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Community of Immunity: A Process Improvement to Increase Influenza Vaccination Uptake

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Abstract

Background & Review of Evidence: Annual flu vaccination has been recommended for everyone over the age of six months (National Foundation for Infectious Disease [NFID], 2016). A low flu vaccination rate among college students living in a residential community poses the risk for spreading a highly-contagious respiratory illness caused by the virus. Students have the ability to spread the disease to everyone around them in their dormitories, classrooms, shared restrooms and via social gatherings (NFID, 2016). College students who contract the flu virus experience approximately eight or more days of the illness (NFID, 2016). **Purpose:** The purpose of this process improvement is to increase influenza vaccine uptake among freshmen who reside at Belmont University and assess barriers and facilitators regarding the influenza vaccine.

Project Design: The scholarly project is a process improvement aimed at evaluating and improving the uptake and administration of the influenza vaccine among freshman students residing on campus at Belmont University. The project utilized the Focus Analyze Develop Execute (FADE) Model as a framework and the Theory of Planned Behavior as a theoretical model. **Results:** A total of 269 freshmen out of 1,861 freshmen received the flu vaccine through Belmont University Health Services in fall 2019 and 251 freshmen completed the survey. The chi-square statistic for comparison of years 2017, 2018, and 2019 was $X^2=228.93$ ($p < .001$, $V=0.15$). **Conclusion:** Increasing the percentage of flu vaccine uptake rates is vital since rates of influenza outbreaks among college students are higher than the average population.

Key words: flu vaccine uptake, flu campaign, flu challenge, barriers, facilitators, college students

Community of Immunity

Annual flu vaccination has been recommended for everyone over the age of six months in order to prevent the spread of the flu virus and its many complications, including mortality (National Foundation for Infectious Disease [NFID], 2016). However, flu vaccine uptake rates among the young adult college-age population remain low. The focus of this process improvement includes increasing influenza vaccine uptake rates among freshmen living on campus at Belmont University. In the 2017-2018 flu season, Tennessee, along with 9 other states, had the lowest uptake rates in the United States (US), ranging between 35.3% to 38.9% uptake (Centers for Disease Control and Prevention [CDC], 2018a). This is well below the national Healthy People 2020 goal of at least 70% uptake (Office of Disease Prevention and Health Promotion, 2014). The NFID performed a nationwide survey among college students and found that between eight to 39% of college students receive an annual flu vaccine (NFID, 2016). This rate is again well below the national recommendation of at least 70%.

In the United States about five to 20% of individuals contract the flu virus each year; this results in over 200,000 individuals being hospitalized and tens of thousands of deaths each year from complications secondary to the flu virus (NFID, 2016). However, research demonstrates the rates of influenza outbreaks among college students are higher than the average population ranging from nine percent to 48% (Poehling, Blocker, Ip, Peters & Wolfson, 2012). This could be related to the low flu vaccine uptake rate and shared living environment. College students who contract the flu virus experience approximately eight or more days of the illness (NFID, 2016). This increases rates of healthcare utilization, school absences, and work absences (Bednarczyk et al., 2015; NFID, 2016; Nyhan, Reifler, and Richey, 2012; Ramsey & Marczynski, 2011). An increased amount of absences in college classes can impair students' academic

performance (American College Health Association [ACHA], 2018; Bednarczyk, et al., 2015; NFID, 2016; Nyhan et al., 2012; Ramsey & Marczinski, 2011). Students often experience hardships when they are ill and miss classes due to the flu virus. These issues can be avoided by increasing flu vaccine uptake rates.

The project Community of Immunity addressed the issues of low flu vaccine uptake rates by targeting the freshman students living on campus, since they are at increased risk of getting and spreading the flu virus. The project incorporated a flu challenge among the freshman students, where each freshman residence hall competed against the others to achieve the highest percentage of flu vaccine uptake. The freshman residence hall with the highest flu vaccine uptake rate was rewarded with a free pizza party. In order to address misconceptions about the flu vaccine, the project leader partnered with Belmont University Health Services to host three educational sessions. The students were incentivized to attend the educational session by receiving convocation credit, which is required for graduation. The project leader also partnered with Belmont University Health Services to host seven pop-up clinics in each of the freshman residence halls. Hosting these pop-up clinics in convenient locations creates increased accessibility for students to receive the flu vaccine. Additionally, the project leader gathered data through a survey which asked students about barriers and facilitators to obtaining the flu vaccine. This information will be provided to Belmont University Student Health Services for recommendations about how to increase flu vaccine uptake rates in the future.

Problem Statement

A low flu vaccination rate among college students living in a residential community poses the risk for spreading a highly contagious respiratory illness caused by the virus. Students have the ability to spread the disease to everyone around them in their dormitories, classrooms,

shared restrooms and via social gatherings (NFID, 2016). Obtaining the flu virus increases the likelihood that one will experience hardships due to the illness, missed classes, and missed days of work (NFID, 2016). In spring 2010, approximately 18% of students reported that symptoms of the common cold, flu, and sore throat negatively affected their academic performance by earning a lower grade on an exam, project, or course, receiving an incomplete grade or dropping the course, or by experiencing disruption in conducting their thesis, dissertation, research, or practicum work (ACHA, 2018).

Purpose

The purpose of this process improvement is to increase influenza vaccine uptake among freshmen who reside at Belmont University and assess barriers and facilitators regarding the influenza vaccine. This data will be provided to Belmont University Health Services. In addition to providing Belmont University Health Services with the data, a set of evidence-based recommendations for future vaccination administration will also be provided.

Hypothesis

The first hypothesis is, by increasing knowledge about the importance of obtaining the flu vaccine, alerting students to the dates and times of pop-up clinics, providing pop-up clinics at convenient locations for students, creating an internal competition and incentivizing students with a free pizza party, there will be an increase in the percentage of flu vaccine uptake among the freshman students residing on Belmont University's campus when compared to the rates in 2017 and 2018. The second hypothesis is, students will state that fear of adverse events and cost are the two most common barriers to obtaining the vaccine. Another hypothesis is that freshman students of female gender will have higher rates of uptake when compared to students of male gender. Another hypothesis is that freshman students that are studying and preparing to be in the

College of Health Sciences will have higher rates of flu vaccine uptake when compared to students studying and preparing to be in other colleges. Lastly, a hypothesis that engagement with the Banner Web announcement and educational sessions will be higher than engagement with the flyers and posters.

Review of Evidence

Even though the flu vaccine is recommended as the most effective way to prevent the flu virus, rates of flu vaccine uptake in adults 18 years or older are below the Healthy People 2020 goal, which is 70% (Gargano et al., 2011; Goldfarb, Panda, Wylie & Riley, 2011, Office of Disease Prevention and Health Promotion, 2014; Masnick & Leekha, 2015; Stedman-Smith, Kingsbury, Dubois & Grey, 2017). The flu virus negatively impacts the health of individuals with comorbidities, as well as immunocompetent individuals. The flu can lead to complications such as secondary infections like tracheobronchitis and pneumonia (Nicholson, Hayes & Bennett, 2009). These complications impair the immune system and can lead to death (Nicholson et al., 2009).

College students, especially freshman students living on-campus, are at high risk for morbidity due to their close living conditions and social spaces (Bednarczyk et al., 2015; Ramsey & Marczinski, 2011). The shared living environment also makes it is more difficult for students to isolate oneself when one is ill. Another factor that places college students at risk is extended travel during semester breaks when transmission of the influenza virus is near peak incidence (Bednarczyk et al., 2015). Students can become infected with the virus during the school semester or during breaks and spread it to others prior to developing symptoms (CDC, 2018b).

In the early stages of the flu, affected individuals may be asymptomatic yet still have the potential to unknowingly spread the virus to others (CDC, 2016). The period of contagiousness

can last up to five to seven days (CDC, 2018b). Increasing flu vaccine uptake can lead to more effective herd immunity and prevent the spread of the flu virus to vulnerable members of a community (CDC, 2015). In order to effectively increase flu vaccination rates among adults, it is essential to identify and understand barriers and facilitators to receiving the flu vaccine.

Barriers to Vaccine Uptake

Fear. The most commonly stated reason for lack of obtaining the flu vaccine in the literature included fear of adverse events (Ahluwalia, Singleton, Jamieson, Rasmussen & Harrison, 2011; Clark, Cowan & Wortley, 2009; De Perio, Wiegand & Brueck, 2014; Dlugacz et al., 2012; Gargano et al., 2011; Goldfarb et al., 2011; Hashmi et al., 2016; Howland, Lu & Diop 2013; Johansen, Stenvig & Wey, 2012; Masnick & Leekha, 2015; Moore, 2009; Naleway et al., 2014; Nicholson et al., 2009; Santibanez, Singleton, Santibanez, Wortley & Bell, 2013; Shropshire, Brenth-Hotchkiss & Andrews, 2013; Stedman-Smith et al., 2017; Wasan et al., 2015). Several studies identified that individuals were concerned that the flu vaccination would cause them to become sick or infected with the flu virus (Gargano et al., 2011; Hashmi et al., 2016; Nicholson et al., 2009; Stedman-Smith et al., 2017). Another adverse event that was commonly feared included an allergic reaction to the ingredients of the vaccine, such as the egg component (Gargano et al., 2011; Johansen et al., 2012; Moore, 2009; Nicholson et al., 2009). The ingredients in the flu vaccine include the inactivated strains of the predicted circulating strains, preservatives such as thimerosal, adjuvants like aluminum salt, stabilizers like gelatin, residual cell culture material like egg protein, residual inactivating ingredients like formaldehyde, and residual antibiotics like neomycin (CDC, 2019a). Each of these ingredients are included for the purposes of providing immunity and keeping the vaccine safe and long-lasting once manufactured (CDC, 2019a). For individuals concerned about an allergic reaction

due to the egg protein, one study viewed egg allergy tolerance in 881 children with documented IgE-mediated egg allergy and found that the majority of children developed a tolerance to the egg protein by early school-age (Savage, Matsui, Skripak & Wood, 2007). However, for those concerned about a reaction to the vaccine due to an egg allergy, there are alternative influenza vaccines available such as a low-egg protein called Flucelvax and an egg free vaccine called Flublok (CDC, 2017).

Other studies confirmed that people are concerned about the pain produced by the needle for the vaccine to be injected as well as needle phobia as a barrier (Gargano et al., 2011; Hashmi et al., 2016; Moore, 2009; Nicholson et al., 2009; Shropshire et al., 2013; Stedman-Smith et al., 2017). Although some individuals who receive the vaccine may have some mild side effects such as soreness, headache, low-grade fever, nausea and muscle aches, those who become infected with the flu virus experience more severe side effects and secondary complications (CDC, 2019b). For some individuals, lack of obtaining the flu vaccine stemmed from financial concern. Some studies identified fear of the cost of the vaccination as a barrier to obtaining the vaccine (Gargano et al., 2011; Shropshire et al., 2013; Stedman-Smith, 2017). Aside from the financial barrier to the flu vaccine, some college students report other financial barriers such as health insurance and the cost of college tuition (Pennamon, 2018).

Belief. Another commonly identified barrier to flu vaccine uptake other than fear is personal belief that one is not at risk of getting the flu virus (Clark, 2009; De Perio et al., 2014; Johansen et al., 2012; Masnick & Leekha, 2015; Naleway et al., 2014; Shropshire et al., 2013; Stedman-Smith et al., 2017). In a couple of studies participants specifically stated that they believed they were not at risk of getting the flu virus because they believed they had a healthy immune system (Johansen et al., 2012; Stedman-Smith et al., 2017). Although certain individuals

may view themselves as being healthy, the flu can affect everyone and college students have an increased risk for getting and spreading the flu to other people (New Jersey Department of Health, n.d.).

Knowledge. Masnick & Leekha (2015) discovered that participants felt they were not adequately knowledgeable about the flu vaccine and they wanted further advice prior to obtaining it. Clark et al. (2009) found that lack of awareness of the recommendation correlated with a decrease in vaccine uptake. Other studies found that participants had misconceptions about the flu vaccine, such as eligibility status and understanding about how the flu vaccine worked (Gargano et al., 2011; Hashmi et al., 2016; Stedman-Smith et al., 2017). Other barriers to obtaining the flu vaccine includes sociodemographic disparities.

Sociodemographic factors. Despite access to health care, racial differences among vaccine coverage continue. Black persons and Hispanic persons were more commonly associated with a low vaccine uptake rate when compared to white, non-Hispanic persons (Banach, Ornstein, Factor & Soriano, 2012; Harris, Schonlau & Lurie, 2009; Howland et al., 2013; Santibanez et al., 2013). Banach et al. (2012) found that not only were Black persons more likely to refuse the vaccine, but they were also more likely to express fears about the safety of the vaccine. Pearson, Guixiang & Ford (2011) viewed vaccine uptake rates among those who preferred speaking English verses those who preferred to speak Spanish. Pearson et al. (2011) found that persons who preferred Spanish were 30% less likely to obtain the flu vaccine than those who preferred speaking English and were less likely to have a healthcare provider (73%) verses those who preferred English (82.2%). Santibanez et al. (2012) found that White persons were more likely to believe that the flu vaccine is effective as compared to Black persons. Older White persons with high-risk conditions are more likely to obtain the flu vaccine than Hispanic

and Black adults with high-risk conditions (Clark et al., 2009; Harris et al., 2009). Another correlating factor is annual income. Those with increased annual income correlates with an increase in flu vaccine uptake (Howland et al., 2013; Santibanez et al., 2012). Years of education is also a predicting factor. Studies found that as the years of education increased so did the vaccine uptake rate (Howland et al., 2013; Naleway et al., 2014; Pearson et al., 2011; Santibanez et al., 2012). Increased age was also associated with an increase in likelihood that one would obtain the vaccine (Clark et al., 2009; Harris et al., 2009; Howland et al., 2013; Naleway et al., 2014; Santibanez et al., 2012; Stedman-Smith et al., 2017). Also, being of the female gender was another predictor in flu vaccine uptake (Santibanez et al., 2012; Stedman-Smith et al., 2017). A couple of studies categorized students by what they were studying and found that students studying health sciences had a higher percent uptake rate when compared to students of other colleges (Merrill et al., 2010; Nyhan et al., 2012). After identifying the populations with low vaccine uptake, it is apparent that certain sociodemographic disparities exist.

Facilitators

Prior receipt of the flu vaccine. The most common predicting factor in influenza vaccine uptake is prior receipt of the flu vaccine (Bednarczyk et al., 2015; Coe, Gatewood, Moczygamba, Goode & Beckner, 2012; NFID, 2016; Poehling et al., 2012; Ramsey & Marczynski, 2011; Ratnapradipa, Norrenberns, Turner, and Kunerth, 2017). Once a person has received the flu vaccine, they are much more likely to receive it in subsequent years. This can create a life-long healthy habit that can protect the individual each year (NFID, 2016).

Recommendation. Provider recommendation is another common facilitator in determining receipt of flu vaccine uptake (De Perio et al., 2014; Dlugacz et al., 2012; Gargano et al., 2011; Goldfarb et al., 2011; Ramsey & Marczynski, 2011; Ratnapradipa et al., 2017). One

study which collected data from eight universities in North Carolina found that college students were most likely to get the vaccine after receiving the recommendation from their provider and were most likely to receive the vaccine in their provider's office followed by student health services (Poehling et al., 2012). Aside from provider recommendation, family recommendation and acceptance of the vaccine was reported as a positive influence when deciding to get vaccinated (Goldfarb et al., 2011). Ratnapradipa et al. found that when an individual's family members had intentions to become vaccinated, that individual was more likely to become vaccinated as well (2017). Wilson & Huttlinger found that the majority of students at New Mexico State University's main Las Cruces campus reported that they received information about the flu vaccine from their family members followed by online sources, friends, and television (2010). Another study performed at Georgia Southern university also noted the importance of parental, peer, and provider influences as important predictors when deciding whether or not to obtain the flu vaccine (Shropshire et al., 2013). Nyhan et al. (2012) found that individuals who perceived their family members and friends to be in support of the flu vaccine were more likely to have a higher vaccination intention.

Interventions. In order to increase flu vaccine uptake rates, many universities and healthcare institutes arranged successful flu challenges with interventions such as creating pop-up clinics in common areas to attract a greater number of people, using peer vaccinators to vaccinate colleagues, and offering small incentives to motivate people to obtain the flu vaccine (Aziz, 2013; Banach et al., 2012; Marwaha, Lorv, Henseleit & Iroanyah, 2016; Monn, 2016; Nicholson et al., 2009; Shropshire et al., 2013). Increasing access to the vaccine has been recommended as a means to increase vaccine uptake (Howard, Foley & Bradley, 2012; Baeyens, J., 2010). In order to attract more people to obtain the flu vaccine, the NFID recommends

offering it in common spaces such as dormitories, student centers, and libraries (2016). The NFID also reported that multiple universities in Pennsylvania have experienced increased flu vaccine uptake by using peer influencers, star athletes, and highly respected professors to promote their flu vaccine campaign (2016). Some programs also incorporated successful educational sessions, distributed flyers, and utilized social media to address concerns that people had about the flu vaccine (Conte et al., 2016; Goldfarb et al., 2011; Gray et al., 2012; Hashmi et al., 2016; Nicholson et al., 2009; Peddecord et al., 2008; Razouki et al., 2016; Shropshire et al., 2013; Wilson & Huttlinger, 2010). Several studies did not implement an educational session however, after viewing survey results where students reported false information about the flu infection and the vaccine, the authors recommended implementing an educational session to address misconceptions about the flu (Agarwal, 2014; Bednarczyk, et al., 2015; Cameron et al., 2009; Coe et al., 2012; Merrill et al., 2010; Moore, 2009; NFID, 2016; New Jersey Department of Health, n.d.; Santibanez et al., 2012; Stedman-Smith et al., 2017; Wasan et al., 2015; Yang, 2012).

A couple of studies found more students were made aware of flu education and of the flu challenge through their campus internet portal and educational sessions rather than flyers and posters (Hashmi et al., 2016; Wilson & Huttlinger, 2010). One study found that use of the campus internet portal followed by posters had the strongest impact of advertisement of flu education and the flu challenge rather than hearing about it from a friend, media outlets or closed-circuit televisions displayed throughout campus (Monn, 2016). Another study found that most students became aware of their campus vaccine program by viewing the campus internet portal, followed by on-campus signage and word of mouth (Bednarczyk et al., 2015).

A study performed in a general practitioner's office found it beneficial to contact patients by phone to talk to them about the flu vaccine and then later send them an email as a reminder to get the flu vaccine (Dovedi & Iyer, 2018). Some studies recommended an intervention to inform family members and friends of the importance of obtaining the flu vaccine annually after reviewing survey results which indicated that individuals are more likely to receive the flu vaccine if their family members and/or friends had a positive attitude about the flu vaccine (Nyhan et al., 2012; Ratnapradipa et al., 2017; Wilson & Huttlinger, 2010).

Some flu campaigns provided incentives to individuals once they received the flu vaccine. The incentives consisted of coffee, chocolate, giftcards and Fitbits (Marwaha et al., 2016; New Jersey Department of Health, n.d.). The New Jersey Health Department recommends involving community partners that may donate free prizes to give to the students such as bowling or movie theater vouchers, iPads, and tickets to sporting events (New Jersey Department of Health, n.d.).

One study compared the amount of interventions and found that flu vaccine uptake was highest when there were more interventions implemented verses one or two interventions alone (Rashid et al., 2016). The multiple interventions in this study included providing educational sessions, having lead advocates promote the importance of the vaccine, provide rewards, improve access, and provide continual reminders (Rashid et al., 2016). Another study reported that the most successful programs offer multifaceted interventions such as educational sessions, improved access, eliminating cost of the vaccine, and expanding hours for flu clinics (Nicholson et al., 2009).

Theoretical Model

The Theory of Planned Behavior (TPB) was developed by social psychologist Icek Ajzen to predict and describe health behaviors (Asare, 2015; LaMorte, 2019). The TPB theorizes that a person's attitude toward a behavior, subjective norm, and perceived behavior control, influence behavioral intention (Asare, 2015). The behavior that the TPB predicts and describes in this project is an individual's intention to engage in health service utilization. The specific behavior of health service utilization that this project predicts and describes is obtainment of the flu vaccine. The performance of a behavior is determined by multiple influences such as attitudes, behavioral intention, subjective norms, social norms, perceived power, and perceived behavioral control (LaMorte, 2019). The most fundamental element of the TPB is the persons' behavioral intent (LaMorte, 2019). A persons' behavioral intention is shaped by an attitude formed by the individual about the risks verses benefits of the behavior.

Attitude

The construct of attitude refers to a positive or negative evaluation of the behavior (LaMorte, 2019). For example, having a positive attitude about obtaining the flu vaccine may lead one to obtain the flu vaccine, whereas having a negative attitude about obtaining the flu vaccine may cause one to decline the flu vaccine. The construct of behavioral intention is created by motivational factors that impact the behavior (LaMorte, 2019). For example, previous flu campaigns at other universities entered students' names in raffles for the potential to win prizes if they received the flu vaccine. The potential to win a prize served as a motivation to perform the behavior of obtaining the flu vaccine.

Subjective Norms

Subjective norms are a construct that represents normative beliefs within. The subjective norms refer to the opinion of either acceptance or disapproval of the behavior by other important persons. The social norms construct refers to the standards of how an individual in a group believes that they should behave (LaMorte, 2019). For example, if a student was raised in a family where it was socially acceptable to receive the flu vaccine every year, the social norm would be that receiving the flu vaccine is a customary code of behavior.

Perceived Behavioral Control

Perceived power is another construct and it refers to the perception of elements that may either facilitate or prevent performance of the behavior. For example, factors that facilitate ease of obtaining the flu vaccine include easy accessibility, low to no cost, and convenience. Easy accessibility refers to the location of where the flu vaccine is being administered. In previous, successful flu campaigns project leaders provided their population with flu clinics in multiple, convenient locations with convenient hours of operation. The most successful flu campaigns provided the flu vaccine to students for free or were able to apply the charge to the students' student-account. Additionally, the most successful campaigns hosted flu clinics in well-populated areas on campus to make it more convenient for students to obtain. The previously listed examples demonstrate how people may perceive barriers and facilitators. A person's perceived power contributes to a person's perceived behavioral control. Perceived behavioral control is a person's opinion of either how easy or difficult they believe it may be to perform the behavior.

Each of the constructs in the TPB affect one another. For example, a persons' attitudes are formed by their subjective norms and social norms. Each of the constructs creates a person's

intention to perform a behavior. The last step of this model is to perform the behavior, meaning one would obtain the vaccine. See Figure 1.

Design

The scholarly project is a process improvement aimed at evaluating and improving the uptake and administration of the influenza vaccine among freshman students residing on campus at Belmont University. The project utilized the Focus Analyze Develop Execute (FADE) Model as a framework. See Figure 1. The project leader followed each step of the FADE Model in a systematic way to help redesign a system of care and promote improvement of flu vaccine uptake rates. The project leader incorporated the Theory of Planned Behavior in the second step of the FADE Model to help predict students' intentions to obtain the flu vaccine.

Focus

The initial step of the model included focusing on flu vaccine uptake rates in the college student population. These rates were compared to the goal of having 70% of people aged 18 years or older receive the flu vaccine annually. Having 70% of adults obtain the flu vaccine annually is a national goal that was set by the Healthy People 2020 organization which is a part of the Office of Disease Prevention and Health Promotion (Office of Disease Prevention and Health Promotion, 2014). This step was completed by conducting a literature review. Please see review of evidence. Following the literature review the project leader specifically obtained data regarding the flu vaccine uptake rates at Belmont University in previous years to further focus the problem on the targeted population.

The project leader completed this step by acquiring the number of the freshman class enrolled in 2017 and 2018. This information was located on the Belmont Admission webpage. Next, the project leader obtained the number of freshmen students each year who received the flu

vaccine through Belmont University Health Services during the fall timeframe. This information was located on the MEDICAT electronic health record in Belmont University Health Services. For purposes of this project, fall is defined as the time period between September 1st through November 1st. Information was only obtained during this time period since the national recommendation from the CDC is to obtain the flu vaccine by the end of October each year (CDC, 2019c). Additionally, this time period was selected since Belmont University Health Services usually receives the flu vaccine and begins administering the flu vaccine in early to middle September each fall. In fall 2017, 20 freshman students out of 1,565 freshman students enrolled at Belmont University received the flu vaccine through Belmont University Health Services. In fall 2018, 83 freshman students out of 1,561 freshman students enrolled at Belmont University received the flu vaccine through Belmont University Health Services.

Project Population. This project targeted freshman students residing in a freshman residence hall at Belmont University in fall 2019. These freshmen were invited to attend the educational sessions, pop-up clinics, complete the survey, and engage in the pizza party competition. However, when looking at the rate of flu vaccine uptake in fall 2017, fall 2018, and fall 2019 all freshman at Belmont University at that time were included regardless of whether they resided on campus or commuted. Also, even though the pop-up clinics were targeted towards the freshman students, other students and faculty were welcome to come and receive the vaccine there as well.

When comparing sociodemographic data correlating with flu vaccine uptake, all freshman students at Belmont University in fall 2019 who obtained the flu vaccine through Belmont University Health Services were included. This information was obtained from the MEDICAT electronic health record. Students who were excluded from the project include

upperclassmen, less than 18 years old, did not receive the flu vaccine or did not receive the flu vaccine through Belmont University Health Services. At Belmont University in fall 2019, 1,861 freshmen students were enrolled (M. Lucus, personal communication, January 13, 2020). Of the 1,861 freshmen enrolled, 1,693 lived on campus in a residence hall.

Clinical Setting. The project was conducted on Belmont University's campus, a private Christian University. It is located in the southeastern region of the United States, two miles from downtown Nashville, Tennessee. There are seven total all freshman residence halls and one freshman residence hall that is mixed with upper-class students. The locations of the educational sessions and pop-up clinics were located in the lobbies of the freshman residence halls on campus.

Analyze

The second step was completed by analyzing data concentrated at increasing flu vaccine uptake rates. To help understand how to increase flu vaccine uptake the project leader first identified barriers and facilitators to obtaining the flu vaccine in the literature. Please see review of evidence. The project manager also reviewed the literature to examine additional interventions that other flu vaccine campaigns had implemented. The literature revealed that the most impactful campaigns used multiple interventions to break down barriers and increase accessibility to obtaining the flu vaccine.

Additionally, during the analyze step, the project leader interviewed the interim director of Belmont University Health Services and analyzed interventions that had been implemented in the past at Belmont University. In fall 2017, there were no interventions to increase flu vaccine uptake rates. In fall 2018, Belmont University Health Services implemented one educational flu vaccine session located on campus in a building where classes were held. All students at

Belmont University were welcome to attend this educational session and received convocation credit as an incentive for attending. They also implemented three pop-up clinics for students in fall 2018. These clinics were located on campus. One was located in the lobby of an upperclassman residence hall, another was located in a freshman residence hall, and another was located inside the fitness and recreational center. Also, in fall 2018, an email was sent to the parents of the entire student body to inform the parents that students were able to receive their flu vaccine on campus. These interventions were targeted at the entire student body at Belmont University.

Develop

The third step of this process involved developing a solution for the problem. A plan was made to implement a multifaceted flu vaccine campaign at Belmont University targeting the freshman population who reside on campus in fall 2019. This plan was made after conducting a literature review and consulting with experts. The project leader met with the interim director of Belmont University Health Services and the director of Residence Life at Belmont University to plan three educational sessions, seven pop-up clinics, a survey examining barriers and facilitators to flu vaccinations, and an internal competition among the freshman residence halls which competed for the highest flu vaccine uptake rate and won a free pizza party.

Execute and Evaluate

The last step of this model was to execute and evaluate the project. The three educational sessions addressed misconceptions about the flu virus and safety of the flu vaccine. These educational sessions were held within the freshman residence hall lobbies on campus to make it more convenient for freshman students residing on campus to attend. Each educational session was in a different area on campus. The first one was located in the southeast part of campus. The

second one was located in the northwest part of campus. The last one was located in the northeast part of campus. Each educational session was held at ten o'clock in the morning and categorized as a wellness convocation. This is the time when students do not have class and are able to come and learn about lifelong wellness and health literacy. In addition to providing three educational sessions, the project leader in conjunction with health services conducted seven pop-up clinics in the freshman residence halls.

All students and faculty were welcome to attend the pop-up clinics however it was targeted at the freshman students residing on campus. Each pop-up clinic was held on a weekday for two hours. The pop-up clinics began in the middle of September 2019 and ended at the end of October 2019 (CDC, 2019c). Students were able to receive their flu vaccine in a timely manner while walking through campus. Student nurses from Belmont University's undergraduate program were recruited as volunteers to help administer the vaccine and influence their peers to obtain the vaccine. Student nurses were supervised by the project advisor. A registered nurse and nurse practitioner from Belmont University Health Services were present at each pop-up clinic. They provided equipment for administering the vaccine and were responsible for collecting funds for the vaccine. The project leader recruited students to come and get their flu vaccine and to complete an anonymous Qualtrics survey. See Figure 2.

This survey was created to help understand what barriers and facilitators freshman students residing at Belmont University were encountering when deciding to obtain or decline the flu vaccine. It was also created to help the project leader learn about which interventions most students engaged with. Additionally, the survey helped answer the question of where students receive their flu vaccine. This survey was distributed to students on Belmont University's campus from September 18th, 2019 through November 22nd, 2019.

In order to increase awareness of the flu campaign the project leader created flyers and posters which were approved by Student Affairs to post in the freshman residence halls. These flyers notified students of the flu campaign. The bulletins listed the dates, times, and location of the educational sessions and pop-up clinics. The project leader communicated with the Director of Communications at Belmont University to announce the flu campaign. The campaign was announced on the announcement board on the <https://my.belmont.edu> website. This same information was also sent out in an email to all students at Belmont University on a weekly basis. Additionally, all students who attended the educational sessions were notified verbally about the flu campaign at the educational sessions. Furthermore, the parents of the students at Belmont University received an email from the Office of Communications about where the students could go to receive their flu vaccine.

Also, to learn more about sociodemographic data correlations with flu vaccine uptake on Belmont University's campus, the project leader collected and analyzed data on freshman students who obtained the flu vaccine through Belmont University Health Services regarding students' gender and college of study. In order to evaluate the interventions, rates of flu vaccine uptake in fall 2019 were compared to rates in fall 2017 and fall 2018. Also, the survey results were analyzed to see which interventions most students engaged with. This project was approved by the internal review board at Belmont University.

Sources of Data. A Qualtrics survey was completed by freshman students living on campus. This survey identified facilitators and barriers to flu vaccine uptake, along with engagement of the campaign interventions and location of where students received the flu vaccine. See Figure 2. The rate of flu vaccine uptake among the freshman class in 2017, 2018,

and 2019 was extracted from the MEDICAT system. Also, the MEDICAT electronic health record revealed sociodemographic data which correlated with flu vaccine uptake.

Data Collection Process

Freshman students who received the flu vaccine through Belmont University Health Services beginning September 1st through November 1st in fall 2017, 2018, and 2019 were totaled. The number of freshmen enrolled during those semesters were used as the denominator to determine the percentage of freshmen each fall who received the flu vaccination through Belmont University Health Services. The MEDICAT electronic health record was also utilized to identify sociodemographic data from freshman students who received the flu vaccine in fall 2019. The sociodemographic data that was retrieved from the MEDICAT electronic health record included gender and college of study.

The Qualtrics survey was initially administered on September 18th, 2019. The end date for completing the Qualtrics survey was November 22nd, 2019. Students were recruited in person by the project leader to complete the survey. The students who were recruited included the freshman students who attended the pop-up clinics, freshman students in the lobbies of the residence halls, and freshman students in Belmont University Health Services, and freshman students at the café located on Belmont University's campus.

Results

The SPSS version 25 was utilized for statistical analysis of a chi-square test and for descriptive statistics. A total of 269 freshmen out of 1,861 freshmen received the flu vaccine through Belmont University Health Services in fall 2019. Of the 1,861 freshmen enrolled at Belmont University during fall 2019, 1,189 were female and 672 were male. A total of 251 freshmen completed the survey.

Rates of Vaccine Uptake

A chi-square test was performed to compare rates of flu vaccine uptake in freshmen students who received the flu vaccine through Belmont University Health Services in fall 2017, 2018, and 2019. The chi-square statistic for comparison of years 2017, 2018, and 2019 was $\chi^2=228.93$ ($p < .001$, $V=0.15$). The chi-square test revealed there was a 4.04 percentage point increase (315.62%, $\chi^2=40.01$, $p < .001$) of flu vaccine uptake in freshmen students who received the flu vaccine by Belmont University Health Services when comparing 2017 to 2018. There was a 9.13 percentage point increase (171.16%, $\chi^2=76.81$, $p < .001$) of flu vaccine uptake when comparing 2018 to 2019. When the year 2017 was compared to year 2019, there was a 13.17 percentage point increase (1,028.91%, $\chi^2=191.09$, $p < .001$). See Table 1.

Upon comparing gender specific rates, there was a higher percentage of flu vaccine uptake among the female freshmen at Belmont. Of the 269 freshmen who obtained the flu vaccine in fall 2019, 173 were females, 84 were males, and 12 students did not list their gender. The percentage of flu vaccine uptake among the female freshmen in fall 2019 was 14.6%. The percentage of flu vaccine uptake among the male freshmen in fall 2019 was 12.5%. See Table 2.

Each of the 269 freshmen recipients of the flu vaccine for fall 2019 were categorized by college of study. The percentage of all freshmen students in each major were calculated. Of the recipients, 18.18% ($n=4$) were in the College of Theology and Christian Ministry 17.03% ($n=31$) were in the College of Health Sciences, 16.53% ($n=40$) were in the College of Music and Performing Arts, 14.01% ($n=109$) were in the College of Entertainment and Music Business. See Table 2.

Barriers

Of the 251 survey respondents who completed the survey, 85 respondents did not receive the flu vaccine in fall 2018 and were asked to select one barrier pertaining to why they did not receive it. The majority of respondents reported it was “not necessary” ($n=32$, 37.65%). The least commonly stated barrier was “fear of vaccine” ($n=9$, 10.59%). See Table 3.

Of the 251 respondents, 103 were prompted to answer the question of why they did not receive the flu vaccine in fall 2019. Respondents were asked to select all the barriers that applied to them. The majority of students ($n=29$, 28.2%) reported “I still intend to get the flu vaccine this year”. The least commonly stated barrier was “inconvenience” ($n=9$, 8.74%). See Table 4.

Facilitators

The 251 survey respondents were asked to select which flu vaccine campaign intervention that they engaged with. Respondents were able to select more than one answer if they engaged with more than one intervention. The majority of respondents reported that they engaged with the flu posters and flyers ($n=162$, 59.6%). The least common source of engagement reported by respondents was educational sessions ($n=44$, 16.18%). See Table 5.

When respondents were asked if they received the flu vaccine last flu season, 141 respondents replied “yes”. These 141 respondents were asked to select all the facilitators that led them to obtain the flu vaccine last flu season. The most commonly stated facilitator was “parent recommendation” ($n=85$, 38.64%). A minimal number of respondents listed “other” as a facilitator ($n=9$, 4.09%). See Table 6.

When respondents were asked if they received the flu vaccine this flu season, 137 respondents replied “yes” and were asked to select all of the facilitators that influenced their decision to receive the flu vaccine. The most commonly stated facilitator for flu vaccine uptake

of fall 2019 was “fear of contracting the flu virus” (n=94, 30.82%). The least commonly stated facilitator reported by respondents was “other” (n=10, 3.28%). See Table 7.

Respondents who answered “yes” to the question asking whether or not they received the flu vaccine for fall 2019 were also prompted to answer a question regarding where they received it. Of the 133 students who responded about where they received the flu vaccine in fall 2019, the majority stated that they received the flu vaccine at a pop-up clinic on Belmont’s campus (n=101, 75.94%). The second most commonly stated answer was at another facility (n=24, 18.05%). Lastly, a minimal number of students reported receiving the flu vaccine at Health Services (n=8, 6.02%). See Table 8.

Discussion

Increasing Flu Vaccine Uptake

The flu campaign team worked together to raise awareness of complications of the flu virus and increase accessibility to the vaccine to help increase flu vaccine uptake rates in fall 2019. There was an increase in the rate of flu vaccine uptake in freshmen students at Belmont University who received the flu vaccine through Belmont University Health Services in fall 2019 when compared to fall 2017 and fall 2018. The results are listed in Table 1. This result is consistent with current research which demonstrates an increase in flu vaccine uptake when a multifaceted flu vaccine campaign is implemented.

Barriers Identified in Survey

The majority of students who reported that they did not receive the flu vaccine in fall 2018 reported “not necessary” as a barrier to obtaining the vaccine. Cost was not listed as an option for students to select. See Figure 2. The question was designed this way due to the fact

that the freshmen students would have been living at home and were likely to be on their parents' insurance plans in fall 2018.

For students who reported they had not received the flu vaccine in fall 2019 at the time of survey completion, the majority reported, "I still plan to get the flu vaccine". It is possible that students who reported, "I still plan to get the flu vaccine" wish to wait until later on in the flu season to get their flu vaccine. All pop-up clinics where students were offered the vaccine were completed by the end of October 2019 which is during the early part of the flu season. These clinics were conducted during this time because the dates selected aligned with the CDC recommendation to receive the flu vaccine annually by the end of October (CDC, 2019c).

Cost was an option for students to select as a barrier to obtaining the flu vaccine if they did not receive the flu vaccine in fall 2019. See Figure 2. However, cost was not the most commonly stated barrier for students who did not receive the vaccine in fall 2019. The most commonly stated barrier for not receiving the flu vaccine in fall 2019 was, "not necessary". The belief that the flu vaccine is not necessary was identified in the literature however it was not the most prevalent barrier identified within the literature. The most commonly identified barriers stated within the literature include fear of adverse events and cost.

Gender Differences in Uptake

The third hypothesis stated that females would have a higher flu vaccine uptake rate than males. This was predicted based on findings in current literature. The outcome of the study demonstrated that females had a higher flu vaccine uptake rate than males. The gender difference could be due to the fact that more females than males attend college at Belmont University. In fall 2019 there were 1,189 female freshmen enrolled at Belmont University and 672 male

freshmen enrolled at Belmont University and 12 freshmen student did not indicate their gender. To test this hypothesis the percentage of flu vaccine uptake was compared between each gender.

Uptake Among the Colleges

The fourth hypothesis predicted that students studying in the College of Health Sciences would have a higher flu vaccine uptake rate than students studying in other colleges. This hypothesis was based upon findings in the literature. Since many students in the College of Health Sciences are required to have the flu vaccine in order to complete their program, the prediction that students within the College of Health Sciences would have a higher flu vaccine uptake rate was made. However, the results show that the students in College of Theology and Christian Ministry had the highest percentage of flu vaccine uptake. Belmont University is a Christian university. This characteristic could be contributing to this result. Another possible explanation for the study result contradicting the results identified in the literature is, freshmen students studying in the College of Health Sciences have yet to begin clinical rotations. It is possible that the College of Health Sciences would have a higher percentage of flu vaccine uptake once the students became upper classmen and began their clinical rotation curriculum.

Facilitators identified in Survey

Lastly, a hypothesis was made stating that more students would report engagement with the Banner Web announcements and educational sessions verses the posters and flyers. The results demonstrate that the majority of students (59.56%) reported engagement with the flu posters and flyers. Only 24.26% of students reported engagement with the Banner Web announcements and 16.18% of students reported engagement with educational sessions. Previous studies indicate that students at other universities involved in multifaceted flu vaccine campaigns have not experienced much engagement with flyers and posters. This may be due to over-

crowding of posters and flyers on other universities' bulletin boards. Competing posters and flyers at other universities would make it more difficult for certain posters and flyers to stand out. However, at Belmont there is a strict policy for posting information in the form of posters and flyers. All posters and flyers on campus in residence halls must first be viewed by the office manager in the student affairs office. The office manager is required to view each flyer and poster and date them with an expiration date. The flyers and posters must be placed by those who work in the residence life department. If the posters or flyers are present on campus past the expiration date it must be removed. Many on campus groups and affiliations do use flyers and posters for this reason. It is possible that the flu flyers and posters accrued more attention due to the lack of other posters and flyers.

Theory and Model

The TPB demonstrates why a student may decide to either accept or decline the flu vaccine. The TPB linked together the constructs of students' attitudes of receiving the flu vaccine, their subjective norms and their perceived behavioral control. The TPB was assessed in the survey by asking students why they decided to either receive the flu vaccine or decline the flu vaccine. The FADE model was utilized to frame the project. Initially the focus phase was completed by assessing the low flu vaccine uptake rates in the freshmen at Belmont University. The analyzing phase was completed by determining facilitators and barriers identified within the literature and analyzing the theory of planned behavior relating to flu vaccine uptake. The developing phase was completed by creating a team and a multifaceted flu vaccine campaign. The execute and evaluation phase was performed by implementing the campaign, administering the survey, and analyzing the results.

Strengths

The project made an important contribution to preventative health care within the freshmen student population at Belmont University. The project was multifaceted and implemented strategic advertisements to students through various approaches. The advertisements were in the forms of educational sessions, flyers, posters, and on-line announcements through emails and Banner Web announcements. The rate of flu vaccine uptake was verified through the MEDICAT electronic health record versus self-report.

Weaknesses

Although the study made an important impact on preventative health there are several limitations to this study. The project leader only had access to the health records within Belmont University Health Services; therefore, if students received the flu vaccine at an outside clinic or pharmacy, it was not recorded within these study results. Secondly, the results of the survey may not be generalizable to an overall population of college students since only freshmen students were surveyed within a small Christian University within the Southeastern region of the United States. The survey results were based off students self-reporting. This can lead to possible biased responses.

Also, all students were recruited to attend the educational sessions. Students were advised that they would receive convocation credit for attendance. The students who attended the educational sessions included a mixture of freshmen, sophomore, juniors, and seniors. Some students may have attended solely for the purpose of obtaining convocation credit.

Additionally, a convenience sampling strategy was utilized to recruit students to complete the survey. Freshmen students who agreed to complete the survey were provided a free piece of

candy. It is possible that some students could have been influenced or biased when answering the survey questions. It is also possible that the respondents were either under or overrepresented.

Lastly, the email that was sent to the parents of the students notifying them of the flu vaccine availability on campus was not sent out to the parents until after the pop-up clinics were completed. Also, the email that was sent to the parents was lengthy with other content listed. There was a short sentence at the end of the email notifying parents of the flu vaccine availability.

Practice Implications

Further research needs to be done to identify why this population views the flu vaccine as “not necessary”. This research could be expanded by conducting a qualitative study and asking students open-ended questions. Continuing education should be provided to this population to inform these students of the dangers of contracting the flu virus.

The least commonly stated barrier was inconvenience and the majority of survey respondents reported receiving the vaccine at the pop-up clinics. The pop-up clinics should continue to be offered to students at Belmont University. Further research should be done to identify which location, dates, and times are most impactful for students who wish to receive the vaccine.

Since “parent recommendation” was the most commonly stated facilitator (38.64%, $n=85$) in receiving the flu vaccine in fall 2018, further communication should be provided to parents to facilitate the decision for students to obtain the flu vaccine and should be done in a timely manner. Belmont University Health Services should communicate with the parents of the students while students are moving into the residence halls each year in August and during parent weekend each year in September. Belmont University Health Services should inform the

parents and students at these times that students can receive the flu vaccine on campus.

Additionally, an email should be sent out to the parents before the end of October to encourage them to talk with their child about obtaining the flu vaccine. This could further increase flu vaccine uptake in subsequent years.

Conclusion

Although the flu vaccine uptake rate among freshmen students at Belmont University increased in fall 2019 during the implementation of the multifaceted flu campaign, it has yet to reach a goal of 70% of uptake. The goal of having at least 70% of adults receive the flu vaccine is a national standardized goal set by Healthy People 2020. Increasing the percentage of flu vaccine uptake rates is vital since rates of influenza outbreaks among college students are higher than the average population.

The most commonly stated barrier indicated by students was that they felt the vaccine was “not necessary”. Further research is needed to identify why students believe the flu vaccine is “not necessary”. Future research should provide surveys with open-ended questions to expand and learn more about what influences and discourages students from obtaining the flu vaccine.

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Figure 1. Applying the FADE Model with the Theory of Planned Behavior to Belmont University Health Services

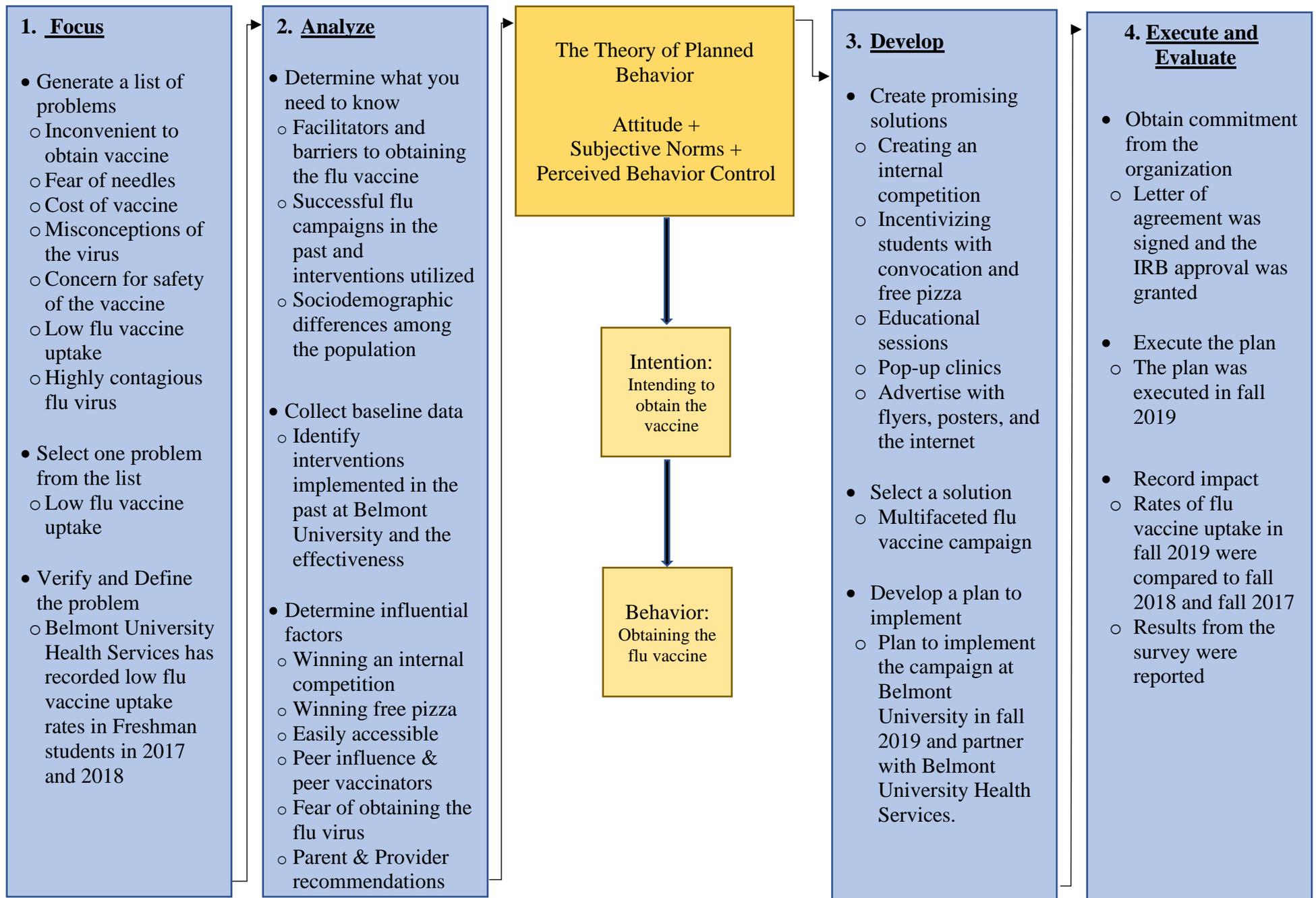


Figure 2. Community of Immunity Qualtrics Survey

Start of Block: Freshman filter

Q1 By taking this survey you are implying consent. Please do not take this survey more than once. Are you a freshman and 18 years or older?

Yes (1)

No (2)

Q2 Do you live on campus in a residence hall?

Yes (1)

No (2)

End of Block: Freshman filter

Start of Block: Survey questions

Q3 Which of the following did you engage with (select all that apply)

educational session (1)

flu posters/flyers (2)

flu banner web announcement (3)

Q4 Did you receive the vaccine last flu season?

Yes (1)

No (2)

Display This Question:

If Did you receive the vaccine last flu season? = Yes

Q5 If yes, why did you receive it? (select all that apply)

- provider recommendation (1)
 - parent recommendation (2)
 - fear of contracting the flu virus (3)
 - other (4)
-

Display This Question:

If Did you receive the vaccine last flu season? = No

Q6 If no, why did you not receive it? (select all that apply)

- inconvenience (1)
 - not necessary (2)
 - fear of vaccine (3)
 - other (4)
-

Q7 Did you receive the vaccine this flu season?

- Yes (1)
 - No (2)
-

Display This Question:

If Did you receive the vaccine this flu season? = Yes

Q8 If yes, of the following, which influenced your decision to receive the vaccine? (select all that apply)

- provider recommendation (1)
- parent recommendation (2)
- recommendation from other students (3)
- fear of contracting the flu virus (4)
- educational session (5)
- educational posters in the residence halls (6)
- advertisement on banner web (7)
- to help the residence hall win the flu challenge pizza party (8)
- other (9)

Display This Question:

If Did you receive the vaccine this flu season? = Yes

Q9 If yes, where did you receive it?

- Student Health Services (1)
 - Pop-up clinic on Belmont's campus (2)
 - Other facility (3)
-

Display This Question:

If Did you receive the vaccine this flu season? = No

Q10 If no, why did you not receive the flu vaccine? (select all that apply)

- cost (1)
- inconvenience (2)
- not necessary (3)
- fear of the vaccine (4)
- I still plan to get the flu vaccine this year (5)
- other (6)

End of Block: Survey questions

Table 1							
<i>Chi-Square analysis of uptake rates by year (N=4,987)</i>							
Year	Yes		No		χ^2	Cramer's V	p-value
	<i>n</i>	%	<i>n</i>	%			
2017	20	1.28	1545	98.72	228.93	0.15	p<.001
2018	83	5.32	1478	94.68			
2019	269	14.45	1592	86.65			
Post-hoc analysis							
Comparison	χ^2	p-value					
2017, 2018	40.01	p<.001					
2017, 2019	191.09	p<.001					
2018, 2019	76.81	P<.001					

Table 2 <i>Descriptive Statistics</i>			
Characteristic	<i>n</i> =number of freshmen who received the flu vaccine	Total number of freshmen	% of uptake
Gender			
Male	84	672	12.5%
Female	173	1,189	14.6%
Not indicated	12		
College of Study			
College of Theology and Christian Ministry	4	22	18.18%
College of Liberal Arts and Social Science	17	95	17.90%
Undeclared/Other	25	143	17.48%
College of Health Sciences	31	182	17.03%
College of Music and Performing Arts	40	242	16.53%
College of Entertainment and Music Business	109	778	14.01%
College of Science and Mathematics	24	207	11.60%
O'More College of Architecture, Art and Design	6	57	10.53%
College of Business	13	135	9.63%
Total	269	1861	14.45%

Table 3 <i>Barriers to obtaining the flu vaccine in fall 2018</i>					
	Not Necessary	Other	Inconvenience	Fear of the Vaccine	Total
<i>n</i>	32	26	18	9	85
%	37.65	30.59	21.18	10.59	100

Table 4 <i>Barriers to obtaining the flu vaccine in fall 2019</i>						
	Cost	Inconvenience	Not Necessary	Fear of the Vaccine	I still plan to get the flu vaccine	Other
<i>n</i>	15	9	18	13	29	19
%	6	3.6	7.2	5.2	11.6	7.6

Table 5 <i>Engagement with Flu Vaccine Campaign Interventions</i>				
	Educational Sessions	Flu Banner Web Announcement	Flu Posters/ Flyers	Total
<i>n</i>	44	66	162	272
%	16.18	24.26	59.56%	100%

Table 6

Facilitators for flu vaccine uptake during flu season of 2018

	Parent recommendation	Fear of contracting the flu virus	Provider recommendation	Other	Total
<i>n</i>	85	83	43	9	220
%	38.64	37.73	19.55	4.09	100

Table 7

Facilitators of flu vaccine uptake during fall 2019

	Fear	Parent recommendation	Provider recommendation	Edu session	Edu posters	Students	Banner web	Pizza party	Other
<i>n</i>	94	79	37	21	20	18	15	11	10
%	30.82	25.9	12.31	6.89	6.56	5.9	4.92	3.61	3.28

Table 8

Place where students received the flu vaccine in fall 2019

	Pop-up Clinic	Other facility	Health Services	Total
<i>n</i>	101	24	8	133
%	75.94%	18.05	6.02	100