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Impact of the Internet on Young Adult's Perceptions of Childhood Vaccinations

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Abstract

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Dissertation Submitted in Partial Fulfillment

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Abstract

The internet and social media have transformed the way people receive information and connect, but the impact on society is still unknown. The purpose of this study was to examine the impact of indirect exposure to vaccine messages via the internet on young adults' perceptions of childhood vaccinations. The health belief model and the social marketing theory were used as the theoretical framework. Research questions explored the relationship between exposure to anti and pro-vaccination messages and perceptions of participants as well as the relationship between perceptions of vaccination and intent to vaccinate. A quantitative correlational study design was used, with 184 responses collected through an online survey instrument. Inclusion criteria included being between the ages of 18 and 24, no children and not currently expecting, and no previous medical education or training. The participants were also screened for religious or cultural objections to vaccinations. Data analysis included descriptive statistics and one-way ANOVA analysis. The results indicated that most participants had been exposed to vaccination content online, but 56% reported experiencing more pro-vaccination messages. Exposure to vaccination messages was found to have a significant relationship with vaccination perceptions but not across all comparisons. The results represent a new proactive approach to vaccine research and significant implications for social change. The knowledge found with this study will increase the effectiveness of vaccine promotion and education programs as well as highlight the need to educate younger individuals about vaccinations before they become parents.

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Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

Introduction

Vaccinations are one of the most effective tools in preventative medicine and prevent an estimated 2 to 3 million deaths globally every year (WHO, 2020). Vaccination has been a critical factor in the eradication of smallpox and the reduction of diseases such as polio and measles. Vaccination not only protects the individual but contributes to community immunity. Community immunity is a phenomenon in which enough of the population has been vaccinated to help protect those who are too young, who have compromised immune systems, or who could not be treated. This protection is threatened when vaccination rates decrease below the safe threshold. The safe threshold varies for different diseases but is typically between 80 and 90% of the population (American Academy of Pediatrics AAP, 2016). In the United States today, vaccine-preventable diseases are not common, but decreasing vaccination rates have increased vaccine-preventable diseases such as measles, pertussis, and mumps (AAP, 2016). Since 2010, there have been increasing cases of measles in the United States, with significantly large outbreaks in 2014, 2018, and 2019. In 2014, there were 23 outbreaks and 667 cases of measles, and of those infected, 635 were United States citizens, and 77% reported being unvaccinated for measles (CDC, 2016). In 2018, the Center for Disease Control and Prevention (CDC) reported 375 cases of measles, and in 2019, there were 1,282 cases confirmed in 31 states. This represents the highest number of reported cases since 1992, and the majority of cases were among communities that were not vaccinated (CDC, 2020).

Vaccination rates have been decreasing in the United States, raising concerns among public health officials. The declining vaccination rates and their potential explanations have long been a topic of public health research, exploring the many reasons why Americans are choosing to delay or refuse vaccinations. According to the America Academy of Pediatrics (2020), the national rate for the combined seven-vaccine series for children is currently 70.4%, which has decreased from 72.2% reported in 2016. This series includes the measles, mumps and rubella vaccine (MMR), polio, hepatitis, and DTaP vaccination, among others. The Healthy People 2020 target goal for childhood vaccination is to increase the national rate to 80% (AAP, 2016). This would put the nation back in the range for community immunity and reduce widespread outbreaks of vaccine-preventable diseases, as well as increase the number of individuals with vaccine protection.

The goal of this chapter is to introduce the research topic, explain why this topic is necessary to public health, and introduce the basic parameters of the research study. Critical research articles will be discussed to provide background information and context for the problem statement and purpose of the study. The research questions and hypotheses will be provided, as well as a brief introduction to the selected theoretical framework. The nature of the study will be outlined, including a description of the methodology, data collection methods, and data analysis plan. Important variables and terms related to the topic will be defined, as well as any assumptions made. The scope of the study will be outlined in addition to any limitations or potential bias. This chapter will conclude with an analysis of the significance of the research and a summary.

Background

Declining vaccination rates and increasing outbreaks of vaccine-preventable diseases have made vaccinations a primary concern for public health officials and a critical research topic (CDC, 2020). Despite public health campaigns to increase vaccination rates, an increasing number of parents are choosing to delay or refuse vaccination. Current research efforts focus on understanding why parents are making these choices and the factors that are influencing the decision-making process. Significant factors identified in the literature are safety and effectiveness concerns, lack of trust in health agencies and pharmaceutical companies, failure to recognize the danger of vaccine-preventable diseases, and religious or philosophical objections to vaccinations (Dredze, Broniatowski, Smith, & Hilyard, 2015; Lee, Whetten, Omer, Pan, & Salmon, 2016; MacDonald & Sage Working Group, 2015; Salmon, Dudley, Glanz, & Omer, 2015). Safety concerns and lack of trust in public health agencies stem from controversial information regarding vaccinations, including examples such as the 1989 Wakefield study that falsely linked autism with vaccination use (Rao & Andrade, 2011). This study was officially retracted, and there have been many studies that disprove this link, yet the fear of autism is still a significant reason behind declining vaccination rates. Ventola (2016) suggested that this link has sustained support due to the unfortunate timing of most autism diagnoses between 18 months and 3 years, which is also the time frame for the majority of childhood vaccinations. Autism is also visually present in society, so the perceived risk is higher than for diseases such as polio or mumps that are not common due to the success of public health efforts and vaccinations (Cheung, Wang, Mascola,

Amin, & Pannaraj, 2015). These studies have provided valuable insights into the declining vaccination rates, but most use a target population of parents that have already made these choices and are retrospective in nature. This strategy does not provide the opportunity to learn about the selected population and impact their perceptions before they make this life-altering choice.

The central element in the vaccine debate is information. Conflicting information has kept controversy flourishing and individuals confused regarding the necessity and safety of vaccinations. Today, people are regularly exposed to information through the internet and social media. These technological advancements provide individuals a platform to express opinions and share information with the world without accountability or accuracy filters. Research conducted on the content of specific websites on vaccination showed that as content regulations decreased the amount of anti-vaccination content increased (Venkatraman, Garg, & Kumar, 2015). YouTube was found to be the least stringent on content regulations, and of the top 175 videos on vaccination, 130 (74.3%) were anti-vaccination in nature. PubMed research database was the most stringent in its regulations, and only 17% of its vaccine-related articles were found to be anti-vaccination (Venkatraman et al., 2015). Social networks have been identified as a critical factor in an individual's cognitive development. Social media and the internet have expanded those social networks to a global level (Brunson, 2013). Social media and constant access to information have revolutionized the way marketing is done and how information is shared. These new advancements take epidemiological marketing to a new dimension.

Declining national vaccination rates not only pose a severe health risk for individuals developing a rare, life-threatening disease, but also more substantial portions of the population left unvaccinated can lead to outbreaks and epidemics of vaccine-preventable diseases. As discussed in previous sections, there has already been an increase in cases of measles and other diseases in the United States that are preventable with strict adherence to vaccine protocols (CDC, 2020). Research has been conducted to understand why parents have made decisions to delay or decline vaccination. Still, these focus on choices retroactively and do not allow time to influence established perceptions.

The internet and social media are relatively new advancements in society, and their impact on health care and public health are just starting to be explored. The limitless virtual access to uncensored information is something that has never had to be addressed before. Young adults between the ages of 18 and 24 represent the next generation of parents and will be the first to be raised in this age of technology. However, the effects of this complete exposure to information on how young adults perceive childhood vaccinations remain unknown. Information obtained through this study can be used to predict future vaccine usage in that generation and inform public health programs designed to increase vaccination rates though successful marketing campaigns before that generation decides on the vaccination of their children.

Purpose

The purpose of this quantitative study was to examine the effects of social media on the perceptions of adults 18-24 years old regarding childhood vaccinations. This study used primary data collected through the administration of an online questionnaire.

Information was collected on social media use, exposure to vaccination information, and personal perceptions about vaccinations, including perceived risk and assessing future intent to vaccinate.

Research Questions

This research project explored three research questions to determine if social media use influenced vaccination perceptions and if those perceptions could help predict vaccination use. The research questions and related hypotheses for this quantitative correlational study are listed in this section.

RQ1: What is the relationship between exposure to anti- and pro-vaccination messages through social media and the perceptions of young adults ages 18-24 years toward the use of childhood vaccinations?

H_o1: There is no significant relationship between the perceptions of young adults ages 18-24 years towards childhood vaccinations due to exposure to anti-vaccination messages or pro-vaccination messages through social media.

H_a1: There is a significant relationship between the perceptions of young adults ages 18-24 years towards childhood vaccinations due to exposure to anti-vaccination messages or pro-vaccination messages through social media.

RQ2: What is the relationship between the perceptions of young adults towards childhood vaccinations and intent to vaccinate future offspring?

H_o2: There is no significant relationship between the perceptions of young adults towards vaccinations and their intent to vaccinate future offspring.

H_a2: There is a significant relationship between the perceptions of young adults towards vaccinations and their intent to vaccinate future offspring.

RQ3: Is there a relationship between the perceptions of young adults toward childhood vaccinations and gender?

H_o3: There is no significant relationship between the perceptions of young adults towards childhood vaccinations and gender.

H_a3: There is a significant relationship between the perceptions of young adults towards childhood vaccinations and gender.

Theoretical Framework

The theoretical framework for this study was based on providing a foundation to understand the current problems with vaccinations and to assess how new technological innovations are changing the way people perceive health topics, specifically childhood vaccinations. The health belief model (HBM) and the social marketing theory were used together to establish the framework that grounded this study as I attempted to add to the current body of literature and understand the new challenges and opportunities that technological innovations present for health care and vaccine promotion. These theories will be briefly introduced in the following sections, but a more in-depth analysis of each approach and its role in the study will be provided in Chapter 2.

The HBM has been a critical theory in vaccine research since the 1970s and was constructed to answer the question of why people refuse preventive screenings and healthcare (LaMorte, 2016). The HBM provides direct insight into an individual's perceptions about health problems and preventive treatment. Six constructs are used to

assess an individual: perceived susceptibility, perceived severity, perceived benefits of action, perceived barriers, cue to action, and self-efficacy (LaMorte, 2016). The HBM was selected for this study to provide insight into the factors that are significant in the formation of one's perception of a health decision and how those perceptions influence actions.

The social marketing theory addresses the issues of vaccine acceptance in a new way. The central point in this public health concern is information and how that information is being distributed to the population. Social marketing focuses on targeting population groups and tailoring campaigns to get the desired health behavior for that specific population (French, 2009). Social media presents a new challenge for marketing and promotion because individuals can promote and market personally from their page, foregoing traditional organizations. This also poses new challenges for controlling the information that is reaching the public.

Nature of the Study

The nature of this study was a quantitative correlational research design. A correlational design is used to explore theoretical relationships between two or more variables in the same group of participants (Creswell, 2009). Correlational research is a quantitative research method, but it is not a true experiment, and no variables are manipulated in the study (Creswell, 2009). This research design can only assess the extent to which variables are related and can draw no conclusions of a causal relationship (Creswell, 2009). The correlational research design allowed for the exploration of the

association between indirect exposure to vaccine information and perceptions of childhood vaccinations in young adults.

There are two critical variables in this study: exposure to vaccination messages through social media and perceptions of vaccination. Social media use was assessed by collecting information on the frequency of use, sites commonly visited, and vaccine information found during routine use. For this variable, one of the objectives was to see how unintentional exposure to vaccine information can impact perceptions. Examples included were social media posts on vaccinations, ads or campaigns on websites, and information found without intentionally studying vaccination. Perceptions of vaccination were measured by collecting participants' responses to questions on topics including vaccination effectiveness, necessity, and promotion. The HBM and current literature on vaccination perspectives was used to help develop questions and effectively gauge perceptions.

Methodology

The target population for this study was young adults between the age of 18 and 24. The age range was identified as part of the literature gap and is a critical element in the study. The study used primary data collection through an online survey. The survey was developed for this research project using the Parent Attitudes about Childhood Vaccines (PACV) questionnaire, the theoretical framework, and review of the literature. This survey was chosen because it is established in the literature and is aligned with the study goals. Questions were added, and sections were edited to fit this specific research study. A pilot test was conducted to ensure that changes made did not impact the

effectiveness or reliability of the study. Participants were required to electronically sign an informed consent document before being directed to the survey. Descriptive information and exclusion criteria such as age and number of children were collected in the first section. Participants could then move on to the survey and once finished, they would receive a thank you note, a link to receive a small incentive, and researcher contact information for any additional follow up information. Once the data had been collected, coded, and imported into the database, it was analyzed using descriptive statistics and one-way ANOVA analysis.

Definitions

The following terms are used frequently throughout this document and are defined here to promote clarity.

Vaccination: Vaccination was defined as the injection of a biological preparation into an individual to improve immunity to a specific disease. The biological development is typically made from a weakened or killed form of the microbe, and it causes the immune system to recognize the foreign agent, destroy it, and be able to recognize it if it is ever in the body again so that it can react quickly and effectively in case of future encounters (CDC, 2017).

Perception: Perception was defined as the process where individuals receive, interpret, and organize sensations and stimuli into something meaningful based on past experiences. Since past experiences and knowledge are used to interpret and organize incoming stimuli, different individuals will have different perceptions of the same object or concept (Borkowski, 2005).

Social Media: Social media was defined as any form of electronic communication which promotes personal communities via the internet where people can share information, ideas, personal messages, and other content (Merriam-Webster, 2017). Examples of social media included in this study consisted of but were not limited to Facebook, Twitter, YouTube, and Instagram.

Indirect exposure to vaccine information was defined as coming across information about vaccinations without searching for this information. Examples included but were not limited to social media post by individuals or groups, advertisements by organizations, or personal stories from friends.

Anti-vaccination messages were defined as any information that discourages or cautions the use of vaccinations.

Pro-vaccination messages were defined as any information that encourages or promotes vaccination use.

Assumptions

Several assumptions were made in the development and methodology of this study. In the study design and methodology, it was assumed that participants were honest and correct in completing the questionnaire and revealing beliefs, knowledge, and opinions regarding vaccinations. In the development of this study, it was assumed that all participants have access to the internet and social media. This assumption was supported by the fact that the survey is online, so some access must be available. The other assumption made was that perceptions formed now by young adults will impact choices made in the future when they become parents.

Scope and Delimitations

The target population was defined as young adults age 18-24. Other exclusion criteria included individuals with children or currently expecting children, and individuals with a medical background or education. Participants with religious or cultural objections to vaccination were also eliminated from the study. There were no criteria regarding sex, race, or ethnicity and socioeconomic status.

The scope of the study was defined by the selected theoretical framework. The HBM narrows down the discussion to the individual's perspective of vaccination and how that perspective influences health behavior. Other factors that have been connected to vaccination rates but will not be considered here include environmental factors, family history of vaccination, socioeconomic status, and religious or philosophical beliefs.

Limitations

All research studies have inherent limitations due to the study parameters and design. The data collected by this survey were subject to recall bias since all data were self-reported. There was no method to verify the data or ensure that participants were completely honest in their answers. The survey was altered for this study, and despite being tested before use for accuracy, the survey tool in its new form was not established in the field. Developing a unique survey tool was also an area for potential bias to be introduced. The questions selected for the survey were carefully created, tested, and reviewed to ensure that no bias was present, and they did not lead participants to provide a response.

The lack of a true experimental design and the methodology choices made to ensure that the study was feasible at the dissertation level could also be limitations and impact the generalizability of the study. This study is to serve as a base of information for future research to recreate and build on the current knowledge base in this topic.

Significance

Declining vaccination rates in the United States have become a serious public health concern, with a national average for the combined seven-vaccine series for children only at 70.4% (AAP, 2020). In recent years as vaccination rates decline, we have seen an increase in vaccine preventable disease cases and outbreaks in the nation, with a significant increase in measle outbreaks in 2019 (CDC, 2020). As rates continue to decline, it becomes more pressing to understand why this is happening and how to reverse this pattern. Research has focused on understanding why vaccination rates are dropping, while the goal is to increase national vaccination rates to 80% (AAP, 2016).

This study has contributed to the current literature by taking a unique perspective on the problem. The internet and social media have revolutionized the way society gathers information and connects to the world. Understanding how new communication methods impact the way the population obtains health information and makes health decisions is critical for effective promotion and marketing of healthy behavior. By targeting a younger audience before they become parents, public health officials have time to use the information collected about their perspective on vaccinations to create more effective public health programs and increase vaccination rates for the children of that generation. Increasing vaccination rates not only protects the individuals that are

vaccinated but also helps increase the national rate back to the community immunity threshold, thus preventing more outbreaks in vulnerable populations.

This research also has significant social change implications. The significance listed above discusses the importance of this research on the health of the population and public health as a whole. For the individuals, families, and communities that make up this population, there are significant advantages. The obvious advantage is increased protection from vaccine preventable diseases for individuals and at a community level through heard immunity. Better education and public health initiatives that reach the target population in a way that is real and effective will also help parents feel confident in their choice to vaccinate and in their public health organizations.

Summary and Transition

Vaccinations are critical to prevention medicine but are in a state of steady decline due to controversy and conflicting information. While vaccinations in general prevent an estimated 2 to 3 million deaths each year yet in the United States, cases of measles are increasing, with 1,282 cases reported in 2019 (WHO, 2020; CDC, 2020). As vaccination rates decrease, the internet is showing increasing rates of anti-vaccination messages on social media with minimal regulations (Venkatraman et al., 2015). A survey was created to assess the impact of the internet and social media on the perceptions of young adults who had not yet become parents toward childhood vaccinations. The HBM was used to help define significant factors in forming health perceptions, and the social marketing theory explained how new communication channels, such as social media,

change how information is shared and how effective marketing campaigns must adapt to new technology.

The remainder of this document explores the study described above in greater detail. Chapter 2 consists of an in-depth literature review of the history of vaccinations, rationales for vaccine delay or refusal, theoretical foundation for the study, and impact of the internet and social media on health and vaccination. This chapter will provide context for the value of this study and contribution that it makes to the current literature.

Chapter 2: Literature Review

Introduction

Vaccines are regarded by health professionals as one of the most effective methods of disease prevention, but these methods are not universally acknowledged among the public. Acceptance rates continue to decline in the United State despite extensive research and documentation by health care professionals to educate the public (Omer, Salmon, Orenstein, DeHart, & Halsey, 2009; McCauley, Kennedy, Baskey, & Sheedy, 2012). Inaccurate information continues to be a cornerstone of the confusion surrounding childhood vaccinations (Omer et al, 2009; Salmon, Dudley, Glanz, & Omer, 2015). The advancement of technology, including the internet and social media, have heightened the role that inaccurate information plays in sustaining parental confusion regarding vaccines. Technology allows everyone to have a voice that may reach millions and to share experiences with no filter for accuracy or relevance. These modern advancements allow individual opinions to compete and challenge public health messages in an open forum. The impact of this access to virtually limitless information via technology remains unknown.

The purpose of this study was to understand how the constant flow of information from the internet and social media impact the perceptions of young adults regarding childhood vaccines. The influence of technology at this level is a completely new frontier. Influencing public perception and assessing available information is completely different than in previous generations. The upcoming generation will be the first parents raised in this new age of information. Understanding the influence that these

advancements have in forming this generation's perceptions and decisions will not only provide insight into how vaccination rates in this generation can be increased but will also form a basis for continuing to learn how to use new technology to improve health outcomes as technology inevitably advances.

This chapter includes an in-depth review of the current literature, discussing the influence of the internet and social media as well as vaccine perceptions. A historical context is given to highlight the development and use of vaccines as well as the conflicting theories that continue to cause confusion. The theoretical framework will be reviewed with an emphasis on the major theoretical proposition of each theory and its relevance to this study. Chapter 2 will conclude with a summary of the current body of literature on this subject and the gaps that need to be addressed by further research. An assessment of how this study fills one such gap and contributes to the existing body of literature will also be included.

Literature Search Strategy

An exhaustive literature search was key to understanding the current body of literature and what areas have not yet been thoroughly researched. This information was collected using Walden University's Library, MEDLINE database, CINAHL database, PubMed database and the Google Scholar search engine. United States government sources were also used such as the CDC, World Health Organization, and National Institutes of Health. The following keywords were used to locate relevant articles in the databases: *vaccine, acceptance, refusal, delay, hesitancy, antivaccine, controversy, children, childhood vaccines, parental perceptions, beliefs, education, health belief*

model, Internet, social media communication, and *social marketing theory.* The scope of the literature review spanned a 5-year time frame with exceptions made for relevant seminal literature. Seminal literature included in the review were related to the history of vaccine development or the theoretical framework. The results were organized based on the central topic and corresponding section. This information was used to give each article a reference number that would keep all data easily accessible.

Theoretical Foundation

The theoretical framework is the structure that introduces the theory chosen to explain the meaning, nature, and challenges of the selected topic. A theoretical framework focuses the spectrum of the study and is the connection between the research topic and relevant literature. A theory can be described as a specific perspective that allows the study to go beyond simple generalizations of the phenomenon (Swanson, 2007). A theory should be selected based on the ease of application, level of appropriateness, and ability to explain the selected topic. Any one theory cannot be expected to explain a phenomenon in its totality given the complex nature of society, and so limitations must be discussed to ensure that this fact is clearly presented to readers (Ravitch & Riggan, 2017).

Two theories were selected to form the theoretical framework for this study. They each informed a vital aspect of the study and were used to provide a specific perspective on the research questions. These theories will be discussed at length individually with specific emphasis on the theoretical propositions, assumptions, and relevance to this study.

The Health Belief Model

The HBM was one of the theories used to generate a theoretical framework for this study. The HBM was originally formulated as a way to explain and predict behavior relative to preventative health care. Originating in the 1950s, this theory was vital to the prevention-oriented US Public Health Service (Hochbaum, Rosenstock, & Kegels, 1952). Hochbaum, Kegels, and Rosenstock are considered to be the driving force behind the development of this theory. Hochbaum started in 1952 by trying to understand why some refused x-rays to detect tuberculosis in the early stages (Hochbaum, Rosenstock, & Kegels, 1952). Research continued through the 50s and 60s, resulting in the theory that is still in use today.

The HBM is constructed on two main assumptions about health behavior. The first assumption is that individuals want to avoid disease or be cured if already diagnosed (LaMorte, 2016). The second assumption is the belief that a specific treatment or behavior will result in the prevention or cure of the feared health outcome (LaMorte, 2016). Acceptance of recommended preventative care is dependent on the perceived risk that the health problem presents and if believed benefits from the recommended behavior outweigh the risk (Hochbaum, Rosenstock, & Kegels, 1952; LaMorte, 2016).

The HBM is composed of six major constructs; the first four were developed with the original theory, and the other two were added as research progressed (Hochbaum, Rosenstock, & Kegels, 1952; LaMorte, 2016).

1. Perceived Susceptibility: This is an individual's perception of their vulnerability to the risk of developing a certain health problem. Certain

individuals would have a very low perception of their risk and would therefore not be worried about developing the health problem. Individuals on the other extreme would perceive their risk to be high and would be more likely to engage in preventative care. There are individuals in-between these two extremes that acknowledge the possibility of specific health problems for them (Hochbaum, Rosenstock, & Kegels, 1952; LaMorte, 2016).

2. Perceived Severity: This refers to the seriousness of the effects of the condition in question. The effects can be physical in nature as well as include difficulties derived from the condition including factors such as: pain, loss of employment, financial burden, related health problems (chronic conditions), and relationship tension. All of these potential stressors are critical factors to consider.
3. Perceived Benefits of Action: The prevention or management of the health condition is the next step once it is recognized as a serious risk. The perceived effectiveness and benefits of the various options available are key in assessing compliance with recommended actions.
4. Perceived Barriers: Barriers may inhibit individuals from taking recommended action even if they believe there to be significant benefits from the treatment. Barriers are different for each individual but can include financial difficulties, inconvenience, pain or discomfort, side effects, or religious beliefs.

5. Cue to Action: Any stimulus that results in the acceptance of the recommended prevention or treatment. The first four construct create a path for action by making the need obvious and demonstrating the benefits over the perceived barriers; however, there is often a need for a trigger to move the decision forward. This stimulus could be physical, as in the worsening of symptoms, or social, such as advice from family or friends.
6. Self-efficacy: This construct was added to the model relatively recently in the mid-1980s. Self-efficacy refers to a person's confidence in his or her ability to successfully follow through with the behavior or treatment.

No single theory can completely explain a social construct given the complexity of human nature. Each theory has limitations that must be taken into consideration when selecting a framework for a study. The HBM does not take into consideration habits or behaviors not related to health (LaMorte, 2016). This theory does not account for environmental or economic factors that play a role in health decisions. This theory assumes that all individuals have access to the same heath information and cues to action, and that some form of action is the intended goal (LaMorte, 2016).

The HBM has been used as an effective theory in vaccine related research since 1979, when Rundall and Wheeler used the theory to understand the factors related to acceptance of swine flu vaccine among senior citizens (LaMorte, 2016; Nemcek, 1990). The premise of this study was similar to historic use of HBM to understand how perceptions of vaccinations impact health decisions. This theory was used to evaluate participants' perspectives of vaccination using the constructs of the HBM such as

perceived severity, susceptibility, barriers, and benefits of action. The addition of technology brought this theory into the modern era, as social influences are no longer a person's immediate relations but reach worldwide. This added a vital dimension that researchers can pursue in future research as technology continues to develop and reach new levels of influence.

Social Marketing Theory

Social marketing theory focuses on how socially important information can be promoted and shared within the correct population. This theory concentrates on creating a framework design and implementing targeted health information campaigns (Evans, 2006). Information is designed, packaged, and distributed all in a manner that is targeted at the specific population of interest. The six basic stages in the social marketing theory are: developing specific strategies based on behavioral theory, selecting specific communication channels and materials based on the desired change and target audience, pretesting materials and altering based on analysis results, implementing the communication campaign, and assessing effectiveness (Evans, 2006). Key steps in this theory involve defining the correct target audience, creating interest in the topic and reinforcing the desired message or behavior, and cultivating an image or impression related to the desired impact of the campaign (Communication Theory, 2016).

New technological advancements and unequaled access to information creates new challenges in reaching the up-coming generation of parents regarding vaccinations. New marketing strategies must not only account for the information to promote but how to counter the exposure to information from virtually all around. The research goal of this

study was to understand what information the target audience was being exposed to and how effective this information was at influencing their perceptions of vaccinations. This could provide critical information to refine current vaccination promotion campaigns.

A cursory look at the surface of society may indicate that the integration of new technology is complete given our dependence on internet-based technology. According to the U.S Census Bureau, in 2016 approximately 89% of all households participating in the study had a computer or smartphone (Ryan, 2018). Eighty one percent of participants also reported having broadband internet subscriptions. Households that reported having smartphones as the only means of internet access were more likely to be low-income families. Approximately half of all households were in the "high connectivity" range, meaning that they had a desktop or laptop, a smartphone, a tablet, and broadband internet subscription (Ryan, 2018). While there are still pockets of the population that remain unable to access the internet and some states with the percentage of households with access reported at or below 70%, the majority of the population has a way to access the information platforms through the internet. The importance of understanding how this access impacts health perspectives is increasingly paramount as the internet becomes more integrated with our daily life.

Literature Review

The purpose of the literature review was to give the reader a comprehensive understanding of the current information available regarding the research study matter. This was also necessary to justify the need and purpose of the study. The literature review served as verification for the choices made regarding research methodology and

study design. In the following section, a brief review will be given of the history of vaccination and the current research associated with the study parameters that this study was conducted with.

Vaccines

Vaccines are a synthetically produced biological preparation containing a weakened or killed form of a microbe, toxins, or surface protein that improve immunity for a specific disease (WHO, 2017). The injected form of the disease stimulates the body's natural immune system to recognize the foreign substance and form antibodies against it so that if the same particles are encountered again, the body can defend against it more efficiently preventing infection (WHO, 2017).

Medical treatments using similar principles as vaccination are recorded by early Chinese civilizations as well as other parts of the world. The beginning of vaccinations as they are known today began in 1796 with smallpox and Edward Jenner's use of cowpox matter to battle the infection (The College of Physicians of Philadelphia, 2017). Jenner's work would be the foundation for the vaccine that would, after many years of research and technological advancement, aid in the eradication of smallpox. The next major advancement in the field was in 1885 when Louis Pasteur developed a vaccine for rabies (The College of Physicians of Philadelphia, 2017). The early 1900's saw tremendous advancements in bacteriology and vaccinations for diphtheria, tetanus, anthrax, cholera, plague, typhoid, and tuberculosis were developed. Technology became the catalyst for vaccines in the twentieth century, with new techniques for growing strains in labs, and it remains the driving force even today with DNA technology expanding the field.

Vaccine Side Effects and Building Controversy

Advancements in technology continue to build upon our ability to fight infection and prevent disease. Vaccines, while very effective, can have side effects and serious adverse reactions, just like any medication. The majority of side effects caused by vaccination are very mild including fever, rash, and soreness in the injection area (Oxford Vaccine Group, 2016). Severe allergic reactions are also possible with vaccination but are rare. Side effects and reactions can be due to the type of vaccination used such as the pertussis vaccine that was first released in the 1950's and 1960's. There was a more than 90% drop in pertussis cases following the distribution of the vaccine. The whole cell vaccine was effective but also associated with frequent minor reactions such as redness and swelling at the injection site, fever, and agitation. An acellular vaccine was developed to help minimize adverse reactions to the whole-cell vaccine, and while the new vaccine causes fewer reactions, it is more expensive to produce and has not completely replaced the whole-cell vaccine in developing countries (WHO, 2015).

Identifying and monitoring any potentially adverse reactions to vaccinations is paramount for detecting signs of vaccine-caused harm (Oxford Vaccine Group, 2016). In the United States, the Vaccine Adverse Event Reporting System (VAERS) is a national vaccine-safety surveillance program run by the CDC and the Food and Drug Administration (FDA). The VAERS was first launched in 1990. Its major goal was to detect new and rare adverse reactions, monitor reports of known side effects, assess risk factors, and monitor the safety of new vaccines (CDC, 2017). VAERS is a voluntary reporting system that can be used by health professionals and the public to report possible

adverse reactions. In 1999, just nine years after the VAERS system was first developed, it played a key role in identifying serious adverse effects in the first rotavirus vaccine, RotaShield (Schwartz, 2012). Through VAERS reporting and extensive research to confirm, RotaShield was linked to an increase in intussusception in its young recipients leading to the withdrawal of its recommendation for use in the United States in 1999 (Schwartz, 2012). In addition to creating a system to monitor and identify potentially dangerous vaccine related events, The National Vaccine Injury Compensation Program (VICAP) was created to provide financial compensation to individuals injured by a vaccination (The Health Resources and Service Administration HRSA, 2017). This program is a no-fault alternative for people to file a claim and get compensation without going through traditional legal channels. Claims filed with the program are reviewed by medical staff to determine the merits of the claim and then their recommendations are passed to the court-appointed special master who will determine if compensation is awarded and what amount (HRSA, 2017).

All reported events of adverse effects are investigated and compiled but not all are truly linked to vaccination. Causal relationships between adverse effects and vaccination can be difficult to determine given the age of the child when vaccines are typically recommended. Coincidental events are when an adverse event occurs after a vaccination is given but is not causally related to the vaccination (WHO, 2013). Vaccinations are typically recommended during infancy and early childhood when congenital or neurological conditions will start to manifest symptoms and children are more susceptible to disease (WHO, 2013). This can create the appearance of causal relationships when the

only factor in common is time. It is important to investigate any implied relationship, not only to verify potential adverse events, but to also educate the public on coincidental events (WHO, 2013).

Coincidental events contribute to confusion regarding the safety of vaccinations. Education and clear ethical research are needed to equip parents with the tools needed to feel confident in their choice to vaccinate. Unethical research can be detrimental to vaccination campaigns and their impact can be widespread. An example of the impact unethical research can have on the perceptions of the public is the 1989 study published by Andrew Wakefield claiming a link between the MMR vaccine and Autism (The College of Physicians of Philadelphia, 2017; Rao & Andrade, 2011). The study was proven to be fraudulent with a significant bias on the part of the researchers with financial motivations. The data was unethically manipulated to guarantee a desired result with no scientific proof to support its claims (Rao & Andrade, 2011). The study was officially retracted but the impact of its allegations is still present today. Multitudes of families refused vaccinations due to the possibility of autism and doubts are still prevalent in the general population regarding the safety of vaccines and the honesty of vaccine related research (Rao & Andrade, 2011). A study conducted by Dixon and Clarke (2013) indicated that people who read articles presenting a balance of conflicting information regarding the link to autism and vaccinations were more likely to believe that vaccines were not safe and were less likely to vaccinate their children. Coincidental events, limited education, and unethical research have created mistrust in vaccinations and this research indicates that without strong statements refuting adverse relationships

that people are likely to be skeptical regarding the safety of vaccinations (Dixon & Clarke, 2013).

Perspectives Regarding Vaccinations

Declining vaccination rates in the United States have resulted in an increase in research exploring parental perspectives and rationales informing vaccination decisions. Insights into parental perspectives and factors that may inform their decision-making process can provide critical information to promote better communication and education about vaccination. The potential reasons for parental decisions to delay or refuse vaccination are as varied as the individuals making them. The human decision-making process is vastly complex with innumerable factors providing influence. In this section, I will not attempt to completely unravel the complexities of human reasoning but instead to explore five major influences in the choice to vaccinate.

Religious or Cultural Exemptions. The choice to not vaccinate can at times be linked to religious or cultural beliefs limiting the use of modern medicine (Dube, Laberge, Guay, Bramadat, Roy & Bettinger, 2013). Orthodox Protestants and the Amish are two examples of groups of individuals who refuse vaccination based on the beliefs of their community. Vaccination refusal on the grounds of religious or cultural beliefs are generally considered acceptable and vaccination exemptions can be granted by physicians for these purposes. All but three states in the United States allow religious or philosophical exemptions but the policy and requirements differ by state (CDC, 2017).

Education. The decision to vaccinate is one that requires parents to be informed and educated on what the risks are both for accepting or refusing vaccination. Education

can be beneficial or detrimental given the amount of information available and the wide range of credibility from those potential sources. Studies exploring the relationship between education and vaccination levels have shown that this relationship is not straightforward (Dube et al., 2013). Some studies have shown that parents who delay or refuse vaccination have done a more substantial amount of research before reaching their decisions than parents who accepted recommendations and had their children vaccinated (Dube et al., 2013). A similar study of 731 parents with kids between the ages of 3-4 years old found that high functional and critical health literacy had a significantly negative association with vaccine acceptance (Aharon, Nehama, Rishpon & Baron-Epel, 2017). This study also found that parents who found informal information resources more reliable were associated with non-compliance to vaccine recommendations. The tendency of hesitant parents seeking out information could be explained by a lack of confidence in the information provided by health professionals. Judith Weiner & associates (2015) conducted a study of 200 first-time mothers exploring their knowledge, beliefs, intentions and behaviors related to childhood vaccinations. Approximately 33% of those new mothers reported receiving information about vaccines from their primary care provider and only half were satisfied with the information (Weiner, Fisher, Nowak, Basket & Gellin, 2015). Seventy percent of mothers in the study reported having little to no information about the recommended vaccine schedule or the number of recommended vaccines. Mothers that indicated intention to delay or refuse vaccination were significantly more likely to rely on socially available resources or internet searches than information provided by a healthcare professional.

Trust and Confidence. Public health initiatives, health education campaigns, and other health promotions are futile without trust from the public. Inaccurate information, unclear motivations, social media, and conspiracy theories are all possible factors for creating mistrust in government health agencies and health care providers. The description of what trust looks like can be different for each individual and can be applied to different aspects in the vaccination process. An individual can be mistrusting of the government and pharmaceutical companies or lack an open relationship with a personal physician leading to mistrust (Dube et al., 2013). Noni MacDonald (2015) proposed the 3 C's model for understanding vaccine hesitancy, one of which was confidence. Confidence was defined as trust in the safety and effectiveness of vaccines; the reliability of health professions and the process of getting vaccinations; and trust in the motivations of the government officials and policy makers responsible for deciding on relevant vaccinations (MacDonald, 2015). A qualitative study conducted by Judith Mendel-Van Alstyne and associates (2017) explored how confidence was defined by vaccine-hesitant mothers and what they were looking for to help make their choice. In addition to trust, the study identified a sense of control, familiarity, personal satisfaction of knowledge base, and certainty of the outcome as key factors in vaccine confidence. Vaccine information was found to play a significant role in vaccine confidence, but participants interest and questions were greatly varied (Mendel-Van Alstyne, Nowak, & Aikin, 2017). Participants were more confident in health-related products that matched what they already believed, indicating that vaccine education in younger individuals before beliefs are being formed could be beneficial in establishing positive vaccination beliefs (Mendel-Van Alstyne et

al., 2017). Emphasis should also be placed on the importance of the relationship between parents and health care providers. Parents feeling supported and able to express questions and concerns regarding vaccinations to health care providers was a significant indicator of trust and positive vaccination intentions (Dube et al., 2013). Trust is a significant component of vaccination because parents do not have extensive experience with vaccine preventable diseases nor do they perceive immediate danger related to these diseases (Dube et al., 2013).

Perceived Risk. In a developed country such as the United States, vaccine preventable diseases are not commonly seen or discussed within the population. This can make it difficult for the general population to accurately assess the risk of not getting vaccinated without medical knowledge or training (Dube et al., 2013; McIntosh, Janda, Ehrich, Pettoello-Mantovani, & Somekh, 2016; MacDonald, 2015). Risk perception consists of several dimensions that must be considered, and these are described in the HBM (Dube et al., 2013; LaMorte, 2016). An individual's vulnerability and the perceived consequences if harm were to happen are balanced against perceived cost, barriers, and the benefits of action to prevent harm. Perceived risk can be described as the risk of contracting a vaccine preventable disease or as the risk of vaccine adverse events (Dube et al., 2013). Vaccines are preventable medications, so the benefits of a vaccine are not easily assessed by an individual living in a country with a minimal number of cases, but the perceived risk of vaccines are clearly visible in society. A study utilizing focus groups with 42 vaccine-hesitant parents found that parents tend to maximize vaccination risk citing that their children were too young or were very sensitive. These parents were very

nervous about the permanence of the vaccination choice and stated that the decision to wait could always be changed later (Blaisdell, Gutheil, Hootsmans, & Han, 2015). Parents in the same group tended to minimize the risk of vaccine-preventable disease using factors such as healthy lifestyle, strong immune system, no plans to travel, and residence in a geographically different location than more disease occurrences (Blaisdell et al., 2015). Parental rationale is completely different to that of a public health professional or epidemiologist who can easily see the danger. Vaccine information must be presented in a way that addresses the concerns of the target group not just stating empirical facts (Dube et al., 2013; Blaisdell et al., 2015).

Social Influence. Social influence is a powerful factor in how individuals make choices every day, from insignificant choices such as a dinner location, to life changing choices like a career change. Studies have shown that people who consider friends and family pro-vaccine are more likely to accept recommended vaccinations (Dube et al, 2013). Bish and associates (2011) conducted a review of the factors related to increased vaccination rates during the 2009 HINI pandemic and found that social pressure and responsibility were significant factors. People were being vaccinated because they felt that others wanted them to be vaccinated and with the spread of HINI, social responsibility was also a factor (Bish, Yardley, Nicoll & Michie, 2011). Social influence is an effective tool for promoting pro-vaccination, but it is just as effective for anti-vaccination. Social media and Internet have amplified the effect of social influence by expanding an individual's social network and access to social information sources.

Impact of the Internet and Social Media

As established in the previous section, an individual's perspective including trust, perceived risk, education, and social influences is key in vaccination decisions. Few innovations have had more of an impact on an individual's ability to gain information and share personal opinions than the rapid development of the internet and, in turn, social media in our society. These innovations have become essential to daily life and communication as the internet and social media are never out of reach, with devices for every scenario. The primary interest of this study is with Web 2.0. This is defined as the second stage of development of the World Wide Web focused on user-generated content and the development of social media (Stern, n.d.). User-generated content and social media are characterized by freedom of speech and minimal content guidelines which leaves users to determine if the information they are exposed to is valid or not.

Research into the impact of the internet and social media is in its early stages given the newness of this factor. The majority of the research found during this review was focused on characterizing the information present on these forums. This new system has altered the communication paradigm between doctors and patients with an increasing number of individuals turning to the Web for healthcare information (Kata, 2012). Information obtained from these sources may alter perceived risk of vaccine preventable diseases or vaccination side effects resulting in altered health behavior (Betsch & Sachse, 2013). The lack of regulation and validity standards make these sources dangerous especially when the topic relates to serious health concerns or vaccine safety. Several studies found that anti-vaccination messages are prevalent over Web 2.0 sites and social

media (Dunn, Surian, Leask, Dey, Mandl, & Coiera, 2017; Kata, 2012; Wilson & Keelan, 2013). A study conducted by Anand Venkatraman and associates (2015) compared the relative amount of freedom of speech on four different websites and measured the relationship with dominant views of a link between vaccinations and autism. The study included YouTube, Google's Search Engine, Wikipedia and PubMed; all representing a declining amount of freedom of speech (Venkatraman, Garg, & Kumar, 2015). The study found that out of the top 175 videos related to vaccination on YouTube, 130 (74.3%) were anti-vaccination. Google was found to contain 41% anti-vaccination articles compared with 17% on a similar PubMed search (Venkatraman et al, 2015). A 2007 study on vaccine content on YouTube found that 48% were pro-vaccination indicating that the anti-vaccination may have increased during this time frame (Keelan, Pavri-Garcia, Tomlinson & Wilson, 2007). A similar study analyzing the content regarding vaccination on Pinterest found that 74% of a sample of 800 pins were anti-vaccination in nature (Guidry, Carlyle, Messner & Jin, 2015). These studies all indicated that anti-vaccination messages are prevalent on websites and social media with minimal regulation, however it does not provide information for how these sources influence perception.

Research on the impact of the internet and social media on vaccination is limited as this is a new phenomenon. The impact of parental social networks is not undocumented and could provide relevant information, as social media is arguably an expansion of personal, immediate social networks on a global scale. A 2013 study conducted by Emily Brunson found that social networks were significantly important for

parents but that parents who were not vaccinated and did not intend to follow all regulation and time recommendation were more dependent on a social network who shared similar views on vaccination. The online survey of 196 parents (of which 126 conformed to all recommended vaccinations) found that of those that did not conform, 72% of their identified social network shared their vaccination views (Brunson, 2013). Research in this field predominately involves parents with children of different ages depending on the study criteria. In my research, I found no studies that targeted a younger population to determine vaccination perceptions. The innovation of the internet and social media have altered social dynamics and expanded social networks into a potentially global network. These new advancements have been integrated into the daily life of young adults and become a critical component of their social and professional development. There is a critical need for peer reviewed research evaluations on the influence of social media on the perceptions of vaccinations.

Review of Relevant Design and Methodology

Research into individual's perspectives of vaccinations was split into two basic groups including qualitative research and quantitative survey studies. In the research found for this study, these classifications are representative of the relevant studies with some literature reviews also used. Several studies were qualitative in nature and focused on a deeper understanding of the factors that influence confidence and vaccine decisions (Blaisdell et al, 2016). The majority of the studies included in this literature review were quantitative survey-based studies (Aharon et al, 2017; Lee et al, 2015 & Weiner et al, 2015). The use of a quantitative design allowed the data to be more empirical and

generalizable within the population whereas qualitative data can explore issues on a deeper level but is less applicable to the public (Creswell, 2009). This study design is effective but does have inherent limitations in that all information collected from participants must be assumed to be truthful (Creswell, 2009). Several studies utilized a cross-sectional observation study similar to what will be used in this research project. This study design is limited to one specific time and cannot determine causal relationships (Creswell, 2009) Studies with this design must maintain randomization and other protocols to limit weaknesses in the study results (Creswell, 2009). The research studies included in this section focuses on parents as the main participants with differences in the inclusion criteria for age and number of children. No studies were found that included a younger population in the attempt to predict vaccination use as this study will. This is a significant gap and while the study design and method remain similar, the difference in population can provide significant advancements in understanding and ultimately influence vaccine acceptance rates.

Summary

The process of human reasoning and decision making is extremely complex and unique to each individual. The choice to vaccinate children is difficult to make given distance from active cases of vaccine-preventable diseases, proximity of perceived dangers due to vaccines, conflicting information, lack of trust not only in health care providers, but also government health agencies, and social influence. As public health professionals and epidemiologists, it is easy to see the risk and benefits of vaccination, but the empirical process that would arrive at those conclusions is not the process that

parents use to make their personal vaccination choices. Individuals that have doubts regarding vaccines are more likely to seek out socially available information and use internet sources than those who are confident about vaccinations and in their health care provider.

The development of the internet and social media has completely altered the way the people connect, communicate, and gather information. People now have access to virtually limitless information without regulation but how this changes our perceptions about valid sources and vaccinations remains unknown. In the previous discussion, one study noted that parents are more confident in health products that are in alignment with their current beliefs suggesting that vaccine education needs to occur before these values have been formed. Understanding how new technological advancements influence the perspectives of young adults before they become parents could provide key information to help public health programs reach this generation before they have formed set beliefs about the importance of vaccinations.

In the next chapter, the design and implementation of this study will be discussed in depth. This will include a discussion of the research design, methodology, sampling procedures, data collection, and ethics.

Chapter 3: Methodology

Introduction

The purpose of this study was to discover if there is a relationship between indirect exposure to pro- and anti-vaccination messages through social media on the perceptions of young adults towards childhood vaccinations. The effect of exposure to vaccine messages through social media on individuals in this age range was unexplored in the available literature. Epidemiological marketing was a key concept in forming the hypothesis for this study. The premise was that, in a similar way to how television commercials impact our thoughts, indirect exposure to vaccine information can influence our perceptions and subsequent choices regarding vaccinations (Lefebvre, 2000).

This chapter includes a detailed description of the research design and study population. Specific sampling and data collection procedures are provided along with the instrument used in the study. The chapter concludes with an examination of the threats to validity and ethics of the study, including treatment of human participants and treatment of collected information.

Research Design

A quantitative correlational research design was chosen to complete this study. A correlational design was used to explore the theoretical relationships between two variables within the same group of participants (Creswell, 2009). Correlational research is a quantitative research method, but it is not a true experiment and no variables are manipulated in the study (Creswell, 2009). This research design can only assess the extent of how variables are related and can draw no conclusions of a causal relationship

(Creswell, 2009). The correlational research design allowed for the exploration of association between indirect exposure to information about vaccines and perceptions of childhood vaccinations in young adults.

Other options for conducting this study were cross-sectional, longitudinal, or qualitative analysis. All other approaches would have brought a different element to the study and are valid options to continue this area of research on a more in-depth scale. This study was a pioneer in using a younger population to assess perspectives on health issues before they have the need to make related choices. A correlational study was appropriate for assessing initial significance of the relationship between selected variables (Creswell, 2009). This approach was also selected because the data was collected via survey and the key objective of the study was to assess the potential relationship between indirect exposure via social media and the target population's perspectives on childhood vaccinations.

Study Variables

A set of three research questions and related hypotheses were developed using the literature review and selected theoretical framework. The main dependent variable was perceptions of childhood vaccinations, while the principle independent variable was indirect exposure to vaccination-related messages. Vaccination intent and gender were also used as variables in the primary research questions. The variables included in these questions were not manipulated in any way during the study; they were assessed by self-reported survey data.

Research Questions / Hypotheses

RQ1: What is the relationship between exposure to anti and pro-vaccination messages through social media and the perceptions of young adults ages 18-24 years towards the use of childhood vaccinations?

H_o1: There is no significant influence on the perceptions of young adults ages 18 – 24 years towards vaccination due to exposure to anti or pro-vaccine messages through social media.

H_a1: There is a significant influence on the perceptions of young adults ages 18 – 24 years towards vaccination due to exposure to anti or pro-vaccine messages through social media.

- Dependent Variable: Perceptions of childhood vaccinations
- Independent Variable: Exposure to vaccination-related messages through social media

RQ2: What is the relationship between the perceptions of young adults towards childhood vaccinations and intent to vaccinate future offspring?

H_o2: There is no significant relationship between the perceptions of young adults towards childhood vaccinations and intent to vaccinate future offspring.

H_a2: There is a significant relationship between the perceptions of young adults towards childhood vaccinations and intent to vaccinate future offspring.

- Dependent Variable: Perceptions of childhood vaccinations
- Independent Variable: Intent to vaccinate

RQ3: Is there a relationship between the perceptions of young adults toward childhood vaccinations and gender?

H_o3: There is no significant relationship between the perceptions of young adults towards childhood vaccinations and gender.

H_a3: There is a significant relationship between the perceptions of young adults towards childhood vaccinations and gender.

- Dependent Variable: Perceptions of childhood vaccination
- Independent Variable: Gender

Methodology

Population

The population for this study included all young adults that did not currently have children and were not expecting and met all other inclusion criteria. Young adults were defined as being between 18 and 24 years old. Using the annual estimate of the population by single year of age, the total population ages 18-24 was calculated to be 30,373,478 in the year 2018 (U.S Census Bureau, 2020). However, the population included in this study was limited by the following inclusion and exclusion criteria.

Participants had to be between the ages of 18 and 24 years old. Individuals who were already parents were excluded from the study as they had already made the choice to vaccinate or not. This also included individuals who were expecting their first child. Individuals with a medical background or education were not included as they would have previous knowledge regarding the subject matter. Individuals that reported a religious or cultural objection to vaccination were also excluded from the study. Not

listed as exclusion criteria but controlled for in the study was participants' own vaccination history.

Sampling

A convenience sampling method was used to obtain participants for the study. The study was promoted through target specific advertisements on the social media sites Facebook and Twitter. Participants were accepted based on the inclusion criteria selected for this study. Once participants had met the inclusion criteria and signed the informed consent, they were redirected to the survey. Upon completion of the entire survey, participants were thanked and received information for further contact if they have any questions.

Convenience sampling is a nonprobability sampling technique that relies on the judgement of the researcher to specifically target individuals based on inclusion and exclusion criteria (Etikan, Musa, Alkassim, 2016; Laerd, 2012). In quantitative research, a probability sampling strategy is always preferred but not always feasible to obtain. With a target population of approximately 30,373,478 individuals, a random sampling strategy was not feasible due to time and resource constraints. Convenience sampling, while necessary for some studies, does come with several limitations. The lack of probability sampling introduces bias into the study and limits the ability of the study to be generalized among the target population with accuracy (Etikan et al., 2016). The limitations of this sampling method are important to consider but given that this is an initial study to ascertain if there is a relationship between identified variables and the other constraints listed above, this was an appropriate method to choose. If a statistically

significant relationship is found, further research can address the limited generalizability by expanding the study participation and using a probability sampling technique.

Sample Size and Power Analysis

G*Power software was used to calculate the minimum sample size for this study. Power analysis uses three set values to determine the sample size needed to detect that the effect on the outcome is indeed due to the study variable (Creswell, 2009).

The alpha value is the level of statistical significance for the experiment. It represents the error rate that the researcher is willing to accept. The accepted alpha level for the majority of social science research is .05 (Creswell, 2009; Zint, 2012).

Power is the probability that a study will reject a null hypothesis that is indeed false (Creswell, 2009). A higher power increases the chance that the study will detect an effect if there is one. The recommended value for power is typically .80 and was used for this calculation.

The final value needed is the effect size. The effect size helps explain statistically significant results and ensure that they are meaningful in the context of the study (Sullivan & Feinn, 2012). This works in conjunction with the p-value, which determines the significance of the results, but at times the p-value can have a significant result when the difference between variables are so minute that it is not practically meaningful (Sullivan & Feinn, 2012). The actual effect size can only be calculated after data has been collected, so for sample size analysis, the effect size is estimated based on generally accepted charts (Creswell, 2009). For this study, a medium effect size was chosen and a value of .25 for Anova testing was used in the sample size analysis (Cohen, 1988).

G* Power analysis was used to calculate the minimum sample size needed for this study. The software was set for ANOVA: fixed effects, omnibus, one-way. The alpha value was .05, power was set at .80, and the effect size was medium range with a value of .25. The number of groups was set to 5 for this calculation. The calculation results are shown in figure 1.

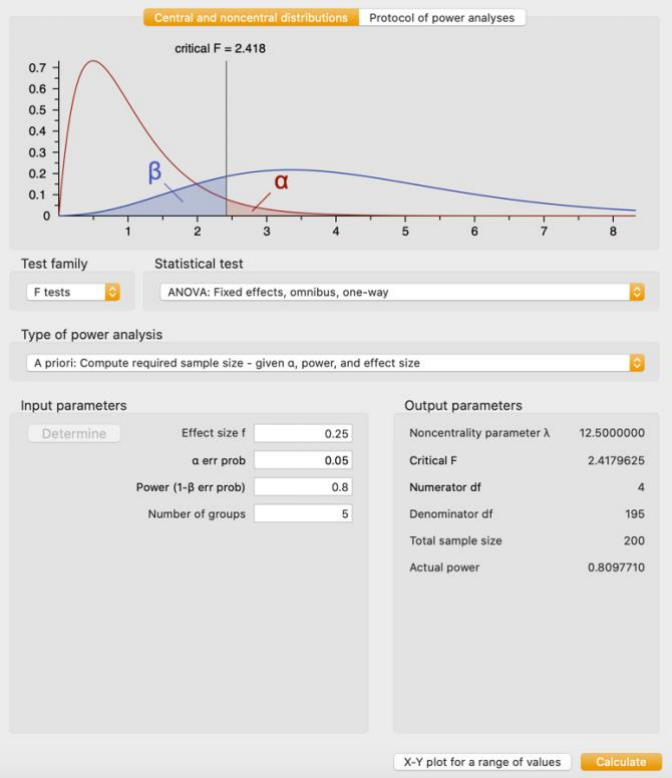

Figure 1. G*Power analysis of population sample.

The initial calculation for the minimum sample size was 200 participants. The x – y plot feature was used to create a plot of the minimum sample size values for a power level of .7 - .9 in intervals of .1 (Figure 2). This provided a range of sample sizes according to the different power levels to create a sample size range.

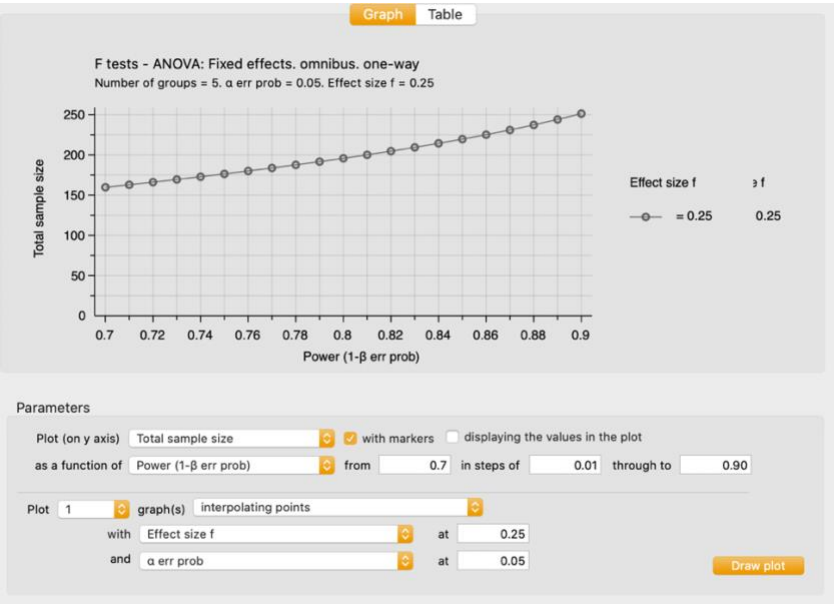

Figure 2. Graph of minimal size values for possible power levels.

The analysis gave a minimum sample size range from 160 participants to 250 participants. Ideally, the power should be kept close to .80. For this study, the acceptable sample size range was calculated to be 180-220 giving the study a power level between .75 and .85.

Procedures for Recruitment, Participation and Data Collection

Participants were recruited using advertisements on the social media sites Facebook and Twitter. Participants were targeted using the inclusion and exclusion criteria discussed earlier. Advertisements had been selected instead of distributing the survey via social media pages to protect the validity and ethics of the study. The advertisements were not connected to my personal profile or people that I know to prevent any bias in the study. The advertisements contained a link to the survey through Survey Monkey. When participants first arrived at the survey site, they were required to

read and sign an informed consent form. This form explained the purpose of the study, what the data collected would be used for, and confidentiality and data protection procedures. Once participants had agreed to the terms outlined in the informed consent document, they were then allowed access to the survey. Upon completion of the survey, participants were thanked for their participation, and assured of the confidentiality of the study and that no personal information was collected or recorded. This study was a one-time collection of data, so no future follow-up was necessary with participants. Participants were given contact information for the university and I in case of further questions. If the study was fully completed, participants were thanked for their participation and received a $2 Amazon incentive code.

An incentive was deemed necessary to increase participation rates for the study. Without using a survey panel or audience that the researcher had direct access to, an incentive was a good way to draw interest in the study and help increase participation. Incentives offered at the end of the study, also serve to increase completion rates as participants would not receive the code unless they completed the survey. There was no follow up research with this specific study population so further incentives were not required. Amazon incentives were used to help draw attention to the study with a popular recognizable brand name but also for the convenient online access and variety of applications allowed the incentives to fit the diversity of the participants involved. The incentive was small but enough to spark interest in the study as it allowed participants to be rewarded by downloading a song or putting the credit towards a small purchase.

Instrumentation and Measures

The survey instrument was composed using the "The Parent Attitudes about Childhood Vaccines (PACV) survey" that was adapted to fit the research topic. Permission was received from the author Dr. Douglas J. Opel to include the instrument in this research study. The survey instrument was altered as little as possible to maintain the validity and reliability, but some changes were necessary to ensure that the data collected would answer the research questions for this study.

The survey instrument was pre-tested once Walden's Institution Review Board (IRB) approval had been obtained. With significant revisions to the core survey, pre-testing was necessary to ensure a valid and reliable survey instrument. The pilot study was conducted after IRB approval was obtained and before any date was collected for the study. A small group of 10 individuals meeting the inclusion and exclusion criteria was asked to complete the survey in the same manner as the main study. Revisions were made based on the results of the pre-test before conducting the main data collection for this study. Pre-test results will be included in Chapter 4.

To begin the survey, 2 items were added to assess social media use in participants. Participants were asked to provide information on which social media sites they used and how often they used them. Items were scored on a 5-point Likert scale similar to the rest of the instrument.

Three items were added to assess exposure to indirect vaccination-related messages. An existing survey could not be found to assess this area of the research study. These items assessed if there had been exposure to vaccination-related messages and

what percentage of that exposure was positive (promoting vaccinations) or negative (anti-vaccination). The same scoring system was used for these items as was used for the items assessing social media use. Multiple select options were used to gather information on the type of vaccine messages participants had be exposed to and the common sources.

The PACV was adapted to fit the topic and specific audience for this study. The major change was to fit it to the audience of young adults who are not yet parents. Items 1 and 2 were removed as they were specific to having a child. Questions 3 and 4 were altered to represent a future choice. Instead of "have you ever decided", it was altered to "would you ever decide" (Opel et al, 2011). Several questions were modified in word choice such as from "your child" to "a child". Items 6-9, and 14 were not altered. Items 15 – 17 were deleted as they were assessing parental relationships and trust in their child's doctors, but one question was added to understand if participants would follow pediatrician recommendation about vaccinations. The thirteen-question survey asked about delaying or refusing vaccinations (5 items), benefits of vaccinations (4 items) and safety of vaccinations (4 items) (Opel et al, 2011). The wording of the questions was the only part of this survey that was altered, the scoring was not changed. This survey also utilized a 5-point Likert scale scoring system throughout, but the word choices associated with the scale did change from (strongly agree - strongly disagree) to (very concerned - not concerned at all) (Opel et al, 2011).

Demographic questions were included at the end of the survey. The PACV included demographic questions and those were used here to assess gender, education, and marital status (Opel et al, 2011). These sections also included questions assessing the

participants own vaccination history. Location and parental status were not included since they were used as inclusion criteria to participate in the study.

Survey Instrument

Social media use was assessed at the beginning of the study. Participants were first asked to rate the frequency of their personal social media use on the following scale: *I do not use social media, I only use social media once or twice a week to look at other people's post, I use social media daily but do not actively post my own content, I constantly monitor social media and post multiple times daily and am very active on friends pages.* Use of social media sites was the subject of the next item, asking participants to select all social media sites they are a member of.

Three items were added to assess exposure to indirect vaccination-related information. A brief statement explaining how indirect exposure was being defined for this study was presented before these questions along with some examples to help participants understand the concept. Functional definitions for anti- and pro-vaccination messages were also given. These were framed to ensure that anti- vaccination was not seen as bad or the wrong choice but a statement that simply does not encourage vaccination. The statements included are "Experienced indirect exposure to vaccination information," "Experienced indirect exposure to anti-vaccination information," and "Experienced indirect exposure to pro-vaccination information." The response scale for this question was: *I have never experienced this, I have experienced this only once or twice, I have experienced this occasionally, I experience this on a daily basis, and I experience this every time I am on social media.*

The next section was used to gather descriptive information on the type of messages participants were exposed to and the common sources of those exposures. The statements " What are the main ideas of anti-vaccination (pro-vaccination) messages that you have experienced and identify the sources that you most commonly see anti-vaccination (pro-vaccination) message from were asked and participants were asked to select all responses that applied, and an "other" response was provides with a fill in option so that participants could write a response if the one they needed was not represented.

PACV measures three key component to establishing perspective (Opel et al, 2011). The questions were based on the Health Belief model but are grouped into three distinct topics. These could be measured separately as independent variables or combined for a total score. The three components were personally identified hesitancy (PIH), perceived benefits and necessity (PB&N), and perceived safety and effectiveness (PS&E) (Opel et al, 2011). For this study, the total perception score was calculated, and the final question was used as the vaccination intent variable. This section began with two questions determining if participants would consider delaying or refusing vaccination. The statements, "Would you ever consider delaying vaccination for reasons other than illness or allergy" and "Would you ever decide not to have your child get vaccinated for reasons other than illness or allergy" were scored on a three-point scale with possible responses of: *yes, no, and don't know.* The next question asked participants if they were confident in the shot recommendations and schedule, with responses ranging from *0 (Not sure at all) to 10 (completely sure)* (Opel et al, 2011). An item assessing participants trust

in a pediatrician and recommended shot schedule was added and the same scale was used for the responses.

The next four items assessed the participants perspective about the benefits of vaccinations. Items were scored on the five-point scale: *Strongly agree, agree, not sure, disagree, and strongly disagree.* Participants were asked to use this scale to respond to the following statements: "Children get more shots than are good for them," "I believe that many of the illnesses that shots prevent are severe," "It is better for a child to develop immunity by getting sick than to get a shot," and "It is better for children to get fewer vaccines at the same time." (Opel et al, 2011).

Participants were asked to imagine that they have just become parents and respond to the next three questions about vaccine safety. The questions were: "How concerned would you be that your child might have a serious side effect from a shot?" "How concerned would you be that one of the childhood shots might not be safe?" and "How concerned would you be that a shot might not prevent the diseases?" Responses were given using the following five-point scale: *not at all concerned, not too concerned, not sure, somewhat concerned, and very concerned.*

The final question in the section echoed the initial question by assessing over all intention of vaccination. The question was "If you were to have an infant today, would you want him/her to get all the recommended shots?" and participants responded with *yes, no, or don't know.* This question was used to assess the participants intent to vaccinate and to answer the second research question.

The final questions in the survey were the demographic questions. These were placed last so that if participants become rushed or impatient toward the end of the survey, these questions would be quick and require little thought. Location and parental status were already assessed as inclusion criteria and were not included in this section. Participant's gender, education level, and marital status were assessed and were used as modifiers in the evaluation of the data. The last question asked participants to disclose their own personal vaccination history by stating if they were or were not vaccinated as a child. After the last question, participants were thanked for their participation in the survey and redirected to the final page with their incentive code and contact information in case of follow up questions about the study.

Data Analysis

The data collected from the survey was analyzed using SPSS version 23. The data was collected and organized through Survey Monkey and exported to SPSS for analysis. Descriptive statistics, percentages and charts were used to describe and summarize the demographic and control data. The mode and median were the measures of central tendency that were used to describe the characteristics and variables in the study. The analysis plan for each research question is discussed in detail below.

Research Question 1: What is the relationship between exposure to anti and pro-vaccination messages through social media and the perceptions of young adults ages 18 – 24 years toward the use of childhood vaccinations?

This was the central research question for this study. With this analysis, I was looking at the relationship between exposure to vaccine messages and the perceptions of

the participants. An ANOVA was used to run two analyses one using pro-vaccination messages and one using anti-vaccination messages as the variable. The overall perception score was calculated and used as the perception variable for this analysis. This allowed for the overall assessment of the relationship but also for comparing results within each level of exposure.

Research Question 2: What is the relationship between the perceptions of young adults towards childhood vaccinations and intent to vaccinate future offspring?

This research question was looking at comparing the overall perception scores with the participants intent to vaccinate. A one-way ANOVA was used for this analysis and the calculated overall perception score was used as the variable as well as vaccination intent. Vaccination intent was coded into three levels including: yes, no and I do not know.

Research Question 3: Is there a significant relationship between the perceptions of young adults toward childhood vaccinations and gender.

This research question addressed the question does gender play a significant role in how people perceive vaccinations. This was a significant question to ask due to the influence of maternal instinct and other social dynamics that impact one gender's thoughts or perspectives on parenthood and thusly vaccinations. A one-way ANOVA was used to assess this question and the perception score was the same variable as used in previous research questions. gender was defined into three groups: female, male and other.

Assumptions of Statistical Test

There was one main statistical test used in the analysis of this research. The assumptions listed here were assessed once the data had been collected and before analysis would take place. The results of the assumption testing will be discussed in Chapter 4.

A one-way ANOVA has six assumptions that must be met for it to be used effectively (Creswell, 2009; Statistic Solutions, 2020; Laerd Statistics, N.D). The first assumption for a one-way ANOVA is that the dependent variable must be a continuous variable measured on the interval or ratio scale. The second assumption addressed the independent variable and it must have two or more categories or groups that are independent of each other. Independence of observations is the third assumptions and states that there are no relationships or interactions between the groups or the observations of the groups (Laerd Statistics, ND.; Statistic Solutions, 2020). Assumption four refers to the presents of outliers in the data and to ensure that outliers do not impact the results of the study, there should not be significant outliers in the data distribution. Assumption number five is also concerned with the distribution of data and is the assumption of normality. This assumptions states that the dependent variable needs to be normally distributed with in each category of the independent variable. This is an approximate normal distribution due to the ANOVA's robust nature to normality variolations (Laerd Statistics, N.D.). The final assumption for the one -way ANOVA is the assumption of homogeneity of variance. This assumption is tested by the Levene's

test in SPSS and tests to ensure that the variance between groups is equal (Laerd Statistics, ND.; Statistic Solutions, 2020).

Data Cleaning and Screening Procedures

Primary data collection often results in an imperfect data set. Researchers must have a plan to resolve common issues such as missing data, extreme outliers and logical conflicts. Missing data, such as questions left unanswered was addressed in two different methods depending on the nature of the missing data. Participants with a significant amount of unanswered questions were not included in the study. Participants with isolated cases of missing data had responses imputed using multiple imputation to replace the missing values and complete the data set (Kang, 2013; Sterne et al, 2013). Extreme outliers and logical conflicts were assessed on a case by case basis. The sample size should not be affected unless there is a significant number of errors in the data. With a sample size range, there was room to account for missing data and data errors without compromising the sample size and integrity of the study.

Validity

All research studies have potential threats that could jeopardize the validity of the study. It is critical for researchers to identify these threats and have a plan to minimize the potential impact as much as possible. There are two basic types of threats to validity: internal and external (Creswell, 2009). Internal validity threats are problems or limitations within the experimental procedures, treatments or experiences of the participants. External validity threats occur when researchers incorrectly generalize the

results of the study to other groups, other settings or past or future situations (Creswell, 2009).

For this study, there were several threats to internal validity that must be considered. The survey was hosted by Survey Monkey and distributed by Facebook and Twitter. The assumption was that these programs will function as they are designed to but flaws or errors in this area could potentially cause problems in the study. Extensive research into options and reviews for each possible organization and recommendations from colleagues and faculty were used to select the above listed organizations. However, using the Internet to recruit participants removes a lot of control from the researcher. This can be beneficial for removing potential bias but there is also no guarantee that the responses needed would be obtained or that the surveys would be completed. To attempt to prevent minimal participation and incomplete data, the study was advertised on two social media sites and a small incentive was used. The incentive was small, so it would not cause problems with people taking the survey only for the incentive, but it would be enough to encourage people's interest in the study. The maximum surveys to be collected was set slightly above what is necessary for the study to account for the potential for missing data or incomplete information.

The population for this study was not selected randomly but a convenience sample was used due to time and resource constraints. A convenience sample was taken by reacting to a social media advertisement for the study that targets individuals based on certain inclusion criteria. This was a critical external validity issue and limits the generalizability of the study to these specific factors. That narrow generalization can be

further questioned since the sample was not random and may not accurately represent the population. These limitations were acceptable in this study since the objective was to do an initial assessment of the existence of a relationship between the variables. If a relationship was found, further studies would be needed to address these issues.

Ethical Procedures

The consideration and application of ethics is a critical element when conducting research. Researchers must ensure that they are not putting participants at risk and understand all ethical risk involved with their study (Creswell, 2009). Ethics impact each stage of the research process through development and implementation.

The research problem and purpose of the study was clearly stated in the informed consent and accurately portrayed during the recruitment process. Participants had a clear understanding of what the research topic was about and that there were no hidden goals or subjects. Definitions were provided and explained in the informed consent and again in the relevant areas of the survey instructions.

The study was approved by the Walden University Institute Review Board and the approval number for this study is 02-13-19-0373557. During this process the recruitment procedures, data collection, and data storage plan were all reviewed for ethical violations. The study topic and survey instrument were also reviewed before being approved to gather data from human subjects.

An informed consent form was developed and presented to all participants before any data was collected. The informed consent form included the researchers name and contact information, Walden University contact information, recruitment criteria, and

purpose of the study. Participants were also informed of the benefits, risk and level of participation needed in the study. Data collected during the study were guaranteed to be stored securely and no personal information was collected at any time. Participants were assured that they can withdraw from the survey at any time if they do not feel comfortable continuing and were given contact information if they have any questions following participation in the survey (Creswell, 2009).

The topic was approached with the minimal possible bias and the survey instructions were designed to reassure participants that there was no right or wrong answer to the questions asked. (Creswell, 2009). All data collected was only assessable by me and was securely held for five years after the conclusion of this study. No personal data was collected during this study and no IP addresses or identifying information was collected by social media sites or Survey Monkey during this study (Survey Monkey, 2018). Participants remained anonymous and were no longer linked to the study once the survey was completed.

The details of the study design and execution will be thoroughly discussed and presented for all readers to establish credibility for the study. All data and results will be included regardless of whether they supported the hypothesis presented or not. Permission was received for the survey instrument to be used and has been included in the appendix section.

Summary

A detailed account of the methodology that was used to conduct this study was presented in this chapter. A quantitative correlational design was used to assess the three

research questions of this study. The variables and data analysis plan were discussed for each research questions, showing how the design and methods provided the data needed to answer each hypothesis. The final sections of this chapter explored possible violations of validity and ethics within the study and the measures that were taken to prevent such errors.

The results of this study will be explained in the following chapter, and how they contribute to the current body of literature and social change will be the topic of the final chapter in this paper.

Chapter 4: Data Collection and Analysis

Introduction

The purpose of this quantitative correlational study was to understand the relationship between exposure to vaccination information over social media and the impact of that information on the perceptions that young adults form about vaccinations. This chapter focuses on the data collection process and analysis of the collected data. The chapter will begin with a discussion of the pilot test, including procedures, data collected, and implications for the main study. The data collection procedures that were laid out in Chapter 3 will be reviewed in addition to a discussion of the data collection time frame, response rates, and any changes in the planned procedures. The final section of the chapter is dedicated to the analysis of the data collected. The data analysis will include general descriptive statistics and specific statistical results organized by research questions.

Pilot Study

A pilot study was conducted to assess the effectiveness and validity of the survey instrument, since several adjustments were made to the original survey instrument. The pilot study consisted of 12 participants all meeting the inclusion criteria for the main study. All participants were between the ages of 18 and 24, had no children, were not in the medical field, and had no religious or cultural objections to vaccinations.

Participants were invited to participate in the pilot study through email. The invitation email included a link to the survey using Survey Monkey as the host site. Once

participants completed the survey, they were asked to answer a few follow up questions (Appendix B) about the survey and their experience.

Analysis of the Data from Assessment Form

All participants indicated that they read the informed consent and that the information provided was clear and easy to understand. The study objective was reported to be very clear and the survey provided easy to follow directions. There was one section indicated that needed instructions because the scales changes in addition to providing the scales and examples in the instructions for each section. After review, a description and example of the scale was added to the instructions of each section where the scale changes. An additional comment suggested that when the question changes from asking for an affirmative to something that is not affirmative, those words or phrases be in bold to better distinguish and capture participants attention and avoid inaccurate responses.

A few questions were reported to be confusing or as having a possible error in wording. These questions were reviewed and reworded as necessary. Several participants reported that the scale used to measure social media use did not accurately capture their use, and the option they would have picked was not listed. This scale was reconfigured to offer more accurate options for this question. The question referring to vaccination schedules was frequently flagged as confusing. Given that the purpose of this study was to understand how people with no prior education about vaccinations views them, this question needed to be reworded so that participants could understand what the question was asking.

Participants in the pilot study suggested that a section be added for participants to describe the main ideas that they had come across about vaccinations and what sources they came from. While a bank area for participants to describe what they saw was not added due to the method and design of the study, four questions were added to assess the main ideas behind what messages participants were seeing and what sources they came from. A copy of the original survey and the survey after the changes from the pilot study are included in the appendix section for reference.

The average survey time was 7 minutes, with a range from 4 minutes to 11 minutes. All participants indicated that they survey seemed to be an appropriate length and was not too long to complete. All participants completed the survey in its entirety and no questions were omitted.

Analysis from the Data Collected from the Survey Instrument

YouTube was listed as the most used social media followed, closely by Facebook and Snapchat. Fifty percent of participants indicated that they use social media every day for at least a few minutes, while 30% said they used social media every day all the time.

Fifty percent of participants stated that they were rarely (25% of the time) exposed to vaccine information while on social media. Thirty-three percent of participants stated that they were exposed to anti-vaccination messages sometimes (50% of the time) and pro-vaccination messages only rarely (25% of the time). The participants reported never sharing information that discouraged vaccination use, but some did report reposting pro-vaccination messages. The results of this sections and individuals' answers

indicated that the percentage scale may have been confusing or difficult to understand, so this scale was edited.

All participants indicated that if they were to have a child today, they would want them to be vaccinated. Several participants indicated some level of concern for vaccine safety and potential side effects; additionally, several indicated that they would be open to delaying vaccination. All participants in the pilot study reported that they were vaccinated as children and had no religious or cultural objections to vaccinations.

The pilot study was successful in pointing out areas that needed revision and procedures that needed to be reassessed. The changes to the survey resulting from the pilot study have been discussed in this section. The following section will focus on the main study, including procedure reviews and changes, timeframe for the study, and the statistical analysis of the results.

Data Collection

The pilot study provided critical insight into the survey format and participants' perspective resulting in revisions incorporated into the survey and procedures before the actual survey was launched. The reminder of this chapter focuses on the data collection and analysis from the main survey launch. The data collection procedures will be reviewed in the following section as well as the timeframe for the data collection.

Review of Data Collection Procedures

Participants were recruited through social media ads that were disseminated through Facebook and Twitter. Participants were selected using specific inclusion and exclusion criteria that was entered into the system. Participants who responded to the ad

were taken directly to the Survey Monkey website and the studies informed consent page. Participants were required to agree to the informed consent before progressing to the survey. Upon completion, participants received a $2 incentive promo code for Amazon.

The ad contained a link to the survey hosted by Survey Monkey. The ad contained a short description, link to the survey and corresponding image. The text of the ad was:

> Important research opportunity for individuals age 18 – 24 living in South Carolina. Impact your community by taking part of this short survey on the impact of social media on the perceptions of vaccines and receive a $2 Amazon promo code for the completion of the survey! Click the link below to get started!

Due to a change in policy, right before the survey launch the initial post and collection procedures were changed since Survey Monkey no longer supported the use of outside promo codes. The survey and ad content were changed to reflect this new development and instead of a promo code, a $2 donation to the Child Heath Foundation was made for each completed survey. The final ad was posted as:

> Important research opportunity for individuals age 18 – 24 living in South Carolina. Impact your community by taking part of this short survey on the impact of social media on the perceptions of vaccines and a $2 donation to the Child Health Foundation will be made for each survey completed! Click the link below to get started!

Time Frame for Data Collection

The time frame for the data collection was initially 6 weeks. The survey was launched on Facebook and Twitter through the add services on both sites. The adds

produced minimal responses and fewer that were completed. To increase the response rate, the dissemination rate of the survey was increased, and survey advertisements were posted on several graduate research pages. These adjustments resulted in little increase in the response rate, so after careful consideration and obtaining approval from my committee, the geographic restriction was dropped. The hope was that increasing the participant pool would result in a greater response rate, and initially the response rate did increase, but the completion rate was still very low.

The time frame was approaching the initial 6-week target plan with minimal progress, so in an effort to get the project back on schedule, the decision to use the Survey Monkey participation pool was made. This was retained as a last resort option due to the expense of getting the amount of responses needed for this project. The survey was launched and had initial success until it was paused with a high non-completion rate. Survey Monkey assigned a survey specialist to analyze the survey and provide suggestions to ensure that the survey fit with the organizational guidelines and had a higher completion rate. The specific changes suggested will be discussed in a different section as my focus in this section is the timeframe of the survey. The survey specialist made several suggestions, and once those were approved and implemented, the survey was relaunched with much more success. The responses from the initial launch were no longer valid to include in the study since the survey was now different. The survey was relaunched for the remaining responses left on the account, and it had a good response rate but did not get the number of responses needed since the initial collections did not count. A second round of data collection was needed with the revised survey and same

parameters in order to collect the remaining participants needed for the survey. This did not happen immediately due to financial constraints. Once the funds were acquired, the second round of data collection was successful in collecting the total number of responses.

The total time frame from the initial launch of the survey to the final collection procedures was approximately 12 weeks.

Recruitment and Response Rates

As discussed in the previous sections, there were significant challenges in the recruitment and response rates with this survey. Before deciding to switch to the paid participation pool, the survey had collected less than 20 completed surveys. The first survey launch had a 45% abandonment rate and an actual incident rate of only 23%. After finalizing all adjustments to the survey and relaunching, the survey final abandonment rate decreased to only 9%, and the actual incident rate increased to 53%. The disqualification rate was 47% with the medical training exclusion having the most impact, excluding 120 participants (34%). Religious or cultural objections accounted for only 2.3% (five participants), and only nine participants (4.2%) reported having children or expecting a child. An additional 11 participants (5.6%) selected no after reading the informed consent. After all selection criteria, they survey ended up with 184 qualified responses.

Changes in the Data Collection Procedures and Instrument

It has been established that changes were made to the original data collection procedures discussed in Chapter 3. These changes were all made to increase the success

and validity of the survey. Changes to the basic procedures have been described as part of the sections above. The changes to the survey after the initial launch complications will be discussed here.

The survey specialist's report assessed if the survey fit with in the established organizational guidelines and if it had any common errors that could reduce response rates. The use of any kind of incentive is against the organizations policy when using the participant pool feature. Since no surveys from the original social media launch were included in the final study participant pool, the incentive of the $2 donation was removed completely from the survey and informed consent.

The specialist suggested that the amount of reading and instruction be condensed and refined. This not only reduced the time that it took for participants to complete the survey but also prevents user fatigue. Page breaks were also suggested so that the different sections feel separate and participants feel like they are moving through the survey instead of one long scrolling survey. Lastly, it was suggested that some of the matrix questions be changed to other formats so that the entire survey is not one question type.

Baseline Descriptive and Demographic Characteristics

The final study population included 184 individual responses. The participants were recruited based on the specified inclusion criteria using the Survey Monkey participant pool. A basic census technique was used for age balancing. The participants included represent the age group between 18–24 years old and come from all over the United States. While participation did include all regions of the United States,

participation was highest on the East coast with clusters of higher participations on the West coast.

General demographics collected in survey for this study were gender, education level, relationship status, and vaccination history. Gender was categorized into three groups as follows: female (n = 114), male (n = 67) and other (n = 2). Other descriptive data are provided in Table 1, including the number of individuals in that group, the percentage of the total sample represented and compared by gender.

Table 1. *General Demographics Data and Gender Comparison*

				Gender		
		Frequency	Percent	Female	Male	Other
Education	Some high school	8	4.4	6	2	0
	Graduated from high school	32	17.5	21	11	0
	1 year of college	25	13.7	18	7	0
	2 years of college	37	20.2	18	18	1
	3 years of college	33	18.0	22	11	0
	Graduated from college	34	18.6	22	11	1
	Some graduate school	5	2.7	3	2	0
	Completed graduate school	3	1.6	2	1	0
Relationship status	Married	10	5.5	7	3	0
	Widowed	1	.5	0	1	0
	Separated	1	.5	0	1	0
	In a domestic partnership	10	5.5	8	2	0
	Single, but cohabitating with a significant other	34	18.6	20	14	0
	Single, never married	127	69.4	79	46	2
Vaccination history	Yes	172	94.0	108	62	2
	No	8	4.4	5	3	0

I do not know	3	1.6	1	2	0

Data Set Preparation

The data set was exported from Survey Monkey into SPSS for data set preparation and analysis. With the Survey Monkey export tools, the only responses that were exported were those that agreed to participate in the survey after the informed consent. The data set, including 184 participants, was cleaned first by removing empty variable labels not connected to the survey such as name, email, platform used to complete survey, among others. These are all variables that can be included in a survey with Survey Monkey. These items were not collected with this survey and no personal information was collected or saved. The labels for these items were still included in the data set export with no data.

The data set was exported with the questions as the labels and only reference numbers for variable names. One priority for the data preparation process was to rename the variables and to create labels that were related to the questions number and also the topic. Variables were named and labeled based on the content of the questions and with the questions number for easy reference. A chart was created to use as reference and this chart is included in the appendix.

Questions that instructed for multiply responses (please select all that reply) were recoded so that each response was a single variable with a 1.00 = yes and 0.00 = no response. This was necessary so that each response was counted, and the individual responses could be used in the data analysis. This procedure was done for question 6, 11,

12, 13, and 14. The variable names and how they were recoded can be seen in the variable name and related survey question chart provided in the appendix.

The data set contained several points of missing data. Participant 51 stopped responding to the survey at question 12 and so this participant was deleted from the data set due to the significant amount of data missing. Multiple imputation was used to replace the remaining missing data. After participant 51 was deleted, there was only 6 remaining missing values. These values were spread over 5 individuals and were all different questions. Multiple imputation was accomplished using the SPSS function with 5 imputations selected. A new dataset was created with the new imputed values replacing the missing data. This data set was used for all other analysis.

The survey items related to vaccination perception were scored and calculated into one perception score. The process was adapted from the directions included with the primary survey used in this study. Perception items included survey items 15 – 25 and each response was assigned a score between 0 and 2. Positive vaccination responses were given a score of 0, negative vaccination responses were given a score of 2 and answers of I do not know, or I am unsure were scored a 1. The raw perception score was calculated by summing each of the perception items. The final perception score was found by converting the raw score into a 0 – 100 scale score. High perception scores indicate a negative perspective towards vaccinations and the lower the perception score indicates a positive perception (Opel, 2011).

Results

Descriptive Statistics and Frequency Analysis

The purpose of this section is to present the results of the data analysis for the study. The steps taken to test each variable and each research question have been laid out along with the results of the test and their statistical significance. The beginning portion of this section discusses the basic descriptive statistics and frequency analysis that was completed for the study. This section will primarily focus on the descriptive and frequencies related to the survey questions. Descriptive results related to the sample were provided in a previous section and will not be repeated here.

Daily social media use and commonly used social media sites were assessed in the study to establish participants social media habits. Fifty four percent of participants reported using social media on a daily basis but not actively posting personal content. Nineteen percent reported constantly monitoring social media and actively posting on personal and friends pages, whereas less than 2% of participants reported not using social media at all.

Participants were also asked to identify all social media sites that they used on a regular basis and were able to select more than one of the listed options. The provided choices were Instagram, Facebook, Twitter, Snapchat, YouTube, and Other. Instagram was the most identified social media site with 73% of respondents indicating regular use of this site. The popularity of the other social media sites is represented in figure 3.

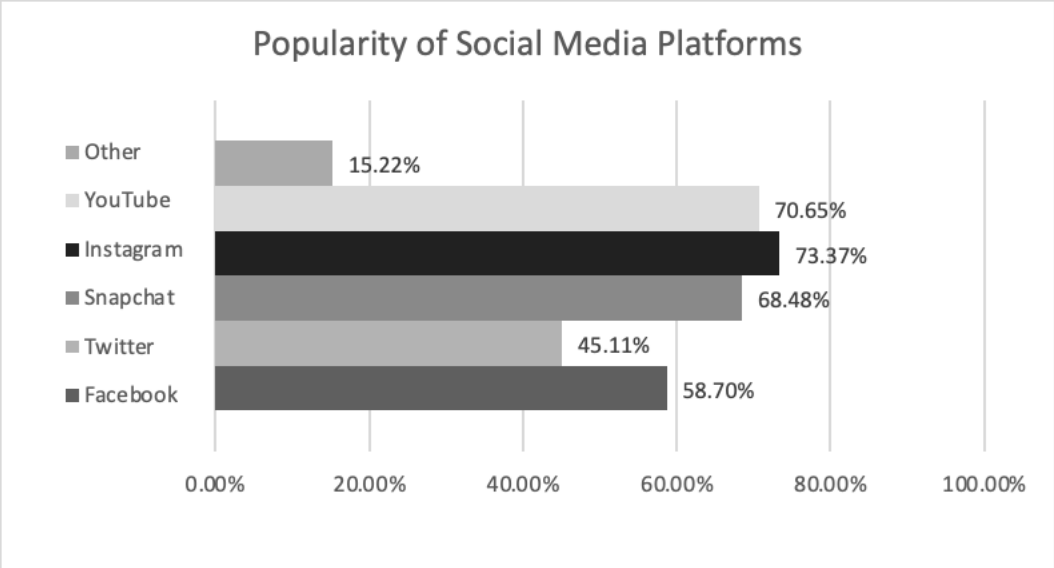

Figure 3. Popularity of social media platforms. Participants were able to choose more than more platform resulting in over 100%.

Exposure to vaccine information was assessed through three questions aimed at understanding general exposure as well as to anti and pro-vaccination information. Forty four percent of participants reported occasional exposure to general vaccination information and 28% reported general exposure on a regular basis. Twenty one percent of participants said that they had never experienced anti-vaccination information on social media, 32% reported occasional exposure but only 10% said they were exposed on a regular basis. Exposure rates were slightly higher for pro-vaccination messages with 40% of participants reported occasional exposure to pro-vaccination messages and 24% experiencing exposure on a regular basis.

When asked to compare exposure rates, 56% stated that they had experienced more pro-vaccination messages while only 16% claimed to have experienced more anti-

vaccination messages while on social media. Ten percent of respondents reported no experience with either type of exposure.

In an effort to gain a better understanding of what participants experienced, a section of the survey focused on the messages and sources of the vaccination information. For these questions, participants that selected “other” as an answer choice were asked to provide a written response. When discussing pro-vaccination messages, approximately 150 of 183 participants experienced messages related to the necessity of vaccinations and 137 reported messages about the safety of vaccinations. Ten participants selected other, four of those reported no exposure to vaccination information and therefore did not have a response to these questions. Written responses included correcting anti-vaccination messages and heard immunity. The main ideas of pro-vaccination messages are presented in figure 4.

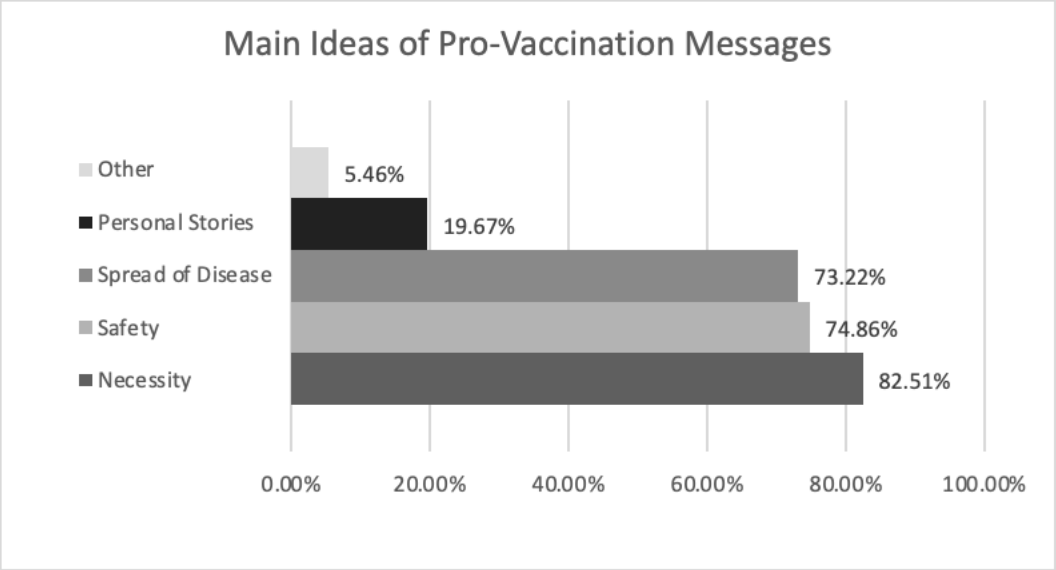

Figure 4. Main ideas of pro-vaccination messages. Participants were able to select more than one option resulting in a total of over 100%.

Anti-vaccination main ideas were concentrated around dangers of vaccination, over 70% of participants reported messages about dangerous side effects and 63% experienced messages about the dangers related to birth defects and down syndrome. Over half of participants indicated seeing messages about giving vaccinations to babies too young and 31% reported messages about government and pharmaceutical financial gain related to vaccinations. Other responses included no exposure, Autism, and dangerous ingredients. The main ideas of anti-vaccination messages are presented in figure 5.

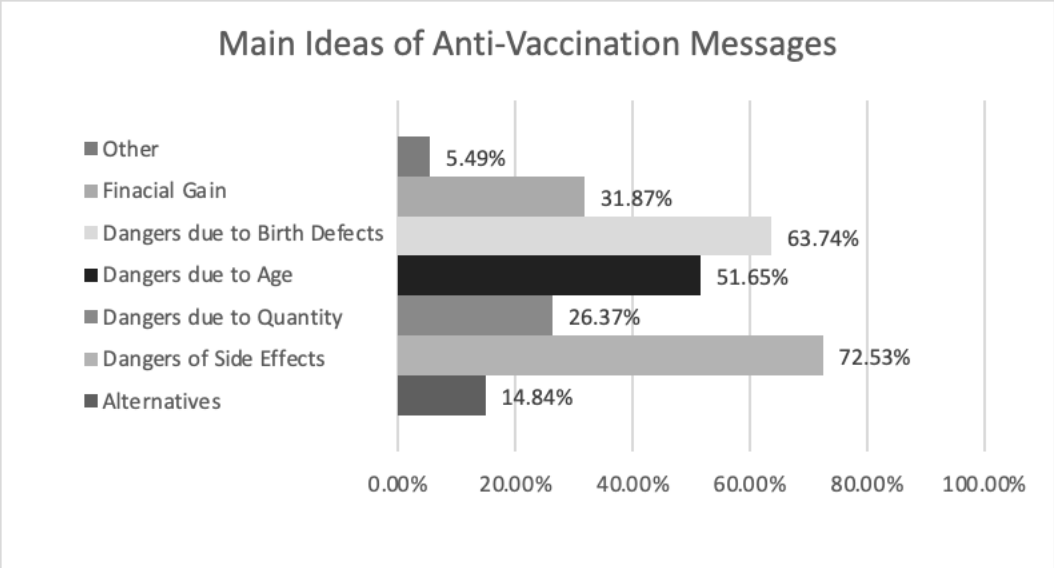

Figure 5. Main ideas of anti-vaccination messages. Participants were able to select more than one option resulting in a total of over 100%.

Personal Posts were identified as the most common source of anti-vaccination messages with 75% of participants selecting this choice compared to only 60% of participants reported seeing personal post for pro-vaccination messages. Organizations and groups were selected by 34% of participants as a source for anti-vaccination messages and news articles were cited by 16%. Medical and health companies were the most common identified source for pro-vaccination messages with 72% of study participants but only 9% of participants selected this option related to anti-vaccination messages. Government organizations were identified as a source by 48% of respondents and then news articles were also reported in 42% of participants for pro-vaccination messages. Facebook was listed as a written option for both anti and pro-vaccination messages.

Vaccination perception was determined by scoring several questions and summing them into one perception score. This process was described in a previous section. Vaccination intent was determined by an additional question as the end of the survey. Eighty eight percent of participants indicated that if they were to have a child today, they would vaccinate that child. Six percent of participants indicated that they would not want to vaccinate and another 6% indicated that they were not sure if they would vaccinate.

Research Question Analysis

RQ1: What is the relationship between exposure to anti and pro-vaccination messages through social media and the perceptions of young adults ages 18 – 24 years toward the use of childhood vaccinations?

H_o1: There is no significant relationship between the perceptions of young adults ages 18 – 24 years towards childhood vaccinations due to exposure to anti-vaccination messages or pro-vaccination messages through social media.

H_a1: There is a significant relationship between the perceptions of young adults ages 18 – 24 years towards childhood vaccinations due to exposure to anti-vaccination messages or pro-vaccination messages through social media.

A one-way ANOVA was conducted using SPSS to address this research question. The one-way ANOVA was conducted twice to account for exposure to anti-vaccination and pro-vaccination messages. The initial step in the analysis of this research question was to assess the assumptions for a one-way ANOVA. There are 6 assumptions that need to be met to effectively conduct an ANOVA. The first three required no statistical

evaluation to determine. The dependent variable in this scenario is the perception score which is measures on a continuous scale. The independent variable is categorical and consists of 5 independent groups. The final assumption was that there was independence of observations and since no participant was in more than one group, this assumption was met. The final 3 assumptions were tested during the analysis process. The presents of outliers in the data was assessed through boxplot analysis. No outliers were found in the data. The assumption of normality was evaluated using normal QQ plots and this assumption was met. The final assumption that must be met is homogeneity of variance. This assumption was met, as assessed by Levene's test for homogeneity of variance for anti-vaccination messages ($p = .372$) and pro-vaccination messages ($p = .819$).

The perception scores of individuals exposed to anti-vaccination messages decreased between no exposure ($n=38$, $M = 31.3$, $SD = 18$) and exposure only once or twice ($n = 64$, $M = 18.82$, $SD = 15.04$). The perception score increased between occasional exposure ($n = 60$, $M = 19.92$, $SD = 16.16$) and exposure on a regular basis ($n = 18$, $M = 24.75$, $SD = 18.98$). The perception score was lowest for exposure every time on social media ($n = 3$, $M = 16.66$, $SD = 9.46$).

Perceptions of childhood vaccinations was statistically significantly different for different levels of indirect exposure to anti-vaccination messages, $F (4,178) = 4.100$. $p = .003$. There was a decrease in the perception score from the no exposure group ($M = 31.3$, $SD = 18$) to the exposure once or twice group ($M = 18.82$, $SD = 15.04$), a mean decrease of 12.51, 95%CI [3.25, 21.78], which was statistically significant ($p = .002$). There was also a decrease in the perception score from the no exposure group ($M = 31.3$, $SD = 18$)

to the occasional experience group (M19.92, SD = 16.16), a mean decrease of 11.41, 95%CI [2.03, 20.79], which was statistically significant (p = .009). All other mean differences were found to not be statistically significant. The full results of the post hoc tests are presented in table 2.

Table 2. *ANOVA Post Hoc Test Results for Perception Score and Exposure to Anti-Vaccination Messages*

Original Group	Comparison Group	Mean Difference	95%CI	Significance
I have never experienced this	I have only experienced this once or twice	12.51	[3.25, 21.78]	p = .002
	I have experienced this occasionally	11.41	[2.03, 20.79]	p = .009
	I have experienced this on a regular basis	6.59	[-6.35, 19.54]	p = .626
	I have experienced this every time I am on social media	14.67	[-12.46, 41.81]	p = .570

The perception scores of individuals exposed to pro-vaccination messages decreased between no exposure (n = 27, M = 31.31, SD = 17.93) and exposure only once or twice (n = 34, M = 22.86, SD = 16.80). Perception scores also decreased between exposure every time on social media (n = 4, M = 31.82, SD = 20.66), occasional exposure (n = 74, M = 21.50, SD = 15.96) and regular exposure (n = 44, M = 16.94, SD = 15.97).

Perceptions scores were statistically significantly different for different levels of indirect exposure to pro-vaccination messages, F (4,178) = 3.556. p = .008. There was a decrease in the perception score from the no exposure group (M = 31.31, SD = 17.93) to the regular exposure group (M = 16.94, SD = 15.97), a mean decrease of 14.37, 95%CI [3.25, 25.49], which was statistically significant (p = .004). All other mean differences were found to not be statistically significant. All results of the post hoc tests are presented in table 3.

Table 3. *ANOVA Post Hoc Test Results for Perception Score and Exposure to Pro-Vaccination Messages*

Original Group	Comparison Group	Mean Difference	95%CI	Significance
I have never experienced this	I have only experienced this once or twice	8.45	[-3.27, 20.18]	p = .277
	I have experienced this occasionally	9.81	[-0.41, 20.04]	p = .067
	I have experienced this on a regular basis	14.37	[3.24, 25.49]	p = .004
	I have experienced this every time I am on social media	-0.50	[-24.88, 23.87]	p = 1

The ANOVA and subsequent post hoc testing revealed that there was a significant difference in perception scores between the levels of exposure to anti and pro-vaccination messages. Therefore, the null hypothesis was rejected in lieu of the alternative hypothesis.

RQ2: What is the relationship between the perceptions of young adults towards childhood vaccinations and intent to vaccinate future offspring?

H_o2: There is no significant relationship between the perceptions of young adults towards vaccinations and their intent to vaccinate future offspring.

H_a2: There is a significant relationship between the perceptions of young adults towards vaccinations and their intent to vaccinate future offspring.

A one-way ANOVA was conducted to determine if there is a significant relationship between participant's perception scores and their reported future vaccination intentions. The variable Q26_VP_VaccinationIntent was divided into three levels: yes (n = 161), no (n = 10) and I do not know (12). The presence of outliers was tested using boxplots and no outliers were detected. The assumption of normality was met through the assessment of normal QQ plots and there was homogeneity of variances, as assessed by Levene's test of homogeneity of variances (p = .123).

The perception score of individuals was significantly related to vaccination intent F (2, 180) = 22.92, p < .001. There was a decrease in the perception score between the no response group (M = 39.54, SD = 9.35) and the yes response group (M = 19.53, SD = 15.69), a mean decrease of 20.01, 95%CI[8.27, 31.74], which was statistically significant (p < .001). There was also an decrease in the perception score between the I do not know response group (M = 45.45, SD = 12.10) and the yes response group (M = 39.54, SD = 9.35), a mean decrease of 25.92, 95%CI[15.14, 36.69], which was statistically significant (p < .001). The full results of the post hoc tests are presented in table 4.

Table 4. *ANOVA Post Hoc Test Results for Perception Score and Intent to Vaccinate*

Original Group	Comparison Group	Mean Difference	95%CI	Significance
Intent Response -No	Intent Response – Yes	20.01	[8.27, 31.74]	p = <.001
	Intent Response – I do not know	5.91	[-9.51, 21.32]	p = .637
Intent Response – I do not know	Intent Response – Yes	25.92	[15.14, 36.69]	p = <.001

The ANOVA and post hoc testing were statistically significant ($p<.05$) and so the null hypothesis was rejected in lieu of the alternative hypothesis.

RQ3: Is there a relationship between the perceptions of young adults toward childhood vaccinations and gender?

H_o3: There is no significant relationship between the perceptions of young adults towards childhood vaccinations and gender.

H_a3: There is a significant relationship between the perceptions of young adults towards childhood vaccinations and gender.

A one-way ANOVA was conducted to explore the relationship between vaccination perceptions and gender. Participants were divided into three groups: female (n = 114), male (n = 67) and other (n = 2). The data contained no outliers as seen through boxplot analysis and the assumption of normality was met through inspection of normal QQ plots. Levene's test of homogeneity of variance was not statistically significant and

the assumption for homogeneity of variance was met (p = 209). There was an increase in the perception score between females (M = 21.49, SD = 17.28) and males (M = 24.15, SD = 16.43) but a decrease between both above groups and participants in the other group (M=9.09, SD = 6.43). The difference within these groups was not statistically significant, F (2,180) = 1.136, p = .323.

The ANOVA was not statistically significant (p > .05). The null hypothesis cannot be rejected, and the alternative hypothesis cannot be accepted.

Analysis of Additional Hypothesis

A1: Is there a significant difference in weekly social media use based on gender?

H_oA1: There is no significant difference in weekly social media use based on gender.

H_aA1: There is a significant difference in weekly social media use based on gender.

A Mann-Whitney U test was conducted to examine if there were significant differences in weekly social media use between male and female participants. The assumption for similar distribution shape between both groups was assessed visually through the inspection of a population pyramid histogram. The distributions were similar, and this assumption was met. Social media use in females (mean rank = 97.95) was statistically significantly higher than males (mean rank = 79.17), U = 3026.50, z = -2.573, p = .01. The Mann-Whitney U test was statistically significant, the null hypothesis was rejected in lieu of the alternative hypothesis.

A2: Is there a significant difference in perception scores between participant's education level?

H_oA2: There is no significant difference in perception scores between participant's education level.

H_aA2: There is a significant difference in perception scores between participant's education level.

A one-way ANOVA was conducted to determine if there was a significant difference in the perception scores of participants based on their reported education level. All assumptions for the ANOVA were met including, no outliers identified in boxplot analysis, normal distribution of data and homogeneity of variance (p = .186). Participants were separated into groups based on their self-reported level of education: some high school (n = 8), graduated high school (n = 32), 1 year of college (n = 25), 2 years of college (n = 37), 3 years of college (n = 33), graduated college (n = 34), some graduate school (n = 5), completed graduate school (n = 3). Perception scores were statistically significantly different for different levels of education, F (7, 169) = 2.32, p = .028.

Post Hoc testing revealed that perception scores decreased between the graduated high school group (M = 29.26, SD = 19.32) and the 3 years in college group (M = 15.98, SD = 14.51), a mean increase of 13.28, 95%CI [.694, 25.87], which was statistically significant (p = .031). All other comparisons were not statistically significant.

The ANOVA and post hoc tests were statistically significant (p<.05) and so the null hypothesis was rejected in lieu of the alternative hypothesis.

Summary

The overall results for the study indicated that there was a significant relationship between exposure to anti-vaccination messages and pro-vaccination messages through social media on the perceptions of young adults towards childhood vaccinations. Survey results provided insight into the nature of these messages and the sources of both anti and pro-vaccination messages. Gender was not found to significant factor to perception scores in participants, but education level was found to be significant. Perception scores and vaccination intent were also found to have a statistically significant relationship.

A detailed discussion of the study results and the implications for social changes of this study will be the primary topic of Chapter 5. Interpretation of the statistical findings based on the theoretical framework and existing literature will establish the importance of this research and what it contributes to the collective body of work on this topic. A discussion of the limitations of this study and recommendations for follow up studies and addition research in this field will conclude the information included in Chapter 5.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this study was to explore the relationship between exposure to information about childhood vaccination and the perceptions that young adults have regarding childhood vaccination and their intent to vaccinate. Quantitative analysis of the data found that perceptions scores were significantly different for different levels of exposure to both anti- and pro-vaccination messages. There is a significant relationship between vaccination perceptions and intent to vaccination, but gender was not a significant factor in vaccination perception.

This chapter includes the interpretation of the data analysis discussed in the previous chapter. The results will be discussed in the context of this study and their implications for the current literature. The chapter will conclude with a discussion of the limitations of the study, implications for social change, and recommendations for further research into this topic.

Interpretation of Findings

General Interpretation

Social media use was widely reported by the study participants, with less than 2% reporting not to use social media in some form. The data indicated that most participants use multiple social media sites with Instagram, YouTube, and Snapchat being the most popular options. Reported exposure rates were overall higher for pro-vaccination messages, with 24% of participants reported regular exposure, and only 10% reporting regular exposure to anti-vaccination messages. These results were confirmed with the

comparison question, where 56% reported experiencing more pro-vaccination messages than anti-vaccination messages.

The nature of these messages showed little similarity in the messages they delivered and the sources that they originated from. The most-reported message for pro-vaccination focused on necessity and safety, and the most common source was medical or health-related companies. Participants stated that anti-vaccination messages were most often about the dangerous side effects and potential for congenital disabilities such as down syndrome; however, 31% also reported seeing messages about government or pharmaceutical companies' financial gain. The most common source for anti-vaccination messages was a personal post, with less than 10% of participants reporting seeing anti-vaccination messages from a medical or health-related company.

The data collected in this study provides critical insights into what information is being promoted and how the messages are being delivered. The first research question attempts to understand if that information has a significant relationship to how these individuals perceive childhood vaccinations.

Research Question 1

The potential relationship between anti-vaccination and pro-vaccination exposure through social media and the participant’s perceptions of childhood vaccinations was the topic addressed by the first research question. The analysis was significant overall for both exposure anti-vaccination messages and pro-vaccination messages impacting the perceptions of participants. The analysis was broken down by the amount of exposure, and each level did not result in a significant impact on the perceptions of participants.

The relationship between pro-vaccination messages and vaccination perception was only significant for one comparison group from the analysis. Participants who reported regular exposure to pro-vaccination messages on social media had a more positive perspective about childhood vaccination than those that reported no exposure. No other groups had significant results. These results indicate that there is a relationship between no exposure to positive vaccine messages and regular exposure to vaccine messages on how young adults perceive getting their children vaccinated.

Exposure to anti-vaccination messages was a significant factor for vaccination perception with more than comparison. Participants that reported exposure only once or twice had a significantly lower perception score than those that reported no exposure. Additionally, participants that reported occasional exposure had a lower perception score than those that reported no exposure. Lower perception scores represent individuals that are less likely to delay and refuse vaccination and have a more positive outlook on vaccinations. These results indicate that, to some extent, there is an inverse relationship between exposure to anti-vaccination messages and perception scores, at least to the level of occasional exposure.

The analysis of research question one provides exciting clues into the relationship between exposure to messages about vaccinations and people's perceptions. However, we must remember that this analysis only allows us to determine if a relationship exists. We cannot make any assumptions about a cause and effect relationship with this level of analysis.

Research Question 2

Research question 2 answers a critical question that may seem like common sense, but assumptions cannot be made in the pursuit of real understanding. The purpose of this research question is to determine if there is a relationship between an individual's perception of vaccinations and their reported intent to vaccinate. A significant relationship was found through data analysis. There was a significant decrease in perception scores between participants that did not intend to vaccinate and those that did. There was also a significant decrease in perception scores between the groups that reported they were unsure if they would vaccinate and those that reported they would vaccinate. These results indicate that there is a relationship between perception and intent to vaccinate. Overall, people who reported an intention to vaccinate future children had a more positive perspective of vaccinations. We cannot speculate if the positive perspective influences the intent to vaccinate or vice versa with this data.

Research Question 3

Research question 3 addressed the question of whether gender played a significant role in how individuals view vaccinations. This question was valuable to consider because gender can play a critical role in our perspective, particularly concerning issues concerning children since the women do carry the child, and there they are influencing factors such as typical gender roles in parenting. For this study, gender was not found to have any significant relationship with perceptive on childhood vaccination. How this information coincides with the current literature will be discussed in the following sections.

Interpretation Based on Literature Review

Comparing the results of this study with the information that was collected in the literature review, specific trends can be identified. The findings of this study echo many established ideas within the field of vaccine research and add to it new information that has not been the focus of research previously.

In the literature review, one common thread in the discussion of vaccine history and understanding perspectives on vaccination is the issue of controversial information and trust. Incidents like the Wakefield controversy create doubt and mistrust that cannot be retracted. We still see the far-reaching impact of unethical research in this field, and this study (Dixon & Clark, 2013). Participants were asked to provide information on the types of anti-vaccination messages that they had been exposed to. For this question, participants could select as many answers as they felt were relevant. There was also an option to provide a written response if there was a message not represented in the provided options. Seventy-two percent of participants reported seeing messages about the dangers of vaccine side effects, and 63% stated that they had seen messages about the dangers of specific risks such as down syndrome and other congenital disabilities. Ten individuals chose to leave a written response, and three of those sited autism directly. Dangerous side effects and congenital disabilities are still a common concern for people regarding childhood vaccination and a persistently used dialogue for anti-vaccination campaigns.

As stated in previous chapters, this research further highlights the importance of information on the topic of vaccination acceptance. This extends to the quality and

quantity of information available and how this information is reaching its audience. In the literature review, studies indicated that mothers who found informal information more reliable were less likely to vaccinate and that mothers who intended to delay or refuse vaccination reported relying on socially available sources of information or the internet (Aharon et al., 2017; Weiner et al., 2015). This study found that 75% of individuals reported personal posts from an individual as a common source of anti-vaccination messages compared to only 9.3% reported seeing anti-vaccination messages from medical or health companies.

While the method and messages being conveyed match the previous research in the field, one area that this study did not confirm was the vastly higher rate of anti-vaccination messages on social media and the internet. Several studies cited in the literature review discuss the prevalence of anti-vaccination messages on sites that have a reduced level of scrutiny and regulations. In a 2015 study assessing the top 175 videos about vaccination on YouTube, 74% of those were anti-vaccination in nature (Venkatraman et al., 2015). A similar study conducted in 2015 found that 74% of 800 vaccination posts on Pinterest were anti-vaccination (Guidry et al., 2015). In this study, 56% of participants reported being exposed to more pro-vaccination messages, while only 16% stated they were exposed to more anti-vaccination content. This study did not explore the content of different social media sites or conduct a thorough investigation of the internet habits of each participant. However, these results do show the possibility of a shift in the content on social media related to vaccination.

The majority of the literature review was spent understanding how perceptions of vaccinations are understood and what factors are considered to be critical components. This information was critical in the development of the survey instrument and in evaluating the participants' perceptions. It is difficult to compare to established work in the field, given that no similar studies that been completed on young adults. The majority of perception studies related to vaccination are conducted with parents being the primary target audience and used to help understand the choice that they have already made. This study was designed to take a proactive and preventive look at this public health issue rather than the standard retroactive approach.

Mendel-Van Alstyne and associates conducted a study on vaccine confidence and the importance of information in 2017. In that study, they talked about how participants displayed more confidence when the information they were receiving matched beliefs that they already held. They recommended that vaccine education in younger individuals could help influence more positive associations with vaccination. This idea is one of the main principles that this study is building off, and one of the main questions is, what do these young adults think about vaccinations.

Overall, the majority of the participants in this study had a favorable perspective on vaccinations. Approximately 92% of participants indicated that they would not refuse vaccination for reasons other than illness or allergy. A higher percentage of the participants were open to delaying vaccination, with only 78% reporting that they would not delay vaccination. Participants showed a high level of trust, with 73% being confident in following the recommended shot schedule and 76% sayings they would fully trust their

child's pediatrician. Only 3.8% of participants reported that they did not feel that vaccine-preventable illnesses were severe. The majority of participants reported that they felt vaccine-preventable illnesses were severe and that it was not better for children to develop natural immunity than receive vaccinations. In the end, 88% indicated that if they were to have a child today, they would want him or her to receive all the recommended vaccinations.

Participants were concerned about a few aspects of vaccination, even though the majority reported that they do intend to vaccinate. Participants were asked to rate their level of concern in three areas: vaccine side effects, overall safety, and failure to prevent specified disease. Twenty-four percent were concerned that the vaccine might not prevent the intended disease, and 15% were concerned that the vaccine might not be safe. Nineteen percent expressed concern for vaccine-related side effects. There was also a higher level of middle-level responses (not sure) for these questions, averaging around 20%.

While participants expressed concerns over side effects and safety, the majority were confident in their choice to vaccinate, and ultimately most participants indicated that they would vaccinate if they had to choose today. The question now becomes, does this perspective change? If so, what factors influence that decision and how many follow through with their intent to vaccinate their children. We know that the current national average is around 72% for the seven series vaccinations for children with some states with levels in the 60% range (AAP, 2016). Our research indicated that 88% intended to

vaccinate, and even with small sample size and study limitations, this is a large discrepancy that merits continuous exploration.

Interpretation Based on Theoretical Framework

The theoretical framework provides the foundational structure that the premise and study are built on. It provides a focus and perspective for the study to focus on and a new way to see the study subject. For this study, two theories were chosen as the theoretical framework. The HBM is very established in public health research and has a strong foundation is vaccine research. Since this study was looking at the vaccination research in a brand-new population, using an established and effective method helped ground the study. This theory was primarily used to help create our assessment for vaccine perception. The second theory that was used in this study is the social marketing theory. This theory was not as directly linked to historic vaccine research. The reason this theory was a perfect fit for this study is due to the focus on social media and indirect exposure. Indirect exposure is, in a way, a form of advertisement. It may not be as structured as a company launching a new health campaign, but the basis is the same. In this section, the results will be interpreted based on these theoretical frameworks.

Health Belief Model.

The HBM was used primarily to inform the research into the participants' perspectives of childhood vaccinations. Human perspectives are complicated, and there is no single theory that can truly capture all the factors that could potentially influence an individual's decision. This theory provides one possible framework for how individuals make choices related to preventative health care. There are six essential constructs used

with this theory. However, since we were trying to understand participants' current frame of mind and not influence their perspective, only three primary constructs were used. In assessing the vaccine perspectives are participants, we looked at perceived severity, barriers, and benefits of action (LaMorte, 20160 Perceived severity was addressed by merely asking participants if they believed that the disease prevented by vaccinations are severe. The benefits of action considered in this study were the effectiveness of the vaccine and natural immunity versus immunity through vaccination. The last construct is perceived barriers. This includes anything that would prevent individuals from vaccinating. The barriers that were included in this study were: confidence and trust in health professionals, the number of shots given, the age of the child when receiving shots, concerns over side effects and vaccine effectiveness, and overall safety. This represents the common barriers found through the literature review, but it does not represent a complete picture of the potential barriers that could influence a parent's decision to vaccinate.

The Social Marketing Theory.

The focus of this theory is that information must be designed, targeted, and distributed with a specific population in mind. Information cannot only be told to everyone in the same format and be equally effective among all populations (Evans, 2006). According to this theory, the critical elements in marketing information effectively is to target the audience correctly, generate interest, strengthen the focus behavior, or message, and develop an image or impression to make an impact (Communication Theory, 2016). These principles can be applied to the research study conducted here. Two

conflicting messages are competing for attention. The platform of social media targets a broad audience due to a large amount of the population using these platforms. The results showed that the approaches these two messages are using to reach the audience are very different. Anti-vaccination messages are more commonly distributed through the personal post and focus on highlighting the barriers such as dangerous side effects and risks associated with vaccinations. Pro-vaccination messages are disseminated mainly through medical and health-related companies, with some coming from personal post and government organizations. Pro-vaccination messages tend to focus on the necessity for vaccinations, the diseases they prevent, and that they are safe to use. The effectiveness of each strategy is impacted by several factors with the population, such as trust in the health care system and social influence.

With the internet and use of social media only increasing in prevalence, social marketing in health care will need to adapt to this new environment in order to be effective. The results of this study show that the participants were favorable to vaccinations. However, actual vaccination rates are declining in the U.S. Could this be due to ineffective social marking of positive vaccination messages to the right audience? Further research is needed to fully understand this issue and how vital it could be to reach young adults before they are making choices about vaccinating their children.

Limitations of the Study

Every study has limitations due to the nature of the study, errors in the research design, bias, and many other potential sources. As a dissertation study, the breadth and reach of this study are limited in its very nature due to time, financial, and personnel

constraints. While this is a national study and there were participants from all across the country, issues with the recruitment on social media and the change to the Survey Monkey participant pool limit the generalizability.

The design of this study introduced a particular bias to the study. The use of a survey instrument, the study assumes that individuals are honest in the answers that they provide, but there is no method to verify the data. Provisions are made to reduce stress and promote anonymity so that participants do not feel like they need to fabricate or alter their responses for fear of judgment or negative consequences. The survey instrument was also altered to fit this study design. The survey tool was tested in a pilot study and approved by the IRB; it is still not established in the field and is a source of potential bias and reliability issues.

The data collected and information gained from this study is new and does add to the existing body of literature. However, it was very general, and additional studies will need to explore deeper into the social media habits and the content of vaccination messages on these platforms. This study is also not able to determine cause and effect relationships; therefore, the information that can be learned from this study is limited. This study design is necessary for determining if there is a relationship worth exploring further with a more in-depth and robust research design.

Recommendations

Based on the strengths and limitations of this study, a large-scale robust study is recommended. This study would need to address the challenges with recruitment via social media and use random sampling to increase the reliability of the study. Additional

research would also help establish the survey instrument and increase the reliability of this and additional studies done with this instrument. Qualitative and quantitative research into the social media habits and content of social media messages regarding vaccination and their relationship to perceptions of vaccinations within this target population is needed to continue what was started with this study. As well as an in-depth study of how different information sources are perceived regarding health information. Do young adults' value personal post and individual communication more than official government and health care organizations?

Updated information on the types of vaccination messages that are prevalent on different social media platforms and how effective the different marketing techniques are against the target audience would increase the effectiveness of new vaccine promotion initiatives focused on young adults and social media platforms. Longitudinal studies that could evaluate the perceptions of young adults before they have kids and then after they have had children reevaluate their choice and their perspective would give insight into if investing in educating young adults about vaccinations before they have children is an effective strategy for health care organizations.

In addition to the suggestions made above, it is important to note the impact of the current public health crisis. The data for this study was collected in 2018 -2019 before the COVID-19 pandemic began. This current public health crisis has increased the visibility of public health and conversation on vaccinations. While not directly linked to childhood vaccinations, these current events could have a significant impact on people’s perceptions of public health and vaccination.

Implications for Social Change

Prevention is the primary focus of public health, and vaccinations are a cornerstone of that mission. With the development of medicine and technology, the illnesses that were prevalent in the early days of this country are no longer a significant health concern. In a country obsessed with health and cleanliness, potentially dangerous side effects seem to be the more significant threat. This world is changing, and an increasing rate of vaccine-preventable diseases are beginning to show up across the country. Recent events have thrown public health and vaccinations back in the national spotlight as our country is fighting against a pandemic, and many hopes that a new vaccine will be the answer. This is an odd change in public opinion for a country that had decreasing vaccination rates, and it is confirmation that perceived susceptibility is a critical component of individuals committing to preventative health care.

This research represents a new approach to vaccine health promotion, taking preventative medicine a step further, and focusing on proactive education and outreach. The potential here is the opportunity to engage generations of future parents and change the narrative between health care organizations and the public. Establish trust, provide honest and accurate education, and address the barrier to vaccine acceptance before they are in the position to make that choice.

On an individual and familial level, the impact of this research is that people do not have to lose someone to a preventable disease. This is a straightforward construct and one that is often lost in the noise of potential side effects and reactions. However, the reality is that with decreasing vaccination rates across the country, this will be a reality

for many families that choose not to vaccinate and those that do not have the immunity to protect themselves. Herd immunity is a term that is often at odds in society about individuality and rights. There needs to be a new direction that speaks to this generation at this time to increase the public's understanding of these critical issues.

Health care organizations can continue this line of research to understand better the impact of social media on our perceptions of vaccinations and how we can use that to be more effective in health prevention promotion. The concept of being proactive about prevention is not limited to vaccination and can be applied to any number of health care issues and public health policy. The essence of public health is that prevention is better than a cure, and this research embodies that philosophy in its methods and framework.

Conclusion

Vaccinations are an incredibly controversial miracle of science. In a developed world, these illnesses are just a memory or a page in a history book for most. The consequences of not understanding and acting on the importance of vaccination are increasing rates of vaccine-preventable diseases across the country. As a critical public health concern, new approaches are needed to address the decline in vaccine acceptance, and this research presents a new direction to consider. Targeting new health promotions and vaccine acceptance initiatives at young adults before they have children could be one element in changing the direction of vaccine acceptance

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Appendix A: Pilot Study Instrument

PILOT STUDY

Impact of the Internet on Perceptions of Vaccinations Assessment Tool Pilot Study

Informed Consent

You are invited to take part in a research study about the impact of the internet and social media on how young adults perceive childhood vaccinations. The researcher is inviting young adults between the ages of 18 -24 years currently living in South Carolina that are not yet parents or medical professionals to be in the study. This form is part of a process called " informed consent" to help you understand the study before deciding whether to part.

The study is being conducted by a researcher named Hollie Xu, who is a doctoral student at Walden University.

Background Information:

The purpose of this study is to understand the impact of exposure to anti-and pro-vaccination messages through the internet and social media on how young adults perceived childhood vaccinations.

Procedures:

If you agree to be in this study, you will be asked to: participate in a one-time collection of data via an online survey. The survey will take approximately 5 -10 minutes and there will be no additional questions or comments beyond this survey.

Here are some sample questions:

-How often do you use social media on a weekly basis?

-Would you ever consider delaying vaccination for reasons other than illness or allergy?

-How concerned would you be that your child might have a serious side effect from a shot?

-If you were to have an infant today, would you want him/her to get all the recommended shots?

Voluntary Nature of the Study:

This study is voluntary. You are free to accept or turn down the invitation to participate. No one at SurveyMonkey, Facebook or Twitter will treat you differently if you decide not to be in the study. If you decide to be in the study now, you can still change your mind later. You may stop at any time.

Risk and Benefits of Being in the Study:

Being in this type of study involves some risk of the minor discomforts that can be encountered in daily life, such as fatigue and stress. Being in this study would not post a risk to your safety or well-being. Other potential risks would include data security measures being breached or violations of confidentiality. Significant measures have been taken to prevent these risks from occurring during the study.

The benefits for this study are more directly seen for the larger community than on an individual level. Increasing vaccination rates increases the protection for member of the population that cannot be vaccinated and are more vulnerable such as newborns and the elderly. Higher vaccination rates also limit the spread and burden of vaccine preventable diseases and protects individuals from these preventable diseases.

Payment:

As a thank you for participating in the study, participants will receive a $2 promo code for Amazon. This gift can be redeemed for a song purchase or put toward any Amazon purchase. Participants will receive the code after completion of the survey.

Privacy:

Reports from this study will not share the identities of individual participants. Details that might identify participants such as location of the study, also will not be shared. The researcher will not use your personal information for any purpose outside of this research project. Data will be kept secure by assigning codes in place of names, electronic copies of the data will be kept in password protects files and paper copies will be locked in a secure location. All Data will only be accessible to the researcher. Data will be kept for a period of at least 5 years, as required by the university.

Contacts and Questions:

For any questions you have now or if you have questions later, you may contact the researcher via [redacted] If you want to talk privately about your rights as a participant, you can call the Research Participant Advocate at Walden University at [redacted]. Walden University approval number for this study is 02-13-19-0373557 and it expires February 12th, 2020.

Obtaining your consent:

If you feel you understand the study well enough to make a decision about it. Please indicate your consent by selecting "yes" below.

1. Please indicate your consent to participate in this study.

Yes
No

Social Media Use:

Social media use is defined as any websites or applications that facilitates the creation and sharing of personal content and encouraging participation in social networking. Social media sites include but are not limited to Facebook, Twitter, Snapchat, Instagram and YouTube.

2. How often do you use social media on a weekly basis?
Once or twice a week
Only when I get a notification
Every few days
Every day for a few minutes
Every day – all the time

3. Which social media site do you use in your daily life? Please check all that apply.
Facebook
Twitter
Snapchat
Instagram
YouTube
Other

Exposure to Indirect Vaccination Information

Indirect exposure to vaccine information is being defined as coming across information about vaccinations without searching for this information. Examples include but are not limited to: social media post by individuals or groups, advertisements by organizations or personal stories from friends or followers. Anti-vaccination messages are being defined as any information that discourages or cautions the use of vaccinations. Pro-vaccination messages are being defined as any information that encourages or promotes vaccination use.

Please indicate how often you have experienced the following items while on social media. (NOTE) Choosing "very frequently (100%)" means that every time you are on social media, you experience these items.

4. Experienced indirect exposure to vaccine information?
Never (0%)
Rarely (25%)
Sometimes (50%)

Somewhat Frequently (75%)
Very Frequently (100%)

5. Experienced indirect exposure to anti-vaccination information?
Never (0%)
Rarely (25%)
Sometimes (50%)
Somewhat Frequently (75%)
Very Frequently (100%)

6. Experienced indirect exposure to pro-vaccination information?
Never (0%)
Rarely (25%)
Sometimes (50%)
Somewhat Frequently (75%)
Very Frequently (100%)

7. Have you ever shared or reposted information that discourages vaccine use?
Never (0%)
Rarely (25%)
Sometimes (50%)
Somewhat Frequently (75%)
Very Frequently (100%)

8. Have you ever shared or reposted information that promotes vaccination use?
Never (0%)
Rarely (25%)
Sometimes (50%)
Somewhat Frequently (75%)
Very Frequently (100%)

9. Do you read / understand everything that you share or repost on social media?
Never (0%)
Rarely (25%)
Sometimes (50%)
Somewhat Frequently (75%)
Very Frequently (100%)

Attitudes about Childhood Vaccination

These questions assess your opinions on childhood vaccinations. There is no correct response. Please provide the answer that is most accurate for you personally. Check only one answer for each of the questions below.

10. Would you ever consider delaying vaccination for reasons other than illness or allergy?

Yes
No
I do not know

11. Would you ever decide NOT to have your child vaccinated for reasons other than illness or allergy?

Yes
No
I do not know

12. How confident are you that following the recommended shot schedule is ideal for children? Please answer on a scale of 1 -10, where 0 is *not confident at all* and 10 is *completely sure*.

13. Children get more shots than are good for them.

Strongly agree
Agree
Neither agree or disagree
Disagree
Strongly disagree

14. I believe that many of the illnesses that vaccines prevent are severe.

Strongly agree
Agree
Neither agree or disagree
Disagree
Strongly disagree

15. It is better for a child to develop immunity naturally by getting sick rather than by getting a shot.

Strongly agree
Agree
Neither agree or disagree
Disagree
Strongly disagree

16. It is better for children to get fewer vaccines at the same time.

Strongly agree
Agree
Neither agree or disagree

Disagree
Strongly disagree

When answering the following questions, imagine that you have just become a new parent. According to national recommendations, your child is ready to receive several vaccinations.

17. How concerned would you be that your child might have a serious side effect from a vaccination?
Not at all concerned
Not too concerned
Not sure
Somewhat concerned
Very concerned

18. How concerned would you be that one of the childhood vaccinations might not be safe?
Not at all concerned
Not too concerned
Not sure
Somewhat concerned
Very concerned

19. How concerned would you be that a vaccination might not prevent the disease?
Not at all concerned
Not too concerned
Not sure
Somewhat concerned
Very concerned

20. If you were to have an infant today, would you want him or her to get all recommended vaccinations?
Yes
No
I do not know

The last questions of the survey are about you. Please check only one answer to each question.

21. What is your gender?
Female
Male
Other

22. What is the highest level of education you have completed?
(Drop down selection)

23. Which of the following best describes your current relationship status?

- Married
- Widowed
- Divorced
- Separated
- In a domestic partnership or civil union
- Single but cohabitating with a significant other
- Single never married

24. Do you have any religious or cultural objections to vaccinations?

- Yes
- No
- I do not know

25. Have you ever done any personal or academic research into childhood vaccinations?

- Yes
- No
- I do not know

26. have you ever worked or trained in the medical field?

- Yes
- No
- I do not know

27. Were you vaccinated as a child?

- Yes
- No
- I do not know

Thank you for completing this Survey

Appendix B: Pilot Study Assessment Form

Pilot Study Assessment Form

** The importance of a pilot study is to evaluate the study protocol and survey instrument to make sure that it is ready to be used in the planned study. This pilot study is to test the revised survey instrument made specifically for my dissertation research study. Please follow the link in the email you received to take the survey before filling out this page.

As the purpose of this pilot is to refine the study and eliminate any problems before it is used to collect data, please provide an honest and critical evaluation of the survey. You do not need to sign or put any personal information on this form and all survey data will not be linked to any personal information.

Please provide as much information as you can in the blanks provided under each question.

- How long did the survey take you?

- Did you read the informed consent form?

- Did you understand the informed consent form? Was there anything that was unclear or that should have been addressed?

- Were the study objectives and instructions easy to understand?

- Were there any sections that needed instructions but did not have any?

- Was the study too long? Were there any questions that seemed redundant or unnecessary?

- Were there any questions that were confusing to you or that you did not understand?

- Do you have any suggestions to make this study better?

Appendix C: Final Survey Instrument

Final Survey Instrument

This survey instrument is composed of an existing survey. Permission was received from the author to include the instrument in this research. Survey instruments were altered as little as possible to maintain the validity and reliability, but some changes were necessary to ensure that data collected would answer the research questions for this study. A full description of all changes made to the survey instrument are included in Chapter 3 of this document.

The survey is presented as a word document here for review but will be constructed and distributed using survey monkey for actual data collection.

Permission to use all instruments was obtained from the authors and the official correspondence and permission is included in Appendix C.

Impact of the Internet on Perceptions of Vaccinations Assessment Tool

Inclusion Criteria Questions

These questions are here to determine if you fit the target population for this study. Please answer the following questions before you begin the survey.

1. Have you ever worked or trained in the medical field?

Yes
No
Other

2. Do you have any religious or cultural objections to vaccinations?

Yes
No
Other

3. Are you a parent or currently expecting a child?

Yes
No
Other

Impact of the Internet on Perceptions of Vaccinations Assessment Tool Informed Consent

You are invited to take part in a research study about the impact of the internet and social media on how young adults perceive childhood vaccinations. The researcher is inviting young adults between the ages of 18 -24 years that are not yet parents or medical professionals to be in the study. This form is part of a process called " informed consent" to help you understand the study before deciding whether to part. The study is being conducted by a researcher named Hollie Xu, who is a doctoral student at Walden University.

Background Information:

The purpose of this study is to understand the impact of exposure to anti-and pro-vaccination messages through the internet and social media on how young adults perceived childhood vaccinations.

Procedures:

If you agree to be in this study, you will be asked to: -Participate in a one-time collection of data via an online survey. The survey will take approximately 5 -10 minutes and there will be no additional questions or comments beyond this survey.

Here are some sample questions:

-How often do you use social media on a weekly basis?

-Would you ever consider delaying vaccination for reasons other than illness or allergy?

-How concerned would you be that your child might have a serious side effect from a shot?

-If you were to have an infant today, would you want him/her to get all the recommended shots?

Voluntary Nature of the Study:

This study is voluntary. You are free to accept or turn down the invitation to participate. No one at SurveyMonkey, Facebook or Twitter will treat you differently if you decide not to be in the study. If you decide to be in the study now, you can still change your mind later. You may stop at any time.

Risk and Benefits of Being in the Study:

Being in this type of study involves some risk of the minor discomforts that can be encountered in daily life, such as fatigue and stress. Being in this study would not post a risk to your safety or well-being. Other potential risks would include data security measures being breached or violations of confidentiality. Significant measures have been taken to prevent these
risk from occurring during the study.

The benefits for this study are more directly seen for the larger community than on an individual level. Understanding the impact of the internet on how we form perceptions and how information influences us, even in an indirect method, is an important concept to study given the ever-expanding reach of the internet. An additional benefit of this study is an assessment of the current vaccine related marketing strategies.

Privacy:

Reports from this study will not share the identities of individual participants. Details

that might identify participants such as location of the study, also will not be shared. The researcher will not use your personal information for any purpose outside of this research project. Data will be kept secure by assigning codes in place of names, electronic copies of the data will be kept in password protects files and paper copies will be locked in a secure location. All Data will only be accessible to the researcher. Data will be kept for a period of at least 5 years, as required by the university.

Contacts and Questions:

For any questions you have now or if you have questions later, you may contact the researcher via hollie.xu@waldenu.edu. If you want to talk privately about your rights as a participant, you can call the Research Participant Advocate at Walden University at 612-312-1210. Walden University approval number for this study is 02-13-19-0373557 and it expires February 12th, 2020.

4. Please indicate your consent to participate in this study.

Yes
No

Social Media Use:

Social media use is defined as any websites or applications that facilitates the creation and sharing of personal content and encouraging participation in social networking. Social media sites include but are not limited to Facebook, Twitter, Snapchat, Instagram and YouTube.

5. How often do you use social media on a weekly basis?

I do not use social media
I only use social media once or twice a week to look at other people's post
I use social media daily but do not actively post my own content
I use social media daily and actively post my own content
I constantly monitor social media, post multiple times daily and am active on friend's pages.

6. Which social media site do you use in your daily life? Please check all that apply.
    Facebook
    Twitter
    Snapchat
    Instagram
    YouTube
    Other

Exposure to Indirect Vaccination Information

Indirect exposure to vaccine information is being defined as coming across information about vaccinations without searching for this information. Examples include but are not limited to: social media post by individuals or groups, advertisements by organizations or personal stories from friends or followers. Anti-vaccination messages are being defined as any information that discourages or cautions the use of vaccinations. Pro-vaccination messages are being defined as any information that encourages or promotes vaccination use.
Please indicate how often you have experienced the following items while on social media.

7. How often have you experienced indirect exposure to vaccine information?
    I have never experienced this
    I have experienced this only once or twice
    I have experienced this occasionally
    I have experienced this on a regular basis
    I experience this every time I am on social media

8. How often have you experienced indirect exposure to **anti-vaccination** information?
    I have never experienced this
    I have experienced this only once or twice
    I have experienced this occasionally
    I have experienced this on a regular basis
    I experience this every time I am on social media

9. How often have you experienced indirect exposure to **pro-vaccination** information?
    I have never experienced this
    I have experienced this only once or twice
    I have experienced this occasionally
    I have experienced this on a regular basis
    I experience this every time I am on social media

10. Have you experienced more anti-vaccination messages or more pro-vaccination messages?

I have experienced more anti-vaccination messages
I have experienced more pro-vaccination messages
I have experienced the same amount of both
I have not experienced either type

Message Content and Sources of Information

These questions assess the main ideas found in the vaccine related information being experienced on social media and the sources of the information. Please choose all answers that apply to your personal experience.

11. What are the main ideas of the **pro-vaccination** messages that you have experienced?

The necessity of vaccinations
The safety of vaccinations
The spread of vaccine preventable diseases
Personal stories of vaccine use
Other
Other (Please Specify) Written response area

12. What are the main ideas of **anti-vaccination** messages that you have experienced?

Alterative vaccination options
Dangers of vaccine side effects
Dangers associated with large numbers of vaccinations required
Dangers associated with giving vaccinations to babies or children to young
Dangers of specific risk such as Down Syndrome or birth defects
Government or Pharmaceutical financial gain
Other
Other (Please Specify) Written response area

13. Identify the sources that you most commonly see **anti-vaccination** messages from.

Personal post from an individual
Government Organizations
Medical or health companies
Private Companies
Organizations or groups
News Articles
Other
Other (Please Specify) Written response area

14. Identify the sources that you most commonly see in **pro-vaccination** information from.

Personal posts from an individual
Government organizations
Medical and health companies
Private companies
Organizations or groups
News articles
Other
Other (Please Specify) Written response area

Attitudes about Childhood Vaccination

These questions assess your opinions on childhood vaccinations. There is no correct response. Please provide the answer that is most accurate for you personally. Check only one answer for each of the questions below.

15. Would you ever consider delaying vaccination for reasons other than illness or allergy?

Yes
No
I do not know

16. Would you ever decide NOT to have your child vaccinated for reasons other than illness or allergy?

Yes
No
I do not know

17. How confident are you that following the recommended shot schedule is ideal for children?

Extremely confident
Very confident
Somewhat confident
Not so confident
Not at all confident

For the following questions, please indicate your level of agreement with each statement. Choose the response that best represents your personal opinion.

18. Children get more shots than are good for them.

Strongly agree
Agree

Neither agree or disagree
Disagree
Strongly disagree

19. I believe that many of the illnesses that vaccines prevent are severe.
Strongly agree
Agree
Neither agree or disagree
Disagree
Strongly disagree

20. It is better for a child to develop immunity naturally by getting sick rather than by getting vaccines.
Strongly agree
Agree
Neither agree or disagree
Disagree
Strongly disagree

21. It is better for children to get fewer vaccines at the same time.
Strongly agree
Agree
Neither agree or disagree
Disagree
Strongly disagree

22. I would fully trust my child's pediatrician and follow all recommendations regarding vaccinations.
Strongly agree
Agree
Neither agree or disagree
Disagree
Strongly disagree

When answering the following questions, imagine that you have just become a new parent. According to national recommendations, your child is ready to receive several vaccinations.

23. How concerned would you be that your child might have a serious side effect from a vaccination?
Not at all concerned
Not too concerned
Not sure

Somewhat concerned
Very concerned

24. How concerned would you be that one of the childhood vaccinations might not be safe?
Not at all concerned
Not too concerned
Not sure
Somewhat concerned
Very concerned

25. How concerned would you be that a vaccination might NOT prevent the disease?
Not at all concerned
Not too concerned
Not sure
Somewhat concerned
Very concerned

26. If you were to have an infant today, would you want him or her to get all recommended vaccinations?
Yes
No
I do not know

The last questions of the survey are about you. Please check only one answer to each question.

27. What is your gender?
Female
Male
Other

28. What is the highest level of education you have completed?
(Drop down selection)

29. Which of the following best describes your current relationship status?
Married
Widowed
Divorced
Separated
Ina domestic partnership or civil union
Single but cohabitating with a significant other
Single never married

30. Were you vaccinated as a child?
    Yes
    No
    I do not know

Thank you for completing this Survey

Appendix D: Survey Permission

PERMISSION: To Use an Existing Survey

4/15/18

Douglas J. Opel, MD, MPH
Seattle Children's Research Institute
Department of Pediatrics University of Washington
School of Medicine Seattle, WA, USA

Dr. Douglas J. Opel:

I am a doctoral student from Walden University writing my dissertation tentatively titled "Impact of the Internet on Young Adults' Perceptions of Childhood Vaccines in South Carolina" under the direction of my dissertation committee chaired by Dr. Tolulope Osoba.

I am requesting your permission to use your survey instrument titled "The Parent Attitudes about Childhood Vaccines (PACV) Survey Tool" in my research study. I would like to use this survey under the following conditions:

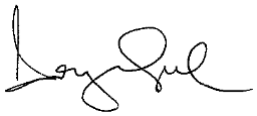
- I will use this survey only for my research study and will not sell or use it with any compensated or curriculum development activities.
- I will include the copyright statement on all copies of the instrument.
- I will send my research study and any related reports to you when completed.

If these are acceptable terms and conditions, please indicate so by signing one copy of this letter and returning it to me via email.

Sincerely,

Hollie Xu
Doctoral Candidate

_____
Signature



Expected Date of Completion: 11/10/19 Permission letter resource: Excerpted from Simon, M.K. (2011). *Dissertation and scholarly research: Recipes for success.* (2011 ED.) Seattle, WA, Dissertation Success, LLC

Appendix E: Variable List

Variable Name	Survey Question
Q1_inclusion_MF	Have you ever worked or trained in the medical field?
Q2_inclusion_OBJ	Do you have any religious or cultural objections to vaccinations?
Q3_inclusion_ParentalStatus	Are you a parent or currently expecting a child?
Q4_consent	Please indicate your consent to participate in this study.
Q5_Socialmedia_weeklyuse	How often do you use social media on a weekly basis?
Q6_Facebook	Which social media sites do you use in your daily life? Facebook
Q6_Twitter	Which social media sites do you use in your daily life? Twitter
Q6_Snap_Chat	Which social media sites do you use in your daily life? Snap Chat
Q6_Instagram	Which social media sites do you use in your daily life? Instagram
Q6_YouTube	Which social media sites do you use in your daily life? YouTube
Q6_OtherSites	Which social media sites do you use in your daily life? Other
Q7_Exposure_general	How often have you experienced indirect exposure to vaccine information?
Q8_Expsure_anti	How often have you experienced indirect exposure to anti-vaccination information?
Q9_Exopure_pro	How often have you experienced indirect exposure to pro-vaccination information?
Q10_Exposure_compare	Have you experienced more anti-vaccination messages or more pro-vaccination messages?
Q11_pro_necessity	What are the main ideas of pro-vaccination messages that you have experiences? The Necessity of Vaccinations
Q11_pro_Safety	What are the main ideas of pro-vaccination messages that you have experiences? The Safety of Vaccinations
Q11_pro_SpreadofDisease	What are the main ideas of pro-vaccination messages that you have experiences? The spread of Vaccine preventable diseases
Q11_pro_Personal	What are the main ideas of pro-vaccination messages that you have experiences? Personal stories of vaccines use
Q11_pro_other	What are the main ideas of pro-vaccination messages that you have experiences? Other
Q11_pro_written	Other (please specify)

Q12_anti_Alternative	What are the main ideas of anti-vaccination messages that you have experienced? Alternative vaccination
Q12_anti_Dangers_SE	What are the main ideas of anti-vaccination messages that you have experienced? Dangers of vaccine side effects
Q12_anti_Dangers_Quantity	What are the main ideas of anti-vaccination messages that you have experienced? Dangers associated with large numbers of vaccinations required
Q12_anti_Dangers_age	What are the main ideas of anti-vaccination messages that you have experienced? Dangers associated with giving vaccinations to babies or children too young
Q12_anti_Dangers_DS	What are the main ideas of anti-vaccination messages that you have experienced? Dangers of specific risks such as Down Syndrome or birth defects
Q12_anti_FinacialGain	What are the main ideas of anti-vaccination messages that you have experienced? Government or Pharmaceutical financial gain
Q12_anti_other	What are the main ideas of anti-vaccination messages that you have experienced? Other
Q12_anti_written	Other (please specify)
Q13_Antisource_Personal	Identify the sources that you most commonly see anti-vaccination messages from. Personal Post from an Individual
Q13_Antisource_Gov	Identify the sources that you most commonly see anti-vaccination messages from. Government organizations
Q13_Antisource_MedicalCom	Identify the sources that you most commonly see anti-vaccination messages from. Medical or health companies
Q13_Antisource_PrivateCom	Identify the sources that you most commonly see anti-vaccination messages from. Private companies
Q13_Antisource_Organizations	Identify the sources that you most commonly see anti-vaccination messages from. Organizations or groups
Q13_Antisource_News	Identify the sources that you most commonly see anti-vaccination messages from. News articles
Q13_Antisource_Other	Identify the sources that you most commonly see anti-vaccination messages from. Other
Q13_Antisource_written	Other (please specify)
Q14_Prosource_Personal	Identify the sources that you most commonly see pro-vaccination information from. Personal post from an individual
Q14_Prosource_Gov	Identify the sources that you most commonly see pro-vaccination information from. Government organizations
Q14_Prosource_MedicialCom	Identify the sources that you most commonly see pro-vaccination information from. Medical and health companies

Q14_Prosource_PrivateCom	Identify the sources that you most commonly see pro-vaccination information from. Private companies
Q14_Prosource_Organizations	Identify the sources that you most commonly see pro-vaccination information from. Organizations or groups
Q14_Prosource_News	Identify the sources that you most commonly see pro-vaccination information from. News articles
Q14_Prosource_Other	Identify the sources that you most commonly see pro-vaccination information from. Other
Q14_Prosource_written	Other (please specify)
Q15_VP_Delay	Would you ever consider delaying vaccination for reasons other than illness or allergy?
Q16_VP_NoVaccine	Would you ever decide NOT to have your child get vaccinated for reasons other than illness or allergy?
Q17_VP_confidence	How confident are you that following the recommended shot schedule is ideal for children?
Q18_VP_Quanity	Children get more shots than are good for them.
Q19_VP_Severity	I believe that many of the illnesses that vaccines prevent are severe.
Q20_VP_Naturalimmunity	It is better for a child to develop immunity naturally by getting sick rather than by getting vaccines.
Q21_VP_LessQuanity	It is better for children to get fewer vaccines at the same time.
Q22_VP_AllRecommendations	I would fully trust my child's pediatrician and follow all recommendations regarding vaccinations.
Q23_VP_SideEffect	How concerned would you be that your child might have a serious side effect from a vaccination?
Q24_VP_NotSafe	How concerned would you be that one of the childhood vaccinations might not be safe?
Q25_VP_NotPrevent	How concerned would you be that a vaccination might not prevent the disease?
Q26_VP_VaccinationIntent	If you were to have an infant today, would you want him or her to get all recommended vaccinations?
Q27_Gender	What is your gender
Q28_Education	What is the highest level of education you have completed?
Q29_RelationshipStatus	Which of the following best describes your current relationship status?
Q30_VaccinationHistory	Were you vaccinated as a child?