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AN ASSESSMENT FOR GRADUATE STUDENTS IN PUBLIC HEALTH

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AN ASSESSMENT FOR GRADUATE STUDENTS IN PUBLIC HEALTH

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ABSTRACT

Parental Intent to Vaccinate Young Children Against the Flu

Background: Influenza is a preventable respiratory condition that affects over 3 million people every year. Young children are especially susceptible to complications from influenza. Daycare settings are highly vulnerable for infectious disease transmission. The objective of the study is to examine parental, child, and demographic factors that are associated with intent to vaccinate and whether intention determines parental vaccinating behavior.

Methods: Parents of children 6 years and younger from 23 daycare centers in Tarrant County participated in a survey. Data on parental intent to vaccinate, education on flu vaccination, access to and utilization of health care, and health status of the child were collected. Analyses included bivariate and multivariate techniques to assess associations between predictors and outcomes.

Results: Predictive factors associated with parental intent to vaccinate include physician discussion of benefits of flu vaccines (OR = 2.91, 95% CI (1.75, 4.83), $p < 0.001$), pediatric routine check-ups (OR = 10.01, 95% CI (2.50, 40.06) $p < 0.001$), medical insurance coverage, (OR = 9.41, 95% CI (2.87, 30.83) $p < 0.001$), health status of the child; “Excellent” (OR = 3.07, 95% CI (1.16, 8.11), $P = 0.05$) and “Good”(OR 5.50, 95% CI (1.92, 15.76), $P < 0.01$). Parental intention to vaccinate was predictive of positive vaccinating behavior (OR = 48.74, 95% CI = 23.54, 100.88).

Conclusions: The study indicates that physician discussion of benefits of the flu vaccine, access to and utilization of health care, the child’s health status are important factors that may help in increasing parental intention to vaccinate their child against the flu. These factors can be utilized to improve the efficacy of outreach programs and vaccination success rates.

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CHAPTER 1

INTRODUCTION

Influenza is considered among the top 10 vaccine-preventable diseases (Centers for Disease Control and Prevention, 2012) and studies have shown that routine vaccinations can considerably reduce the incidence of this contagious disease (Baba, Okono, Tanaka-Taya, Okabe, 2011). Influenza is of great public health concern resulting in the loss of productivity and economic strain. Globally, each year about 3 to 5 million suffer from the flu and a quarter to a half million people die from this vaccine-preventable infectious disease. Influenza and related illnesses inflict a financial cost on families as well as the entire nation (Yoo, 2011). A recent study found that among US families, the direct medical cost of influenza illness in children is estimated to be greater than 1.2 billion dollars per year. Indirect cost burden assessments include caregivers of children hospitalized for flu infections missing an average of 73 work hours (Ortega, et al., 2012). This totals to a cost of \$1,456 per household, while the average out-of-pocket medical expenses total more than \$250 per flu case (Ortega, et al, 2012).

Statement of Purpose

Only a few studies have examined the different factors that influence parents' decision to have their children vaccinated against the flu. While findings from these studies are important in distinguishing the factors that are barriers and motivators, most did not address demographic factors such as race or socioeconomic status, which may confound the association between barriers, facilitators, parental perceptions, and parental intent to vaccinate. Research does show that poverty, young parental age, nonwhite race, low socioeconomic status, and low parental education levels are associated with lower rates of immunizations in general (Orenstein, 1999). To address this gap in the research, the current study focused on exploring possible predictors that may play a role in parental intent to vaccinate their children including their perceptions, barriers, and facilitators as they relate to demographics (parental age, education, race/ethnicity, and parental income).

Although past research provides insight into many of the factors that affect parents' decision to vaccinate their children for the flu, the limitations and biases of these studies need to be taken into consideration. Several studies used samples of parents of children presenting at inner-city health centers or at pediatric emergency departments (Esposito, Marchisio, Bosis, Lambertini, 2006; Fleming, Cochi, Hightower, Broom, 1987; Hurwitz, et al. 2000). Therefore, results from these studies may only be generalizable to clinical populations. Additionally, the use of these study populations may introduce potential selection bias. Parents of sick or ill children at the inner-city health clinics and emergency departments may over-represent a certain demographic or be more inclined toward certain medical or preventative practices as compared to parents from the general population.

Study rationale and objective

Research on vaccination usage for children under the age of 2 is sparse. Compliance rates for voluntary vaccinations for children ages 2 to 6 years were shown to be below 56% (Smith, et al. 2008). Previous studies underscored the need for further research to determine the effectiveness of voluntary vaccinations on desired public health outcomes to reduce the incidence and spread of influenza. In this regard, assessment of parental intent to vaccinate or compliance with recommended child vaccinations is essential, which is the main focus of the study. Previous studies have assessed different barriers, facilitators, and parental perceptions that may affect parents' decision to have their children vaccinated. However, findings from these studies are limited in generalizability as they suffer from selection bias (e.g., clinical samples). The external validity of the current study is much higher as the sample of mothers was drawn from childcare settings representing general population.

The overall objective of the study is to determine the individual contribution of selected parental, child, and healthcare utilization factors that influence parental intent to vaccinate children between the ages of six months and six years against influenza. Additionally, this study seeks to quantify the contribution of each of these factors, adjusting for other potential confounders and investigate the nature of the interaction between specific factors in their

contribution to parental intent to vaccinate children between the ages of six months and six years against influenza.

Research Question and Hypotheses

The main research question the study addresses is “What is the nature of the relationship between selected parental, child, and healthcare utilization factors that influence parental intent to vaccinate their children against influenza?” The study examined the following four hypotheses:

Hypothesis 1: The higher level of health education and communication about the flu vaccine influences parental intent to vaccinate their child against influenza.

Hypothesis 2: The perceived health status of the child impacts parental intent to vaccinate their child against influenza

Hypothesis 3: Utilization of routine medical care for children influences parental intent to vaccinate their child against influenza.

Hypothesis 4: Parental intent to vaccinate their child against the flu is a predictor for successful vaccination behavior.

Specific aims:

AIM 1: Descriptive

To determine the individual contribution of selected parental, child, and healthcare utilization factors that influence parental intent to vaccinate children between the ages of six months and six years against influenza. This will be evaluated by all three hypotheses together, assessing the following factors:

- a) Hypothesis 1: Parental Factors include education and awareness of health-related factors impacting flu vaccination, opinion and perception of the flu vaccine, communication and association with child’s physician or doctor, and exposure to flu

vaccine-related educational material and the parental ranking of the importance of these factors as it relates to their intention to vaccinate.

- b) Hypothesis 2: Child Factors include perceived health status of the child and the parental ranking of the importance of their child's health status as it relates to their intention to vaccinate.
- c) Hypothesis 3: Healthcare Utilization was assessed as perceived access to and availability of healthcare for their child and the parental ranking of the importance of their child receiving regular health checks as it relates to their intention to vaccinate.

AIM 2: Relational

In order to quantify the predictability of parental intent to vaccinate on the behavioral outcome, vaccinating their child against the flu, the respondents who reported an intention to vaccinate was assessed as a predictor predictor for the survey respondents who reported vaccinating their children within the past 12 months.

- d) Hypothesis 4: Reported intent to vaccinate is a predictor of successful vaccination as a behavioral outcome. This was assessed including identified potential confounding demographic variables.

CHAPTER 2

LITURATURE REVIEW

A seasonal influenza epidemic occurs annually, especially during the autumn and winter seasons. Most often, influenza starts to peak in late December and January (CDC, 2012). The surveillance data indicate that influenza usually peaked in February for 1982-1983 through 2011-2012 flu seasons, followed by large peaks (Figure 1) in January and March (CDC, 2012). During the 1976 to 2007 flu seasons, the Centers for Disease Control and Prevention (CDC)

estimated 3,000 to 49,000 flu-associated deaths in the United States (CDC Morbidity and Mortality Weekly Report, 2011). During the yearlong period from September 1, 2010 to August 31, 2011, the CDC confirmed 115 influenza-related deaths among children in 33 states (Yoo, 2011). Children under the age of 5, especially children younger than 2 years, adults over the age of 65, and pregnant women are at higher risk for developing flu-related complications (CDC, 2012). Children with underlying medical conditions are at higher risk of influenza-related morbidity and mortality. Recent surveillance data from the United States indicates that during the 2010-2011 influenza season, 49% of pediatric deaths and 52% of pediatric hospitalizations due to influenza occurred in normally healthy children (Effler, 2012). It has also been estimated that 1 in every 1000 children under the age of 5 will be hospitalized due to seasonal influenza each year (Effler, 2012).

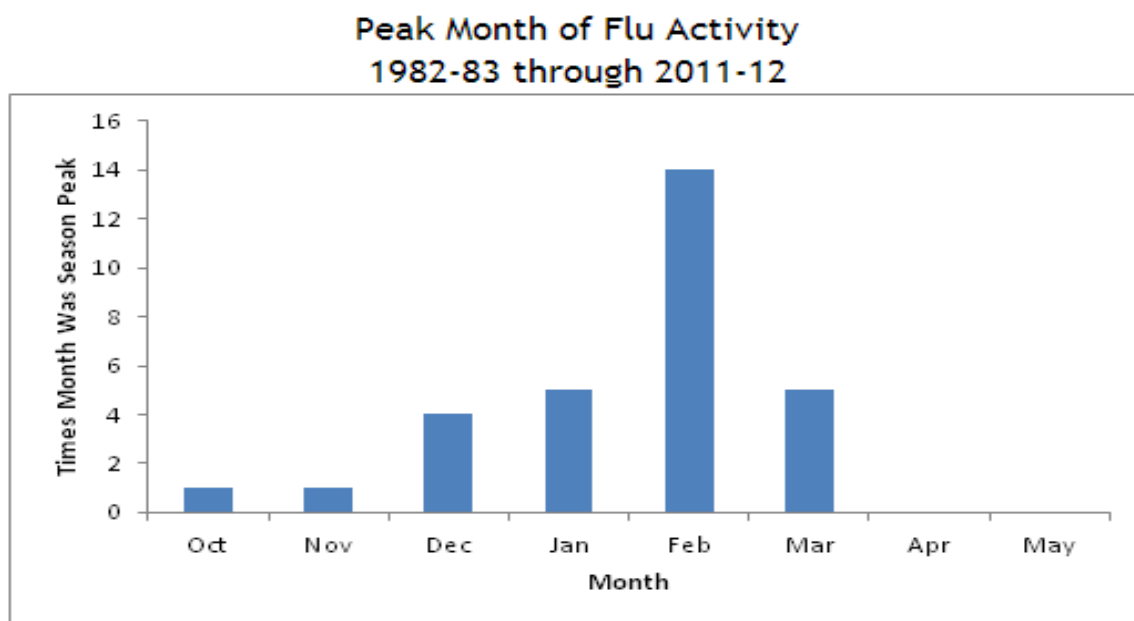


Figure 1: CDC Surveillance of seasonal flu activity

Vulnerable settings and Populations

In the recent past, the United States has seen a dramatic shift in the number of women working outside of the home (Brady, 2004). In accordance with this shift, many young children spend a great proportion of their time in daycare centers. It is estimated more than 13 million children under the age of 6 are enrolled in out-of-home childcare centers (Brady, 2004). The close proximity of a large number of children provides an optimal setting for the transmission of infectious disease (Brady, 2004). Children may shed larger quantities of the influenza virus for longer periods of time than adults, thus facilitating the spread of the virus to family members and to the community (Principi & Esposito, 2004). Disease may be spread from child to child via coughing, sneezing, and placement of toys in the mouth (Brady, 2004). Additionally, poor hand hygiene practices among caregivers facilitates the spread of infection (Brady, 2004). Studies have shown that children in larger day care centers have a greater risk of acquiring a respiratory infection than children in smaller centers or children who stay home (Hurwitz, et al., 2000). Children are considered one of the main disseminators of influenza in the community (Heikkinen, 2004). One study found that approximately 50% of day care children were infected with influenza in a single flu season (Hurwitz, et al., 2000). Although considered a benign disease in children, increased spread of the flu in this population has significant medical and economic impacts including: loss of work days, school absenteeism, increased physician visits, increased antibiotic use, and spread of infection among household contacts (Esposito, et al., 2006; Hurwitz, et al., 2000).

Prevention Efforts

Studies have shown that the influenza vaccination, an effective measure of prevention, provides protection to both adults and children (Diekema, 2005). The Advisory Committee on Immunization Practices recommends the annual influenza vaccine for all persons 6 months or older. However, only 49.4% of children between the ages of 6 months and 17 years were vaccinated during the 2011-2012 influenza season (CDC, 2012). The *Haemophilus influenzae* type b (Hib) vaccine has been established as being 99.9% effective in preventing specific flu

virus strains and is highly recommended by physicians and disease specialists world-wide (Zhou, et al., 2005). A study conducted in a community in Japan for six consecutive influenza seasons demonstrated that two doses of the trivalent inactivated vaccine (TIV) showed yearly efficacies from 42% to 69% and also reduced the rate of hospitalization associated with both influenza A and influenza B among children 6 months to 6 years of age (Katayose, et al., 2011). This research indicates that although the flu vaccine is effective in preventing certain flu strains and reducing illness in children, many parents decide not to vaccinate their children. Since influenza is considered especially harmful in children younger than 2 years and children with other underlying chronic conditions, the influenza vaccine is highly recommended for this specific high-risk child population. However, flu prevention methods are not enforced on healthy children over 2 years of age (Esposito, et al., 2006). Results from the 2011 National Flu Survey indicate that 60.9% of children ages 6 months to 4 years received a flu vaccine for the 2010–2011 flu season (CDC, 2012), thereby leaving approximately 40% at risk for influenza. Also, in a study conducted in 2011 among children 6 months to 4 years of age, only 38-44% of children eligible for vaccination received the influenza vaccine over a 3-year study period (Brown, et al., 2011). However, no studies have found the flu vaccination coverage among children in day care facility, a prime location for infectious disease transmission.

Prior research on pediatric influenza vaccination

Under most circumstances, parents and guardians are the primary decision-makers regarding medical care for their children. Although the American Academy of Pediatrics endorses universal immunizations, parents reserve the right to refuse childhood vaccinations (Diekema, 2005) based on religious and/or personal beliefs in all states except Mississippi and West Virginia (Omer, Pan, Halsey, 2006). However, relatively few studies have been conducted to assess the different factors and personal perceptions that influence parent(s) decision to have their children vaccinated for influenza. All previous studies conducted among parents utilized a cross-sectional design. The study populations in these studies consisted of parents from inner-city health centers and parents in pediatric hospitals. Currently, no studies have been conducted among parents of children in daycare centers. Results from the studies indicate

that various barriers, motivators, and parental perceptions play a role in influencing parents' decision to have their children receive the seasonal influenza vaccine.

Flu vaccination of day care children is a logical prevention strategy for reducing the spread of flu in the community and reducing the social-economic burden associated with influenza infection. However, few studies have assessed the effectiveness of the influenza vaccine in daycare children to reduce flu infection spread. One study conducted by Hurwitz, et al. (2000) found that unvaccinated household contacts of vaccinated daycare children had 42% fewer febrile respiratory infections than unvaccinated household contacts of unvaccinated children. Additional population-based studies are needed to assess the effectiveness of vaccinating day care children for the flu.

Previous research indicates there is little information for vaccination usage for children under the age of 2. Compliance rates for voluntary vaccinations for children ages 2 to 6 years were shown to be below 56%. (Orenstein and Hinman, 1999). Assessment of parental intent to vaccinate or compliance with recommended child vaccinations is essential for implementation of public health interventions focusing on prevention and reduction of spread of the influenza virus. Previous studies have assessed the different barriers, facilitators, and parental perceptions that may affect parents' decision to have their children vaccinated. However, these studies are limited in generalizability of their study findings to certain populations and may contain potential selection bias. The current study will help further the research in this area by adding another research component to the childcare settings. This study will help validate findings of previous studies, provide daycare centers and public health official estimates of flu vaccination coverage among children attending daycare centers in the region, and provide suggestions for future research and intervention planning.

CHAPTER 3

METHODOLOGY

The study was compliant with all the institutional Review Board (IRB) requirements of confidentiality and other research protocols at the UNT Health Science Center. It was conducted under IRB approval dated June 21, 2013.

Participant Recruitment process

Daycare centers recruitment: An initial meeting was set up with the daycare center directors to introduce the project and explain details of participation; then a follow-up meeting arranged to finalize procedural aspects of instrument distribution and retrieval. After this meeting those who were interested completed the final recruitment document and fully accepted to comply with the study procedures. Out of the original 24 daycare centers contacted, a total of 23 daycare centers in Tarrant County agreed to provide access to the parents. This provided a daycare participation acceptance rate of 95.8%.

Parents who are 18 years or older and responsible for a child between the ages of 6 months and 6 years old were invited to participate. Daycare personnel distributed the questionnaire via email to all parents who have children attending the daycare centers; an online survey option were presented, along with an option to print out the questionnaire and return it to a drop box located at the daycare center front desk. They responded to the survey by submitting the questionnaire via the online survey or returning a printed version to the daycare center front desk. Informed consent was explained via a cover letter attached to the survey instrument and implied by voluntary response to the questionnaire. Weekly communication was maintained with the daycare center directors to maximize cooperation and response. No incentives were offered to the daycare centers or individual respondents.

Instrument Development

Items on the survey instrument were selected and developed based on the hypothesized relationships between the outcome and predictor variables. Attitude was assessed through the variables assessing the parent's perceived health status of the child, their opinion and perception of the flu vaccine, and their ranking of the importance of health education and their opinions and perceptions. Perceived control was measured in variables assessing parental perceptions of access to and availability of healthcare; whether their child had routine medical care. Subjective norms were assessed in variables targeted to measure the perception of the flu vaccines, their communication and relationship with their child's pediatrician or medical doctor, and their ranking of the importance to them of health education and each of the contributing variables.

The next step in developing the survey instrument was conducting a pilot survey to validate the concepts and variables measurement of the intended construct. The intended sample population includes all parents or guardians of children age 6 months to 6 years, targeted through daycare centers within Tarrant County. There were no other inclusion criteria for the participants. However, in order to access a broader, more representative population, daycare center selection/inclusion criteria require they accept national or state funded subsidization.

The objective of the pilot study was to determine which specific topics were most focused and associated with behavioral intention as the outcome assessed through the estimation of attitude and subjective norms through the measurement of parental, child, and healthcare utilization factors. Survey items were adapted from similar surveys and based on prior literature and previously conducted research. Results from this pilot study were used in the selection and finalizing the survey items.

There were a total of 28 questions that represent each component of the theoretical model. Behavioral intention was the intended outcome and was assessed in relation to established demographic components. Demographic factors that were taken into account

included race/ethnicity, age (of both parent and child), education level, household income, and subsidized childcare. Please see Appendix A for a complete survey questionnaire.

Variables Description

Outcome variables:

The study has two outcome variables:

- a) Parental intent to vaccinate their child for the flu was the outcome variable for the first specific aim and related 3 hypotheses. Respondents were grouped into two categories (“Did not intend to vaccinate” and “Intended to vaccinate”) based on their response to the following question: item #4: “Did you plan on getting your child vaccinated for the flu in the past 12 months?”
- b) Vaccination rate: For the second specific aim the outcome variable was reported child vaccination rate within the past 12 months. The was assessed with a dichotomous variable (“Yes” or “No”) based on their response to the following question: Item #3: “Has your child been vaccinated for the flu in the past 12 months?”

Predictor variables related to the study hypotheses

Hypothesis 1: The level of health education and communication about the flu vaccine as it influences parental intent to vaccinate their child against influenza. This is assessed using several predictor variables as they have an aggregate effect on the outcome.

a) Health education and Physician Relationship: This was measured with item #13: “Did/does your child’s doctor tell you about the benefits of flu vaccinations?”, Item #15: “Did/does your child’s doctor tell you about the benefits of flu vaccinations?”, item # 17: “Did you receive a letter or email from your doctor’s office about your child getting a flu shot?”, and item 19: “Have you read any posters or brochures, or listened to television or radio

announcements to find out more information on flu shots?”. Items 17 and 19 were combined for bivariate and multivariable analysis to create one variable indicating if the responder had received any additional flu information.

b) Parental Perceptions about the flu vaccine: This was potentially to be measured with item #5: “If yes to question 3, what were the reasons for not getting the flu vaccine? Please select one of the following statements: I believe that flu vaccines always work, I believe that flu vaccines sometimes work, I believe that flu vaccines never work, I believe flu vaccines cause more harm than good, I believe flu vaccines can cause the flu”, and item # 6 “What is your opinion of the flu vaccine?” and item #7 “How important is your opinion of the flu vaccine when deciding about getting the flu vaccine for your child?”

c) Parental Ranking of individual factors: Each of the predictor variables were assessed as a group for aggregated weight with item #21: “Please rank from most important (#1) to least important (#5) these considerations for the flu vaccination”. Stratified Chi Square analysis of independence of association with the outcome and predictor variables showed that only two of the answers (“Access to routine healthcare” and “Doctor Discussion”) were not related to parental intent to vaccinate.

Hypothesis 2: The perceived health status of the child impacts parental intent to vaccinate their child against influenza

d) Perceptions of current health status: This was measured with item #11: “How would you rate your child’s current health?” and Item # 12: “How important is your child’s health status when deciding about getting the flu vaccine for your child?”

Hypothesis 3: Utilization of routine medical care for children influences parental intent to vaccinate their child against influenza.

e) Healthcare utilization: This was measured with item #8: “Does your child currently have health insurance (including employer-provided insurance, privately purchased insurance, Medicare/Medicaid, and workplace medical cost assistance programs)?”, item #9: “Does your

child receive routine medical check-ups every year?”, item #10: “How important is it to you for your child to receive regular health care when deciding about getting the flu vaccine for your child?”

Hypothesis 4: Reported intent to vaccinate is a predictor of successful vaccination as a behavioral outcome,

f) Intention to vaccinate: This was the predictor variable under specific aim 2 and measured with item #3 “Did you plan on getting your child vaccinated for the flu in the past 12 months?”

Demographic variables

The following variables were assessed as potential confounders or effect modifiers based on prior research and literature: Parents Age (item #25: “What is your age?”) and Child’s age, (item #1: “How old is your youngest child attending daycare?”) Parent Gender: item #26: “What is your gender?” and child gender, Item #2 “What is the gender of your youngest child attending daycare?”, Race/ethnicity: item #27: “How do you describe yourself?”, and Marital Status: item #28: “What is your marital status?”. Education level: Item #22: “What is the highest level of education you have received?”, subsidized childcare costs, item #23: “Do you receive any kind of subsidy or funding to help pay for childcare?”, annual household income, and item #24: “What is your annual household income level?”

Data Collection

IRB Process: The process of getting approval from the Institutional Review Board was done by completing a set of tasks pertaining to proper training of the team members and final versions of the questionnaire and cover letter being sent to the study participants, and finally proper delineation of all the details of the study and how it would be carried out. In order to accomplish these tasks the first step was to conduct a proper literature review to show the

importance of the study question and how the study would actually help address the issue. Once the literature review was completed an IRB protocol was created to specify all of the characteristics of the study that included:

- The inclusion and exclusion factors of the study participants,
- Process of recruiting study subjects
- Procedures being carried out to obtain a response from study subject
- Potential risk of the study
- Special precautions being taken
- Key Personnel Involved in the Study
- Locations where research was being conducted
- Potential benefits of the study
- Risk to benefit assessment
- List of references used

Along with the description of the study, team members also completed and submitted a Collaborative Institutional Training Initiative (CITI) Certification. A final version of the questionnaire was agreed upon to submit for approval. Although the survey originally intended to be distributed in both English and Spanish, due to translation verification difficulties, the English version was the only questionnaire approved to be included in the study.

Phase 1: Daycare Center Recruitment: A non-probability sample of 24 subsidized, Fort Worth daycare centers were chosen to participate in the distribution of the flu survey to parents of children, ages 6 months to 6 years, attending daycare. Since a complete list of all daycares centers in Tarrant County, TX could not be obtained, every daycare center in Tarrant County did not have equal probability of being selected to participate in this study and thus were not randomly selected. A narrowed list of subsidized daycare centers in Fort Worth was obtained from the Texas Department of State Health Services Website; this list provided contact numbers for the centers. The list was alphabetized and, beginning at the top of list, the daycare directors were contacted via the phone. The purpose of the phone call was to describe

the basic purpose of the study and set up a meeting with directors from each center in order to further explain details related to the study and obtain consent to conduct the survey at their center. If granted a meeting, an in-person appointment was conducted with each center director. The meeting allowed the team member to describe the study in more detail, allowed the directors to ask any questions regarding the study, and also helped facilitate a more personal relationship between the researchers and the client. A total of 23 daycare centers in Fort Worth agreed to participate in this study. Participating daycare centers distributed the flu survey to parents of children attending each center via email and paper copies were also made available if the director deemed it a good method to maximize response rates.

Phase 2 Parent Survey: Parents had several options to complete the survey. The instrument was disseminated via email addresses through the daycare centers management personnel in order to protect any potentially identifying information from being shared. The email contained a cover letter explaining pertinent study details, informed consent, and contact information. A link to take the survey online was contained in the email, along with a printable survey in English that was also be attached to the email, including directions to turn the completed survey in at the front desk drop box assigned for collection. Parents were requested to complete the survey within a two-week period from the date of the receipt. Two email attempts were made during the collection period. After the initial two-week period, a reminder was sent to those who did not respond requesting them to either complete the survey or return it during the following week. After this period, no reminders were sent to parents. No incentives were offered for participation. Day care centers and parents were free to withdraw from the study at any time.

Statistical Analysis

The data were maintained and analyzed in the SPSS version 20.0. The process of cleaning and data quality assessment was accomplished using various biostatistical methods. The chi-square test is a “test to determine independence of association of observed frequencies to frequencies that one would expect if the data were generated under some particular theory

of hypothesis” (Daniel, 2009). The chi square test is used to compare the observed data from the sample to theoretical expected sample outcomes and is used mostly when the data is in the form of frequencies. The null hypothesis states that the two categorical variables being compared are predictor of each other. A p-value of less than 0.05 indicates that there is statistical significance in support of evidence that the null hypothesis can be rejected and the two variables are associated with each other. Prevalence odds ratio: An odds ratio is: “the odds for success are the ratio of the probability of success to the probability of failure” (Daniel, 2009). The prevalence odds ratio is simply the ratio of probability for all the cases, old or new, to the probability of failure. It can also be thought of as incidence rate in the exposed population over the incidence rate of the unexposed (Daniel, 2009). The crude odds ratio will first be calculated from 2x2 tables in SPSS. An odds ratio alone does not prove statistical association. It needs to be assessed accompanied by a confidence interval and p-value to determine the statistical significance.

Data Manipulation

The response distribution for each variable in the dataset was assessed using univariate analysis. In line with the focus of the study, first descriptive analyses (e.g., frequency distributions and calculations of continuous variables) were conducted on each variable considered in this study. These analyses helped identify participant characteristics and the prevalence estimates of outcome variables and main predictors. Incomplete questionnaires were assessed for data relevance to estimate whether essential data is missing from the instrument that would require all responses be discarded from analysis. Variables with a low number of responses in certain categories of the variable were collapsed into fewer categories in order to obtain power needed for the bivariate and multivariate analyses.

All variables included in bivariate and regression analysis were recoded for missing variables. Intent to vaccinate as the outcome variable was recoded and assessed with two levels (0 = Intended to vaccinate, 1 = Did not intend to vaccinate). This was done using the yes/no responses of the survey item. Similarly, successful vaccination rates were assessed using yes/no responses to the survey item regarding if the parent had reported vaccinating their child

against the flu within the past 12 months. Two separate variables were calculated from yes/no responses to survey items to determine if the respondent had been exposed to any additional information about the flu, combining the variables into one variable that indicated if the respondent reported seeing and ads or if they received a letter or pamphlet from their doctor, then was coded 0 = “yes”, 1 = “no”. Parental perception of child health status was recalculated to collapse the lowest categories (“good and fair”) due to few responses. Respondent’s ranking of their child’s health status important related to deciding to vaccinate was also re-categorized to three levels, collapsing the lower choices (Not important at all and slightly important).

Results of bivariate analyses based on a Chi Square test of association between the main predictors and covariates as they relate to parental intent to vaccinate children against the flu, are represented in Table 3. Associations between outcome and predictor variables were assessed for independence.

Step 1 – Univariate analysis:

Specific Aim 1: The predictor variables—health education, child’s health status, and healthcare utilization—were measured with all categorical response and yes/no response questions. The outcome variable, parental intent to vaccinate child for the flu, is measured with two yes/no response questions. Therefore, a chi-square test was used to determine independence between each predictor variable measure and the outcome variable. A p-value of less than 0.05 was considered significant and will indicate that the predictor variable and outcome variable are associated with each other.

a) Health education and Physician Relationship: This was measured with item #13: “Did/does your child’s doctor tell you about the benefits of flu vaccinations?”, Item #15: “Did/does your child’s doctor tell you about the benefits of flu vaccinations?”, item # 17: “Did you receive a letter or email from your doctor’s office about your child getting a flu shot?”, and item 19: “Have you read any posters or brochures, or listened to television or radio announcements to find out more information on flu shots?”. Each of these variables were assessed to be weighted based on how the respondent answered questions asking them to rate

the relative importance of each of these items (“Very Important”, “Moderately important”, “Slightly important”, or “Not important at all”). However, analysis of how respondents rated the items revealed that approximately 98% of them gave the same rating for all of their answers (i.e. said all the factors were “Very Important”). This effectively eliminated the ability to weight the variables. Item #17 and #19 were recoded to create a single, dichotomous variable that indicated whether they had received or been exposed to any additional material related to the flu vaccine.

b) Parental Perceptions about the flu vaccine: This was potentially to be measured with item #5: “If yes to question 3, what were the reasons for not getting the flu vaccine? Please select one of the following statements: I believe that flu vaccines always work, I believe that flu vaccines sometimes work, I believe that flu vaccines never work, I believe flu vaccines cause more harm than good, I believe flu vaccines can cause the flu”, and item # 6 “What is your opinion of the flu vaccine?” and item #7 “How important is your opinion of the flu vaccine when deciding about getting the flu vaccine for your child?” However, chi square analysis of independence of association showed that item #5 (Reasons why they didn’t get the flu vaccine) was dependent on the outcome variable, intention to vaccinate, and therefore was not included in the final model for this hypothesis.

c) Parental Ranking of individual factors: Each of the predictor variables was assessed as a group for aggregated weight with item #21: “Please rank from most important (#1) to least important (#5) these considerations for the flu vaccination”. Stratified Chi Square analysis of independence of association with the outcome and predictor variables showed that only two of the answers (“Access to routine healthcare” and “Doctor Discussion”) were not related to parental intent to vaccinate. This was consistent with previous literature, so lead to the conclusion that each of the answers was to be included in the final model, assessed for inclusion using forward step-wise selection.

d) Perceptions of current health status: This was measured with item #11: “How would you rate your child’s current health?” and Item # 12: “How important is your child’s health

status when deciding about getting the flu vaccine for your child?” Chi Square analysis for independence of association with parental intent to vaccinate found that only item #11 was statistically significant predictor of the outcome and was the only predictor included in the final analysis model.

e) Healthcare utilization: This was measured with item #12: “Is your child currently covered under health insurance?”, and item #9: “Does your child receive routine medical check-ups every year?”. Originally item #10: (“How important is it to you for your child to receive regular health care when deciding about getting the flu vaccine for your child?”) was to be included in weighting these variables, however Chi Square analysis for independence of association with parental intent to vaccinate found that items 8 and 9 were statistically significant as predictors of the outcome, and item #10 was not included in the final analysis model.

Specific Aim 2: The predictor variable, parental intent to vaccinate their child for the flu, was a dichotomous variable with a yes/no response. The outcome variable, child vaccinated against the flu in the past 12 months, was also dichotomous with yes/no responses. A Chi Square test was also used to assess for association between these variables. Other than coding for missing variables, no additional manipulation was required to clean the data for analysis. See tables 1 and 2 for results of final univariate analysis.

Step 2- Bivariate analysis:

The predictor variables—barriers, facilitators, and parental perceptions—were measured with all categorical responses and yes/no response. The outcome variable, parental intent to vaccinate child for the flu, is measured with a yes/no response question; therefore, a chi-square test was used to determine association between each predictor variable and the outcome variable. Bivariate analyses were conducted to examine associations between outcome variables, access to care and quality of care, with the main predictors and demographic variables.

For both specific aims, potential confounders, identified from the literature, were first assessed to determine whether they meet the 3 criteria for confounding: 1) Confounder is associated with the predictor variables, 2) Confounder is associated with the outcome, and 3) Confounder is not in the pathway between the predictor variable and the outcome variable. A chi-square test for independence will be used to determine association between categorical potential confounders and the predictor and outcome variables. The continuous child age variable was grouped into 6 categories, one for each year, and the continuous parent age variable was grouped into 3 categories, one for each decade represented in the sample (twenties through forties) and used as a categorical variable in further analyses. Each potential confounder was identified as a confounder by assessing against 3 criteria for confounding and, based on statistical significance of the association, included in the final regression models with categorical variable included as stratified factors.

For the final test of association, four binary logistic regression models were used to test the association between the predictor variables and covariates in their aggregate association to the outcome variable. The odds ratios obtained from these regressions were collected for assessment of interaction and evaluation of strength of association between multiple variables. See Table 3 for results of bivariate analysis related to the main research question.

Step 3-Multivariate Analysis:

As outlined under the study's Specific Aim 1, the final regression model determined the individual contribution of the selected parental, child, and healthcare utilization factors as they predict parental intent to vaccinate children

Final Regression models for intent to vaccinate

In all, of the three separate final regression models that were run related to specific aim 1, intent to vaccinate was the main outcome. In the Final Model 1 parental intent to vaccinate was regressed on health education, along with covariates marital status and parental ethnicity, which were found to be significantly associated with health education.

In the final Model 2, intent to vaccinate was regressed on the main predictor perceived health status of the child along with the covariates, all of which were found to be significantly associated. These included respondent's marital status, race/ethnicity, age (categorical), education level, annual income, and child's age (categorical).

In the final Model 3, intent to vaccinate was regressed on healthcare utilization, the main predictor, along with covariates that were identified as potential confounders, based on the bivariate analysis, and included parental age (categorical), education level, and race/ethnicity.

Final regression model for parental vaccination behavior

This model with parental vaccination of their child within the past 12 months as the outcome behavior was regressed on Intention to vaccinate, the main predictor of interest along with covariates that were identified as potential confounders, including child's age (categorical), receipt of subsidized childcare costs, and ethnicity

Odds ratios and 95% confidence intervals with p-value set at 0.05 were obtained and reported in Table 6.

CHAPTER 4

RESULTS

Approximately 1,200 surveys were distributed to 23 daycare centers that agreed to take part in the study. A total of 563 surveys from parents of children ages 6 months to 6 years were returned with estimated return rate of 47% and were included in the final analyses.

Participant description

The majority of the respondents (91%) were females (See Table 1 for the sample demographics distribution). The demographic distribution of the sample included 59.3% who described themselves as non-Hispanic white, 19.3% as African American or Black, 15.6% as Hispanic or Latino, and 5.9% as other (which included Non-Hispanic black, Asian and Asian American, and Pacific Islander). The average age of respondents was 32.21 (SD 5.53), ranging from 22 to 47 years old

Table 1: Survey Sample Demographics Distribution

Variable	Frequency	Percentage
Parent Age	Mean: 32.21 yrs St.Dev: 5.53	Range: 22 to 47
Child Age	Mean: 3.67 yrs St.Dev: 2.36	Range: 0.5 to 6
Parent Gender		
Male	48	9.1
Female	480	90.9
Child Gender		
Male	237	46.9
Female	272	54.1
Marital Status		
Married	92	17
Single	424	78.5
Ethnicity/Race		
Black/African-American	104	19.3
Hispanic/Latino	84	15.6
White	320	59.3
Other	32	5.9
Annual Household Income		
Less than \$35K	116	21.5
\$35 - \$50K	108	20
\$50K and up	284	53.6
Education		
High School or GED	52	9.6
Some college/ Technical school	172	31.9
Bachelors or above	300	55.6

Three quarters of the participants reported as single, divorced, widowed, separated, or never married. A little over one-half of the respondents reported having an annual household income of at least \$50,000 or more per year, 20% reported making between \$35,000 and \$50,000, 21.5% reported to make less than \$35,000. The largest percentage of the sample (55.6%) had a Bachelors degree, professional certificate or higher-level education, while an

additional 31.9% reported some college or technical school, while 9.6% reported having high-school education or a GED. Nearly 80% stated they did not receive any kind of subsidy or funding to help pay for childcare, with the remaining claiming they did receive subsidy. The average age of the child the respondent reported on was 3.67 years old (SD 2.36) and 46.9% were male and 54.1% were female. Table 2 below presents the distribution of predictor and outcome variables.

Table 2: Predictor and Outcome Variable Distribution

Variable	Frequency	Percentage
OUTCOME VARIABLES		
Child vaccinated for the flu within past 12 months	364	67.4
Positive intent to vaccinate for the flu	404	74.8
PREDICTOR VARIABLES		
Doctor discussed benefits	444	82.2
Doctor discussed risks	388	71.9
Received information about the flu vaccine	304	56.3
Child covered under health insurance	520	96.3
Child received routine medical checkup	516	95.6
Parent received childcare subsidy	84	16.4
Child's Perceived Health Status		
Excellent	376	69.6
Very Good	124	22.9
Good to Fair	36	6.7
Parental Rank of Child Health		
Very Important	488	90.4
Somewhat Important	32	5.9
Less Important	20	3.7

Three quarters of the parents surveyed reported that they intended to vaccinate children while only two-thirds of parents vaccinated their children against the flu during the previous year. For the predictor variables related to Specific Aim 1, about 82% of the respondents reported that their pediatrician discussed the benefits of their child getting the flu vaccine, while 72% reported the doctor discussing the risks of pediatric flu vaccines. Approximately 56% said that they received some type of information about the flu vaccine (either a letter from their doctor, TV or radio ad, pamphlet or handout, or billboard). Most respondents (96%) reported that their child had health insurance, and almost the same percentage reported their child had received a routine medical checkup within the past 18 months. Over 90% of parents reported that their child's perceived health status was "very important" to their decision to vaccinate their child against the flu, with 70% reported "Excellent" health for their child, 23% reporting "very good", and the remaining 7% "good" to "fair."

Results of bivariate analyses based on a Chi Square test of association between the main predictors and covariates as they relate to parental intent to vaccinate children against the flu, are represented in Table 3.

Table 3: Chi Square Analysis for Independence of Association between Main Predictors and Covariates with Parental Intent to Vaccinate

Main Predictors	Proportion (n)	Chi-Sqr (df)
Health Education:		
Doctor discussed benefits	99.3 (536)	28.33 (1)***
Doctor discussed risks	99.3 (536)	0.33 (1)
Received information about flu	99.3 (536)	1.53 (1)
Child's perceived health:		
Health status	99.3 (536)	8.77 (1)*
Parental rank of child health	98.5 (528)	1.32 (1)
Healthcare utilization:		
Health insurance	97.8 (528)	12.74 (1)***
Routine checkup	98.5 (532)	15.18 (1)***
Covariates of interest:		
Child age (categorical)	99.3 (536)	24.51 (1)
Parent age (categorical)	95.9 (518)	9.65 (1)**
Parent gender	99.3 (536)	1.72 (1)
Child gender	95.9 (518)	5.58 (1)
Education level	97.0 (524)	8.14 (1)*
Marital status	95.6 (516)	2.52 (1)
Annual income	94.1 (508)	1.45 (1)
Received childcare subsidy	94.8 (512)	0.01 (1)
Parental race/ethnicity	99.3 (536)	45.33 (1)***

*p<.05; **p<.01; *** p<.001

Based on the results displayed in Table 3, the only predictor variable found significantly associated with intent to vaccinate was health education whether the doctor had discussed the benefits of the pediatric flu vaccine to the respondent. As expected, neither doctor discussing the risks of flu vaccines, nor receipt of additional flu-related information were found to be statistically significant as predictor of parental intent to vaccinate.

For the two variables related to hypothesis 2 (Child's perceived health status is an predictor of parental intent to vaccinate), only the health status was found

statistically significant, while the ranking it was given was not. Healthcare utilization was assessed for hypothesis 3, and both the child being covered under health insurance and whether the child received a routine medical check up.

Results of bivariate analyses based on a Chi Square test of association between parental intent to vaccinate as it relates to reported vaccination rate of children against the flu (specific aim 2), are represented in Table 4.

Table 4: Chi Square Analysis for Independence of Association between Main Predictor, Outcome “Vaccinated child against the flu” and Covariates

Variable	Proportion (n)	Chi Square (df)
Predictor Variable		
Intent to vaccinate	98.0 (529)	187.69 (1)***
Covariate		
Child age (cat)	98.7 (533)	21.08 (1) ***
Parent age (cat)	95.6 (518)	3.66 (1)
Parent gender	96.5 (521)	1.34 (1)
Education	95.7 (517)	2.17 (1)
Marital status	94.3 (509)	0.002 (1)
Annual income	92.8 (501)	0.86 (1)
Subsidy	93.5 (505)	4.77 (1)*
Ethnicity	98.7 (533)	49.52 (1)***

*p<.05; **p<.01; *** p<.001

As expected, intent to vaccinate was significantly associated with parental vaccination behavior. Among covariates, child age, ethnicity and subsidy were also associated at the bivariate level.

Covariates were assessed for independence to the outcome variable parental intent to vaccinate and for independence to predictor variables. See table 5 for results of chi square analysis of independence between covariates and predictor variables.

Table 5: Chi Square Analysis for Independence of Association to assess for confounding between predictor variables and covariates

Predictor Variable	Covariate (n)	Chi Square (df)
Doctor discussed benefits	Child Age (cat) (540)	9.92 (1)
	Parent Age (cat) (522)	2.27 (1)
	Parent Gender (528)	0.02 (1)
	Child Gender (509)	2.75 (1)
	Education (524)	2.95 (1)
	Marital Status (516)	6.38 (1)*
	Income (508)	1.57 (1)
	Subsidy (512)	0.59 (1)
	Ethnicity (540)	12.60 (1)**
Child's perceived health status	Child Age (cat) (540)	48.84 (1)***
	Parent Age (cat) (522)	23.63 (1)***
	Parent Gender (528)	10.55 (1)**
	Child Gender (509)	28.62 (1)***
	Education (524)	60.38 (1)***
	Marital Status (516)	12.18 (1)**
	Income (508)	53.37 (1)***
	Subsidy (512)	7.60 (1)*
	Ethnicity (540)	74.57 (1)***
Child covered by health insurance	Child Age (cat) (532)	16.63 (1)**
	Parent Age (cat) (518)	36.07 (1)***
	Parent Gender (520)	1.25 (1)
	Child Gender (504)	14.41 (1)***
	Education (516)	45.99 (1)***
	Marital Status (508)	2.72 (1)
	Income (504)	20.12 (1)***
	Subsidy (504)	2.46 (1)
	Ethnicity (532)	19.02 (1)***
	Routine Checkup(536)	1.12 (1)
Child received routine checkup	Child Age (cat) (536)	12.76 (1)
	Parent Age (cat)(522)	17.43 (1)***
	Parent Gender (524)	2.51 (1)
	Child Gender (508)	2.69 (1)
	Education (520)	10.74 (1)*
	Marital Status (512)	5.46 (1)
	Income (504)	56.38 (1)***
	Subsidy (508)	4.94 (1)
	Ethnicity (536)	80.41 (1)***

*p<.05; **p<.01; *** p<.001

Several parental and demographic variables were significantly associated with the main covariates of interest.

Regression models:

Based on the results, parental ethnicity and marital status were included as covariates in the final first model assessing the impact of health education and physician relationship on parental intent to vaccinate, using the positive identification of a doctor discussing the benefits of the flu vaccine as the reference as the referent category. For the second final model, looking at the impact of the child's perceived health status, all the identified covariates were found statistically significant covariates and were included in the model. For the final model assessing healthcare availability and utilization on parental intent to vaccinate, parental age (categorical variable), education level, annual income, and ethnicity were all included as covariates in the model. For the forth final model examining the predictive value of parental intent to vaccinate their child against the flu on the reported vaccination of their child within the past 12 months, child age (categorical), parental ethnicity, and receipt of childcare subsidy were included in the model.

Multiple logistic regression models were run separately for two outcome variables, intent to vaccinate and parental vaccination behavior. Models were regressed on main predictor variables and covariates that were significantly associated with the outcomes to assess each specific aim. Results from final regression analyses are presented in Table 6. The predictor variables that produced increased odds of intent to vaccinate included parent's who reported their doctor discussing the benefits of the flu vaccine, child's perceived health status, whether the child had health insurance coverage, and received routine medical checkups.

Table 6. Odds ratios and 95% Confidence intervals from multiple logistic regression predicting intent to vaccinate and vaccinated (N= 540)

Predictor Variables	Intent to Vaccinate Adjusted OR and 95% CIs	Vaccinated Adjusted OR and 95% CIs
Intent to vaccinate	--	48.74 (23.54, 100.88)***
Doctor discussed benefits	2.91 (1.75,4.83)***	--
Child's perceived health status (ref: Fair to poor)		--
Excellent	3.07 (1.16,8.11)*	
Good	5.50 (1.92, 15.76)**	
Child received routine medical checkups	10.01 (2.50, 40.06)***	--
Child covered under health insurance	9.41 (2.87,30.83)***	--
Parent received childcare subsidy	1.14 (0.52, 2.52)	1.88 (0.81, 4.40)
Marital status	0.69 (0.39,1.22)	--
Race/ethnicity (ref: White)		
Black	5.27 (2.05,13.86)***	0.22 (0.06,0.77)*
Hispanic	2.08 (0.73, 5.86)	0.51, (0.24, 1.08)
Other	11.95 (3.65, 39.86)***	17.67 (4.06, 76.90)***
Parent age (ref: 20-29)		--
30-39	4.90 (0.71, 33.71)	
40-49	3.75 (0.54, 26.80)	
Parent's Education level (ref: Bachelors and above)		--
HS or GED	7.04 (0.93, 53.16)	
Some College	9.64 (1.44, 64.29)	
Annual Income (ref: \$35-\$50K)		--
Less than \$35K	1.33 (0.32, 5.50)	
\$50K+	0.40 (0.09, 1.86)	
Child age (ref: 6.0-6.9)		
0.5-1.9	1.58 (0.68,3.70)	0.78 (0.03, 0.20)***
2.0-2.9	2.76 (1.26, 6.07)*	0.30 (0.12, 0.75)**
3.0-3.9	1.42 (0.63, 3.23)	0.39 (0.13, 1.17)
4.0-4.9	0.59 (0.27, 1.32)	0.50 (0.16, 1.52)
5.0-5.9	1.94 (0.90, 4.18)	0.15 (0.57 0.39)***

*p<.05; **p<.01; *** p<.001

Exploratory Analysis

Additional analyses were conducted to assess the associative relationship between several explanatory variables related to parental attitudes and perceptions related to parental intent to vaccinate toward pediatric flu vaccines.

Table 7 depicts the results from Chi Square analysis for independence of association examining the association between parental intent to vaccinate their child against the flu and the stratified responses given regarding the reason why they did not vaccinate their child against the flu.

Table 7: Chi Square Analysis for Independence of Association between explanatory variables and Parental Intent to Vaccinate

	Response (n)	Chi Square (df)
Question: “If you did not vaccinate your child against the flu, what was the reason that you did not	I don’t like shots (8)	1.98 (1)
	Vaccine isn’t safe (52)	30.64 (1)***
	Can’t afford it (16)	4.18 (1)*
	Medical Issues (20)	0.76 (1)
	Vaccine doesn’t work (48)	11.06 (1)***
	No known location (12)	9.50 (1)**
	Not able to get off work (28)	31.48 (1)
	Don’t know enough about child flu vaccine (36)	0.83 (1)

*p<.05; **p<.01; *** p<.001

Results from this analysis revealed that about 38% of respondents who did not intend to vaccinate their child for the flu said it was because they believed that the flu vaccine wasn’t safe, and almost 12% of the respondents stated it was because they couldn’t afford to get the vaccine, while 35.3% said it was because they believed the flu vaccine did not work, and 9% stated that they did not know a location to obtain the flu vaccine for their child.

Table 8 depicts the results of Chi Square analysis for independence of association related to Specific Aim 1, examining the association between parental intent to vaccinate their child against the flu and the respondent's ranking (one through five) of each one of the predictor variables included in the analysis.

Table 8: Chi Square Analysis for Independence of Association between explanatory variables and Parental Intent to Vaccinate (n = 519)

Question: "Please rank from most important to least important these considerations for deciding about getting your child vaccinated against the flu"	Response	Chi Square (df)
	Health Information	4.66 (1)
	Access to routine healthcare	27.48 (1)***
	Doctor discussion	14.28 (1)*
	Your opinion	8.87 (1)
	Child's health status	3.82 (1)

*p<.05; **p<.01; *** p<.001

Results from this analysis showed that there was two main reasons respondents considered of higher importance when deciding to vaccinate their child against the flu. These were if their child had access to routine healthcare and if their doctor discussed the flu vaccines with them. Both of these were statistically significantly related to parental intent to vaccinate their child for the flu.

Table 9 provides the results from Chi Square analysis for independence of association between parental intent to vaccinate their child against the flu and the respondent's opinion of the flu vaccine, while table 10 shows the results related to reported vaccination of the child against the flu and the respondent's opinion.

Table 9: Chi Square Analysis for Independence of Association between explanatory variables and Parental Intent to Vaccinate

	Response (n)	Chi Square (df)
Question: “Please select one of the statements that best suits you: I believe that flu vaccines....”	Always work (104)	19.94 (1)***
	Sometimes work (319)	30.02 (1)***
	Never work (8)	2.65 (1)
	Cause more harm than good (44)	146.71 (1)***
	Cause the flu (60)	11.20 (1)***

*p<.05; **p<.01; *** p<.001

Table 10: Chi Square Analysis for Independence of Association between explanatory variables and reported child vaccination against the flu

	Response (n)	Chi Square (df)
Question: “Please select one of the statements that best suits you: I believe that flu vaccines....”	Always work (104)	23.27 (1)***
	Sometimes work (319)	27.21 (1)***
	Never work (8)	1.26 (1)
	Cause more harm than good (44)	77.63 (1)***
	Cause the flu (60)	38.09 (1)***

*p<.05; **p<.01; *** p<.001

Results from these analyses indicate that there are several additional factors that impact both parental intent to vaccinate their child against the flu and reported successful vaccination of their child within the past 12 months. Parental opinion of how successful the flu vaccine is in preventing the flu was determined to impact both outcomes. Almost 60% of the respondents indicated that they felt the flu vaccine sometimes worked and approximately 20% said they believed the flu vaccine always worked. Eight percent stated they believed that the flu vaccine caused more harm than good, while eleven percent stated they thought the vaccine caused the flu. These responses were found to be statistically significant to both parental intent to

vaccinate their child against the flu, and reported vaccination of their child within the past 12 months. Only 1.5% of respondents reported that they believed that the flu vaccine never worked and this was not found statistically significantly related to either outcome variables.

CHAPTER 5

DISCUSSION & CONCLUSIONS

Each of the hypotheses under Specific Aim 1 that targeted at assessing the individual contribution of selected parental, child, and healthcare utilization factors that influence parental intent to vaccinate children against the flu, were supported by the results. As hypothesized, parents who reported that their doctor discussed benefits of the flu vaccine with them were indicated to have significantly higher likelihood of intending to vaccinate their child against the flu with a 1.91 increased odds of intending to vaccinate (1.75, 4.83 95% CI, p-value <0.001) when compared with parents whose doctor did not discuss the benefits, even after adjusting for the demographic variables. Parental race/ethnicity was observed to be statistically significant in this analysis, with Hispanics observed to have the highest OR of 11.95 (3.65, 26.86 95% CI, p-value <0.001) and Whites with a 5.27 OR (2.05, 13.86 95% CI, p-value <0.001) when compared to all other ethnicities. Overall, these results supported conclusions from other studies showing that doctor's discussion of risks and benefits of the pediatric flu vaccine have a positive impact on both intention to vaccinate and reported vaccination rates. (Esposito, et al., 2006; Hurwitz, et al., 2000).

Results from analysis of child factors supported that perceived health status of the child was important to parental intent to vaccinate with a 2.07 increased odds (1.16, 8.11 95% CI, p-value <0.05) for children who were given the rating of "excellent" health and a 4.5 increased odds (1.92, 15.76 95% CI, p-value <0.01) for children with a "good" health rating, when compared to children who were given a "fair" to "poor" health rating. This was also supported by results of other studies showing that children's perceived health status have a strong impact on reported vaccination rates as a health behavior outcome (Diekema, 2005). Covariates included in the analysis were not found

statistically significantly related, with the single exception of children who were between 2 and 2.9 years old (2.76 OR, 1.26, 6.07 95% CI, p-value <0.05). This indicates that parents of children who are 2 years old might have different perceptions of pediatric flu vaccines.

Analysis of the impact of children receiving routine medical checkups and health care insurance coverage supported the importance of access to and utilization of healthcare for children as it relates to parental intention to vaccinate. There was a high correlation observed between children who were covered under health insurance and children who received routine medical care. Children who received routine medical checkups were found to have an 9.01 increased odds (2.50, 40.06 95% CI, p-value <0.001) of parental intent to vaccinate when compared to children who did not received routine medical care, after adjusting for demographic variables. Children who were covered under health insurance were observed to have an 8.41 increased odds (2.87, 30.83 95% CI, p-value <0.001) of parental intent to vaccinate when compared to children who were not covered under medical insurance, after adjusting for demographic variables.

Specific aim 2 focused on quantifying the value of parental intent to vaccinate is a predictor of successful vaccination as a behavioral outcome. Parents who reported a positive intention to vaccinate their child against the flu were found to be nearly 50 times more likely to report having successfully obtained the flu vaccine for their child (48.74 OR, 23.54, 100.88 95% CI, p-value <0.001). This was observed even after adjusting for demographic variables. Results support that the respondents who reported an intention to vaccinate were highly likely to report vaccinating their children within the past 12 months.

Additional exploratory analyses results support the idea that there are several barriers related to successful vaccination practices among parents and even factors that predict intention to vaccinate. Several identified barriers to obtaining the flu vaccine, assuming they intend to get the child vaccinated, involve access to and knowledge of a convenient location to get pediatric flu vaccines, inability to get off work in order to obtain the vaccine with their child, and affordability of the vaccine. Other predictive factors of parental intent to vaccinate included the parent's opinion of the effectiveness of the flu vaccine, and how important health education was in general to the parent.

Past research concerning parental intention as a predictor of health behavior, indicates that parents have a predominantly assigned hierarchy of importance to various factors as they relate to vaccinating behavior. Vaccination success rates are linked to the interaction or presence of several components. The factors that have been shown to hold the most importance are physician relationship leading to positive health education, healthcare utilization and availability, and perceptions related to the overall effectiveness of the flu vaccine. (Diekema, 2005; Esposito, et al., 2006; Hurwitz, et al., 2000). While these conclusions are generally supported by the results from this study, there is no indication that they have an overall aggregate effect that is predictable by relative importance assigned by a parent. Due to the overwhelming consistency of respondents assigning the same level of importance to each factor assessed by the survey instrument, it is reasonable to conclude that these individual factors do not weigh in differently, based on how the parent perceives their worth, but that the parent's overarching attitude or perception regarding these factors predicts the level of importance that is assigned to all related factors. Supposedly, parents who say that each of the related factors are all important, would be more likely to report a positive intent to vaccinate and/or vaccinating their child for the flu within the past 12 months, when compared to parents that say that each of the related factors are not important at all.

Analysis of how intention to vaccinate is a predictor of vaccinating behavior choices that lead to successful vaccination rates for children in daycare centers indicates that, although there is certainly high predictability for those who vaccinate, it is also highly relevant to note that specific barriers exist that prevent intention from equaling success.

The major barriers assessed in this study included lack of knowledge of or access to locations that provide the flu vaccine for children under 6, lack of physician relationship, inability to get off work during business hours to take their child to obtain the vaccine, and lack of understanding the safety issues related to vaccinating children against the flu (particularly when related perceived child health status). It would be beneficial to examine more specifically, looking at how parents categorize these issues related to their overall attitude or perception regarding health in general.

Study Strengths and Limitations

The findings of the study help further increase the strength of the previous studies and intervention methods, as well as contribute to the body of work related to intention and health behaviors. By delineating the determinants one can then help tailor interventions to maximize outcomes and give specific direction for education efforts. One of the strengths of this study was the updated approach to understanding vaccination rates as an intention driven health behavior. Since parents are not likely to accidentally or unintentionally vaccinate their children, understanding what goes into the predetermination of parental intention in to vaccinate is a very important component of understanding health behavior. The impact of understanding this component in the global public health effort to increase vaccination rates and participation in prevention efforts is crucial. It has the potential to predict vaccination rates and quantify factors that play in reaching vaccination goals.

However, like any research study there were still some limitations. The first potential limitation found was the sample size of the study group. Although the response rate was higher than realistically expected, due to time constraints, corporate litigation and regulations, and lack of resources, the recruitment process was not as successful as anticipated. The second limitation was potential selection bias among the people that decided to participate in the study. It is possible that parents decided to participate in the study felt more strongly over the subject and therefore were more inclined to participate in the first place. No analysis was done on why study subjects decided to participate in the study.

Generalizability of this study is another limitation due to the restricted geographic area of the study. It was only conducted within Tarrant County, so generalizing to a different, diverse geographic region with different demographic components is not recommended. Further, since the survey was conducted only in English, it is possible that the study missed non-English speakers thus limiting its external validity to English speakers.

Conclusions and Implications:

Influenza is especially harmful to children under the age of 2 and therefore highly recommended for influenza vaccine. Since influenza vaccines are not required vaccinations for children under age 6, this population becomes particularly at risk and the reason for our study focus (Esposito, Marchisio, Bosis, Lambertini, 2006). The population selected for this study was parents of children, ages 6 months to 6 years, attending daycare centers in Tarrant County, TX. This survey measured the different factors and perceptions of flu vaccines that may potentially hinder or facilitate parental intent to vaccinate their children. The main predictor variables found related to intent to vaccinate in this study were consistent with previous literature findings. These variables were health education, healthcare utilization, and perceived child health status. This study's main aim was to determine the association between these variables and parental intent to vaccinate children for the flu. Study findings revealed several factors were found to be statistically significant, as well as consistent with previous related literature. Most significant of those related to parental intent to vaccinate included if the child received routine check-ups, physician discussion of risks and benefits of the flu vaccine, and prior history of obtaining the flu vaccine. Other factors, such as the child's health status and certain opinions about flu vaccination effectiveness, were found related to the outcome.

By delineating the determinants of parental intent to vaccinate their children against the flu, interventions and policies can be tailored to maximize outcomes and give specific direction for education efforts. To improve upon these results, future research should be focused on increasing the precision and generalizability of the findings, as well as assessing new factors, including the environmental setting (e.g. rural vs. urban), the social construct that race/ethnicity presents (e.g. the Hispanic paradox), and the difference among socio-economic class. Constructing a way to select a representative, random sample would greatly improve these components. By addressing the factors found to be significant in the results of this study, particularly those supported by and supporting prior research, we can improve the efficacy of outreach programs and improve vaccination success rates. Addressing policy and programs aimed at increasing facilitators and reducing barriers within the community would maximize the efforts to reduce the impact of influenza within the community.

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APPENDIX A: EXPANDED QUESTIONNAIRE WITH INTENDED VARIABLE ITEMS

Questions related to the outcome variable:

1) Has your child been vaccinated for the flu in the past 12 months?

- ☐ Yes
- ☐ No

2) Did you plan on getting your child vaccinated for the flu in the past 12 months?

- ☐ Yes
- ☐ No

Items 1 and 2 were designed to examine the outcome variable related to Specific Aim 1: parental intent to vaccinate. It is defined at two levels: 0 = Intended to vaccinate and 1 = Did not intend to vaccinate.

Questions related to perceptions about the flu vaccine:

3) If you answered No to question 2, what were the reasons for not getting the flu vaccine?

- ☐ I don't like shots
- ☐ Because of religious reasons
- ☐ I don't think flu vaccines are safe
- ☐ I can't afford to get the shots
- ☐ My child's doctor advised against the flu shot due to medical issues
- ☐ I don't think that flu vaccines work
- ☐ I couldn't find a location that offered child flu vaccines
- ☐ I was not able to get off work
- ☐ I don't have transportation
- ☐ I don't know enough about flu vaccine for children

Items 3 through 5 are designed to examine parental perception and opinion of the flu vaccine as a component of the main parental factor predictor variable health education and physician relationship.

4) Please select one of the following statements that best suits you:

- ☐ I believe that flu vaccines always work.
- ☐ I believe that flu vaccines sometimes work.
- ☐ I believe that flu vaccines never work.
- ☐ I believe flu vaccines cause more harm than good.
- ☐ I believe flu vaccines can cause the flu.

5) How important is your opinion of the flu vaccine when deciding about getting the flu vaccine for your child?

- ☐ Very important
- ☐ Moderately important
- ☐ Slightly important
- ☐ Not important at all

Questions related to Healthcare Utilization:

6) Is your child currently covered under health insurance?

- ☐ Yes
- ☐ No

7) In the past 18 months has your child received a routine medical check-up?

- ☐ Yes
- ☐ No

Items 3 through 5 are designed to examine parental perception and opinion of the flu vaccine as a component of the main parental factor predictor variable health education and physician relationship.

Items 6 through 8 are designed to assess perceived access and availability of healthcare for the child as a component of the main predictor variable healthcare utilization.

8) How important is it for your child to receive regular healthcare when deciding about getting the flu vaccine for your child?

- ☐ Very important
- ☐ Moderately important
- ☐ Slightly important
- ☐ Not important at all

Questions about the perceived child's health status:

9) How would you rate your child's current health? (Please select one)

- ☐ Excellent
- ☐ Very Good
- ☐ Good
- ☐ Fair
- ☐ Poor

10) How important is your child's health status when deciding about getting the flu vaccine for your child?

- ☐ Very important
- ☐ Moderately important
- ☐ Slightly important
- ☐ Not important at all

Questions about health education and physician relationship

11) Did/does your child's doctor tell you about the benefits of flu vaccinations?

- ☐ Yes
- ☐ No
- ☐ I don't have a doctor that I see regularly

Items 9 and 10 are designed to assess the parent's perception of the child's health status and relative importance as the child factor main predictor.

Items 11 through 18 are designed to assess the main predictor of parental factors that are related to communication with and relationship to their child's pediatrician or primary care manager.

12) How important is your child's doctor explanation of the benefits of the flu vaccine when deciding about getting the flu vaccine for your child?

- ☐ Very important
- ☐ Moderately important
- ☐ Slightly important
- ☐ Not important at all

Items 11 through 18 are designed to assess the main predictor of parental factors that are related to communication with and relationship to their child's pediatrician or primary care manager.

13) Did/does your child's doctor tell you about the risks of flu vaccinations?

- ☐ Yes
- ☐ No
- ☐ I don't have a doctor that I see regularly

14) How important is your child's doctor explanation of the risks of the flu vaccine when deciding about getting the flu vaccine for your child?

- ☐ Very important
- ☐ Moderately important
- ☐ Slightly important
- ☐ Not important at all

15) Did you receive a letter or email from your doctor's office about your child getting a flu shot?

- ☐ Yes
- ☐ No
- ☐ I don't have a doctor that I see regularly

16) How important is it that a doctor informs you about the flu vaccine?

- ☐ Very important
- ☐ Moderately important
- ☐ Slightly important
- ☐ Not important at all

17) Have you read any posters or brochures, or listened to television or radio announcements to find out more information on flu shots?

- ☐ Yes
- ☐ No
- ☐ I haven't seen any posters or brochures or heard any announcements.

18) How important is it that you understand how the flu vaccine works when deciding about getting the flu vaccine for your child?

- ☐ Very important
- ☐ Moderately important
- ☐ Slightly important
- ☐ Not important at all
- ☐ I'm not even interested

Overall ranking of each predictor variable:

19) Please rank from most important (#1) to least important (#5) these considerations for getting the flu vaccine for your child:

- ☐ Access to routine healthcare for your child
- ☐ Health information about the flu vaccine
- ☐ Your child's doctor discussing flu vaccination with you
- ☐ Your opinion of the flu vaccine
- ☐ Your child's health status

Items 11 through 18 are designed to assess the main predictor of parental factors that are related to communication with and relationship to their child's pediatrician or primary care manager.

Item 19 asks the respondent to rank from most important to least important the predictor variables as they relate to their intention about vaccinating their child for the flu.

Questions related to demographics:

Items 20 through 28 collect demographic information that will assess the covariates included in this study.

20) What is the highest level of education you have completed?

- ☐ Never attended school
- ☐ Some elementary (grades 1-8)
- ☐ Some high school (grades 8-11)
- ☐ High School Diploma or GED
- ☐ Some college or technical school
- ☐ Bachelors Degree or professional certificate
- ☐ Graduate Degree

21) Do you receive any kind of subsidy or funding to help pay for childcare?

- ☐ Yes
- ☐ No

22) What is your annual household income level?

- ☐ Less than \$20,000 per year
- ☐ \$20,000 to less than \$35,000 per year
- ☐ \$35,000 to less than \$50,000 per year
- ☐ \$50,000 to less than \$75,000 per year
- ☐ \$75,000 or more per year

23) What is your age? _____

24) How old is your youngest child attending daycare? _____

25) What is your gender?

- ☐ Male
- ☐ Female

26) What is the gender of your youngest child attending daycare?

- ☐ Male
- ☐ Female

Items 20 through 28 collect demographic information that will assess the covariates included in this study.

27) How do you describe yourself? (Please check the one option that best describes you)

- ☐ American Indian or Alaska Native
- ☐ Hawaiian or Pacific Islander
- ☐ Asian or Asian American
- ☐ Black or African American
- ☐ Hispanic or Latino
- ☐ Non-Hispanic White
- ☐ Non-Hispanic Black

28) What is your marital status?

- ☐ Married
- ☐ Divorced
- ☐ Widowed
- ☐ Separated
- ☐ Never Married