2016

Trends in Vaccination Rates Amongst Young Children and the Factors Affecting Parent Decisions

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TRENDS IN VACCINATION RATES AMONGST YOUNG CHILDREN AND THE FACTORS AFFECTING PARENT DECISIONS

A MASTER'S PROJECT
SUBMITTED TO THE GRADUATE FACULTY
GRADUATE SCHOOL
BETHEL UNIVERSITY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
MASTERS OF SCIENCE IN PHYSICIAN ASSISTANT

AUGUST 2016

BETHEL UNIVERSITY

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JUNE 2016

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ABSTRACT

Problem: Throughout the United States, there has been an increasing trend in the number of parents refusing to vaccinate their children. Studies have shown that since the upward trend of refusal to vaccinate has started, there has been an increase in outbreaks of preventable diseases. In Minnesota, there have been no studies to evaluate how many parents are refusing vaccinations for their children or the reasons why.

Purpose: This study will evaluate how many parents with children ages five and under are choosing to vaccinate their children or refusing vaccination, and the reasons behind their choice to vaccinate or not.

Methods: For three weeks, surveys will be administered to parents of children ages five in a suburban or rural clinic in Minnesota. A receptionist will administer the questionnaire to parents that fall into the established criteria and the parent will complete the survey while they are in the clinic. These surveys will then be collected by the researchers to analyze answers.

Outcomes: Data will be obtained from the questionnaires and quantified. The number of parents that vaccinate their children and those that refuse to vaccinate their children will be compared along with reasons for the decisions and the importance of each reason.

Benefit: This research project will enhance knowledge of vaccination rates in Minnesota based on suburban or rural settings and reasons why a parent may choose to vaccinate their child, or choose not vaccinate their child.

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CHAPTER 1

Background

In our country, the number of parents refusing to immunize their children is on the rise. This trend has been continuing to increase despite copious amounts of positive research for vaccines. In 2014 Jeanette Ruiz and Robert Bell investigated this topic further and found that parents were not vaccinating their children due to myths that they found on the Internet. They conducted an analysis of the web pages that come up with negative, positive, and neutral terms for the topics "vaccination," "MMR," and "vaccine" (Ruiz, Bell, 2014). They then analyzed the websites depending on whether they contained one of fifteen myths about vaccines that are currently circulating. They graded the websites if they were neutral, positive, or negative against vaccines. Their results showed that the myths were much more prevalent on the websites where the search terms were negative or neutral toward vaccines. They concluded that if a parent has a concern about vaccines they will primarily find data containing one of the many myths associated with them (Ruiz, et al. 2014).

As discussed above, independent Internet research about immunizations is a significant issue in our current culture. A growing amount of people are turning to their computer for their health information. Unfortunately, people generally share their concerns and complaints online and these posted concerns can spread very easily. The public generally does not post excitement because their child made it to the age of five without getting a childhood illness that she/he was immunized against. The negative information is easily found and available online about the parent's opinion on why the adverse reaction happened. Despite the lack of a positive correlation between the MMR

vaccine and autism, parents are still convinced that there is a connection. Public health websites need to be more prevalent in order to keep parents well informed (Salmon, Moulton, Omer, DeHart, Stokley, Halsey, 2005).

Vaccine risks are different than most other medications or activities because they are given to children and there is no way to know if the child will have an adverse effect. Risk assessments must be done and parents must decide if the relatively small risk is worth protecting their child from deadly diseases. Furthermore, parents have to take into account that they are endangering other people by not getting their children vaccinated. Documentation exists about using a different model for risk assessment that stems from communication from health care providers after trust has been developed between the caregiver and the patients (Larson, Paterson, Erondu, 2012). Trust is a large key that is not often discussed (Larson, et al. 2012).

Problem Statement

An increasing trend is occurring in parents who are not vaccinating their young children. The decrease in vaccination rates has led to an increase in preventable disease outbreaks.

Purpose

The purpose of this research is to learn about the reasons why parents with children ages five and under in Minnesota choose to vaccinate or choose to decline vaccination for their children.

Significance

The significance of patient education on vaccinations can be seen by observing the effects of not vaccinating an individual and the consequences of refusal. Patient

education is very important because of the recent decreasing trends in vaccination rates. It has been seen that when disease prevalence seems to reach a low point, this is when vaccine refusal seems to peak. The decrease in vaccination rates is probably due to the fact that the effects of an infectious disease or an endemic is not seen when the disease prevalence is low and people become more concerned about the post-effects of the vaccine (Omer, Salmon, Orenstein, DeHart, & Halsey, 2009). It would be an excellent time to educate individuals on the importance of vaccines when disease prevalence is low. In order to keep on top of vaccine-preventable diseases, education needs to be implemented at all times to try to eradicate these diseases.

Vaccinations are very important for our society in that they can prevent many devastating diseases not only for that particular individual but for others that cannot receive the vaccine. Vaccinations create what is called "herd-immunity." According to the CDC, herd immunity is defined as a situation in which a sufficient proportion of a population is immune to an infectious disease to make its spread from person to person unlikely (CDC 2013). Herd immunity protects not only the individual receiving the vaccine, but those that cannot receive a vaccine for whatever reason (Fine, Eames, & Heymann, 2011). With the decrease in vaccination rates, this herd-immunity does not exist and those that cannot receive a vaccine will no longer be protected. Herd immunity and its effects are an important note within education about vaccinations because decrease in herd immunity is one of the many effects of not vaccinating.

While some diseases do not affect the majority of people significantly, certain populations and individuals are considerably affected. These particular individuals include children who are too young to receive a vaccine, the immunocompromised

individuals, and the elderly. Many complications can result from these diseases, even in a healthy individual. While there are possible complications and side effects to vaccines, the benefits of the vaccines outweigh the harmful effects of the vaccine-preventable diseases.

With the decrease in vaccination rates there has been many diseases making a significant comeback. These diseases include; mumps, measles, rubella, polio, pertussis, etc. (Omer et al. 2009). According to the Center for Disease Control and Prevention (CDC), measles and pertussis consume the highest number of cases worldwide. North America leads in the number of vaccine-preventable disease cases. The CDC reported that in the United States during 2012, pertussis emerged once again and infected almost 50,000 individuals. In 2014, this number then declined to about 24,000 individuals infected. Even though there was a significant drop from 2012 to 2014 of pertussis cases, 24,000 cases of pertussis is still a significant increase from 30 years ago, which was under 2,000 cases (Doucleff, 2014). While mortality rates appear to be low, a chance still exists that an individual will die if they contract one of these vaccine-preventable diseases. Because of the measles vaccine, childhood deaths has decreased by 78%, but 400 children still die from measles every day worldwide (CDC, 2014). Measles outbreaks have been specifically prevalent in the United States. For the year of 2014, there were 668 reported cases of the measles in the United States. In 2015, from January 1st to May 1st there were 169 cases of measles reported in the United States, which included an outbreak at Disney World (CDC, 2015). Patient education of vaccines is important because even though these diseases are preventable, so many deaths still occur due to not vaccinating and patients must know that these diseases can be deadly (Sifferlin, 2014).

Limitations

A few limitations may arise when conducting this research. The first limitation will be the self-reported data collected from the participants. When individuals participate in this research study they will be answering questions about their specific beliefs. Participants may not always answer questions honestly. Therefore, it is difficult to determine the validity of the results. The questions need to be straightforward and clear so the individuals will understand and be able to answer truthfully. Also, informing the participants of the importance of honesty and confidentiality of the study will allow the participants to openly express their true opinions.

Many parents/soon-to-be parents may be set in their ways and beliefs about vaccinations. Another limitation is the openness of these individuals to take part and give their personal feedback while partaking in this study. They have their own definitive reasons as to whether or not they are going to vaccinate their child and for some it may be difficult for them to express those beliefs. They may know that they are already going to vaccinate their children and the positive benefits of vaccination. Parents' opinions may differ in that they feel the risks of vaccinations outweigh the benefits and stand firm in those beliefs. Participants must be open to share their own beliefs on vaccination.

Research Questions

The following research questions will be addressed in this study:

- How do vaccination rates of children differ from rural Minnesota vs. suburban Minnesota?
- Where do parents get their information? What are some factors that have affected the parent's decision?

- Do parents believe their health care provider is reliable? Is there a significant difference between rural and suburban populations in regards to how parents view their provider?

CHAPTER 2

Introduction

This literature review examines two different surveys on vaccination; looking at studies done on the effects of not vaccinating children and the reason behind the parent's refusal to vaccinate. Vaccination rates in the United States have been on the decline. Due to the decrease in vaccination there has been a subsequent trend in vaccine-preventable diseases. Even with an increase in diseases, parents are still refusing to vaccinate their children.

Effects of Not Vaccinating Children

There have been a number of studies done that have examined the effects of not vaccinating children. This includes the increase in vaccine-preventable diseases and the provider's response to patients that refuse to vaccinate. The studies have a common trend that vaccine refusal not only increases the risk of vaccine-preventable diseases to those individuals, but to the whole community and also those that cannot receive vaccinations.

A study published in *The New England Journal of Medicine*, researched the risks of vaccine-preventable diseases in the children of parent's that refused vaccines and were exempt from the mandatory school vaccination requirements. According to the information gathered and a study that the researchers collected, the researchers found that from 1985-1992, children that were exempt from the required vaccines were 35 times more likely to contract measles than the children that had to follow the requirements. In a second study based in Colorado, the researchers found unvaccinated children were 22 more times likely to contract measles between the years of 1987 and 1998. The study was expanded to find that these same children were six times more likely to contract pertussis

(Omer, et al. 2009). When there has been outbreaks of the disease, it was found that almost all of the children that were infected were not vaccinated (Omer et al. 2009).

Omer and Saint-Victor wrote an article called, "Vaccine Refusal and the Endgame: Walking the Last Mile First." Within the article, the authors discuss the importance of vaccine education at all times and when vaccine-preventable diseases are at a low, the vaccine rates tend to decrease (Saint-Victor & Omer, 2013). The authors also discuss eradication of smallpox that is attributed to the smallpox vaccine. This article is important within this study because not only does it discuss one of the issues that will be faced in dealing with individuals who refuse vaccines and why they may refuse a vaccine, but it also shows the effects of vaccinations and not vaccinating. The article also states, "The World Health Organization estimates that 1.5 million deaths among children under 5 years were due to vaccine-preventable diseases" (Saint-Victor et al. 2013).

According to the same article published in *The New England Journal of Medicine*, the research indicated that individuals that cannot receive vaccinations for whatever reason are also more susceptible when children around them are unvaccinated. When there is a high vaccine coverage, these individuals are protected and the opposite is true when the coverage rate of vaccines falls (Omer et al. 2009).

Not vaccinating one individual not only has potential risk for that particular individual, but the community as well. In 2008, an intentionally unvaccinated 7 year old contracted measles after a trip to Switzerland. This child was asymptomatic after returning to San Diego, California, and unknowingly infected his siblings. The number of infected individuals quickly began to rise, in part due to the fact that 2.5% of San Diego kindergarteners were unvaccinated due to parents who signed exemption forms. In the

end, 839 individuals were exposed and 11 children became infected. All of the children who were infected were also unvaccinated (Sugerman, Barskey, Delea, Ortega-Sanchez, Bi, Ralston, Rota, Walters-Montijo, & Lebaron, 2010). This case study is an example of how easy it is for diseases to come back into the United States because of how easy it is to travel. The ease of travel makes it harder to fully eradicate a disease at this time until we are able to vaccinate the world. Parents choosing not to vaccinate affects those in the community as well. Assessing parents' understanding of herd immunity can help to explain their views on vaccination.

An additional concern that was brought forward was the healthcare provider's response to the patients that refused vaccinations. According to a study done by the American Academy of Pediatrics, about 40% of physicians who responded to the survey said they would refuse care to families that refused all vaccines and about 28% said that they would refuse care to families that refused some vaccines (Omer et al. 2009). Some possible reasons that a healthcare provider may discontinue their relationship with the patient is a situation in which the provider believes the unvaccinated individual is putting others at risk and also if the provider's beliefs are different than those of the unvaccinated child's parent (Gilmour, Harrison, Asadi, Cohen & Vohra, 2011). Not vaccinating a child could lead to families having difficulty finding primary care providers and could cause an increase in emergency room visits because the families do not have anywhere else to go. An individual that denies vaccinations for their children may not realize these possible consequences. This article did not look into the possibility that the parents may not understand these consequences and if not knowing the consequences would play a role in an individual's decision to vaccinate their child.

Knowing the negative effects of not vaccinating is important in moving forward in our studies and trying to understand all sides of the non-vaccination or pro-vaccination movements. In the future this study can be expanded to determine if information on vaccinations are presented to individuals that do not know about the negative effects of not vaccinating, and if the new knowledge changes their opinions.

Survey of Why Parents Do Not Vaccinate Their Children

The number of parents who are not vaccinating their children has been rising. There have been multiple groups who have looked into reasons why this is happening despite the fact that immunizations have decreased childhood illnesses. In 2005, Daniel Salmon and some of his associates mailed out surveys to parents of school-aged children from both private and public schools and 2435 were completed. The participants were living in Colorado, Massachusetts, Missouri, and Washington. The study concluded that most children were at least partially vaccinated however many of them were not fully vaccinated. The number one reason why some of the vaccines were omitted was because the parents were concerned that the vaccines would cause harm. Therefore, they were not vaccinating against the diseases that they did not believe to be "harmful" (Salmon, et al. 2005). The number one vaccine that was omitted was Varicella and this was because the parents did not want to expose their child to the toxin when they thought that the disease was not going to hurt them long-term (Salmon, et al. 2005).

The survey in 2005 also included other questions about the parents trust in the healthcare system, trust in the government, use of alternative medicine, trust in alternative medicine, income, and education. The parents of exempt children reported using alternative medicine more than the parents of fully vaccinated children (Salmon, et

al. 2005). The study concluded that parents of exempt children did not have as much trust in the government or the healthcare system for their vaccine information. Overall, the parents also trusted alternative medicine more so than their family practice providers.

Janette Ruiz and Robert Bell investigated websites that parents were using for vaccine education. They found that when parents search the word "risk" they were 3.6 times more likely to encounter a vaccine myth then when they searched the word "benefit" in terms of vaccines (Ruiz, et al. 2014). This study points out a major problem because if the parent is apprehensive about vaccines at all they are more likely to search a negative term in regards to vaccines. This results in myths about vaccines. Parents who are apprehensive about vaccines in general are more likely to have trust issues with the information that their health care provider gives them. Daniel Salmon found that parents who are not vaccinating generally have a low level of trust in the information that their health care provider is giving them (Salmon, et al. 2005). Government agencies and public health agencies need to make sure that their website is toward the top of the search results (Ruiz, et al. 2014).

Katherine LaVail and Allison Kennedy evaluated the reason why parents really were not vaccinating with a survey in 2013. They wanted to measure the confidence that the parents had about the vaccine and determine if that had an effect on their decision. However, after their statistical analysis they really did not find a correlation between their confidence on the efficacy and whether or not they were vaccinating. They concluded that other barriers exist to vaccination other than safety, but could not determine them at that time (LaVail, Kennedy, 2013). Based on the other research discussed in this article,

the other barriers are likely based on information that they got on the internet or from a non-medical source.

In 2004, Daniel Salmon conducted a study with other colleagues to review the amount of education and knowledge the nurse or school employee who were reviewing the immunization status of children had. The study looked at the types of education the school personnel were giving parents on immunizations (Salmon, et al. 2004). The study determined that the students were much more likely to be fully vaccinated if there was a nurse who reviewed their records versus a non-health care worker. They concluded that a major barrier to the parent's vaccinating or not vaccinating was determined by the information that the parents were getting about the vaccines and the credibility of the person who they were getting it from (Salmon, et al. 2004).

Summary of Literature Review

Vaccine refusal is leading to an increase in preventable childhood diseases. There is a growing deficit in herd immunity leading to dangerous situations for children who cannot get the vaccines for medical reasons. Providers are responding and at times refusing to treat people who do not vaccinate. Providers refusing to treat individuals is a large preventable problem that our country needs to deal with starting with public health organizations and primary medical providers.

Parent's refusing immunizations for their children are on the rise in our country. Multiple surveys have been conducted asking these parent's why they are not vaccinating and the results from the surveys are similar. They are concerned about the safety of the vaccines or do not believe that the vaccines are protecting against harmful diseases. The

lack of education about the diseases and the education about the safety of the vaccines is an area where health care providers can do better.

This study will look at Minnesota parents' beliefs about vaccination and the reasons behind those beliefs. The issues discussed in the above studies will be addressed in this study, in reference to rural and suburban Minnesota. This study appears to be the first undertaken in Minnesota when discussing parental views on vaccination.

CHAPTER 3

Methodology

Introduction

The purpose of this study is to learn about the reasons why parents with children ages five and under in Minnesota choose to vaccinate or decline vaccination for their children. The research questions that will be addressed include:

- How do vaccination rates of children differ from rural Minnesota vs. suburban Minnesota?
- Where do parents get their information? What are some factors that have affected the parent's decision?
- Do parents believe their health care provider is reliable? Is there a significant difference between rural and suburban populations in regards to how parents view their provider?

This chapter will discuss the study design of the research, the population that will be used, validity and reliability of the research itself, and how the data will be collected and analyzed.

Study Design

The design of this study is a mixed design with quantitative and qualitative analysis. The study is a one-shot case study in which a survey will be administered to the individuals chosen based on pre-existing criteria and voluntary participation, the results from the single questionnaire will then be collected and measured. Everybody will receive the same survey and a control or randomized group will not be included within this study. There is also no pre-test or posttest included in the study. This type of design

allows for the information gathered to aid in answering the research questions of this vaccination study.

Study Population

The population who will be chosen for this study are parents who are 18 years of age or older who have children age five years old and younger. The study sites are rural and suburban primary care clinics in Minnesota, the specific locations are: Baxter and Mankato. For our study, rural is described as a population of less than 2,500 people and suburban is a population between 2,500 and 50,000 people. The selection of the clinic sites is to compare different population areas of Minnesota in regards to vaccination rates of young children relating to the research questions. Parents of children age of five and under, are being selected based on the recent trend of declining vaccination rates and the need to condense the research study. To condense the information, the survey will be administered to a larger population but for the purpose of our study, the pre-existing criteria will filter out what does not pertain to the purpose of the study.

Validity/Reliability

This vaccination study is a pilot study that has not been done before in Minnesota. The surveys will be administered the same way and with the same script so if the study is done in the same way, the results should be repeatable. The same data analysis will also be used throughout the study and if collected the same way and a similar survey is administered, the results should have the potential to be duplicated. The survey includes questions that will aid in answering the research questions and the responses to the survey will contribute to the purpose of the study.

Data Collection

The data will be collected over a three-week time period in June 2015 in two separate clinics. The participants will be given an informed consent (appendix 1.1) and once they have signed, they will be given the survey (appendix 1.2) by the receptionist at their respective clinics. The receptionist will have a script (appendix 1.3) given to them by the researchers, in order to avoid bias. All of the data collected will be anonymous without patient identifiers as having identifiers will not aid or strengthen our study.

The completed surveys will be stored and protected with the researchers until they can be scored and analyzed. Once they have been analyzed they will be destroyed with a paper shredder. The results will be kept on the researcher's computer hard drives and will only be accessed through the researcher's permission.

Data Analysis

The data from this study will be collected weekly from the three different studies, quantified, and stored in Microsoft Excel. The data will be quantifiable and categorical, and at the end of the study will be analyzed in Microsoft Excel using their data analysis software. A correlational analysis will be done with the data from all the different categories to see if there are similarities between the two different clinics. The results will relate back to the research questions as we are looking for the difference between vaccination rates in the two clinics. We will use ANOVA to analyze the differences between the suburban and rural populations. The correlation studies will be used to compare trends in vaccination rates between the two populations and the differences between how reliable the participants believe their health care provider is.

Limitations/Delimitations

There are a few limitations of this study. One of the limitations is being unable to control who will respond to the survey. Since this is an optional survey, individuals may refuse to participate. An additional limitation is the openness of the individuals to provide their honest feedback. Parents may not respond truthfully to the questions, even though the survey is anonymous. Both of these limitations are beyond the control of the researchers. One of the delimitations of this study is the sample population. Only parents over the age of 18, with children ages 5 or under, or who are currently expecting will be allowed to participate in the survey.

CHAPTER 4: RESULTS

Data Analysis

This study used quantifiable surveys that were scored by the three researchers involved. The results collected demonstrated differences between Baxter, Minnesota and Mankato, Minnesota. The questions to be answered were:

1. Is there a significant difference in vaccination rates between the two populations?
2. Is there a significant difference between the reliability of the provider between the two populations?
3. What are the factors that affected the participant's decision to vaccinate?
4. Where did the participant get their information?

Out of our participants in suburban Minnesota (Mankato, MN), 120 children were vaccinated and 5 children were not vaccinated. Out of the participants in rural Minnesota (Baxter, MN), 126 children were vaccinated and 5 children were not vaccinated. Analysis of variance in the data collected was done in Excel using a single factor ANOVA test and is shown in Table 1. The null hypothesis was that there would be no difference between the two populations in vaccination rates.

Table 1

Analysis of Variance of Vaccination Rates

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	36	1	36	2.88	0.23177872	18.51282051
Within Groups	25	2	12.5			
Total	61	3				

*Data is significant at $p < 0.05$

Considering that the p value is 0.23, the null hypothesis is accepted indicating that there is no significant difference in vaccination rates between suburban and rural Minnesota.

The participant's belief in how reliable their provider was also analyzed in this study. All participants were asked how reliable they believed their provider was on a scale of 1-5. A bar graph depicting that data is below (Figure 1). Analysis of variance in the data collected for this question was also done in Excel using a single factor ANOVA test and is shown in Table 2.

Figure 1

The participant's opinion on the reliability of their health care provider.

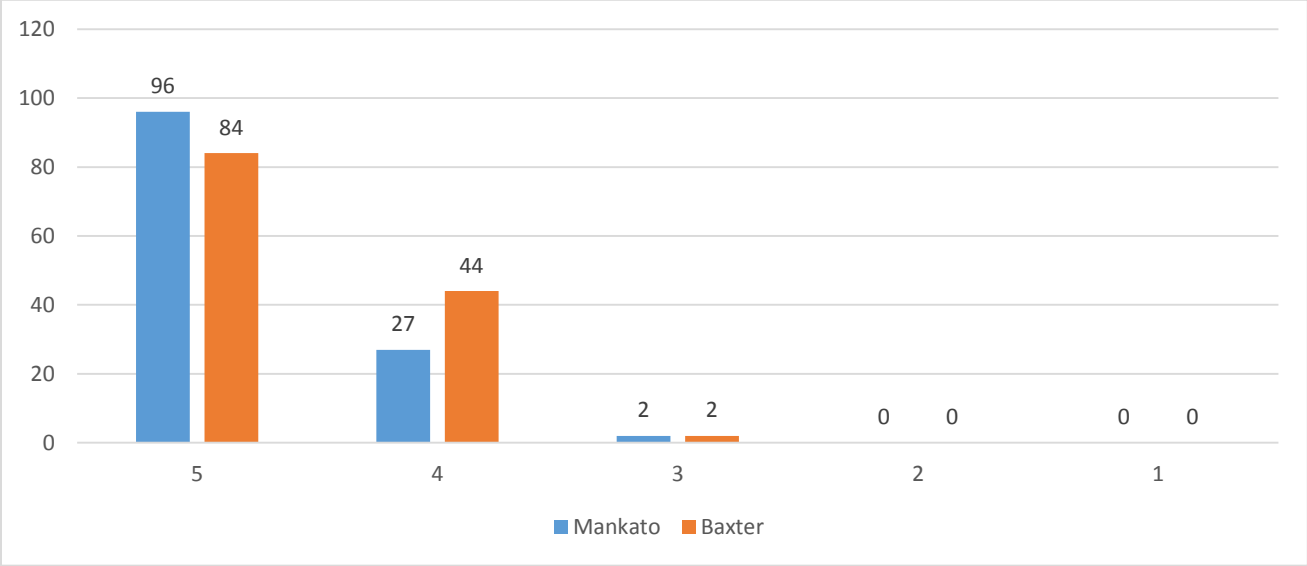


Table 2

Analysis of variance of provider reliability

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	2.5	1	2.5	0.001607717	0.968998909	5.317655072
Within Groups	12440	8	1555			
Total	12442.5	9				

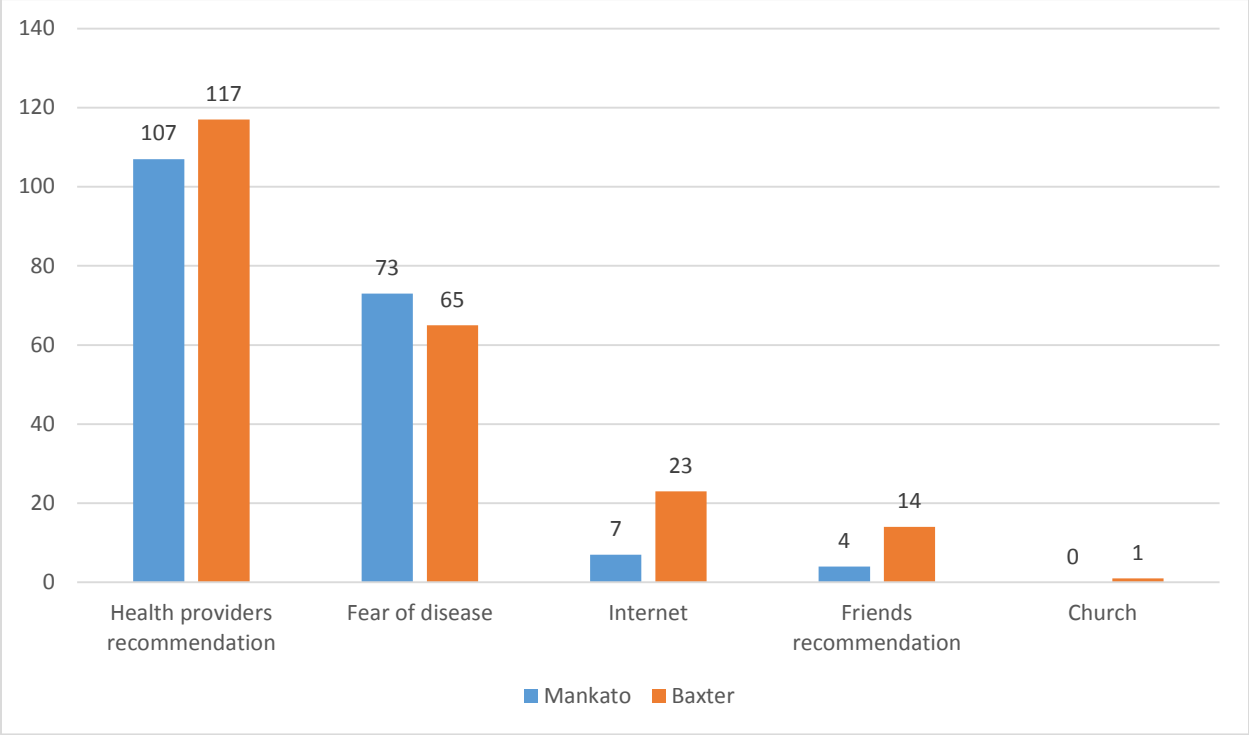
*Data is significant at $p < 0.05$

Considering that the p value is 0.96, the null hypothesis is accepted indicating that there is no significant difference in how reliable the participants believe that their health care provider is in rural versus suburban Minnesota.

The question was then asked what factors affected their decision to vaccinate or not vaccinate their children. The data is depicted in Figure 2 below and shows that the most common reason that the participant vaccinated their child is because of their health provider's recommendation.

Figure 2

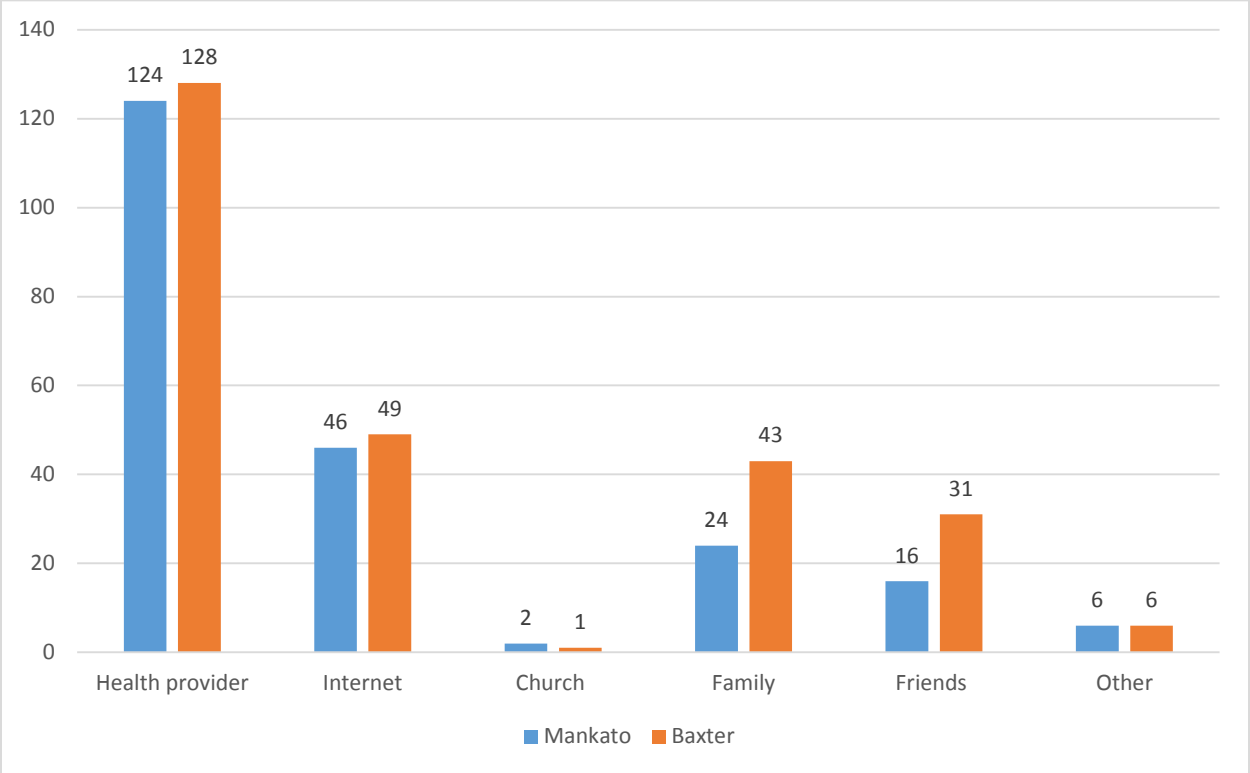
Factors that affected the participant's decision to vaccinate.



Finally, they were asked where they got their information on vaccinations. The most common place that people got their information was their health care provider; however, people also used the internet, their family, and their friends. This is depicted in Figure 3 below.

Figure 3

Where the participant got their information on vaccines.



CHAPTER 5

Summary

The goal of this research was to determine if there was a significant difference in the vaccination rates in different areas of Minnesota, where individuals get most of their information about vaccinations, and if the parents believe the healthcare provider is reliable. Vaccination rates throughout the United States have been on the decline. This study looked to see if this trend happening throughout the United States is also happening in Minnesota. Even through there is a great amount of positive research, many individuals are still refusing to vaccinate their children. This research looked at childhood vaccination rates by surveying parents with children ages 5 and under in both rural (Baxter) and suburban (Mankato) Minnesota and their reasons behind whether they vaccinated their child or not.

When looking at individuals and vaccination rates between these two areas, this research also studied whether or not there was a significant difference between the populations reliability in their healthcare providers in rural versus suburban Minnesota. The research also evaluated what other factors affected the parent's decision on whether or not to vaccinate their children.

Short surveys were sent to Baxter, MN and Mankato, MN during the summer of 2015. Over a three-week period, these surveys were distributed to the patient's parent. The patient must have met the criteria of being 5 years old or younger. One hundred twenty five children were surveyed in Mankato, MN and 131 children were surveyed in Baxter, MN. The analysis of variance for these surveys was done in Excel using a single factor ANOVA test. Two ANOVA tests were completed, one for analysis of vaccinated

versus non-vaccinated individuals in these two areas, and a second ANOVA test for the reliability of the healthcare provider's recommendations in rural versus suburban Minnesota.

As discussed in Chapter 4, it is determined that there is no significant difference between the vaccination rates of children 5 years old or younger in a rural area versus a suburban area. The p-value = 0.23 leads to the conclusion that the difference in the vaccination rates is insignificant and the majority of children in both these areas are vaccinated individuals. One hundred and twenty children Mankato were vaccinated and only 5 were not vaccinated. In Baxter, 125 children were vaccinated while 5 children did not receive their recommended vaccinations.

Through this research, it was also determined there was no significant difference in the parent's view of healthcare professionals reliability when it came to the topic of vaccinations between rural and suburban Minnesota. The p-value between these two areas is 0.96 leading to the conclusion that in both of these areas the reliability of the healthcare providers' opinion is similar, and parents in both of these areas find their healthcare providers' opinion quite reliable.

In both rural and suburban Minnesota, the majority of parents receive their information from their healthcare providers. These recommendations from their providers make an impact on their reasoning to vaccinate their children. Another main reason that most of the individuals in these areas vaccinated their children was due to fear of the potential disease. These parents seem to understand the risks of contracting the disease and are vaccinating their children to help prevent these outbreaks.

Limitations

Limitations of this research study provided a few obstacles to completing this research. The limitation most difficult to assess is due to the self-reported data. The findings are based on self-reported data collected by participants present in a clinic setting. These participants may have not answered the questions honestly or have felt more pressure to answer a certain way due to their environment in which they were taking the survey. Parents may have felt pressured to falsely report their answers due to the fact that these surveys were administered in a health care related clinic.

A second limitation could have been the language used in the consent form and as well as the survey. The consent information given to the patient provided clear instructions to the confidentiality of the survey. However, there were surveys that were completed by families with children older than age 5, and those surveys were not counted towards this research. The language may have been difficult for some of these individuals to understand, and therefore we were unable to use all of the survey's collected from the participants.

Another limitation to this study was the population of participants. Only parents who were over the age of 18, and had a child aged 5 years or younger was able to participate in this research that received care at one clinic in Baxter, MN and one clinic in Mankato, MN. This is a very small population of individuals, which provides only a minor view of the overall state of Minnesota.

Suggestions for Further Research

One suggestion for further research relating to vaccination rates is to obtain data from a larger sample size. For this research, seventy-five surveys were sent to the rural

setting and one hundred surveys were sent to the suburban clinic. The data was collected in a short time period so it would be reasonable to send out more surveys to gather more data in the future to expand on the information collected from this research. Collecting more surveys for a longer amount of time would aid in making a more reliable conclusion about the information gathered. More surveys could help reach a larger amount of participants and may have changed the results in this research.

Another suggestion for further research is to gather results from different populations than from the locations that were used for this research. The information was gathered from one rural location and one suburban location. It would be beneficial to expand this particular research to other suburban and rural locations along with one or more urban locations. Only two clinics were assessed in this research to represent our definitions of suburban and rural and gathering information from more locations would make that representation more accurate.

This research project could have been slightly biased because it was focused on two standard clinics. This demographic of people may have been more likely to vaccinate their child than other areas, or other types of clinics. To see an accurate representation of vaccination rates, the research could look elsewhere to survey people including chiropractic clinics, holistic clinics, birthing classes, or potentially schools. This could potentially gather information from individuals and families that do not go to a standard medical clinic and the variation of vaccination rates may differ.

Lastly, during this research the parent was given the choice whether to respond to the survey or not. This research potentially missed out on a lot of responses that could

have changed the results. For further research, there may be a better way to encourage the parents to respond no matter their views on the matter.

This research on vaccination rates in Minnesota could be expanded upon in the future. The above are suggestions that would help improve the research to potentially get a more accurate representation. Along with these suggestions, there are many other questions that could be asked of the participants in relation to their vaccination status and the reasoning around that decision including the gender or age of the patient. This research is fairly broad and could go in many directions in the future.

Conclusion

Based on this research there was no significant difference in the vaccination rates of children five and under between rural and suburban clinics in Minnesota. However, due to the limitations to this research and the small population size, further research may suggest a different outcome. The vaccination rates of the survey responders were quite high and many of the responders also found their healthcare provider to be reliable and trusted them in their decision to vaccinate. This is an important finding when looking at the literature on vaccine-preventable diseases and the rise in these diseases across the nation. Due to the number of participants who choose not to vaccinate and the potential number of people that did not fill out the survey who choose not to vaccinate, there is still a need for education in regards to vaccines and the potentially harmful diseases that they prevent against. Research in this area is important to obtain and can be done frequently to assess whether education makes a difference in vaccination rates in the future.

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Appendix 1.1

Informed Consent:

Dear participant:

We are three physician assistant students from Bethel University, conducting research in partial fulfillment of the requirements for a Masters Degree in Physician Assistant Studies. Our study is investigating vaccination rates among children five years and younger.

Attached is a survey to gather necessary information to complete the data collection of this research. The survey will take approximately 5-10 minutes to complete. By completing this survey, you are indicating informed consent to participate in this study. Reports and subsequent data will not discuss individual responses, but will include only group data. Your identity will be kept strictly confidential.

This is a voluntary survey, but your participation is vital to the success of this research. The information that you provide is essential to the validity of this study. Thank you in advance for your participation in this study.

Thank you again for your help.

Sincerely,
Kaitlyn Baldridge
Janna Bjoin
Kate Pool

Appendix 1.2

Survey:

Your Child's Vaccination Questionnaire

Attached is a childhood vaccination schedule for your reference

Please circle response as it relates to yourself

Gender

Male Female

Have you received vaccines?

Yes No

How many children do you have under the age of 5?

1 2 3 4 5 or more

What is/are their age(s)?

1. What is your child/children's vaccination status? Have they:
    a) Received all the recommended vaccines
    b) Received some of the recommended vaccines
    c) Received no vaccines
2. Do all your children have the same vaccination status?
    a) Yes
    b) No
    c) N/A

If you answered "No" to the above question, please fill out a survey for each of your children under the age of 5.

3. If you answered (a) in question 1, what were the factors that affected your decision to vaccinate? (circle all that apply)
    a) Health providers recommendation
    b) Fear of disease
    c) Secondhand information from internet
    d) Secondhand information from friends
    e) Religious reasons
    f) Other _____

4. If you answered (b) in question 1, what were the factors that affected your decision to partially vaccinate and leave some of the vaccinations out? (circle all that apply)
    a) Fear of the side effects and/or complications including autism
    b) Bad experience from certain vaccines by you or someone close to you
    c) Some of the illnesses are rare and/or non-serious
    d) Information from the internet

e) Information from friends
f) Religious reasons
g) Other _____

5. If you answered (c) in question 1, what were the factors that affected your decision to not vaccinate your child? (circle all that apply)
    a) Fear of the side effects and/or complications
    b) Bad experience from vaccines by you or someone close to you
    c) Distrust with pharmaceutical companies
    d) Information from the internet
    e) Illnesses that are covered by vaccines are rare and non-serious
    f) Preference of natural immunity versus immunity from vaccines
    g) Religious reasons
    h) Other_____

6. Where do you get your information regarding vaccinations? (circle all that apply)
    a) Family physician
    b) Internet
    c) Church
    d) Family members
    e) Friends
    f) Other_____

7. Which source of information do you find most reliable? (circle one)
    a) Family physician
    b) Internet
    c) Church
    d) Family members
    e) Friends
    f) Other_____

Answer questions 8-10 on a rating scale of 1 through 5, 1 being not at all and 5 being most reliable/knowledgeable

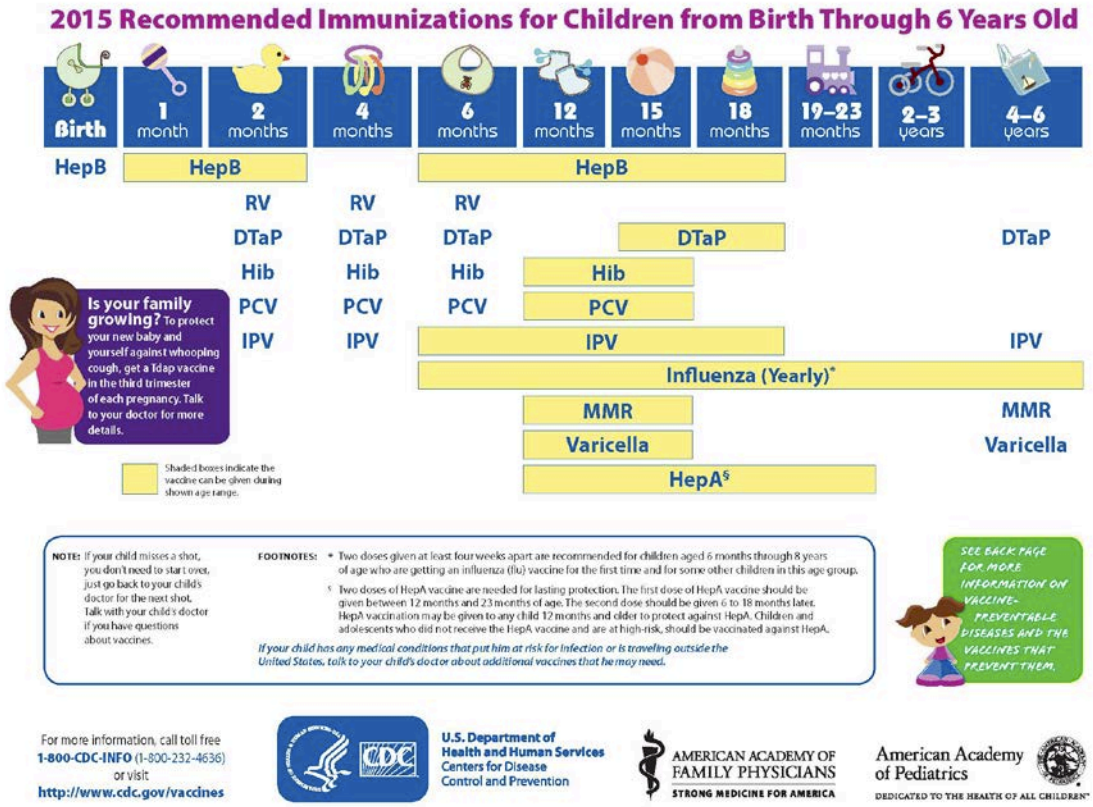
8. How reliable do you find Internet sources on a scale of 1-5? _____

9. How reliable do you find your healthcare provider on a scale of 1-5? _____

10. How knowledgeable do you think you are about vaccines? 1-5 _____

Appendix 1.3

Vaccination schedule that will be attached to the survey



Appendix 1.4

Script for receptionist:

Physician assistant students from Bethel University are doing research on the vaccination status of children ages 5 and under. Would you be willing to help them out with their research by completing this short survey? The survey should only take about 5-10 minutes. It will be 100% confidential without any patient identifiers and there will be a sealed envelope provided. The sealed envelope will be given directly to the researchers and no one from this clinic will open the envelope and see any of your answers. This is a voluntary survey.