however, rejected this null hypothesis. Since normality and homogeneity of variance were not adequate to perform an independent samples *t* test, the non-parametric equivalent (Mann-Whitney *U* test) was used and significance ($p < .001$) in rank of perceived benefit between the vaccinated and unvaccinated respondents was demonstrated. The vaccinated group had a higher perceived benefit score rank then unvaccinated respondents. Perceived benefit of the vaccine was a valid predictor of vaccination status, which supported the findings of Ramsey and Marczinski (2011).

Descriptive statistics were used to assess the barrier questions asked to the unvaccinated portion of the study population in an attempt to answer the second research question. The participants who responded “no” ($N = 372$) when asked if they received the influenza vaccine during the 2013-2014 season were asked a follow-up question to gather barrier information. The highest percentage (40.9%) reported that they believed the seasonal influenza vaccine had dangerous side effects. Furthermore, more than a third of unvaccinated participants (33.9%, 34.9%, and 35.7%) reported that they did not believe they were at a higher risk of contracting the flu; they believed that they may actually get the flu from the immunization; and/or, they did not have time to get the flu vaccine. The lowest percentage of participants (13.2%) reported that they were not informed that the flu vaccine might be important for them to remain healthy.

Ad hoc statistical analysis was performed to determine if various factors (demographic, individual questions used to score knowledge, risk of disease questions, and benefit questions) not specific to the research question predicted student vaccination uptake rate. Analysis found that students living on campus, living with their parents, those 19 to 23 years of age, majoring in a health care field or in a major not listed on the survey (categorized as "other") successfully predicted vaccination status at $p < .05$ level. Furthermore, knowledge that the influenza virus was a respiratory virus; influenza is a greater health risk than the vaccine; and, that the vaccine was needed annually predicted vaccination status at $p < .05$ level. Students who perceived that the flu was dangerous and that they would personally get the flu unless vaccinated, predicted vaccination status at $p < .05$ level. Additionally, the respondents were more than twice as likely to be vaccinated if they believed the flu was dangerous or if they thought they would get the flu without immunization. Respondents who perceived the vaccination as beneficial and useful were significantly ($p < .001$) more likely be vaccinated against seasonal influenza.

Additionally, students were more than six times as likely (6.57 and 6.40) to be vaccinated if they understood the flu vaccine was beneficial and useful to them personally.

Discussion of Results

In excess of 90% of the participants received the influenza vaccine as an intramuscular injection rather than the nasal route, and a majority of the participants (67.2%) received the vaccination between October 2013 and December 2013. Nearly half of the participants (47.2%) were immunized at their personal physician's office, while more than a quarter (25.8%) received the immunization at a pharmacy. Finally, most (78.6%) respondents sought to be immunized, while 14.8% accepted the immunization when offered by the health care provider while being treated for another reason. Results indicating that most respondents received the vaccine via intramuscular injection and between October and December 2013 were expected. The intramuscular injection is the traditional vaccine, and general availability of the vaccine occurs during the fall season. Reported location of immunization and whether or not the respondent sought the vaccine specifically are novel information for this type of study based on reviewed literature, and can be used for comparison in future studies.

The self-reported influenza vaccine uptake rate for this population during the 2013-2014 influenza season was 38.1% (229 / 601). This rate is similar to findings of Annuziata et al. (2012), which reported the highest vaccine uptake rate of 36% in 2011 and reported significant increases ($p < .05$) in seasonal influenza vaccination uptake rates every year between 2007 and 2011 among college-age students. Annuziata et al. (2012) found the vaccination uptake rate to increase from 28% in 2007 to 31% in 2008 and then from 32% in 2009 to 35% in 2010. However, the rates reported by Annuziata et al.

(2012) were generally higher when compared to other studies that had reported rates between 8% and 30% (Blank et al., 2010; Merill et al., 2010; Uddin et al., 2010; Poehling et al., 2012). The difference in these rates may be attributable to the inherent differences in populations represented. As an example, Merill et al. (2010) indicated lower response rates among African-Americans and Hispanics. The rate identified in this study population coincided with the upward trend identified in the study performed by Annuziata et al. (2012) and is encouraging when compared to that of other studies, which previously reported lower uptake rates among college-age students (Blank et al., 2010; Merill et al., 2010; Uddin et al., 2010; Poehling et al., 2012).

The findings of this study showed that college-aged students' knowledge about influenza disease and vaccination did not predict vaccination status and was consistent with the findings of Blank et al. (2010) and Merill et al. (2010). However, the results of the participants' answers to the knowledge questions demonstrated that the undergraduate students had several misconceptions about the influenza virus and the disease. Students were not aware that influenza virus is a respiratory virus; believed that getting the vaccine was a greater health risk than the disease; and, did not realize the vaccine was needed annually. Supplemental analysis showed that these misconceptions were statistically significant predictors ($p < .05$, .05, and .001) of vaccination. Individuals with these misconceptions were less likely to get immunized, even though the overall knowledge score was not a predictor. Additional research on how specific misconceptions relate to vaccination uptake rate may be warranted.

This study identified that both perceived risk of disease and perceived benefit of the vaccine were valid predictors ($p < .001$) of vaccination status for the study population.

Additional analysis identified that a student perceiving that the influenza disease can be a health risk or that s/he is susceptible to the disease without immunization were valid predictors (p < .05 and .001) of vaccination. This finding was supported by the meta-analysis conducted by Brewer et al. (2007) that concluded that vaccination is significantly (p < .05) predicted by risk and susceptibility. In a previous study, students reporting concern for safety, severity of the disease, vaccine efficacy, and susceptibility to the disease were the most commonly cited reasons used when determining vaccine acceptance (Ravert et al., 2012). Furthermore, this study found that a student perceiving the vaccine as beneficial or useful was a valid predictor (p < .001) of his or her vaccination status. This result coincided with the conclusion of the 2011 Ramsey and Marczinski study that found that an undergraduate student did not get vaccinated if s/he felt the vaccine was unsafe or ineffective.

The results of the supplemental analysis of demographic variables identified that the youngest students (those 18 years of age) who are not living with their parents or on campus and are majoring in a non-health care field, such as business and humanities, were less likely to get vaccinated. It is also important to note from this study that gender and race were not identified as significant factors related to vaccination status, however the population sampled was not diverse. Therefore, results have limited generalizability to the general population. Whether a student's vaccination status is predicted by age, living status, or specific major was demonstrated in one publication reviewed. Sunil & Zottarelli (2011) found that age and living in a residence hall were the two statistically significant demographic characteristics predicting the vaccination status of older students and residents. Older students were more likely to receive the vaccine then students younger and those not living on campus (Sunil & Zottarelli, 2011). The results of this study agree with the Sunil and Zottarelli (2011) study. Future research focusing on specific demographic variables and their relationship to vaccination uptake rates may be warranted.

Similar to the study by Weinstein et al. (2007), the belief that influenza vaccines cause influenza was seen as barrier to vaccination. The anticipation of regret if one is not vaccinated and subsequently becomes ill also proved to be a powerful predictor of behavior (Weinstein et al., 2007). Weinstein et al. (2007) suggested that a person's feelings about risk are better predictors of behavior than "purely cognitive reasoning" about risks and coincides with the conclusions of the Wroe et al. (2004) study (p. 146).

Unvaccinated students of this study population did not cite a financial limitation to getting vaccinated, but rather a lack of time. This observation was similar to the findings of the 2010 study by Merill et al., which found respondents to have an agreement level of neutral (2.99) when asked if the vaccine was too expensive. Merill et al. (2010) concluded that eliminating the cost of the influenza vaccine would not substantially increase immunization rates. The researchers concluded that participants of their study were motivated to become immunized based on perceived severity of disease and communication of disease severity is key to increasing vaccination rates among college students (Merill et al., 2010).

Limitations of Study

There were several identifiable limitations in this research study. First, the results have limited generalizability to the general population. The study population consisted of 601 undergraduate students, the majority of whom were Caucasian (85.9%) and female

(78.5%). Results may not be generalizable to males and individuals who are not Caucasian. Study of a larger and more diverse study sample might make the results more generalizable. A second limitation is the lack of previously published research specific to this topic. Most research studies examined influenza vaccination rates in college students of a specific major (such as health care) or after an outbreak of influenza disease on a campus. Self-reported data was another limitation. In this type of data collection, the researcher is unable to independently verify the participants' responses, so results were analyzed under the assumption that all respondents answered honestly and accurately. The final limitation was that the instrument was not pilot tested prior to data collection. An independent expert for suitability and a focus group for comprehension of the questions only reviewed the survey instrument. A pilot review might have uncovered issues that could have made the dataset more robust. For example, assessment of barriers to vaccination for the vaccinated and unvaccinated population; the addition of specific questions related risk of disease and benefit of vaccination; and, the addition of a risk of vaccination scored variable to the survey could have resulted in a more thorough analysis of the dataset.

Recommendations for Action

Previous studies have shown that traditional college aged students are unlikely to determine their risk level for contracting the flu and typically do not seek immunization on their own (Ramsey & Marczinski, 2011). As reported by Shropshire et al. (2013), college campus mass media campaigns were shown to increase student participation up to 30%, which may be another way to promote immunization and increase the uptake rate among undergraduates. Conclusions from this study suggest that a more focused pro-immunization campaign, combined with the reduction of specific barriers to help increase the uptake rates among students, that targets younger college students (<19 years of age), who live off campus, and are enrolled in non-health care majors should be implemented. Advertisements that influenza is a respiratory virus, and that influenza disease is a greater health risk than the vaccine may also bolster the participation rate. It is also important to convey to students that the vaccine is needed annually, and immunity from the flu does not continue from season to season. Students should be provided information to explain that the influenza disease can be dangerous to one's health, and that being not vaccinated would put them at a higher risk of illness during the influenza season.

Overall, students need to understand that the annual immunization is beneficial and useful to them particularly on a college campus. Advertising against certain misconceptions, such as the perception that the vaccine has common and severe side effects or that young adults are not susceptible to the flu, may help reduce barriers reported by the unvaccinated students. Providing students with information about the seasonal influenza vaccine risk implications should alleviate the misconception about the vaccination's side effects. A pro-immunization on-campus campaign should emphasize that even healthy young college students are susceptible to the flu and they should take action to be immunized each year. Also, the misconception that the seasonal influenza vaccine can inadvertently cause a person to the get the flu should be challenged. Finally, college personnel should offer annual flu clinics to provide students ample opportunities to get vaccinated while on campus.

Significance of Study

Despite the health care industry's recommendation that all college age students receive the seasonal influenza vaccine, a review of the literature revealed limited research that described seasonal influenza vaccination uptake rates and predictors of immunization of college students. This study provided a unique analysis of a dataset that described the immunization status, knowledge of influenza, and perceptions of risks, benefits, and barriers (if unvaccinated) of a sample of primarily Caucasian female college students residing in Scranton, PA. New information was provided about the uptake rate of the seasonal influenza vaccine and the factors that influence that rate among undergraduate college students ages 18 to 24 years enrolled at two liberal arts colleges in Scranton, PA. These results may be useful to other universities and colleges for when student campus policies are reviewed and immunization programs are being developed. Finally, these findings may encourage new investigative research into vaccine uptake rates and perceptions within this or other adult community populations.

Recommendations for Further Study

Two recommendations for further study will be provided. The first recommendation would be to repeat the current study with a few modifications to the survey: barrier information of vaccinated population should be gathered; questions related to risk of disease and benefit of vaccination should be added; and, a risk of vaccination scored variable should be included. The second recommendation would be to repeat the study using a pro-immunization campaign geared toward undergraduates during the next influenza season and compare the uptake results to the current study results. This type of experimental study may determine whether or not a change in students' behavior occurred due to the implementation of a pro-immunization campaign.

Additional changes could improve the results of this research study. First, barriers to vaccination for both the vaccinated and unvaccinated population should be added as a predictor variable. The barrier information was useful in describing the unvaccinated population, but knowledge of the barriers present within the vaccinated population would also enable another variable to be added to the model for predicting behavior. This information would be invaluable to the design of an effective pro-immunization campaign geared toward undergraduates. The second change would be to add specific questions related to the risk of disease and benefit of vaccination. Although several of the findings of this study were significant, the dataset would be stronger if the questions for risk of disease and benefit of vaccination were expanded to assure a scoring model with more variability. This modification would result in a larger distribution of scores and be more aligned with the knowledge scoring distribution. The third change would be to add a risk of vaccination scored variable to the survey. Although risk of vaccination was implied by a few questions, the addition of a stand-alone variable as a predictor would provide a more diverse model.

An experimental study following this modified design would add to the research literature on influenza immunization and inform additional strategies to increase vaccination rates among college students.

Conclusion

This study was based on the Health Belief Model that theorized immunization would not occur in college students if the perceived barriers outweighed the perceived benefits. These results further reinforced this theory by demonstrating a benefit of immunization while reducing barriers and showed an increase in the seasonal influenza vaccination rates among college students. Results of this study suggest that knowledge, perceived risk, and perceived benefit are valid predictors that influence the seasonal influenza vaccine uptake among full-time undergraduate students. Only perceived risk and perceived benefit, however, determined vaccination.

Additional statistical analysis showed that younger students living off campus and not majoring in a health care field were less likely to seek immunization. Misconceptions about the virus and vaccine, such as the vaccine being unnecessary, having to receive the vaccine on an annual basis, or having exaggerated side effects, were significant barriers to vaccination. However, students in this study reported that they would seek immunization if they felt the flu was dangerous to their well-being or if that they would get the flu without immunization. This study also found that college students were more than six times as likely to be vaccinated if they saw the flu vaccine as beneficial and useful.

This study and the associated results should positively impact public health within the United States. Finding ways to increase vaccination compliance will reduce disease within the population. This reduction in disease should prevent other diseases from proliferating, contributing to a better overall health status of the population. The hope of this researcher is that any administrator (college or otherwise) considers these results and the results of similar research studies when designing pro-immunization campaigns. Finding ways to effectively increase the health of any population is a well-intentioned enterprise that this researcher has been honored to contribute towards.

Researching new ways to keep college aged students healthy is a meaningful enterprise. While attending school, it is the responsibility of the university or college to ensure the safety and well-being of all students on campus. The results of this study suggest that university and college administrators would benefit from the development and implementation of annual pro-immunization campaigns geared toward undergraduates to bolster the immunization uptake rate among this population. Increasing the immunization uptake rates among college aged students will help to protect the campus from seasonal influenza disease outbreaks, decrease the amount of time students are absent from class, and prevent the spread of the virus among the larger community.

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Appendix A

Permission to Recruit at Marywood University

Marywood
UNIVERSITY
VICE PRESIDENT FOR STUDENT LIFE

MARYWOOD UNIVERSITY
SCRANTON, PA 18509-1598
TEL: (570) 348-6246
FAX: (570) 961-4737
EMAIL:HEATH@MARYWOOD.EDU
WWW.MARYWOOD.EDU

June 26, 2014

Exempt Review Committee
Office of Research Sponsored Programs
O'Neill Center for Healthy Families
Room 208
Marywood University
2300 Adams Avenue
Scranton, PA 18509

Dear ERC Members:

I have reviewed the research proposal of Mr. Matthew Caputo related to *Factors Influencing Seasonal Influenza Vaccination Uptake Rates Among Undergraduate College Students in Scranton, PA.* Participation in the study will be voluntary and anonymous.

Matt's request to recruit undergraduate students to participate in the study through use of the e-mail distribution lists, fliers and personal contact is approved.

Sincerely,

Raymond P. Heath

Raymond P. Heath, Ph.D.
Vice President for Student Life

RPH/ptg

cc: Mr. Matthew Caputo
Ms. Sara Woolsey
Deborah Hokien, Ph.D.

An education inspired by the Sisters, Servants of the Immaculate Heart of Mary.

Appendix B

Permission to Recruit at University of Scranton

THE UNIVERSITY OF
SCRANTON
A JESUIT UNIVERSITY

OFFICE OF STUDENT AFFAIRS

June 27, 2014

Exempt Review Committee
Office of Research and Sponsored Programs
Keith J. O'Neill Center for Healthy Families
Room 208
Marywood University
2300 Adams Avenue
Scranton, PA 18509

Dear Marywood ERC:

I have read a synopsis of Matthew S. Caputo's research project, entitled *Factors Influencing Seasonal Influenza Vaccination Uptake Rate Among Undergraduate College Students in Scranton, Pennsylvania.*

I am aware of the purpose of this study. I am authorized to approve email communications to all undergraduate students at The University of Scranton. I am prepared to grant approval of an email, distributing an electronic survey for Mr. Caputo's study, on the condition that both Marywood University and The University of Scranton's respective Institutional Review Boards fully approve this study.

Sincerely,

Anitra McShea, Ph.D.
Interim Vice President for Student Affairs

Rev: 8/5/2013

SCRANTON, PENNSYLVANIA 18510-4655
(570) 941-7680 • FAX: (570) 941-7963

Appendix C

E-mail Recruitment Script (Stamped)

Marywood University
Exempt Review Committee
APPROVED
DATE: 7/11/14

Email Recruitment Script

Factors Influencing Seasonal Influenza Vaccination Uptake Rate among Undergraduate College Students in Scranton, Pennsylvania

Good day,

My name is Matthew Caputo and I am a doctoral student at Marywood University working with Dr. Deborah Hokien, Director of the Center for Interdisciplinary. I am seeking participants for my research study. This study will look at factors related to undergraduate students' acceptance of the seasonal influenza vaccine, commonly known as the 'flu shot.' This study will assess participants' knowledge about the flu shot and flu disease, risks of contracting influenza disease felt, risks and benefits of the flu shot felt, and reasons why the flu shot might not be taken.

You must be between 18 and 24 years of age as of July 1, 2013 in order to participate. If you agree to participate in this study, you will be asked to do the following things: 1) click on the survey link below and 2) read the letter to participants and answer all questions within the survey. The total time investment is approximated to be about 10 to 15 minutes. After completing the survey, participants will have the option to enter for a chance to win one of fifteen $20.00 gift cards to Dunkin' Donuts.

Your participation in this study will provide new information about the acceptance of the seasonal influenza vaccine and the factors that influence that rate among undergraduate college students 18 to 24 years of age in Scranton, Pennsylvania. This information can then be provided to universities and colleges in order to shape campus policies and immunization programs to increase the uptake rate of the seasonal influenza vaccine among students. Additionally, the findings of this study will help to launch new research into vaccine uptake and perceptions within this or other adult populations.

If you would like to participate in this study, please click the following link:

https://www.surveymonkey.com/s/N9TPFHV

If you have any questions, please email me at: mcaputo@m.marywood.edu

The Marywood University Exempt Review Committee has approved this study.

Thank you,

Matthew Caputo

APPROVED BY THE UNIVERSITY
SEP 0 8 2014
OF SCRANTON IRB

Appendix D

Letter to Participants (Stamped)

Letter to Participants
Factors Influencing Seasonal Influenza Vaccination Uptake Rate among Undergraduate College Students in Scranton, Pennsylvania

You are invited to participate in a research study about the seasonal influenza vaccine, more commonly known as the 'flu shot.' You were selected as a possible participant because you are an undergraduate college student within Scranton, Pennsylvania. You must be 18 years of age or older in order to participate in this study. I ask that you read this form and ask any questions you may have before agreeing to participate in this study.

This study is being conducted by: Matthew S. Caputo, M.S., a Marywood University doctoral student completing a dissertation.

Background Information
The purpose of this study is to evaluate factors that affect college students' acceptance of the seasonal influenza vaccine, more commonly known as the 'flu shot.'

Procedures
If you agree to participate in this study, you will be asked to do the following things: complete a survey that was developed to evaluate factors that affect college students' acceptance of the seasonal influenza vaccine, more commonly known as the 'flu shot.' This survey will ask you about your knowledge and perceptions about the seasonal influenza vaccine and influenza disease. You will also be asked questions about yourself for demographic purposes only. The survey will take approximately 10 minutes of your time to complete. At the conclusion of the survey you will be offered a chance to enter to win one of fifteen, $20 gift cards to Dunkin' Donuts for your participation.

Risks and Benefits of Being in the Study
The risks to participants are no greater than ordinarily encountered in daily life.

Please note: while it is understood that no computer transmission can be perfectly secure, reasonable efforts will be made to protect the confidentiality of your transmission of the survey information.

The benefit of your participation is to the general undergraduate student population of Scranton, Pennsylvania. The information obtained from this study will provide a unique analysis of a dataset that describes a college student's immunization status, knowledge of influenza, and their own perceptions of risks, benefits, and barriers to becoming immunized. The expectation of this research study is to provide new information about the uptake rate of the seasonal influenza vaccine and the factors that influence that rate among undergraduate college students 18 to 24 years of age in Scranton, Pennsylvania. This information can then be provided to universities and colleges in order to shape campus policies and immunization programs to increase the uptake rate of the seasonal influenza vaccine among students. Additionally, the findings of this study will help to launch new research into vaccine uptake and perceptions within this or other adult populations.

Confidentiality
The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a participant. Research records will be kept in a locked file; only the researchers will have access to the records.

Records will be retained for a minimum of 3 years and will be destroyed by deleting electronic records and shredding any paper record.

Participation is Voluntary
Your decision whether or not to participate will not affect your current or future relations with the researcher, or Marywood University or the University of Scranton.

Your participation is voluntary and you may withdraw without affecting those relationships previously identified. Because the survey is anonymous, it cannot be withdrawn once it has been submitted.

Contacts and Questions
The researcher conducting this study is Matthew S. Caputo, M.S.

You may ask any questions you have now. If you have questions later about the research, you may contact the researcher at: 570-241-3651 or via email at: mcaputo@marywood.edu

You may also contact the researcher's sponsor, Deborah Hokien, Ph.D., Chair of Dissertation Committee, Marywood University, at 570-348-6279 or e-mail at hokien@marywood.edu

If you have any questions now or later, related to the integrity of the research (the rights of research subjects), you may contact Dr. Maria Edwards at Marywood University, Assistant Vice President for Research, at: (570) 961-4778 or via email at: montoro@maryu.marywood.edu.

You may keep a copy of this form for your records.

APPROVED BY THE UNIVERSITY
SEP 0 8 2014
OF SCRANTON IRB

Appendix E

Survey Instrument

Letter to Participants

Factors Influencing Seasonal Influenza Vaccination Uptake Rate Among Undergraduate College Students in Scranton, Pennsylvania

You are invited to participate in a research study about the seasonal influenza vaccine, more commonly known as the 'flu shot'. You were selected as a possible participant because you are an undergraduate college student within Scranton, Pennsylvania. I ask that you read this form and ask any questions you may have before agreeing to participate in this study.

This study is being conducted by: Matthew S. Caputo, M.S., Marywood University doctoral student completing dissertation.

Background Information
The purpose of this study is to evaluate factors that affect college students' acceptance of the seasonal influenza vaccine, more commonly known as the 'flu shot'.

Procedures
If you agree to participate in this study, you will be asked to do the following things:
You will be asked to complete a survey that was developed to evaluate factors that affect college students' acceptance of the seasonal influenza vaccine, more commonly known as the 'flu shot'. This survey will ask you about your knowledge and perceptions about the seasonal influenza vaccine and influenza disease. You will also be asked questions about yourself for demographic purposes only. The survey will take approximately 10 minutes of your time to complete. At the conclusion of the survey you will be offered a chance to enter to win one of 15, $20 gift cards to Dunkin' Donuts for your participation.

Risks and Benefits of Being in the Study
The risks to participants are no greater than ordinarily encountered in daily life.

The benefits to participation are:

The benefit of your participation is to the general undergraduate student population of Scranton, Pennsylvania. The information obtained from this study will provide a unique analysis of a dataset that describes a college student's immunization status, knowledge of influenza, and their own perceptions of risks, benefits, and barriers to becoming immunized. The expectation of this research study is to provide new information about the uptake rate of the seasonal influenza vaccine and the factors that influence that rate among undergraduate college students 18 to 24 years of age in Scranton, Pennsylvania. This information can then be provided to universities and colleges in order to shape campus policies and immunization programs to increase the uptake rate of the seasonal influenza vaccine among students. Additionally, the findings of this study will help to launch new research into vaccine uptake and perceptions within this or other adult populations.

Confidentiality
The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a participant. Research records will be kept in a locked file; only the researchers will have access to the records.

Records will be retained for a minimum of 3 years and will be destroyed by deleting electronic records and shredding any paper record.

Letter to Participants
(Continued)

Factors Influencing Season Influenza Vaccination Uptake Rate Among Undergraduate College Students in Scranton, Pennsylvania

Participation is Voluntary
Your decision whether or not to participate will not affect your current or future relations with the researcher, or Marywood University or the University of Scranton. Your participation is voluntary and you may withdraw without affecting those relationships previously identified. Because the survey is anonymous, it can not be withdrawn once it has been submitted.

Contacts and Questions
The researcher conducting this study is Matthew S. Caputo, M.S., Marywood University, 570-241-3651, or mcaputo@marywood.edu. You may ask any questions you have now. If you have questions later about the research, you may contact the researcher at: 570-241-3651 or via email at: mcaputo@marywood.edu.

You may also contact the researcher's sponsor, Deborah Hokien, Ph.D., Chair of Dissertation Committee, Marywood University, at 570-348-6279 or e-mail at hokien@marywood.edu. If you have any questions now or later, related to the integrity of the research (the rights of research subjects), you may contact Dr. Maria Edwards at Marywood University, Assistant Vice President for Research, at: (570) 961-4778 or via email at: montoro@maryu.marywood.edu.

You may keep this form for your records.

Section 1: Demographic Information

The following questions will be used for demographic purposes. Please answer each question in full before moving on to the next section.

1. What was your age as of July 1, 2013?

- ◯ 17 years of age or less
- ◯ 18
- ◯ 19
- ◯ 20
- ◯ 21
- ◯ 22
- ◯ 23
- ◯ 24
- ◯ 25 years of age or more

2. Which university do you currently attend?

- ◯ Marywood University
- ◯ University of Scranton
- ◯ I do not attend either of these universities

3. How many credits are you currently enrolled (or plan on enrolling) for during the Fall 2014 semester?

- ◯ Less than 12.0 credits
- ◯ 12.0 or more credits

4. How many credits are you currently enrolled (or plan on enrolling) for during the Spring 2015 semester?

- ◯ Less than 12.0 credits
- ◯ 12.0 or more credits

5. What is your gender?

- ◯ Male
- ◯ Female

6. What is your area of study (major) at your university? If currently undeclared, choose the area of study of most interest to you. Use the "other" option if you feel your major does not fit in one of the categories. (choose one that best applies)

- ◯ Science (Biology, Chemistry, Mathematics, Physics, Computer Science, etc.)
- ◯ Health Care (Nursing, Physical Therapy, Occupational Therapy, etc.)
- ◯ Humanities (Art, Music, Theology, Philosophy, etc.)
- ◯ Business (Accounting, Economics, Management, etc.)
- ◯ Psychology (Psychology, Counseling, etc.)
- ◯ Education (Elementary, Secondary, Special, etc.)

Other (please specify)

7. What "year" are you considered at your university?

- ◯ First-year / Freshman (less than 30.0 credits completed)
- ◯ Second-year / Sophomore (30.0 of more credits completed, but less than 60.0 credits)
- ◯ Third-year / Junior (60.0 or more credits completed, but less than 90.0 credits)
- ◯ Fourth-year / Senior (90 or more credits completed, no degree granted to date)
- ◯ Fifth-year / Graduate student

8. Which best describes your current living situation?

- ◯ Live on campus in a residence hall / dormitory or school sponsored housing
- ◯ Live off campus in apartment or home not managed by school
- ◯ Live with parents, commute to school daily

9. What is the highest level of education achieved by your parent or parent(s)? ***Choose the highest level of education achieved overall.***

- ◯ Attended but never graduated high school
- ◯ High School
- ◯ Attended but never graduated college
- ◯ Associate's / Technical Degree
- ◯ Bachelor's Degree
- ◯ Graduate Degree (Master's, M.B.A, etc.)
- ◯ Professional / terminal degree (M.D., J.D., Ph.D., etc.)

10. What is your ethnicity?

- ◯ African American
- ◯ Asian
- ◯ Caucasian
- ◯ Hispanic
- ◯ Mixed Race
- ◯ Prefer not to answer

11. Have you received information about or been encouraged to receive the influenza vaccination from any of the following sources in the past year?

	Yes	No
Personal physician or nurse?	◯	◯
Parents?	◯	◯
Student health center?	◯	◯
Television, billboard, flyer, advertisement, etc.?	◯	◯
Students, friends, or other peers?	◯	◯

12. Are you allergic to components of the flu vaccine, e.g. eggs, or do you have another medical condition that prohibits you from getting the seasonal flu vaccine?

- ◯ Yes
- ◯ No

Section 2: Knowledge of Influenza Vaccine and Disease

Please answer each question / statement completely before moving on to the next section.

13. Is influenza a respiratory virus?

- ◯ Yes
- ◯ No
- ◯ Not sure

14. Common symptoms of influenza are?

	True	False
Fever	◯	◯
Dry Skin	◯	◯
Nausea	◯	◯
Runny / Stuffy Nose	◯	◯
Swollen Hands and Feet	◯	◯
Headache	◯	◯
Diarrhea	◯	◯
Sore Throat	◯	◯
Excessive Tiredness	◯	◯
Muscle Aches	◯	◯

15. Evaluate the following statements about the seasonal influenza vaccine, commonly known as the "flu shot":

	True	False
The vaccine causes disease	○	○
The vaccine protects against all known flu strains	○	○
The vaccine can cause an allergic reaction	○	○
It is better to get the flu then the flu vaccine	○	○
It is better to get the flu vaccine late in the flu season to ensure protection longer	○	○
There is no point in getting the flu vaccine after Thanksgiving	○	○
You do not need to get the flu vaccine every year	○	○
You need special permission to get the flu vaccine if you are pregnant	○	○
The vaccine protects against the stomach flu	○	○

Section 3: Risk Perception of Contracting Influenza disease

Please answer each question / statement completely before moving on to the next section.

16. Evaluate the following statements.

	Strongly Disagree	Disagree	Agree	Strongly Agree
If you do not get vaccinated, you will get the flu	◯	◯	◯	◯
The flu is a dangerous disease for a college student to have	◯	◯	◯	◯
The flu can severly disrupt your semester, and impact your grades	◯	◯	◯	◯

Section 4: Benefits of Vaccination

Please answer each question / statement completely before moving on to the next section.

17. How often do you personally get the seasonal influenza vaccine?

- ◯ Annually
- ◯ Every few years
- ◯ Rarely
- ◯ Never

18. Do you think the flu vaccine is worth getting for yourself?

- ◯ Yes
- ◯ No
- ◯ I don't know

19. Do you think the flu vaccine is effective in preventing the flu?

- ◯ Yes
- ◯ No
- ◯ I don't know

Section 5: Vaccination Status

20. Have you received the flu vaccine between July 1, 2013 and June 30, 2014? It could have been a shot, or a spray, drop, or mist in the nose.

- ◯ Yes
- ◯ No
- ◯ I Don't Know

Section 6: Vaccine Uptake Information for Immunization Adopters

Please answer each question / statement completely before moving on to the next section.

21. When did you receive this flu vaccine?

- ◯ Between July 2013 and September 2013
- ◯ Between October 2013 and December 2013
- ◯ Between January 2014 and March 2014
- ◯ Between April 2014 and June 2014

22. How was the vaccination given to you? Was it a shot, <u>or</u> a spray, drop or mist in the nose?

- ◯ Shot
- ◯ Spray, Drop, or Mist in the Nose
- ◯ I Don't Know

23. Where was this flu vaccination given to you?

- ◯ Doctor's Office
- ◯ City Clinic or Health Center (Not Affiliiated with University)
- ◯ University Health Clinic
- ◯ Hospital
- ◯ Pharmacy
- ◯ Work

Other (please specify)

[ ]

24. Did you specifically go to that location to get the flu vaccination?

- ◯ Yes
- ◯ No
- ◯ I Don't Know

25. Was the flu vaccine suggested while you were there, or did you ask for it?

- ◯ Yes, the vaccine was suggested by the health care professional
- ◯ No, I specifically asked for the vaccination
- ◯ I Don't Know

Section 7: Barriers to vaccination

Please answer each question / statement completely before moving on to the next section.

26. Evaluate the following statements about the influenza vaccination

	Strongly Disagree	Disagree	Agree	Strongly Agree
Vaccines are too expensive for me right now	◯	◯	◯	◯
I do not have time to get a flu vaccination	◯	◯	◯	◯
I believe that as a result of the flu shot I may actually get the flu	◯	◯	◯	◯
I do not know where to receive a flu vaccination	◯	◯	◯	◯
I do not believe I am in danger of contracting the flu	◯	◯	◯	◯
I believe that vaccines may have dangerous side effects	◯	◯	◯	◯
I was not informed that flu vaccines might be important	◯	◯	◯	◯
I do not believe the flu vaccine works to prevent the flu	◯	◯	◯	◯

The End

Thank you for taking the time to answer the questions of this survey.

If you would like to be entered in a drawing to win 1 of 15, $20 Gift Cards to Dunkin' Donuts please send an e-mail to "mcaputo@m.marywood.edu" with the subject line "DD Gift Card Entry". This method of entry will ensure that specific responses to this survey are not linked to any particular e-mail adress, which will ensure all information remains confidential.

Appendix F

Professional Review

PROFESSIONAL REVIEW
OF RESEARCHER-DEVELOPED INSTRUMENT

To the Marywood ERC Members,

I, Frederic Koralewski, Ph.D., certify that I have reviewed the research instrument developed by Matthew S. Caputo for use in the project entitled *Factors Influencing Seasonal Influenza Vaccination Uptake Rates Among Undergraduate College Students in Scranton, Pennsylvania.* I can attest that the instrument is appropriate for the nature of the research proposed.

I fully endorse the use of the researcher-developed instrument within this study.

Sincerely,

[signature]
Signature

20 Jun 2014
Date

KORALEWSKI
Name – Printed

Deputy Director
Professional Title

570.242.7563
Phone

frederic.koralewski@sanofipasteur.com
Email

Rev. 8/5/2013

Appendix G

Variables and Scoring

Ques-tion	Description	Purpose / Variable	Scoring	Interpretation
1*	What was your age as of July 1, 2013?	Demographic, * = Inclusion	N/A	N/A
2*	Which university do you currently attend?			
3 & 4*	How many credits are you enrolled for?			
5	What is your gender?			
6	What is your area of study (major) at your university?			
7*	What "year" are you considered at your university?			
8	Which best describes your current living situation?			
9	What is the highest level of education achieved by your parent or parent(s)?			
10	What is your ethnicity?			
11	Have you received information about or been encouraged to receive the influenza vaccine from any of the following sources in the past year?			
12*	Are you allergic to components of the flu vaccine, or have a medical condition that prohibits you from getting the vaccine?			
20	Did you get the flu vaccine?	Dependent Variable	Yes = 1, No or I Don't Know = 0	Score of 1 = Vaccine Compliance and a score 0 = Vaccine Non-compliant

Question	**Description**	**Purpose / Variable**	**Scoring**	**Interpretation**
21	When did you receive this flu vaccine?	Descriptive Information for compliant population	N/A	N/A
22	How was this vaccination given to you?			
23	Where was the vaccine given?			
24 & 25	Did you go to the location to get the flu vaccine?	Descriptive Information for compliant population	N/A	N/A
13	Is Influenza a respiratory virus?	Independent Variable (Knowledge)	Yes = 1, No or I Don't Know = 0	0 – 20 points (Low Knowledge – High Knowledge)
14	Common symptoms of influenza disease (10, T/F)		Correct Answer = 1, Incorrect Answer = 0	
15	Evaluate statements about the seasonal influenza vaccine (9, T/F)		Correct Answer = 1, Incorrect Answer = 0	
16	Evaluate the following three statements (4 point Likert Scale)	Independent Variable (Risk of Disease)	Strongly Agree = 4, Agree = 3, Disagree = 2, and Strongly Disagree = 1	3 – 12 points (Low Risk Perceived – High Risk Perceived)

Ques-tion	**Description**	**Purpose / Variable**	**Scoring**	**Interpretation**
17	How often do you get the seasonal influenza vaccine?	Independent Variable (Benefit of Vaccination)	Annually = 0, Every few years = 1, rarely = 2, never = 3	Score of 0 - 1 = High Benefit Perceived, Score of 2 - 3 = Average Benefit Perceived and Score of 4 - 5 = Little to No Benefit Perceived
18	Do you think the flu vaccine is worth getting for yourself?		Yes = 0, No or I Don't Know = 1	
19	Do you think the flu vaccine is effective in preventing the flu?		Yes = 0, No or I Don't Know = 1	
26	Evaluate the following eight statements about the flu vaccine (4 point Likert Scale) - Vaccines are too expensive for me right now. - I do not have time to get a flu vaccination. - I do not know where to receive a flu vaccination - I do not believe I am in danger of contracting the flu. - I was not informed that flu vaccines might be important - I do not believe the flu vaccine works to prevent flu. - I believe that as a result of the flu shot I may actually get the flu. - I believe that vaccines may have dangerous side effects.	Descriptive Information for non-compliant population	N/A	N/A

Appendix H

Variable Coding Scheme in SPSS

Variable Name	Variable Description	Measure	Values	Survey Instrument Question
age	Respondent's age	Scale	18 - 24	Question 1
school	Respondent's university	Nominal	1 = "Marywood University"; 2 = "University of Scranton"	Question 2
sex	Respondent's gender	Nominal	1 = "Female"; 2 = "Male"	Question 5
major_recode	Respondent's university	Nominal	1 = "Business"; 2 = "Education"; 3 = "Health Care"; 4 = "Humanities"; 5 = Psychology; 6 = "Science"; 7 = "Other (Comm, CJ, H. Admin, Arcitecture)"	Question 6
schyear	Respondent's year at university	Ordinal	1 = "Freshman (<30 Credits)"; 2 = "Sophomore (30 - 59 Credits)"; 3 = "Junior (60 - 89 Credits)"; 4 = "Senior (>90 Credits)	Question 7
living	Respondent's current living situation	Nominal	1 = "Live on campus"; 2 = "Live off campus"; 3 = "Live with parents"	Question 8
parental_educ	Respondent's reported highest parental education	Ordinal	0 = "Attended by never graduate high scool"; 1 = "High School Diploma"; 2 = "Attended but never graduated college"; 3 = "Associate's / Technical Degree"; 4 = "Bachelor's Degree"; 5 = "Master's Degree"; 6 = "Professional / Terminal Degree"	Question 9

Variable Name	Variable Description	Measure	Values	Survey Instrument Question
race	Respondent's race	Nominal	1 = "African American"; 2 = "Asian"; 3 = "Caucasian"; 4 = "Hispanic"; 5 = "Mixed Race"; 6 = "Prefer not to answer"	Question 10
info_med	Respondent's reported information source as personal physician or nurse	Nominal	0 = "No"; 1 = "Yes"	Question 11
info_parent	Respondent's reported information source as parent(s)	Nominal	0 = "No"; 1 = "Yes"	Question 11
info_healthcenter	Respondent's reported information source as student health center	Nominal	0 = "No"; 1 = "Yes"	Question 11
info_media	Respondent's reported information source as television, billboard, flyer, advertisment	Nominal	0 = "No"; 1 = "Yes"	Question 11
info_peer	Respondent's reported information source as students, friends, or other peers	Nominal	0 = "No"; 1 = "Yes"	Question 11

Variable Name	Variable Description	Measure	Values	Survey Instrument Question
know_respvirus	Respondent's knowledge question: influenza is a respiratory virus	Nominal	0 = "No"; 1 = "Yes"; 2 = "Not sure"	Question 13
know_fever	Respondent's knowledge question: the flu may cause fever	Nominal	0 = "False"; 1 = "True"	Question 14
know_dryskin	Respondent's knowledge question: the flu may cause dry skin	Nominal	0 = "False"; 1 = "True"	Question 14
know_nausea	Respondent's knowledge question: the flu may cause nausea	Nominal	0 = "False"; 1 = "True"	Question 14
know_nasalconj	Respondent's knowledge question: the flu may cause nasal conjestion	Nominal	0 = "False"; 1 = "True"	Question 14
know_swollen	Respondent's knowledge question: the flu may cause swollen hands and feet	Nominal	0 = "False"; 1 = "True"	Question 14
know_headache	Respondent's knowledge question: the flu may cause headache	Nominal	0 = "False"; 1 = "True"	Question 14

Variable Name	Variable Description	Measure	Values	Survey Instrument Question
know_diarrhea	Respondent's knowledge question: the flu may cause diarrhea	Nominal	0 = "False"; 1 = "True"	Question 14
know_sorethroat	Respondent's knowledge question: the flu may cause a sore throat	Nominal	0 = "False"; 1 = "True"	Question 14
know_tired	Respondent's knowledge question: the flu may cause excessive tiredness	Nominal	0 = "False"; 1 = "True"	Question 14
know_muscleache	Respondent's knowledge question: the flu may cause muscle aches	Nominal	0 = "False"; 1 = "True"	Question 14
know_vac_disease	Respondent's knowledge question: The vaccine causes disease	Nominal	0 = "False"; 1 = "True"	Question 15
know_vac_protectsall	Respondent's knowledge question: The vaccine protects against all known flu strains	Nominal	0 = "False"; 1 = "True"	Question 15
know_vac_allergy	Respondent's knowledge question: The vaccine can cause an allergic reaction	Nominal	0 = "False"; 1 = "True"	Question 15

Variable Name	Variable Description	Measure	Values	Survey Instrument Question
know_vac_worse_flu	Respondent's knowledge question: It is better to get the flu then the flu vaccine	Nominal	0 = "False"; 1 = "True"	Question 15
know_vac_late	Respondent's knowledge question: It is better to get the flu vaccine late in the flu season to ensure protection longer	Nominal	0 = "False"; 1 = "True"	Question 15
know_vac_tgiving	Respondent's knowledge question: There is no point in getting the flu vaccine after Thanksgiving	Nominal	0 = "False"; 1 = "True"	Question 15
know_vac_annual	Respondent's knowledge question: You do not need to get the flu vaccine every year	Nominal	0 = "False"; 1 = "True"	Question 15
know_vac_preg	Respondent's knowledge question: You need special permission to get the flu vaccine if you are pregnant	Nominal	0 = "False"; 1 = "True"	Question 15

Variable Name	Variable Description	Measure	Values	Survey Instrument Question
know_vac_stomflu	Respondent's knowledge question: The vaccine protects against the stomach flu	Nominal	0 = "False"; 1 = "True"	Question 15
know_score	Respondent's knowledge score on scale of 0 – 20	Scale	0 – 20	N/A
risk_novac_disease	Respondent's reported risk of disease likert: If you do not get vaccinated, you will get the flu	Ordinal	1 = "Strongly Disagree"; 2 = "Disagree"; 3 = "Agree"; 4 = "Strongly Agree"	Question 16
risk_flu_danger	Respondent's reported risk of disease likert: The flu is a dangerous disease for a college student to have	Ordinal	1 = "Strongly Disagree"; 2 = "Disagree"; 3 = "Agree"; 4 = "Strongly Agree"	Question 16
risk_flu_school	Respondent's reported risk of disease likert: The flu can severly disrupt your semester, and impact your grades	Ordinal	1 = "Strongly Disagree"; 2 = "Disagree"; 3 = "Agree"; 4 = "Strongly Agree"	Question 16
risk_score	Respondent's risk of disease score on scale of 3 – 12	Scale	3 – 12	N/A

Variable Name	Variable Description	Measure	Values	Survey Instrument Question
benefit_vaccinate	Respondent's benefit of vaccination: frequency of flu vaccination	Ordinal	0 = "Never"; 1 = "Rarely"; 2 = "Every few years"; 3 = "Annually"	Question 17
benefit_useful	Respondent's benefit of vaccination: usefulness of flu vaccination for respondent	Nominal	0 = "No"; 1 = "Yes"; 2 = "I don't know"	Question 18
benefit_effective	Respondent's benefit of vaccination: effectiveness of flu vaccination in preventing disease	Nominal	0 = "No"; 1 = "Yes"; 2 = "I don't know"	Question 19
benefit_useful_recode	Respondent's benefit of vaccination: usefulness of flu vaccination for respondent (recoded to dichotomous)	Nominal	0 = "No / I don't know"; 1 = "Yes"	Question 18
benefit_effective_recode	Respondent's benefit of vaccination: effectiveness of flu vaccination in preventing disease (recoded to dichotomous)	Nominal	0 = "No / I don't know"; 1 = "Yes"	Question 19

Variable Name	Variable Description	Measure	Values	Survey Instrument Question
benefit_score	Respondent's benefit of vaccination score on scale of 0 – 5	Scale	0 – 5	N/A
vaccination_status	Respondent's vaccination status (dependent variable)	Nominal	0 = "No"; 1 = "Yes"	Question 20
vaccination_date	Vaccinated Respondent's vaccination date	Ordinal	1 = "Jul 2013 – Sep 2013"; 2 = "Oct 2013 – Dec 2013"; 3 = "Jan 2014 – Mar 2014"; 4 = "Apr 2014 – Jun 2014"	Question 21
vaccination_type	Vaccinated Respondent's vaccine type received	Nominal	1 = "Shot"; 2 = "Nasal"; 3 = "Unknown"	Question 22
vaccination_place	Vaccinated Respondent's vaccination location	Nominal	1 = "Doctor's Office"; 2 = "City Clinic"; 3 = "Hospital"; 4 = "Pharmacy"; 5 = "University Health Center"; 6 = "Work"; 7 = "Other – Home or Hosp Event"	Question 23
vaccination_sought	Whether the respondent went to the identified location in order to be vaccinated	Nominal	0 = "No"; 1 = "Yes"; 2 = "I Don't Know"	Question 24

Variable Name	Variable Description	Measure	Values	Survey Instrument Question
vaccination_suggested	If the respondent was at the location for another reason, reported whether they asked for the vaccine or it was 119ffered.	Nominal	0 = “No, respondent asked for vaccine”; 1 = “Yes, vaccine was suggested”; 2 = “I Don’t Know”	Question 25
unvac_barrier_expense	Unvaccinated Respondent’s reported barrier likert: Vaccines are too expensive for me right now	Ordinal	1 = “Strongly Disagree”; 2 = “Disagree”; 3 = “Agree”; 4 = “Strongly Agree”	Question 26
unvac_barrier_time	Unvaccinated Respondent’s reported barrier likert: I do not have time to get a flu vaccination	Ordinal	1 = “Strongly Disagree”; 2 = “Disagree”; 3 = “Agree”; 4 = “Strongly Agree”	Question 26
unvac_riskvac_disease	Unvaccinated Respondent’s reported risk of vaccine likert: I believe that as a result of the flu shot I may actually get the flu	Ordinal	1 = “Strongly Disagree”; 2 = “Disagree”; 3 = “Agree”; 4 = “Strongly Agree”	Question 26

Variable Name	Variable Description	Measure	Values	Survey Instrument Question
unvac_barrier_where	Unvaccinated Respondent’s reported barrier likert: I do not know where to receive a flu vaccination	Ordinal	1 = “Strongly Disagree”; 2 = “Disagree”; 3 = “Agree”; 4 = “Strongly Agree”	Question 26
unvac_barrier_notneeded	Unvaccinated Respondent’s reported barrier likert: I do not believe I am in danger of contracting the flu	Ordinal	1 = “Strongly Disagree”; 2 = “Disagree”; 3 = “Agree”; 4 = “Strongly Agree”	Question 26
unvac_riskvac_sideeffect	Unvaccinated Respondent’s reported risk of vaccine likert: I believe that vaccines may have dangerous side effects	Ordinal	1 = “Strongly Disagree”; 2 = “Disagree”; 3 = “Agree”; 4 = “Strongly Agree”	Question 26
unvac_barrier_importance	Unvaccinated Respondent's reported barrier likert: I was not informed that flu vaccines might be important	Ordinal	1 = "Strongly Disagree"; 2 = "Disagree"; 3 = "Agree"; 4 = "Strongly Agree"	Question 26

Variable Name	Variable Description	Measure	Values	Survey Instrument Question
unvac_barrier_ineffective	Unvaccinated Respondent's reported barrier likert: I do not believe the flu vaccine works to prevent the flu	Ordinal	1 = "Strongly Disagree"; 2 = "Disagree"; 3 = "Agree"; 4 = "Strongly Agree"	Question 26

Appendix I

Marywood University Exempt Review Committee Approval

MARYWOOD UNIVERSITY
EXEMPT REVIEW COMMITTEE
O'Neill Center for Healthy Families, 2300 Adams Avenue, Scranton, PA 18509

DATE:	July 11, 2014
TO:	Matthew Caputo, B.S., M.S.
FROM:	Marywood University Exempt Review Committee
STUDY TITLE:	[622989-2] Factors Influencing Seasonal Influenza Vaccination Uptake Rates Among Undergraduate College Students in Scranton, Pennsylvania
MU ERC #:	2014-E077
SUBMISSION TYPE:	Amendment/Modification
ACTION:	APPROVED
APPROVAL DATE:	July 11, 2014
EXPIRATION DATE:	July 11, 2015
EXEMPT CATEGORY:	Category 2

Thank you for your submission of an Exemption Request for this research study. Marywood University's Exempt Review Committee has **APPROVED** your request for an Exemption. The project meets the criteria defined by federal regulations for an Exemption and involves minimal risk to participants. All research must be conducted in accordance with this approved submission.

Please remember only the approved participant letter and advertisements, if applicable, may be used in this research.

Please also note that:

- Any REVISION TO THE PROTOCOL must be submitted to and approved by the ERC prior to initiation.
- All SERIOUS and UNEXPECTED adverse events must be reported to this office.

- All NON-COMPLIANCE issues or COMPLAINTS regarding this study must be reported to this office.
- This project requires CONTINUING REVIEW by this office on an annual basis. Should your study continue beyond the one-year approval period, please reapply prior to the expiration date. No research may continue beyond the expiration date until approved by the ERC.
- A CLOSURE REPORT is due prior to July 11, 2015, unless you are applying for renewal/continuing review.

The appropriate forms for any of the reports mentioned above may be found in the Forms and Templates Library on IRBNet.

If you have any questions, please contact the Exempt Review Coordinator at 570-961-4778 or lacamlet@marywood.edu. Please include your study title and MU ERC number in all correspondence with this office.

Thank you and good luck with your research!

Exempt Review Staff

Appendix J

University of Scranton Internal Review Board Approved

THE UNIVERSITY OF
SCRANTON
A JESUIT UNIVERSITY

INSTITUTIONAL REVIEW BOARD
FOR THE PROTECTION OF HUMAN SUBJECTS

To: Matthew S. Caputo, M.S./ Patricia Popeck, M.S.

From: Tabbi Miller-Scandle, Ph.D.

Date: September 8, 2014

Re: IRB Protocol #4-15A
Factors influencing influenza vaccination uptake rates among undergraduate college students in Scranton, Pennsylvania

---

I am pleased to advise you that the above referenced project is approved **for a period of one year**.

Please use the enclosed document/s stamped with the IRB approval date. This wording is also approved for use in electronic format. Any alterations to it or the protocol must be approved by the IRB prior to instituting them.

Adverse or unexpected events must be reported immediately to the IRB Chair.

If you have any questions, please do not hesitate to contact me.

Thank You,

Tabbi L. Miller-Scandle, Ph.D.
Director of Research and Sponsored Programs
IRB Administrator
(570) 941-5824
tabbi.miller-scandle@scranton.edu

cc: Margarete Zalon, Ph.D., IRB Chair

Appendix K

Dissertation Proposal Approval Form

MARYWOOD UNIVERSITY
Interdisciplinary Ph.D. in Human Development
DISSERTATION PROPOSAL APPROVAL FORM

Student Name: Matthew Stephen Caputo

Dissertation Title: Factors Influencing Seasonal Influenza Vaccination Uptake Rate Among Undergraduate College Students in Scranton, Pennsylvania

Date of Dissertation Proposal Meeting:

6 25 2014

Committee Approval:

Deborah [illegible], Ph.D. 6.25.2014.
Chair Signature date

[illegible] 6/25/14
Member Signature date

Raymond P. Heath 6/25/14
Member Signature date

Status of Proposal: _____ Approved

X Approved with Modifications

Modifications:

edits to text + contextual content.

A copy of this completed form must be submitted to the Director of the Ph.D. Program in Human Development within one (1) week of the Dissertation Proposal meeting date.

Last Updated 6/26/13

Appendix L

SPSS Analysis Export Summaries

DEMOGRAPHIC STATISTICS (FREQUENCIES) – SEPARATED BY UNIVERSITY

Information for Table 2

		Respondent's age						Total
		18	19	20	21	22	23	
Respondent's university	Marywood University	63	67	40	25	9	3	207
	University of Scranton	121	111	124	31	4	3	394
Total		184	178	164	56	13	6	601

Age Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Respondent's age	601	18	23	19.26	1.114
Valid N (listwise)	601				

GENDER

		Respondent's gender		Total
		Female	Male	
Respondent's university	Marywood University	170	37	207
	University of Scranton	302	92	394
Total		472	129	601

MAJOR

		Respondent's major					
		Bus-iness	Educ-ation	Health Care	Human-ities	Psych-ology	Science
Respondent's university	Marywood University	26	18	57	24	22	19
	University of Scranton	57	12	133	19	27	110
Total		83	30	190	43	49	129

Count

		Respondent's major	Total
		Other	
Respondent's university	Marywood University	41	207
	University of Scranton	36	394
Total		77	601

CLASS YEAR

		Respondent’s year at university				Total
		Freshman (<30 Credits)	Sophomore (30 – 59 Credits)	Junior (60 – 89 Credits)	Senior (>90 Credits)	
Respondent’s university	Marywood University	19	51	77	60	207
	University of Scranton	29	83	126	156	394
Total		48	134	203	216	601

LIVING STATUS

		Respondent's current living situation			Total
		Live on campus	Live off campus	Live with parents	
Respondent's university	Marywood University	103	52	52	207
	University of Scranton	244	98	52	394
Total		347	150	104	601

HIGHEST PARENTAL EDUCATION

		Respondent's reported highest parental education				
		Attended but never graduated high school	High School Diploma	Attended but never graduated high school	Associate's / Technical degree	Bachelor's degree
Respondent's university	Marywood University	1	43	21	29	65
	University of Scranton	1	48	39	39	141
Total		2	91	60	68	206

		Respondent's reported highest parental education		Total
		Master's Degree	Professional / Terminal degree	
Respondent's university	Marywood University	40	8	207
	University of Scranton	100	26	394
Total		140	34	601

RACE

		Respondent's race					
		African American	Asian	Caucasian	Hispanic	Mixed Race	Prefer not to answer
Respondent's university	Marywood University	2	6	181	9	2	7
	University of Scranton	3	20	335	13	15	8
Total		5	26	516	22	17	15

		Total
Respondent's university	Marywood University	207
	University of Scranton	394
Total		601

IDENTIFIED INFORMATION SOURCES OF STUDY POPULATION (Table 3)

INFORMATION SOURCE – DOCTOR/NURSE

		Respondent's reported information source as personal physician or nurse		
		No	Yes	Total
Respondent's university	Marywood University	84	123	207
	University of Scranton	158	236	394
Total		242	359	601

INFORMATION SOURCE – PARENT

		Respondent's reported information source as parent(s)		
		No	Yes	Total
Respondent's university	Marywood University	105	102	207
	University of Scranton	173	221	394
Total		278	323	601

INFORMATION SOURCE – HEALTH CENTER

		Respondent's reported information source as student health center		
		No	Yes	Total
Respondent's university	Marywood University	115	92	207
	University of Scranton	208	186	394
Total		323	278	601

INFORMATION SOURCE – MEDIA

		Respondent's reported information source as television, billboard, flyer, advertisment		
		No	Yes	Total
Respondent's university	Marywood University	68	139	207
	University of Scranton	129	265	394
Total		197	404	601

INFORMATION SOURCE – PEERS

		Respondent's reported information source as students, friends, or other peers		
		No	Yes	Total
Respondent's university	Marywood University	151	56	207
	University of Scranton	277	117	394
Total		428	173	601

FOLLOW-UP INFORMATION FOR VACCINATED POPULATION

Information for Table 4

Vaccinated Respondent's vaccination date * Respondent's vaccination status (dependent variable) Crosstabulation

Count

		Respondent's vaccination status (dependent variable)		
		No	Yes	Total
Vaccinated Respondent's vaccination date		372	0	372
	Jul 2013 - Sep 2013	0	48	48
	Oct 2013 - Dec 2013	0	154	154
	Jan 2014 - Mar 2014	0	18	18
	Apr 2014 - Jun 2014	0	9	9
Total		372	229	601

Vaccinated Respondent's vaccine type received * Respondent's vaccination status (dependent variable) Crosstabulation

Count

		Respondent's vaccination status (dependent variable)		
		No	Yes	Total
Vaccinated Respondent's vaccine type received		372	0	372
	Shot	0	207	207
	Nasal	0	21	21
	Unknown	0	1	1
Total		372	229	601

Vaccinated Respondent's vaccination location * Respondent's vaccination status (dependent variable) Crosstabulation

Count

		Respondent's vaccination status (dependent variable)		Total
		No	Yes	
Vaccinated Respondent's vaccination location		372	0	372
	Doctor's office	0	108	108
	City Clinic	0	8	8
	Hospital	0	8	8
	Pharmacy	0	59	59
	University Health Center	0	37	37
	Work	0	7	7
	Other - Home or Hosp Event	0	2	2
Total		372	229	601

Whether the respondent went to the identified location in order to be vaccinated * Respondent's vaccination status (dependent variable) Crosstabulation

Count

		Respondent's vaccination status (dependent variable)		Total
		No	Yes	
Whether the respondent went to the identified location in order to be vaccinated		372	0	372
	No	0	45	45
	Yes	0	180	180
	I don't know	0	4	4
Total		372	229	601

If the respondent was at the location for another reason, reported whether they asked for the vaccine or it was offfered. * Respondent's vaccination status (dependent variable) Crosstabulation

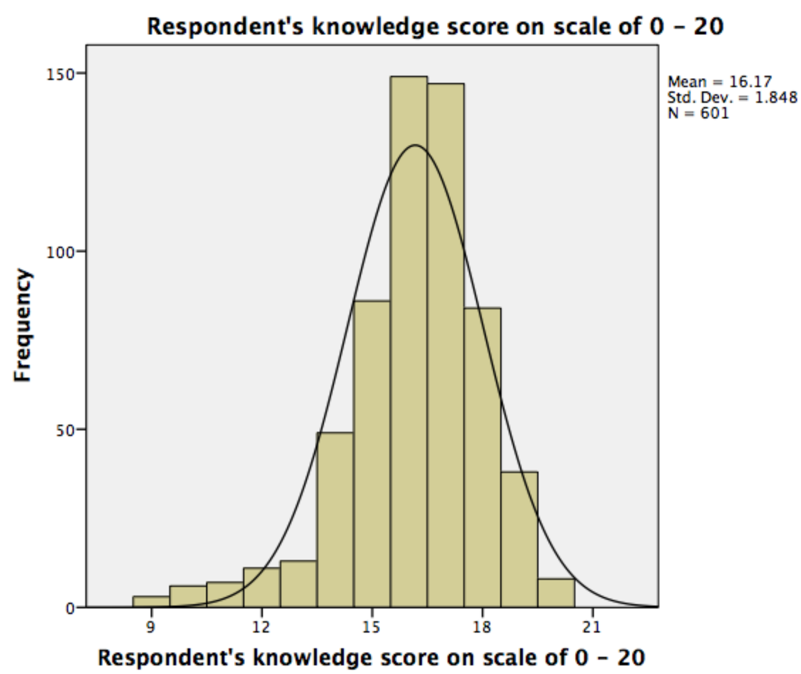
Count

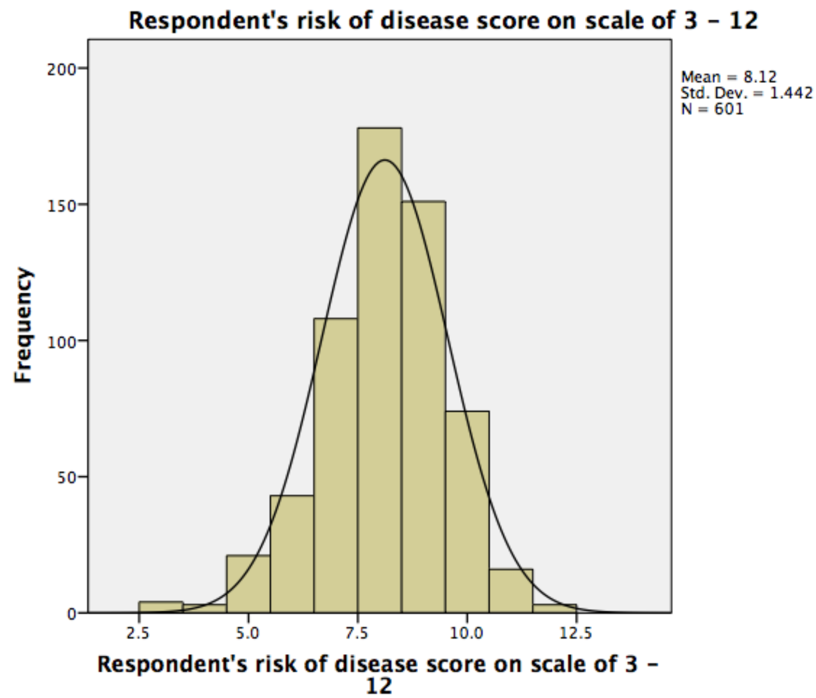
		Respondent's vaccination status (dependent variable)		
		No	Yes	Total
If the respondent was at the location for another reason, reported whether they asked for the vaccine or it was offfered.		372	184	556
	No, respondent asked for vaccine	0	10	10
	Yes, vaccine was suggested	0	34	34
	I don't know	0	1	1
Total		372	229	601

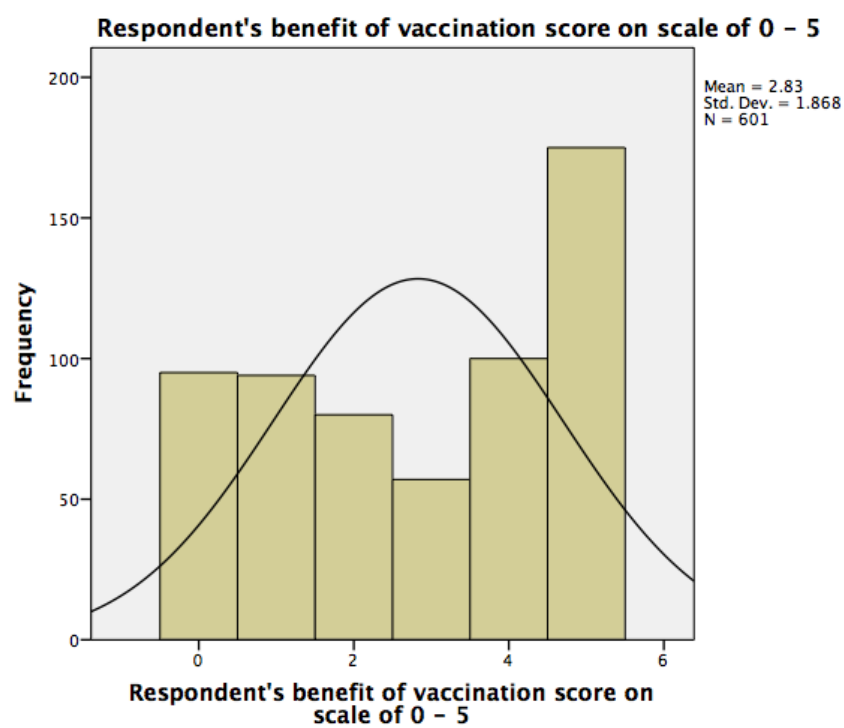
KNOWLEDGE, RISK OF DISEASE, BENEIFIT SCORE ANALYSIS OF STUDY POPULATION

Statistics

		Respondent's knowledge score on scale of 0 - 20	Respondent's risk of disease score on scale of 3 - 12	Respondent's benefit of vaccination score on scale of 0 - 5
N	Valid	601	601	601
	Missing	0	0	0
Mean		16.17	8.12	2.83
Std. Deviation		1.848	1.442	1.868
Skewness		-.907	-.435	-.210
Std. Error of Skewness		.100	.100	.100
Kurtosis		1.703	.654	-1.459
Std. Error of Kurtosis		.199	.199	.199
Range		11	9	5
Minimum		9	3	0
Maximum		20	12	5




Respondent's risk of disease score on scale of 3 - 12
Mean = 8.12
Std. Dev. = 1.442
N = 601
Frequency
200
150
100
50
0
2.5
5.0
7.5
10.0
12.5
Respondent's risk of disease score on scale of 3 - 12


Respondent's benefit of vaccination score on scale of 0 - 5
Mean = 2.83
Std. Dev. = 1.868
N = 601
Frequency
200
150
100
50
0
0
2
4
6
Respondent's benefit of vaccination score on scale of 0 - 5

COMPARISON OF DEMOGRAPHIC STATISTICS TO INFLUENZA VACCINE UPTAKE RATE

Information for Table 5

Vaccination Status x AGE

Count

		Respondent's age						Total
		18	19	20	21	22	23	
Respondent's vaccination status (dependent variable)	No	116	106	93	41	11	5	372
	Yes	68	72	71	15	2	1	229
Total		184	178	164	56	13	6	601

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.446[a]	5	.093
Likelihood Ratio	10.127	5	.072
Linear-by-Linear Association	1.465	1	.226
N of Valid Cases	601		

a. 3 cells (25.0%) have expected count less than 5. The minimum expected count is 2.29.

Vaccination Status x SCHOOL

Count

		Respondent's university		Total
		Marywood University	University of Scranton	
Respondent's vaccination status (dependent variable)	No	139	233	372
	Yes	68	161	229
Total		207	394	601

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.694[a]	1	.055		
Continuity Correction[b]	3.362	1	.067		
Likelihood Ratio	3.732	1	.053		
Fisher's Exact Test				.063	.033
Linear-by-Linear Association	3.688	1	.055		
N of Valid Cases	601				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 78.87.

b. Computed only for a 2x2 table

Vaccination Status x GENDER

Count

		Respondent's gender		Total
		Female	Male	
Respondent's vaccination status (dependent variable)	No	285	87	372
	Yes	187	42	229
Total		472	129	601

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.141[a]	1	.143		
Continuity Correction[b]	1.853	1	.173		
Likelihood Ratio	2.175	1	.140		
Fisher's Exact Test				.153	.086
Linear-by-Linear Association	2.138	1	.144		
N of Valid Cases	601				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 49.15.

b. Computed only for a 2x2 table

Vaccination Status x MAJOR

		Respondent's major							Total
		Bus-iness	Educ-ation	Health Care	Human-ities	Psych-ology	Science	Other	
Respondent's vaccination status (dependent variable)	No	57	18	98	31	34	79	55	372
	Yes	26	12	92	12	15	50	22	229
Total		83	30	190	43	49	129	77	601

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.290[a]	6	.012
Likelihood Ratio	16.351	6	.012
Linear-by-Linear Association	1.421	1	.233
N of Valid Cases	601		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.43.

Vaccination Status x CLASS YEAR

		Respondent's year at university				
		Freshman (<30 Credits)	Sophomore (30 – 59 Credits)	Junior (60 – 89 Credits)	Senior (>90 Credits)	Total
Respondent's vaccination status (dependent variable)	No	31	86	126	129	372
	Yes	17	48	77	87	229
Total		48	134	203	216	601

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.878[a]	3	.831
Likelihood Ratio	.879	3	.830
Linear-by-Linear Association	.835	1	.361
N of Valid Cases	601		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.29.

Vaccination Status x LIVING STATUS

		Respondent's current living situation			
		Live on campus	Live off campus	Live with parents	Total
Respondent's vaccination status (dependent variable)	No	198	99	75	372
	Yes	149	51	29	229
Total		347	150	104	601

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.117[a]	2	.010
Likelihood Ratio	9.290	2	.010
Linear-by-Linear Association	9.015	1	.003
N of Valid Cases	601		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 39.63.

Vaccination Status x PARENTAL EDUCATION

Count

		Respondent's reported highest parental education					
		Attended but never graduated high school	High School Diploma	Attended but never graduated high school	Associate's / Technical degree	Bachelor's degree	Master's Degree
Respondent's vaccination status (dependent variable)	No	2	64	38	49	123	75
	Yes	0	27	22	19	83	65
Total		2	91	60	68	206	140

Count

		Respondent's reported highest parental education	
		Professional / Terminal degree	Total
Respondent's vaccination status (dependent variable)	No	21	372
	Yes	13	229
Total		34	601

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.538[a]	6	.073
Likelihood Ratio	12.360	6	.054
Linear-by-Linear Association	6.910	1	.009
N of Valid Cases	601		

a. 2 cells (14.3%) have expected count less than 5. The minimum expected count is .76.

Vaccination Status x RACE

		Respondent's race						
		African American	Asian	Caucasian	Hispanic	Mixed Race	Prefer not to answer	Total
Respondent's vaccination status (dependent variable)	No	5	18	317	14	8	10	372
	Yes	0	8	199	8	9	5	229
Total		5	26	516	22	17	15	601

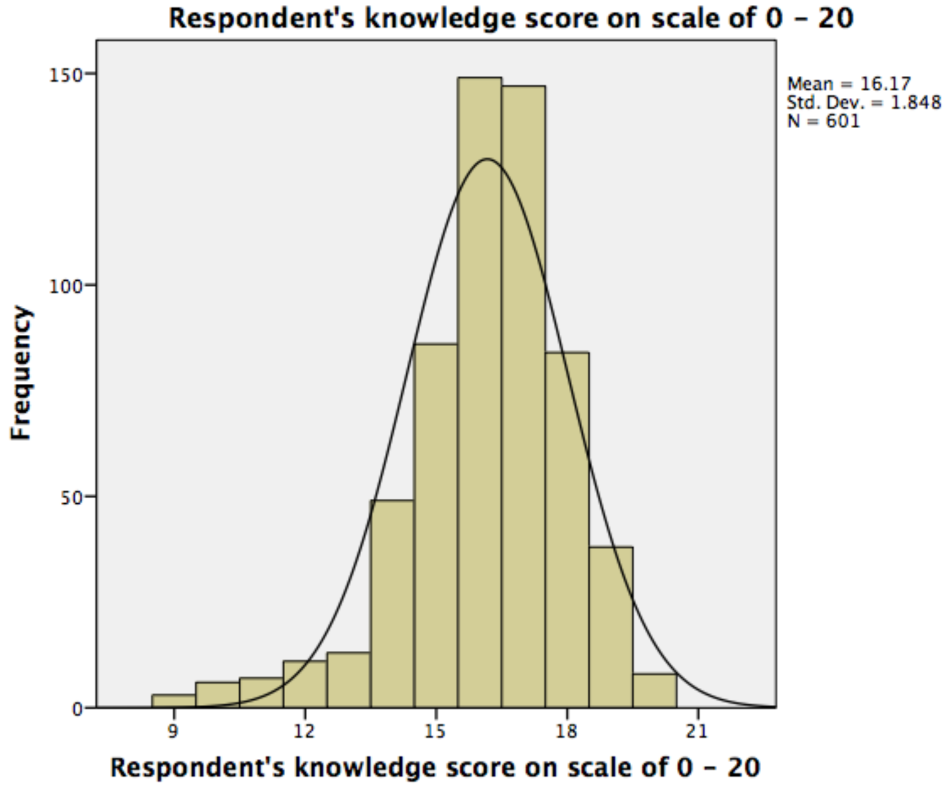
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.478[a]	5	.360
Likelihood Ratio	7.165	5	.209
Linear-by-Linear Association	1.087	1	.297
N of Valid Cases	601		

a. 2 cells (16.7%) have expected count less than 5. The minimum expected count is 1.91.

RESEARCH QUESTION 1 - LOGISTIC REGRESSION ANALYSIS

Normality



Outlier Analysis (Mahalanobis Distance)

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Respondent's benefit of vaccination score on scale of 0 - 5, Respondent's knowledge score on scale of 0 - 20, Respondent's risk of disease score on scale of 3 - 12[b]	.	Enter

a. Dependent Variable: Unique Respondent ID

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.043[a]	.002	-.003	238.322

a. Predictors: (Constant), Respondent's benefit of vaccination score on scale of 0 - 5, Respondent's knowledge score on scale of 0 - 20, Respondent's risk of disease score on scale of 3 - 12

b. Dependent Variable: Unique Respondent ID

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	63526.515	3	21175.505	.373	.773[b]
	Residual	33908090.783	597	56797.472		
	Total	33971617.298	600			

a. Dependent Variable: Unique Respondent ID

b. Predictors: (Constant), Respondent's benefit of vaccination score on scale of 0 - 5, Respondent's knowledge score on scale of 0 - 20, Respondent's risk of disease score on scale of 3 - 12

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	492.446	98.291		5.010	.000
	Respondent's knowledge score on scale of 0 - 20	-1.223	5.322	-.009	-.230	.818
	Respondent's risk of disease score on scale of 3 - 12	-7.290	7.179	-.044	-1.015	.310
	Respondent's benefit of vaccination score on scale of 0 - 5	2.351	5.565	.018	.423	.673

a. Dependent Variable: Unique Respondent ID

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	388.98	467.66	420.16	10.290	601
Std. Predicted Value	-3.030	4.617	.000	1.000	601
Standard Error of Predicted Value	9.877	48.322	18.632	5.561	601
Adjusted Predicted Value	389.70	481.49	420.15	10.561	601
Residual	-431.640	411.707	.000	237.726	601
Std. Residual	-1.811	1.728	.000	.997	601
Stud. Residual	-1.838	1.733	.000	1.001	601
Deleted Residual	-444.666	414.408	.007	239.408	601
Stud. Deleted Residual	-1.842	1.736	.000	1.002	601
Mahal. Distance	.032	23.668	2.995	2.780	601
Cook's Distance	.000	.025	.002	.002	601
Centered Leverage Value	.000	.039	.005	.005	601

a. Dependent Variable: Unique Respondent ID

Explore

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Mahalanobis Distance	601	100.0%	0	0.0%	601	100.0%

Descriptives

			Statistic	Std. Error
Mahalanobis Distance	Mean		2.9950083	.11340267
	95% Confidence Interval for Mean	Lower Bound	2.7722939	
		Upper Bound	3.2177227	
	5% Trimmed Mean		2.6270594	
	Median		2.3791785	
	Variance		7.729	
	Std. Deviation		2.78010061	
	Minimum		.03215	
	Maximum		23.66801	
	Range		23.63586	
	Interquartile Range		2.32670	
	Skewness		3.043	.100
	Kurtosis		13.104	.199

Extreme Values

			Case Number	Value
Mahalanobis Distance	Highest	1	99	23.66801
		2	260	18.85952
		3	171	18.06208
		4	303	16.77368
		5	568	16.70483
	Lowest	1	564	.03215
		2	540	.03215
		3	438	.03215
		4	382	.03215
		5	370	.03215[a]

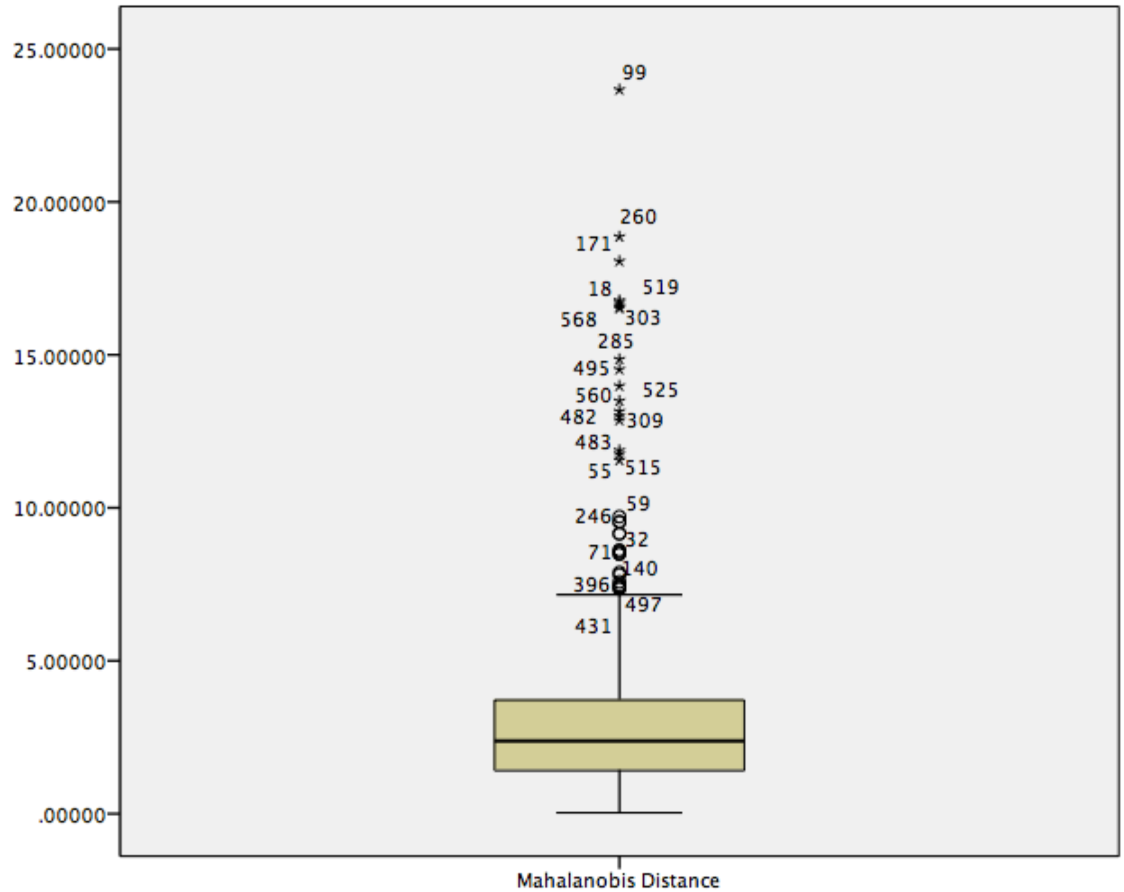
a. Only a partial list of cases with the value .03215 are shown in the table of lower extremes.

Mahalanobis Distance

Mahalanobis Distance Stem-and-Leaf Plot

```
 Frequency    Stem &  Leaf

    31.00        0 .  0000000222222222444444444444444
    68.00        0 .  55555555555555556666666666666666666666666666777888888888888999999999
    90.00        1 .
000000000111111111111111111112333333333333333333333344444444444444444444444444444444444
4444
    47.00        1 .  55555556666666666667777777777778888888888888899
    89.00        2 .
00000000000000000000011112222222222222222222233333333333333333333333333333333333444444
444
    74.00        2 .
55555555555555555556666677777777777888888888888889999999999999999999999999
    37.00        3 .  0000000012222222223333333333333344444
    39.00        3 .  555555666666677777777777788888888999999
    26.00        4 .  00000000011222222333333334
    18.00        4 .  555566677777889999
    22.00        5 .  0000001112222222234444
    10.00        5 .  6677778899
    11.00        6 .  00001112224
     4.00       6 .  5666
     2.00       7 .  01
    33.00 Extremes    (>=7.3)
 Stem width:   1.00000
 Each leaf:       1 case(s)
```



25.00000
20.00000
15.00000
10.00000
5.00000
.00000
99
260
171
18
519
568
303
285
495
560
525
482
309
483
55
515
59
246
32
71
140
396
497
431
Mahalanobis Distance

Information for KNOWLEDGE, Table 6

Logistic Regression

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	594	100.0
	Missing Cases	0	.0
	Total	594	100.0
Unselected Cases		0	.0
Total		594	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
No	0
Yes	1

Block 0: Beginning Block

Classification Table[a,b]

Observed			Predicted: Respondent's vaccination status (dependent variable) No	Predicted: Respondent's vaccination status (dependent variable) Yes	Predicted: Percentage Correct
Step 0	Respondent's vaccination status (dependent variable)	No	367	0	100.0
		Yes	227	0	.0
	Overall Percentage				61.8

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.480	.084	32.369	1	.000	.619

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	know_score	4.153	1	.042
		risk_score	40.436	1	.000
		benefit_score	247.275	1	.000
	Overall Statistics		247.728	3	.000

Block 1: Method = Forward Stepwise (Likelihood Ratio)

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	301.089	1	.000
	Block	301.089	1	.000
	Model	301.089	1	.000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	489.060[a]	.398	.541

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Classification Table[a]

	Observed		Predicted: Respondent's vaccination status (dependent variable) No	Predicted: Respondent's vaccination status (dependent variable) Yes	Percentage Correct
Step 1	Respondent's vaccination status (dependent variable)	No	284	83	77.4
		Yes	38	189	83.3
	Overall Percentage				79.6

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	benefit_score	1.103	.088	157.371	1	.000	3.012
	Constant	-4.146	.349	141.179	1	.000	.016

a. Variable(s) entered on step 1: benefit_score.

Variables not in the Equation

			Score	df	Sig.
Step 1	Variables	know_score	.014	1	.905
		risk_score	.637	1	.425
	Overall Statistics		.647	2	.724

Step Summary[a,b]

Step	Improvement			Model			Correct Class %	Variable
	Chi-square	df	Sig.	Chi-square	df	Sig.		
1	301.089	1	.000	301.089	1	.000	79.6%	IN: benefit_score

a. No more variables can be deleted from or added to the current model.

b. End block: 1

INDPENDENT SAMPLES T-TEST ANALYSIS

Information for Sub-question 1

Group Statistics

	Respondent's vaccination status (dependent variable)	N	Mean	Std. Deviation	Std. Error Mean
Respondent's knowledge score on scale of 0 - 20	Yes	229	16.36	1.865	.123
	No	372	16.05	1.830	.095

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Respondent's knowledge score on scale of 0 - 20	Equal variances assumed	.187	.665	1.965	599	.050	.304
	Equal variances not assumed			1.957	475.839	.051	.304

Independent Samples Test

		t-test for Equality of Means		
		Std. Error Difference	95% Confidence Interval of the Difference	
			Lower	Upper
Respondent's knowledge score on scale of 0 - 20	Equal variances assumed	.155	.000	.608
	Equal variances not assumed	.156	-.001	.610

Information for Sub-question 2

Group Statistics

	Respondent's vaccination status (dependent variable)	N	Mean	Std. Deviation	Std. Error Mean
Respondent's risk of disease score on scale of 3 - 12	Yes	229	8.59	1.398	.092
	No	372	7.83	1.394	.072

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Respondent's risk of disease score on scale of 3 - 12	Equal variances assumed	.037	.848	6.460	599	.000	.757
	Equal variances not assumed			6.455	481.653	.000	.757

Independent Samples Test

		t-test for Equality of Means		
		Std. Error Difference	95% Confidence Interval of the Difference	
			Lower	Upper
Respondent's risk of disease score on scale of 3 - 12	Equal variances assumed	.117	.527	.987
	Equal variances not assumed	.117	.527	.988

Information for Sub-question 3

First independent t Test (no data transformed)

Group Statistics

	Respondent's vaccination status (dependent variable)	N	Mean	Std. Deviation	Std. Error Mean
Benefit score recoded for normality	No	372	1.5914	.62278	.03229
	Yes	229	2.6026	.57292	.03786

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Benefit score recoded for normality	Equal variances assumed	6.915	.009	-19.923	599	.000
	Equal variances not assumed			-20.322	513.390	.000

Independent Samples Test

		t-test for Equality of Means			
		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
				Lower	Upper
Benefit score recoded for normality	Equal variances assumed	-1.01122	.05076	-1.11090	-.91154
	Equal variances not assumed	-1.01122	.04976	-1.10898	-.91347

Second independent t Test (data inversely transformed)

Group Statistics

	Respondent's vaccination status (dependent variable)	N	Mean	Std. Deviation	Std. Error Mean
Benefit score recoded for normality	No	372	1.8199	.54187	.02809
	Yes	229	2.6419	.48953	.03235

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Benefit score recoded for normality	Equal variances assumed	3.942	.048	-18.728	599	.000
	Equal variances not assumed			-19.186	519.888	.000

Independent Samples Test

		t-test for Equality of Means			
		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
				Lower	Upper
Benefit score recoded for normality	Equal variances assumed	-.82203	.04389	-.90823	-.73583
	Equal variances not assumed	-.82203	.04285	-.90620	-.73786

Mann-Whitney Test

Ranks

	Respondent's vaccination status (dependent variable)	N	Mean Rank	Sum of Ranks
Respondent's benefit of vaccination score on scale of 0 - 5	No	372	213.77	79523.00
	Yes	229	442.70	101378.00
	Total	601		

Test Statistics[a]

	Respondent's benefit of vaccination score on scale of 0 - 5
Mann-Whitney U	10145.000
Wilcoxon W	79523.000
Z	-16.023
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: Respondent's vaccination status (dependent variable)

BARRIERS TO VACCINATION REPORTED BY UNVACCINATED POPULATION

Information for Table 7

Unvaccinated Respondent's reported barrier likert: Vaccines are too expensive for me right now * Respondent's vaccination status (dependent variable) Crosstabulation

Count

		Respondent's vaccination status (dependent variable)	
		No	Total
Unvaccinated Respondent's reported barrier likert: Vaccines are too expensive for me right now	Strongly Disagree	83	83
	Disagree	221	221
	Agree	56	56
	Strongly Agree	12	12
Total		372	372

Unvaccinated Respondent's reported barrier likert: I do not have time to get a flu vaccination * Respondent's vaccination status (dependent variable) Crosstabulation

Count

		Respondent's vaccination status (dependent variable)	
		No	Total
Unvaccinated Respondent's reported barrier likert: I do not have time to get a flu vaccination	Strongly Disagree	52	52
	Disagree	187	187
	Agree	122	122
	Strongly Agree	11	11
Total		372	372

Unvaccinated Respondent's reported risk of vaccine likert: I believe that as a result of the flu shot I may actually get the flu * Respondent's vaccination status (dependent variable) Crosstabulation

Count

		Respondent's vaccination status (dependent variable)	
		No	Total
Unvaccinated Respondent's reported risk of vaccine likert: I believe that as a result of the flu shot I may actually get the flu	Strongly Disagree	72	72
	Disagree	170	170
	Agree	104	104
	Strongly Agree	26	26
Total		372	372

Unvaccinated Respondent's reported barrier likert: I do not know where to receive a flu vaccination * Respondent's vaccination status (dependent variable) Crosstabulation

Count

		Respondent's vaccination status (dependent variable)	
		No	Total
Unvaccinated Respondent's reported barrier likert: I do not know where to receive a flu vaccination	Strongly Disagree	157	157
	Disagree	163	163
	Agree	47	47
	Strongly Agree	5	5
Total		372	372

Unvaccinated Respondent's reported barrier likert: I do not believe I am in danger of contracting the flu * Respondent's vaccination status (dependent variable) Crosstabulation

Count

		Respondent's vaccination status (dependent variable)	
		No	Total
Unvaccinated Respondent's reported barrier likert: I do not believe I am in danger of contracting the flu	Strongly Disagree	40	40
	Disagree	206	206
	Agree	113	113
	Strongly Agree	13	13
Total		372	372

Unvaccinated Respondent's reported risk of vaccine likert: I believe that vaccines may have dangerous side effects * Respondent's vaccination status (dependent variable) Crosstabulation

Count

		Respondent's vaccination status (dependent variable)	
		No	Total
Unvaccinated Respondent's reported risk of vaccine likert: I believe that vaccines may have dangerous side effects	Strongly Disagree	56	56
	Disagree	164	164
	Agree	127	127
	Strongly Agree	25	25
Total		372	372

Unvaccinated Respondent's reported barrier likert: I was not informed that flu vaccines might be important * Respondent's vaccination status (dependent variable) Crosstabulation

Count

		Respondent's vaccination status (dependent variable)	
		No	Total
Unvaccinated Respondent's reported barrier likert: I was not informed that flu vaccines might be important	Strongly Disagree	107	107
	Disagree	216	216
	Agree	45	45
	Strongly Agree	4	4
Total		372	372

Unvaccinated Respondent's reported barrier likert: I do not believe the flu vaccine works to prevent the flu * Respondent's vaccination status (dependent variable) Crosstabulation

Count

		Respondent's vaccination status (dependent variable)	
		No	Total
Unvaccinated Respondent's reported barrier likert: I do not believe the flu vaccine works to prevent the flu	Strongly Disagree	66	66
	Disagree	225	225
	Agree	63	63
	Strongly Agree	18	18
Total		372	372

LOGISTIC REGRESSION, DEMOGRAPHIC VARIABLES TO INFLUENZA VACCINE UPTAKE RATE

Information for Table 8

LINEAR REGRESSION

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Combined minorities, Respondent's university, Combined 21+, Respondent's gender, Respondent's major, Combined high school, Respondent's current living situation, Respondent's year at university[b]	.	Enter

a. Dependent Variable: Respondent's vaccination status (dependent variable)
b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.190[a]	.036	.023	.480

a. Predictors: (Constant), Combined minorities, Respondent's university, Combined 21+, Respondent's gender, Respondent's major, Combined high school, Respondent's current living situation, Respondent's year at university
b. Dependent Variable: Respondent's vaccination status (dependent variable)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.093	8	.637	2.758	.005[b]
	Residual	136.651	592	.231		
	Total	141.744	600			

a. Dependent Variable: Respondent's vaccination status (dependent variable)

b. Predictors: (Constant), Combined minorities, Respondent's university, Combined 21+, Respondent's gender, Respondent's major, Combined high school, Respondent's current living situation, Respondent's year at university

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.117	.508		2.198	.028		
	Respondent's gender	-.050	.048	-.042	-1.036	.301	.972	1.029
	Respondent's university	.044	.043	.043	1.041	.298	.933	1.071
	Respondent's major	-.009	.010	-.035	-.844	.399	.974	1.027
	Respondent's year at university	.056	.031	.110	1.833	.067	.453	2.209
	Respondent's current living situation	-.063	.026	-.099	-2.377	.018	.934	1.071
	Combined 21+	-.045	.029	-.095	-1.570	.117	.448	2.232
	Combined high school	.027	.014	.081	1.959	.051	.957	1.044
	Combined minorities	-.005	.046	-.005	-.111	.912	.976	1.024

a. Dependent Variable: Respondent's vaccination status (dependent variable)

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.11	.59	.38	.092	601
Std. Predicted Value	-2.985	2.296	.000	1.000	601
Standard Error of Predicted Value	.031	.113	.057	.013	601
Adjusted Predicted Value	.09	.59	.38	.093	601
Residual	-.567	.894	.000	.477	601
Std. Residual	-1.180	1.861	.000	.993	601
Stud. Residual	-1.187	1.880	.000	1.001	601
Deleted Residual	-.574	.913	.000	.484	601
Stud. Deleted Residual	-1.187	1.884	.000	1.001	601
Mahal. Distance	1.577	32.435	7.987	4.454	601
Cook's Distance	.000	.017	.002	.002	601
Centered Leverage Value	.003	.054	.013	.007	601

a. Dependent Variable: Respondent's vaccination status (dependent variable)

LOGISTIC REGRESSION ANALYSIS

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	593	100.0
	Missing Cases	0	.0
	Total	593	100.0
Unselected Cases		0	.0
Total		593	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
No	0
Yes	1

Categorical Variables Coding

		Frequency	Parameter coding					
			(1)	(2)	(3)	(4)	(5)	(6)
Respondent's major	Business	81	1.000	.000	.000	.000	.000	.000
	Education	30	.000	1.000	.000	.000	.000	.000
	Health Care	190	.000	.000	1.000	.000	.000	.000
	Humanities	43	.000	.000	.000	1.000	.000	.000
	Psychology	48	.000	.000	.000	.000	1.000	.000
	Science	126	.000	.000	.000	.000	.000	1.000
	Other	75	.000	.000	.000	.000	.000	.000
Combined high school	Up to High School	91	1.000	.000	.000	.000	.000	
	Never graduated high school	59	.000	1.000	.000	.000	.000	
	Associate's / Technical degree	67	.000	.000	1.000	.000	.000	
	Bachelor's degree	204	.000	.000	.000	1.000	.000	
	Master's Degree	139	.000	.000	.000	.000	1.000	
	Professional / Terminal degree	33	.000	.000	.000	.000	.000	
Respondent's year at university	Freshman	47	1.000	.000	.000			
	Sophomore	132	.000	1.000	.000			
	Junior	200	.000	.000	1.000			
	Senior	214	.000	.000	.000			
Combined 21+	18 years old	181	1.000	.000	.000			
	19 years old	177	.000	1.000	.000			
	20 years old	162	.000	.000	1.000			
	21 - 23 years old	73	.000	.000	.000			
Combined minorities	Caucasian	516	1.000	.000				
	Non-caucasian	70	.000	1.000				
	Prefer not to answer	7	.000	.000				
Respondent's current living situation	Live on campus	346	1.000	.000				
	Live off campus	148	.000	1.000				
	Live with parents	99	.000	.000				

Classification Table[a,b]

Observed			Predicted: Respondent's vaccination status (dependent variable) No	Predicted: Respondent's vaccination status (dependent variable) Yes	Percentage Correct
Step 0	Respondent's vaccination status (dependent variable)	No	368	0	100.0
		Yes	225	0	.0
	Overall Percentage				62.1

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.492	.085	33.797	1	.000	.611

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 3	Step	8.285	3	.040
	Block	33.216	11	.000
	Model	33.216	11	.000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
3	754.030[a]	.054	.074

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Classification Table[a]

	Observed		Predicted: Respondent's vaccination status (dependent variable) No	Predicted: Respondent's vaccination status (dependent variable) Yes	Predicted: Percentage Correct
Step 3	Respondent's vaccination status (dependent variable)	No	317	51	86.1
		Yes	172	53	23.6
	Overall Percentage				62.4

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 3[a]	living			8.360	2	.015	
	living(1)	.568	.257	4.904	1	.027	1.765
	living(2)	.055	.297	.034	1	.853	1.057
	Age_Recoded			7.899	3	.048	
	Age_Recoded(1)	.430	.330	1.697	1	.193	1.537
	Age_Recoded(2)	.701	.323	4.698	1	.030	2.015
	Age_Recoded(3)	.823	.326	6.369	1	.012	2.276
	major_recode			14.856	6	.021	
	major_recode(1)	.163	.358	.208	1	.648	1.177
	major_recode(2)	.462	.460	1.011	1	.315	1.588
	major_recode(3)	.865	.300	8.302	1	.004	2.375
	major_recode(4)	-.025	.433	.003	1	.954	.975
	major_recode(5)	.154	.410	.140	1	.708	1.166
	major_recode(6)	.423	.320	1.742	1	.187	1.526
	Constant	-1.858	.422	19.341	1	.000	.156

a. Variable(s) entered on step 3: Age_Recoded.

Variables not in the Equation

			Score	df	Sig.
Step 3	Variables	school	1.007	1	.316
		sex	.363	1	.547
		schyear	3.766	3	.288
		schyear(1)	.148	1	.701
		schyear(2)	.789	1	.374
		schyear(3)	.187	1	.666
		parental_educ_recoded	7.639	5	.177
		parental_educ_recoded(1)	2.009	1	.156
		parental_educ_recoded(2)	.331	1	.565
		parental_educ_recoded(3)	3.633	1	.057
		parental_educ_recoded(4)	.371	1	.543
		parental_educ_recoded(5)	2.710	1	.100
		Race_recode	1.617	2	.445
		Race_recode(1)	.414	1	.520
		Race_recode(2)	.063	1	.801
	Overall Statistics		13.477	12	.335

Step Summary[a,b]

Step	Improvement			Model			Correct Class %	Variable
	Chi-square	df	Sig.	Chi-square	df	Sig.		
1	16.595	6	.011	16.595	6	.011	62.1%	IN: major_recode
2	8.337	2	.015	24.931	8	.002	62.1%	IN: living
3	8.285	3	.040	33.216	11	.000	62.4%	IN: Age_Recoded

a. No more variables can be deleted from or added to the current model.

b. End block: 1

LOGISTIC REGRESSION, KNOWLEDGE VARIABLES TO INFLUENZA VACCINE UPTAKE RATE

Information for Table 9

LINEAR REGRESSION

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Resondent's knowledge question: The vaccine protects against the stomach flu, Resondent's knowledge question: the flu may cause nasal conjestion, Resondent's knowledge question: influenza is a respiratory virus, Resondent's knowledge question: the flu may cause dry skin, Resondent's knowledge question: You need special permission to get the flu vaccine if you are pregnant, Resondent's knowledge question: You do not need to get the flu vaccine every year, Resondent's knowledge question: The vaccine can cause an allergic reaction, Resondent's knowledge question: the flu may cause excessive tiredness, Resondent's knowledge question: It is better to get the flu then the flu vaccine, Resondent's knowledge question: It is better to get the flu vaccine late in the flu season to ensure protection longer, Resondent's knowledge question: the flu may cause fever, Resondent's knowledge question: The vaccine protects against all known flu strains, Resondent's knowledge question: the flu may cause nausea, Resondent's knowledge question: the flu may cause headache, Resondent's knowledge question: The vaccine causes disease, Resondent's knowledge question: the flu may cause diarrhea, Resondent's knowledge question: the flu may cause a sore throat, Resondent's knowledge question: There is no point in getting the flu vaccine after Thanksgiving, Resondent's knowledge question: the flu may cause swollen hands and feet, Resondent's knowledge question: the flu may cause muscle aches[b]	.	Enter

a. Dependent Variable: Respondent's vaccination status (dependent variable)

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.249[a]	.062	.030	.479

a. Predictors: (Constant), Resondent's knowledge question: The vaccine protects against the stomach flu, Resondent's knowledge question: the flu may cause nasal conjestion, Resondent's knowledge question: influenza is a respiratory virus, Resondent's knowledge question: the flu may cause dry skin, Resondent's knowledge question: You need special permission to get the flu vaccine if you are pregnant, Resondent's knowledge question: You do not need to get the flu vaccine every year, Resondent's knowledge question: The vaccine can cause an allergic reaction, Resondent's knowledge question: the flu may cause excessive tiredness, Resondent's knowledge question: It is better to get the flu then the flu vaccine, Resondent's knowledge question: It is better to get the flu vaccine late in the flu season to ensure protection longer, Resondent's knowledge question: the flu may cause fever, Resondent's knowledge question: The vaccine protects against all known flu strains, Resondent's knowledge question: the flu may cause nausea, Resondent's knowledge question: the flu may cause headache, Resondent's knowledge question: The vaccine causes disease, Resondent's knowledge question: the flu may cause diarrhea, Resondent's knowledge question: the flu may cause a sore throat, Resondent's knowledge question: There is no point in getting the flu vaccine after Thanksgiving, Resondent's knowledge question: the flu may cause swollen hands and feet, Resondent's knowledge question: the flu may cause muscle aches

b. Dependent Variable: Respondent's vaccination status (dependent variable)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.774	20	.439	1.914	.010[b]
	Residual	132.969	580	.229		
	Total	141.744	600			

a. Dependent Variable: Respondent's vaccination status (dependent variable)

b. Predictors: (Constant), Resondent's knowledge question: The vaccine protects against the stomach flu, Resondent's knowledge question: the flu may cause nasal conjestion, Resondent's knowledge question: influenza is a respiratory virus, Resondent's knowledge question: the flu may cause dry skin, Resondent's knowledge question: You need special permission to get the flu vaccine if you are pregnant, Resondent's knowledge question: You do not need to get the flu vaccine every year, Resondent's knowledge question: The vaccine can cause an allergic reaction, Resondent's knowledge question: the flu may cause excessive tiredness, Resondent's knowledge question: It is better to get the flu then the flu vaccine, Resondent's knowledge question: It is better to get the flu vaccine late in the flu season to ensure protection longer, Resondent's knowledge question: the flu may cause fever, Resondent's knowledge question: The vaccine protects against all known flu strains, Resondent's knowledge question: the flu may cause nausea, Resondent's knowledge question: the flu may cause headache, Resondent's knowledge question: The vaccine causes disease, Resondent's knowledge question: the flu may cause diarrhea, Resondent's knowledge question: the flu may cause a sore throat, Resondent's knowledge question: There is no point in getting the flu vaccine after Thanksgiving, Resondent's knowledge question: the flu may cause swollen hands and feet, Resondent's knowledge question: the flu may cause muscle aches

Coefficients

Model	Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1 (Constant)	.340	.198		1.715	.087		
Influenza is a respiratory virus	-.067	.028	-.099	-2.429	.015	.971	1.030
The flu may cause fever	.120	.177	.030	.676	.500	.822	1.216
The flu may cause dry skin	.055	.054	.047	1.016	.310	.759	1.318
The flu may cause nausea	-.067	.054	-.054	-1.237	.217	.836	1.196
The flu may cause nasal congestion	.065	.095	.030	.681	.496	.817	1.224
The flu may cause swollen hands / feet	.017	.048	.016	.347	.729	.779	1.283
The flu may cause headache	-.033	.085	-.017	-.393	.694	.869	1.151
The flu may cause diarrhea	-.030	.043	-.031	-.689	.491	.819	1.221
The flu may cause a sore throat	.076	.072	.048	1.057	.291	.799	1.252
The flu may cause excessive tiredness	-.040	.111	-.016	-.361	.718	.842	1.188
The flu may cause muscle aches	.085	.100	.039	.853	.394	.760	1.316
The vaccine causes disease	.027	.056	.021	.490	.625	.880	1.137
The vaccine protects against all strains	-.019	.049	-.016	-.391	.696	.910	1.099
The vaccine can cause an allergic rxn	-.002	.086	-.001	-.020	.984	.947	1.056
It is better to get the flu then the flu vaccine	-.157	.078	-.088	-2.011	.045	.848	1.180
It is better to get the flu vaccine late in the flu season to ensure protection longer	.107	.074	.062	1.445	.149	.873	1.146
There is no point in getting the flu vaccine after Thanksgiving	-.044	.096	-.021	-.455	.649	.792	1.263
You do not need to get the flu vaccine every year	-.187	.056	-.143	-3.352	.001	.889	1.124
You need special permission to get the flu vaccine if you are pregnant	-.067	.054	-.051	-1.232	.218	.946	1.057
The vaccine protects against the stomach flu	.030	.059	.022	.517	.606	.904	1.107

a. Dependent Variable: Respondent's vaccination status (dependent variable)

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-.07	.68	.38	.121	601
Std. Predicted Value	-3.755	2.495	.000	1.000	601
Standard Error of Predicted Value	.040	.207	.084	.031	601
Adjusted Predicted Value	-.08	.67	.38	.124	601
Residual	-.631	.919	.000	.471	601
Std. Residual	-1.319	1.920	.000	.983	601
Stud. Residual	-1.352	1.998	.000	1.000	601
Deleted Residual	-.663	.995	.000	.488	601
Stud. Deleted Residual	-1.353	2.003	.000	1.001	601
Mahal. Distance	3.115	111.288	19.967	16.580	601
Cook's Distance	.000	.033	.002	.003	601
Centered Leverage Value	.005	.185	.033	.028	601

a. Dependent Variable: Respondent's vaccination status (dependent variable)

LOGISTIC REGRESSION

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	559	100.0
	Missing Cases	0	.0
	Total	559	100.0
Unselected Cases		0	.0
Total		559	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
No	0
Yes	1

Classification Table[a,b]

Observed			Predicted: Respondent's vaccination status (dependent variable) No	Yes	Percentage Correct
Step 0	Respondent's vaccination status (dependent variable)	No	343	0	100.0
		Yes	216	0	.0
	Overall Percentage				61.4

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.462	.087	28.345	1	.000	.630

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	39.861	19	.003
	Block	39.861	19	.003
	Model	39.861	19	.003

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	705.971[a]	.069	.093

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Classification Table[a]

Observed			Predicted: Respondent's vaccination status (dependent variable) No	Yes	Percentage Correct
Step 1	Respondent's vaccination status (dependent variable)	No	289	54	84.3
		Yes	159	57	26.4
	Overall Percentage				61.9

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	know_respvirus	-.318	.130	5.983	1	.014	.727
	know_dryskin	.308	.248	1.541	1	.215	1.361
	know_nausea	-.386	.246	2.461	1	.117	.680
	know_nasalconj	.426	.533	.637	1	.425	1.530
	know_swollen	.005	.222	.000	1	.983	1.005
	know_headache	-.354	.449	.622	1	.430	.702
	know_diarrhea	-.165	.203	.667	1	.414	.848
	know_sorethroat	.467	.361	1.669	1	.196	1.594
	know_tired	.037	.786	.002	1	.962	1.038
	know_muscleache	.258	.735	.124	1	.725	1.295
	know_vac_disease	.157	.263	.354	1	.552	1.170
	know_vac_protectsall	-.140	.234	.357	1	.550	.869
	know_vac_allergy	.105	.424	.061	1	.804	1.111
	know_vac_worse_flu	-1.040	.431	5.818	1	.016	.353
	know_vac_late	.287	.349	.678	1	.410	1.333
	know_vac_tgiving	.046	.515	.008	1	.929	1.047
	know_vac_annual	-1.003	.299	11.228	1	.001	.367
	know_vac_preg	-.341	.245	1.941	1	.164	.711
	know_vac_stomflu	.221	.274	.651	1	.420	1.248
	Constant	-.245	1.409	.030	1	.862	.783

a. Variable(s) entered on step 1: know_respvirus, know_dryskin, know_nausea, know_nasalconj, know_swollen, know_headache, know_diarrhea, know_sorethroat, know_tired, know_muscleache, know_vac_disease, know_vac_protectsall, know_vac_allergy, know_vac_worse_flu, know_vac_late, know_vac_tgiving, know_vac_annual, know_vac_preg, know_vac_stomflu.

LOGISTIC REGRESSION, RISK SCORE VARIABLES TO INFLUENZA VACCINE UPTAKE RATE

Information for Table 10

LINEAR REGRESSION

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Respondent's reported risk of disease likert: The flu can severly disrupt your semester, and impact your grades, Respondent's reported risk of disease likert: If you do not get vaccinated, you will get the flu, Respondent's reported risk of disease likert: The flu is a dangerous disease for a college student to have[b]	.	Enter

a. Dependent Variable: Respondent's vaccination status (dependent variable)
b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.266[a]	.071	.066	.470

a. Predictors: (Constant), Respondent's reported risk of disease likert: The flu can severly disrupt your semester, and impact your grades, Respondent's reported risk of disease likert: If you do not get vaccinated, you will get the flu, Respondent's reported risk of disease likert: The flu is a dangerous disease for a college student to have
b. Dependent Variable: Respondent's vaccination status (dependent variable)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.067	3	3.356	15.213	.000[b]
	Residual	131.677	597	.221		
	Total	141.744	600			

a. Dependent Variable: Respondent's vaccination status (dependent variable)
b. Predictors: (Constant), Respondent's reported risk of disease likert: The flu can severly disrupt your semester, and impact your grades, Respondent's reported risk of disease likert: If you do not get vaccinated, you will get the flu, Respondent's reported risk of disease likert: The flu is a dangerous disease for a college student to have

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.295	.114		-2.576	.010		
	Respondent's reported risk of disease likert: If you do not get vaccinated, you will get the flu	.139	.031	.183	4.538	.000	.962	1.039
	Respondent's reported risk of disease likert: The flu is a dangerous disease for a college student to have	.071	.030	.107	2.346	.019	.751	1.331
	Respondent's reported risk of disease likert: The flu can severly disrupt your semester, and impact your grades	.064	.033	.086	1.920	.055	.775	1.290

a. Dependent Variable: Respondent's vaccination status (dependent variable)

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-.02	.80	.38	.130	601
Std. Predicted Value	-3.105	3.229	.000	1.000	601
Standard Error of Predicted Value	.025	.088	.037	.012	601
Adjusted Predicted Value	-.05	.82	.38	.130	601
Residual	-.799	1.021	.000	.468	601
Std. Residual	-1.702	2.174	.000	.997	601
Stud. Residual	-1.721	2.204	.000	1.001	601
Deleted Residual	-.818	1.049	.000	.472	601
Stud. Deleted Residual	-1.724	2.211	.001	1.001	601
Mahal. Distance	.674	20.022	2.995	2.845	601
Cook's Distance	.000	.033	.002	.003	601
Centered Leverage Value	.001	.033	.005	.005	601

a. Dependent Variable: Respondent's vaccination status (dependent variable)

LOGISTIC REGRESSION ANALYSIS

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	598	100.0
	Missing Cases	0	.0
	Total	598	100.0
Unselected Cases		0	.0
Total		598	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
No	0
Yes	1

Classification Table[a,b]

Observed			Predicted: Respondent's vaccination status (dependent variable) No	Predicted: Respondent's vaccination status (dependent variable) Yes	Predicted: Percentage Correct
Step 0	Respondent's vaccination status (dependent variable)	No	370	0	100.0
		Yes	228	0	.0
	Overall Percentage				61.9

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.484	.084	33.068	1	.000	.616

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	risk_flu_danger_recode	11.111	1	.001
		risk_novac_disease_recode	12.899	1	.000
		risk_flu_school_recode	.264	1	.607
	Overall Statistics		22.752	3	.000

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	22.942	3	.000
	Block	22.942	3	.000
	Model	22.942	3	.000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	772.018[a]	.038	.051

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Classification Table[a]

Observed			Predicted		
			Respondent's vaccination status (dependent variable)		Percentage Correct
			No	Yes	
Step 1	Respondent's vaccination status (dependent variable)	No	347	23	93.8
		Yes	195	33	14.5
	Overall Percentage				63.5

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	risk_flu_danger_recode	.696	.224	9.631	1	.002	2.005
	risk_novac_disease_recode	.878	.266	10.899	1	.001	2.406
	risk_flu_school_recode	-.207	.381	.295	1	.587	.813
	Constant	-2.297	.778	8.728	1	.003	.101

a. Variable(s) entered on step 1: risk_flu_danger_recode, risk_novac_disease_recode, risk_flu_school_recode.

LOGISTIC REGRESSION, BENEFIT SCORE VARIABLES TO INFLUENZA VACCINE UPTAKE RATE

Information for Table 11

LINEAR REGRESSION

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Respondent's benefit of vaccination: effectiveness of flu vaccination in preventing disease (recoded to dichotomous), Respondent's benefit of vaccination: frequency of flu vaccination, Respondent's benefit of vaccination: usefulness of flu vaccination for respondent (recoded to dichotomous)[b]	.	Enter

a. Dependent Variable: Respondent's vaccination status (dependent variable)

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.657[a]	.432	.429	.367

a. Predictors: (Constant), Respondent's benefit of vaccination: effectiveness of flu vaccination in preventing disease (recoded to dichotomous), Respondent's benefit of vaccination: frequency of flu vaccination, Respondent's benefit of vaccination: usefulness of flu vaccination for respondent (recoded to dichotomous)

b. Dependent Variable: Respondent's vaccination status (dependent variable)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	61.269	3	20.423	151.508	.000[b]
	Residual	80.475	597	.135		
	Total	141.744	600			

a. Dependent Variable: Respondent's vaccination status (dependent variable)

b. Predictors: (Constant), Respondent's benefit of vaccination: effectiveness of flu vaccination in preventing disease (recoded to dichotomous), Respondent's benefit of vaccination: frequency of flu vaccination, Respondent's benefit of vaccination: usefulness of flu vaccination for respondent (recoded to dichotomous)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.063	.028		-2.251	.025		
	Respondent's benefit of vaccination: frequency of flu vaccination	.201	.017	.497	12.062	.000	.560	1.787
	Respondent's benefit of vaccination: usefulness of flu vaccination for respondent (recoded to dichotomous)	.211	.044	.215	4.845	.000	.481	2.078
	Respondent's benefit of vaccination: effectiveness of flu vaccination in preventing disease (recoded to dichotomous)	-.003	.038	-.003	-.073	.942	.676	1.479

a. Dependent Variable: Respondent's vaccination status (dependent variable)

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-.07	.75	.38	.320	601
Std. Predicted Value	-1.398	1.158	.000	1.000	601
Standard Error of Predicted Value	.021	.052	.029	.007	601
Adjusted Predicted Value	-.07	.76	.38	.320	601
Residual	-.751	1.063	.000	.366	601
Std. Residual	-2.046	2.895	.000	.997	601
Stud. Residual	-2.059	2.904	.000	1.001	601
Deleted Residual	-.761	1.069	.000	.369	601
Stud. Deleted Residual	-2.065	2.922	.000	1.002	601
Mahal. Distance	1.033	10.882	2.995	2.195	601
Cook's Distance	.000	.028	.002	.003	601
Centered Leverage Value	.002	.018	.005	.004	601

a. Dependent Variable: Respondent's vaccination status (dependent variable)

Logistic Regression

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	601	100.0
	Missing Cases	0	.0
	Total	601	100.0
Unselected Cases		0	.0
Total		601	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
No	0
Yes	1

Classification Table[a,b]

Observed			Predicted: Respondent's vaccination status (dependent variable) No	Predicted: Respondent's vaccination status (dependent variable) Yes	Predicted: Percentage Correct
Step 0	Respondent's vaccination status (dependent variable)	No	372	0	100.0
		Yes	229	0	.0
	Overall Percentage				61.9

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.485	.084	33.365	1	.000	.616

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	250.782	3	.000
	Block	250.782	3	.000
	Model	250.782	3	.000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	548.027[a]	.341	.464

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Classification Table[a]

Observed			Predicted: Respondent's vaccination status (dependent variable) No	Yes	Percentage Correct
Step 1	Respondent's vaccination status (dependent variable)	No	282	90	75.8
		Yes	37	192	83.8
	Overall Percentage				78.9

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	benefit_useful_recode	1.857	.307	36.537	1	.000	6.402
	benefit_effective_recode	.197	.288	.465	1	.495	1.217
	benefit_vaccine_recode	1.882	.273	47.401	1	.000	6.569
	Constant	-5.018	.481	108.772	1	.000	.007

a. Variable(s) entered on step 1: benefit_useful_recode, benefit_effective_recode, benefit_vaccine_recode.