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Attitudes Towards Vaccinations in the Minnesota Slavic Community

Maksim Kozak
Bethel University

Hannah Margaret Roy
Bethel University

Rachel Van Heest
Bethel University

ATTITUDES TOWARDS VACCINATIONS IN THE MINNESOTA SLAVIC COMMUNITY

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BY

MAKSIM KOZAK, PA-S

HANNAH ROY, PA-S

RACHEL VAN HEEST, PA-S

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Abstract

The incidence of vaccine preventable illnesses is increasing in the United States. Negative attitudes towards vaccinations, or vaccine hesitancy is fueling the decreasing vaccination rates. Ascertaining the level of vaccine hesitancy in susceptible populations is essential in combatting the rise of vaccine preventable illnesses in the United States. Very little research has previously been compiled on vaccine attitudes in Slavic immigrants. Slavic immigrants identify racially as "white" on surveys, masking differences in the Slavic population from the much larger Caucasian population in the United States.

In order to better understand the level of vaccine hesitancy in the Minnesota Slavic immigrant population, the researchers dispensed the Parental Attitudes on Childhood Vaccinations (PACV) survey at a Ukrainian church. The PACV has been validated to accurately measure vaccine hesitancy. Participants that indicated on the survey that they were born in a Slavic country were included in the final data collection.

Surveys revealed a high level of vaccine hesitancy in the Minnesota Slavic immigrant population. The average PACV score of the Minnesota Slavic immigrants was compared to the average PACV score of the populations of three other research studies that had also used the PACV survey. The Minnesota Slavic immigrant population reported a significantly higher level of vaccine hesitancy than any of the three other populations that had taken the PACV survey.

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Introduction

Preventative care measures, such as the use of vaccinations, rely on the compliance of the general population (The College of Physicians of Philadelphia [CPP], 2016). Unfortunately, vaccination effort is often resisted for a variety of reasons. Four common reasons for resistance against vaccines are as follows: anecdotal evidence against vaccinations, cultural and communication barriers, religious beliefs, and doubts in their safety and efficacy (CPP, 2016).

As the population in Minnesota grows, the risk for communicable disease increases. Compliance with vaccination programs in Minnesota is key to keeping the general population healthy (CPP, 2016). In order to combat misinformation on vaccines, locating which communities are at risk of widespread vaccination refusal is necessary. Currently, the ever-growing Slavic community in Minnesota has little known about them regarding their overall opinion on vaccinations (The Minneapolis Foundation [TMF], 2004). The lack of knowledge within the Minnesota Slavic population is largely due to this immigrant population's official categorization as "white" (TMF, 2004). Examining the vaccine hesitancy rate within this particular population in Minnesota will open the doors to further understanding and research on similar Slavic communities throughout America.

Background Information

Overestimating the effect vaccines have had on global healthcare is difficult. According to a study by the John Hopkins Bloomberg School of Public Health (2016), for every $1 spent on vaccinations, $44 is acquired in net gain. The money saved by vaccines comes both from the avoided treatment costs, and the negative impact that illness in the population has on the economy (John Hopkins Bloomberg School of Public Health, 2016). Moreover, due to the

person-to-person mode of transmission employed by the vast majority of vaccine-preventable illnesses, a phenomenon known as “community immunity is documented (National Institute of Allergy and Infectious Diseases [NIAID], 2016, para. 2). In community immunity, if a high percentage of individuals in a population are vaccinated against a given pathogen, even the unvaccinated are protected (NIAID, 2016). This protection against communicable diseases extends to persons who cannot receive a vaccine due to an immunocompromised status, or other reasons that might make someone ineligible to receive vaccinations (NIAID, 2016).

The benefits of community immunity are only enjoyed by the population if a very high percentage of the group, typically 95-97%, receive the vaccinations (CPP, 2016). The local, state, and national government must decide whether receiving vaccinations should be a mandatory protocol, or if each citizen is allowed to make an individual choice, and may refuse vaccination if they desire (CPP, 2016). In the United States, the history of vaccine refusal dates back to 1905, with a lawsuit protesting the smallpox vaccine (Parmet, 2005). The most common reasons for refusal can be broken down into three categories: individual agency, religious beliefs, and lack of trust in authorities (CPP, 2016).

According to CPP (2016), individual agency refers to each person’s right to decide what goes into his or her own body, including medications. This value of individual agency is held in especially high esteem in the United State of America, where individual freedom is a cherished right. However, a problem arises when the health and welfare of society suffers due to poor choices by some of its members, as is the case with refusals to vaccinate against communicable diseases (CPP, 2016). In the first lawsuit against forced vaccinations, the request to not be vaccinated against smallpox was denied, due to the high concern over the deadly spread of smallpox to those with weakened immunities (Parmet, 2005). In that original case of

noncompliance in receiving the smallpox vaccine, the interests of society trumped the right of the individual to refuse medical interventions (Parmet, 2005).

Religious beliefs are another powerful reason for many to avoid vaccinations (CPP, 2016). The development process of some vaccines has used tissue acquired from aborted fetuses, causing some groups to avoid using these vaccines whenever possible (Luno, 2006). Others refuse medications in general on the grounds that they are "unnatural," and full of unknown chemicals or animal products that should not be enveloped into the body (CPP, 2016). Men and women who hold religious beliefs that cause them to refuse vaccinations are of special concern, as they tend to cluster together in small communities (CPP, 2016). Clustering of unvaccinated individuals can result in a large-scale, uncontrolled outbreak among a population that is all vulnerable to the same disease (CPP, 2016).

Lack of trust in authorities is the third and final most common reason for vaccine refusal (CPP, 2016). The people pressuring society hardest to vaccinate tend to be among the most highly educated, wealthy, and powerful, such as healthcare professionals and those in government positions (CPP, 2016). The sponsorship of vaccines by the privileged can result in mistrust by the poor, less educated members of the community who may view vaccines as a conspiracy created by a corrupt government (Reyes & Curry-Stevens, 2015).

According to the Minnesota Department of Health [MDH] (2016), three populations have been identified as "at risk" for lack of sufficient health care: persons with medical limitations, persons with functional independence limitations, and persons with communication limitations. Individuals with medical limitations are at risk of developing complications due to an underlying medical condition, such as dialysis, an open wound, or reliance on suction (MDH, 2016). Many

of the medically limited do not possess the ability to care for themselves alone, and do not have a caregiver, further increasing their risk of insufficient healthcare (MDH, 2016).

People with functional independence limitations are at risk for decreased access to healthcare due to either mobility or psychiatric conditions (U.S. Department of Health & Human Services [HHS], 2016). Those people with functional independence limitations include wheelchair users, people with Alzheimer's disease, and people with debilitating psychiatric illnesses, such as depression, anxiety, and mood disorders (HHS, 2016). Individuals with functional independence limitations are more likely to have complicated medical needs, and less likely to have access to healthcare, particularly if they have limited family/friend/healthcare personnel support or resources (MDH, 2016).

The third at risk group identified consists of those with communication limitations (MDH, 2016). Those people with communication limitations includes persons with a language or culture barrier, and individuals such as an elderly patient with decreased hearing who experience difficulty exchanging information (HHS, 2016). People with communication limitations are less likely to access healthcare due to a lack of comfortability and trust in the healthcare system (MDH, 2016). Those people with communication limitations are also less likely to be able to enact the medical regimen they are prescribed, as a consequence of inadequate understanding (HHS, 2016).

Minnesota is well-known as an immigrant-friendly state, particularly to Hispanics, Somalians, Hmong, Indians, and Slavic (TMF, 2004). A primary reason these immigrant populations have traveled to Minnesota is the attractiveness of the existing support structure that exists for individuals from these backgrounds. This support structure includes increased awareness and resources within healthcare (TMF, 2004). Translators are more available within

the hospitals and clinics for those speaking Spanish, Somali, Hmong, Hindi, and Russian, and clinics are built with these communities in mind.

Although each group faces unique problems when navigating the Minnesota health system, the Slavics are particularly at risk for communication limitations and unidentified disagreements with American practitioners regarding medical care (TMF, 2004). Slavics are at high risk of facing communication barriers because they are identified by the United States government as white, and oftentimes are not categorized as a distinct group from Caucasians (TMF, 2004). Because they are combined with all persons of Western European descent in government surveys, the Slavs tend to receive inadequate language and cultural translation assistance (TMF, 2004). However, despite their appearance and government identification as white, Slavs themselves report feeling very separate from the Caucasians of Minnesota (TMF, 2004). Slavs hold a strong desire to protect and preserve their own cultural heritage, including the Slavic languages, just like any other immigrant population (TMF, 2004). The end result is the Slavs hold many beliefs, including beliefs on medical practices that are very different from the majority of Caucasians (TMF, 2004). However, these differences between Slavic and non-Slavic beliefs are often not reflected in surveys, as Slavs select "white" as their identifying race, and they are not great enough in number to significantly impact the trend-line in the survey outcome (TMF, 2004).

Problem Statement

The health of our nation is an ongoing struggle, but a struggle in which our country has been slowly gaining traction (CPP, 2016). Diseases that once plagued the nation years ago do not surface in our general population today. The CPP (2016) attributes this successful eradication of many serious infections to vaccines, but also notes that vaccines have also long been the subject

of various ethical controversies. Identifying the populations that are most likely to refuse vaccines, and the underlying beliefs that motivate this behavior of vaccine rejection, can greatly strengthen the health of the American population (CPP, 2016).

Minnesota has a rich multi-cultural population, including many immigrant groups from Asia, Africa, South America, and Europe. Previous studies have found that immigrant subpopulations tend to have lower overall vaccination rates than the non-immigrant population (MDH, 2016). However, within this important work of recording immigrant vaccination beliefs, a knowledge gap is noted in one of Minnesota's largest immigrant populations: Slavic immigrants (TMF, 2004). Studies have not yet been published on the rate of vaccine hesitancy in Minnesota's Slavic immigrant population. Furthermore, a study executed in Washington State found that the Slavic immigrant population is especially susceptible to low vaccination rates (Wolf, Rowhani-Rahbar, Tasslimi, Matheson, & DeBolt, 2016). Therefore, surveying the Slavic immigrant population in Minnesota on vaccine hesitancy is imperative.

Purpose

The purpose of this study was to use survey methods to obtain data on the Minnesota Slavic immigrant population's level of vaccine hesitancy, and explore how likely Slavic immigrants in Minnesota were to vaccinate, when compared with other populations. This research on Slavic vaccine hesitancy levels was important to identify a population potentially at risk for under-vaccination, as well as for overall community immunity in the Minnesota population, which depends on high levels of compliance.

Significance of the Problem

According to the CPP (2016), "Unvaccinated individuals pose risks to children or people with medical contraindications who can't be vaccinated, as well as vaccinated individuals

(vaccines are not 100% effective)" (para. 4). The only way to protect these unvaccinated or ineffectively vaccinated individuals, is to keep them from coming into contact with anyone carrying the preventable disease (Centers for Disease Control and Prevention [CDC], 2014b). Disease outbreaks can occur with even a single infected individual, as he or she enters a community and begins to infect others who are not immune to the infection (CDC, 2014b). A person who has not received any of the vaccinations given in the United States leaves themselves vulnerable to a plethora of diseases that have historically killed a significant percentage of populations (CPP, 2016). An unvaccinated person is not only risking his or her own health, but also the health of many others (CPP, 2016). One unvaccinated person is potentially infecting everyone he or she comes in contact with, including those who were not able to get the vaccine or did not have an effective immune response (CDC, 2014b).

"Vaccines are responsible for many global public health successes, such as the eradication of smallpox and significant reductions in other serious infections like polio and measles" (CPP, 2016, para. 1). Certain diseases against which vaccines have been created, have been entirely eliminated in the United States, but still have a presence in other parts of the world (PublicHealth, 2016). Vaccines provide a barrier against these preventable diseases, but if this barrier is penetrated, these diseases could reappear in the United States (CPP, 2016). Immigrants provide a means for communicable diseases to penetrate the protection established through years of careful vaccination (CDC, 2014b). The CDC (2014b) states that, "disease rates are low in the United States today. But if we let ourselves become vulnerable by not vaccinating, a case that could touch off an outbreak of some disease that is currently under control is just a plane ride away" (para. 4). If an immigrant is infected in his or her country of birth and then travels to the United States, that disease has the potential to infect vulnerable people (CDC, 2014b).

An unvaccinated individual will come in contact with many people in a typical day, particularly if he or she travels through a highly trafficked public area, such as a supermarket or school (CDC, 2014b). An unvaccinated individual is posing a risk to everyone with whom he or she is in close proximity (CDC, 2014b). Unvaccinated individuals are especially dangerous to individuals who were not able to get vaccinated due to contraindications and those who did not have a successful immune response from the vaccine (CDC, 2014b). If individuals who do not want to get vaccinated or have their children vaccinated can be identified, then the particular reasons for that vaccine hesitancy can be more effectively addressed. Through specific targeting of vaccine hesitant populations with information that matches each population's unique concerns, the gap between the actual and ideal vaccination rate within the United States population can eventually be closed. With this goal of 100% vaccination coverage in mind, conducting specific research studies on the vaccine hesitancy level in unique populations such as the Slavic population of Minnesota is necessary.

Research Questions

Given the lack of vaccination information on Minnesota's Slavic community, the researchers posed the following questions:

1. What was the vaccine hesitancy level of the Slavic immigrant community in Minnesota?
2. How did the vaccine hesitancy level of the Slavic immigrant community compare to other non-Slavic populations when compared to in previous research?

Definitions of Terms

The following are definitions for important terms found throughout this study:
Community immunity: synonymous with herd immunity; a state in which the majority of the community has been vaccinated, thus protecting individuals who have not been vaccinated or

who cannot get vaccinated, due to the limited opportunity for disease outbreak (PublicHealth, 2016).

Compliance: the action of following through with a request or guideline. In the case of this research proposal this means the act of receiving government and medical provider recommended vaccinations (CPP, 2016).

Eradication: the process of removing a disease throughout the world permanently. An example of this is smallpox, which was eradicated in 1980 (CPP, 2016).

Elimination: the process of reducing the incidence of a specific disease in a population to zero (CPP, 2016). Many diseases have been successfully eliminated in the United States by vaccines, but have not been successfully eliminated throughout the world (CPP, 2016). Elimination is only permanent if achieved worldwide (CPP, 2016).

Immunization: synonymous with vaccination. See vaccination.

Slavic Community: a community of immigrants from East Europe and Northwest Asia, including Belarus, Bulgaria, Czech, Poland, Serbia, Croatia, Slovenia, Russia, Ukraine, Slovakia, Macedonia, and Montenegro, who speak an Indo-European language.

Slavic Immigrant**:** for the purpose of this research proposal, "Slavic immigrant" includes any first generation immigrant from a Slavic country who can read and fill out a survey in either English or Russian.

Vaccination: abbreviated to vaccine, synonymous with immunization. A vaccination is a product created for a specific disease that produces an immune response to that disease after being introduced into the body (CDC, 2014a). Typically, a vaccination is a weakened version of the pathogen that is unable to cause infection, but is recognizable to the body (CDC, 2014a). Most often the vaccine is transmitted through needle injection but can also be a nasal spray or taken

orally (CDC, 2014a). The term "vaccination" can also refer to the action of administering this product.

Vaccine hesitancy: apprehension to vaccines, resulting in a reluctance or refusal to receive vaccinations. A low PACV score correlates with an increased rate of vaccine hesitancy according to the studies done in Washington State and Tennessee using the PACV (Opel, et al., 2013; Williams, et al., 2015).

Summary

Vaccinations play an important role in strengthening communities by preventing outbreaks and protecting the vulnerable through community immunity (CPP, 2016). Community immunity is fragile and breaks down if high vaccination rates (95-97%) are not maintained (CPP, 2016). The Slavic population in Minnesota is growing, many of whom may be at risk for under-vaccination due to cultural and communication barriers (TMF, 2004).

Chapter 2 contains three major elements: first, a review of the role of vaccinations and community immunity in public health; second, a summary of the existing research findings on vaccination rates and attitudes among immigrants; third, a summary of the research conducted on vaccination rates and attitudes specifically in Slavic immigrants. The purpose of chapter 2 is to evaluate what the existing literature has found regarding the tendency of Slavic immigrants to follow vaccination recommendations, and determine existing attitudes about vaccines. Additionally, Chapter 2 summarizes existing literature about Slavic immigrant knowledge of vaccine safety, efficacy, and importance and Chapter 3 will cover the methodology behind the study and the data collection.

Chapter 2: Literature Review

Introduction

Current research shows that the Slavic population is an ever growing community in Minnesota (Hirsi, 2016). Research conducted in the Portland, Oregon area revealed that many in the Slavic community hold negative opinions about vaccinations (Wolf et al., 2016). However, a lack of available information on the vaccine hesitancy level of the Minnesota Slavic population, and the underlying assumptions and experiences that have shaped the views of this community. Because effective community immunity requires participation from all population sub-groups, and can be addressed through community outreach, identifying the vaccine hesitancy within the Minnesota Slavic population is important (CPP, 2016). This chapter will address this first step of exploring the vaccine hesitancy level of the Slavic community in Minnesota.

The first portion of this chapter defines a vaccine, how the introduction of vaccines affected certain diseases, and the dangers associated with an under-vaccinated population. The second part of this chapter examines the views immigrants hold on vaccinations: first broadly, and then with a specific focus on the Slavic population.

The Benefits of Vaccines

A vaccine is any substance that triggers the immune response to build protective immunity against a communicable disease, but does not actually cause the disease (CDC, 2014a). Vaccines can be given through a number of different ways, although most commonly they are administered with sterile needles and syringes into the muscle (CDC, 2014a). Vaccines are extremely cost effective, as they are relatively inexpensive, yet a single dose can provide lifelong immunity (although some require boosters) from a devastating disease (World Health Organization [WHO], 2016a). Furthermore, because persons receiving a vaccine do not need to

undergo lifestyle modification, vaccines are accessible to every population subset, given local and government cooperation (WHO, 2016a). According to the WHO (2016a), "Immunization is a proven tool for controlling and eliminating life-threatening infectious diseases, and is estimated to avert between 2 and 3 million deaths each year" (para. 2).

The WHO estimates vaccines could potentially prevent 1.5 million more deaths each year if worldwide vaccination rates increased (WHO, 2016b). Complete eradication of infectious diseases is now possible because of vaccines, as smallpox was eradicated in 1980 (Maurice, 2015). However, many factors, including patient and parent vaccination refusal, as well as lack of supplies in many locations, stand in the way of the health goal of complete eradication (CDC, 2014c). Until a disease is completely eradicated worldwide, lowered rates of vaccination at any time and in any place, can cause an epidemic (CDC, 2014c).

Diseases and the Introduction of Vaccines

Diseases that plagued the United States in the past are no longer common or threatening to the American people (Roser, 2016). This dramatic decrease in disease is due to the fact that vaccines have almost eliminated twenty diseases from the United States (CPP, 2016). Below is a list of the twenty diseases against which a vaccine has been formulated (CPP, 2016):

Diphtheria is a disease caused by *Corynebacterium diphtheriae* bacteria, and is transmitted from person to person by respiratory droplets (CDC, 2016). *C. diphtheriae* affects the throat and may eventually cause the development of a thick grey pseudomembrane, which can cause asphyxiation (CDC, 2016).

Haemophilus influenzae Type B (Hib) is a bacterium that mostly infects children, and can cause a multitude of diseases, including meningitis, pneumonia, and epiglottitis (CPP, 2016).

Hepatitis A (Hep A) and Hepatitis B (Hep B) are both viruses that cause an infection of the liver (CPP, 2016). Hepatitis A is transmitted via the fecal-oral route, and Hepatitis B is transmitted through contact with bodily fluids (CPP, 2016).

Human Papillomavirus (HPV) causes cervical cancer and anogenital warts (CPP, 2016). HPV is sexually transmitted (CPP, 2016).

Influenza is a virus that causes a respiratory infection, and is commonly referred to as the "flu" (CPP, 2016). The influenza virus is transmitted from person to person via respiratory droplets (CPP, 2016).

Measles, also known as Rubeola, is a virus from the paramyxovirus family, and lives in the nose and throats of the infected individual (WHO, 2017a). Measles is highly contagious and transmitted by respiratory droplets via person to person (WHO, 2017a).

Meningitis is caused by the bacteria *Neisseria meningitidis*, and is spread by direct contact or by respiratory droplets (CPP, 2016). Common symptoms of meningitis include fever, headache, confusion and stiff neck (CPP, 2016).

Mumps is caused by the Paramyxovirus, and is transmitted via respiratory droplets (CPP, 2016). The most distinguishable symptom of Mumps is swelling of the salivary glands below the ear (CPP, 2016).

Pertussis is caused by the *Bordetella pertussis* bacterium, and transmitted via respiratory droplets (CPP, 2016). Pertussis causes an inflammation of the respiratory tract, commonly known as whooping cough (CPP, 2016).

Pneumococcal disease, caused by the bacteria *Streptococcus pneumoniae*, is a common childhood illness (CPP, 2016). *S. pneumoniae* colonizes the noses and throats of the infected

individual, and may or may not cause symptoms, allowing for infection to be spread through asymptomatic carriers (CPP, 2016).

Polio, the common name for poliomyelitis, is caused by a virus in the Enterovirus genus (CPP, 2016). Polio is typically asymptomatic or presents as a mild respiratory or gastrointestinal infection, but in less common instances can cause paralysis (CPP, 2016).

Rotavirus is transmitted via the fecal-oral route, and causes diarrhea, resulting in severe dehydration in infants and children (CDC, 2015a).

Rubella is caused by the Rubivirus, which is transmitted through respiratory droplets, and causes a full body rash after 2 weeks of exposure (CPP, 2016).

Shingles is caused by the Varicella zoster virus, which also is the causative agent in chickenpox (CPP, 2016). Shingles typically occurs in the sixth decade of life, and presents as severe pain and a subsequent rash, that occupies a dermatome (CPP, 2016).

Tetanus is caused by the spores of the bacteria *Clostridium tetani*, and typically enters the body through an injury to the skin, then infects the nervous system causing painful muscle spasms and death if untreated (CPP, 2016).

Tuberculosis, caused by the bacteria *Mycobacterium tuberculosis*, is spread via respiratory droplets (WHO, 2017b). Tuberculosis can cause an active infection, manifesting as a bloody cough, or the bacteria can lay dormant in a host, showing no symptoms until reactivation during times of immunosuppression (WHO, 2017b).

Typhoid Fever, caused by the bacteria *Salmonella typhi*, is spread through contaminated water and presents as a high fever (CPP, 2016).

Varicella, commonly known as chickenpox, is caused by the Varicella zoster virus, which is also the causative agent in shingles (CDC, 2015a). Chickenpox is transmitted via respiratory

droplets, and tends to infect young children (CDC, 2015a). The varicella vaccine is a live vaccine, and thus the virus is weakened and unable to cause disease in a healthy immune system (CDC, 2015b).

Yellow Fever, caused by a virus from the family Flaviviridae, is transmitted to people from infected mosquitoes (CPP, 2016). Yellow fever causes fevers, jaundice, and hemorrhage leading to shock and multisystem failure in severe cases (CPP, 2016).

According to the book, *Our World in Data*, the presence of the 20 diseases listed previously has greatly decreased since the advent of the vaccines formulated against them (Roser, 2016). For example, in the United States, diphtheria had a 100 percent reduction in cases after the introduction of the vaccine, which occurred in the 1920's (Roser, 2016). Before the diphtheria vaccine was introduced, an average of 21,053 cases were reported annually in the United States, 1,822 of which resulted in death (Roser, 2016). Similarly, the number of polio cases in the United States was reduced by 100 percent, after the introduction of the vaccine in 1955 (Roser, 2016). Before the polio vaccine, there was an annual average of 19,794 cases of acute polio per year in the United States, with 7% per year resulting in death, and an annual average of 16,316 cases of paralytic polio, with 12% per year resulting in death (Roser, 2016). According to the CDC (2014b), measles also affected "nearly everyone in the U.S…before there was a vaccine, and hundreds died from it each year" (para. 1). After widespread implementation of the measles vaccine, the United States reported the annual average of measles cases declined by 99.9% (Roser, 2016). This steep reduction in reported cases of the 20 previously listed diseases after vaccine implementation, is a common trend, with most vaccine-preventable diseases showing a case decrease in the upper 90th percentile (Roser, 2016).

In the United States, where vaccines are readily available and actively promoted, the decrease in annually reported cases of these vaccine preventable diseases is particularly high (CDC, 2016). However, in many countries with fewer healthcare resources, regular community outbreaks of vaccine preventable diseases still occur, this is linked to low vaccination rates (CDC, 2016). According to the CDC (2016) in 2014, 7,321 new cases of diphtheria were documented in developing countries, as well as many other unreported cases. Diphtheria is still endemic in developing areas, such as the Caribbean, Latin America, Eastern Europe, Southeast Asia, and Africa (CDC, 2014b). Polio, while entirely eliminated from the U.S. since 1979, continues to cause paralysis in children every year in Africa (CDC, 2014b). Measles outbreaks occurred in 2011 in the Pacific Islands, Asia, Africa, and Europe, with more than 35,000 newly reported measles cases (CDC, 2014b). The burden of these vaccine preventable diseases falls almost exclusively on developing countries, as they do not have the means or finances to administer the vaccine to the general population (Roser, 2016).

Vaccines have significantly reduced the number of annual cases of communicable diseases reported in the United States, and have begun to slowly extend this decrease throughout the world, as countries industrialize (Roser, 2016). The WHO (2016c) considers smallpox "one of the world's most devastating diseases known to humanity" (para. 1). However, as a result of the smallpox vaccine introduced in 1796 by Edward Jenner, smallpox was eradicated throughout the world in 1980 (WHO, 2016c). The elimination of smallpox was a global effort, in which each country strove to achieve 80 percent vaccine coverage (WHO, 2016c). This campaign to end smallpox began in 1966 and lasted until 1977 (WHO, 2016c). By 1980 the goal of worldwide eradication was met, and smallpox became the first and only disease to be permanently ended through the application of vaccines (WHO, 2016c).

The Risk of Under-vaccination

As stated in the previous section, vaccine preventable diseases have not disappeared, except for smallpox (CPP, 2016). Vaccine preventable diseases may not be reported in the U.S. but they are still a problem in developing countries (CDC, 2016). According to the CDC (2014b) in 2011, "90% of measles cases in the U.S. were associated with cases imported from another country" (para. 3). The U.S. has been spared from a nationwide outbreak because the majority of Americans have been vaccinated against measles (CDC, 2014b). Clearly, the United States population is still being exposed to a plethora of vaccine preventable diseases on a daily basis, largely due to travelers or immigrants entering the country (CDC, 2014b).

According to the NIAID (2016), "when a critical portion of a community is vaccinated against a contagious disease…there is little opportunity for an outbreak" (para. 1). If an individual has been vaccinated against a particular disease, the risk of contracting that disease is minimal, and the threat of spreading that disease to others is eliminated (NIAID, 2016). The idea of having the majority vaccinated is known as community immunity, where the vaccinated community effectively provides a type of immunity to those who could not get vaccinated (NIAID, 2016). This protection of community immunity occurs because the contagious disease, which propagates and spreads from person to person, is unable to establish enough active infections within a population to effectively spread through a community (NIAID, 2016). Community immunity relies on a vast majority of the population being vaccinated, and if this majority does not receive vaccinations, then an outbreak of a vaccine preventable disease can occur (NIAID, 2016). One case of the measles in a community under-vaccinated against measles is all it takes to put the entire local population at risk of an epidemic (NIAID, 2016).

Vaccination Rate in the General Population

In order to combat the risk an under-vaccinated population poses to all of society, it is imperative that persons who are less likely to vaccinate themselves or their children can be identified (NIAID, 2016). One effective means to detect high levels of vaccine hesitancy in parents is the use of screening tools (Opel, et al., 2013). The Parent Attitudes About Childhood Vaccines survey (PACV) is a survey that was validated in 2013, and showed an ability to reliably predict childhood immunization status (Opel, et al., 2013). In the original PACV validation study, parents who received higher scores on the PACV were significantly less likely to have vaccinated their children at the time of the follow up survey 8 weeks later (Opel, et al., 2013). The first study was conducted in the state of Washington and included 437 parents (Opel, et al., 2013). The surveys taken by the parents were given a score of 0-100, with 100 signifying complete vaccine hesitancy, and the mean score was found to be 28.5 (Opel, et al., 2013).

A follow up study in the state of Tennessee, with a sample size of 158, found that the PACV successfully predicted which parents would immunize their children at older ages than the recommended childhood vaccine schedule (Williams, et al., 2015).. A third study using the PACV was conducted in two pediatric clinic in the state of Arizona, and had 158 participants, with a mean adjusted PACV score of 19.65 (Eby, 2017). The PACV was utilized as a method to risk stratify parents of young children, and identify the group of parents most likely to benefit from extra education on the benefits and side effects of vaccines (Eby, 2017). Through the PACV, the vaccine hesitancy rate in any population can be quantified and compared with other populations, providing insight into the risks posed by vaccine preventable diseases in a particular area of the world (Opel, et al., 2013).

Immigrants to the United States

In 2014, the United States accepted 1.3 million foreign-born individuals into the country (Zong & Batalova, 2016). According to the Migration Policy Institute, the U.S. population in 2014 consisted of 81 million immigrants and their U.S. born children, which accounted for 26 percent of the total U.S. population (Zong & Batalova, 2016). In addition, the United States houses a significant number of undocumented immigrants who are not included in government statistics (Zong & Batalova, 2016).

Minnesota had a population of 404,819 foreign-born individuals in 2014, who collectively have 177,463 U.S. born children (Wilder Research, 2016). One large immigrant group entering Minnesota is the Slavic population (Hirsi, 2016). Overall, the Slavic population in Minnesota is estimated to be as large as 60,000 people, both foreign and U.S.-born (Hirsi, 2016). The primary language of Slavics, Russian, is the 5th most spoken foreign language in Minnesota. (Wilder Research, 2010). To put this into perspective: of those who primarily speak a foreign language at home, 40% speak Spanish, 26% speak Hmong, 11% speak Somali, 4% speak Vietnamese, and 3% speak Russian. (Wilder Research, 2010). This study will focus on the Slavic immigrant population.

The Vaccination History of Ukraine

The vast majority of the Slavic immigrants in Minnesota come from the former Soviet Union, having traveled to the United States in several waves (Hirsi, 2016). “One group arrived in the 1970s, another in the 1980s, and a large group came after the Soviet Union collapsed in 1991” (Hirsi, 2016, para. 11). In order to understand the behavior and beliefs of these Minnesota-dwelling Slavic immigrants a person should look at the current experiences of their counterparts who did not emigrate, but in remained Eastern Europe (Hirsi, 2016). Of particular interest are the

Slavs living in Ukraine, where plummeting vaccination rates have allowed for outbreaks of vaccine preventable diseases that had previously been entirely removed from the country (WHO, 2016b).

The fear of a vaccine preventable epidemic occurring due to lowered vaccination rates in a population was realized in Ukraine in the past decade (WHO, 2016b). Ukraine has a complex past and present political history, beginning with years of abuse from Soviet-era policies, and continuing to the present day with the current annexation of Crimea by Russia. The effects of political instability on vaccination rates has been dramatic in Ukraine (The United Nations Children's Fund [UNICEF], 2013). In 2005 and 2006 the vaccination rates for measles and rubella in Ukraine were 93%, below the 95% threshold needed to avoid the spread of measles and rubella, and the result was 46,000 reported cases with 4 deaths (Bazylevych, 2011). According to Bazylevych (2011), the decrease in effective community immunity against measles and other vaccine preventable illnesses is "linked to Soviet immunization policies and practices" (para. 1).

Ukraine again made headlines in the summer of 2011, when two cases of paralysis caused by poliovirus occurred, raising global concern over the vaccination rates in this country, particular that of polio (WHO, 2016b). In 2014, the percentage of the population vaccinated against polio was 95% in Europe, which is the minimum threshold required to keep community immunity intact against polio (Bagcchi, 2015). In Ukraine in 2014, the percentage of the people vaccinated against polio was 50%, and only 14% for those under one year old (Bagcchi, 2015). UNICEF (2013) has collected data on the national vaccination coverage rates in Ukraine in the years 1995, 2000, and 2005-2011. Vaccination coverage in Ukraine of diphtheria-tetanus-pertussis (DTP3), hepatitis B (HepB3), meningococcal (MCV), and polio (Pol3), while close to

100% from 1995-2006, began to fall rapidly over the next five years (UNICEF, 2013). UNICEF (2016) found from 2006 to 2015, the percentage of the Ukrainian population receiving the DTP3 vaccine dropped from 98% to 23%, HepB3 from 96% to 22%, MCV from 98% to 56%, and Pol3 from 99% to 45%.

The explanation for the extreme decline in vaccine coverage in Ukraine is complex and multilayered (Bazylevych, 2011). Dr. Bazylevych is a professor at Luther College in Decorah, Iowa (Luther College, 2016). She is an expert in the field of medical anthropology with a special interest in post-socialist environments (Luther College, 2016). In 2007-2008, Dr. Bazylevych traveled to central and western Ukraine, and collected 150 interviews with medical providers, conducted in Russian or Ukrainian (Bazylevych, 2011). The interviews with Ukrainian providers collectively revealed key insights that help explain the alarming decline in vaccination coverage in Ukraine (Bazylevych, 2011).

Socialism, the ideology behind the Soviet Union, was highly concerned with the well-being of the general population. Freedom from disease was one of the greatest goals of Socialism and preventive health was seen as the road to this end (Bazylevych, 2011). Vaccinations aligned perfectly with the Soviet belief that the group should be considered above the individual at all times, even if coercion and manipulation was necessary to secure the health of the working class (Bazylevych, 2011). “As early as 1919, the Commissariat of Public Health initiated mass vaccination against smallpox, tuberculosis in late 1930s, diphtheria (1940), pertussis (1955), polio (1956), and measles and mumps (1970)” (Bazylevych, 2011, para. 10). Although the Soviet Union dissolved in 1991, the healthcare model set up by the Soviet regime, in which the government makes healthcare decisions for the people, and pays for that healthcare, has remained (Bazylevych, 2011). According to Bazylevych (2011, para. 14), “The Constitution of

Ukraine dictates that the state has a legal responsibility for ensuring free and universally accessible health care". This policy of government controlled and funded healthcare, when combined with political instability, led to disastrous results (Bazylevych, 2011). In February 2015, Holt wrote "Fighting between Ukrainian Government forces and pro-Russian separatists has led to the almost complete breakdown of essential services.…Vaccine coverage for some diseases is down to 40% and doctors fear outbreaks of polio and measles" (p. 494).

However, even in times when all vaccinations were readily available and entirely paid for by the government, deep-set distrust within the Ukrainian people has caused a widespread rejection of vaccines as dangerous (Bazylevych, 2011). This distrust of vaccines is two-fold, arising from both a suspicion of anything resembling the former Soviet-sponsored health programs, and a distrust of the current vaccine manufacturers (Bazylevych, 2011).

Although the Soviet Union was effective to a large degree at effectively vaccinating the people of Ukraine against many communicable diseases, evidence has shown multiple vaccines manufactured during the Soviet era had reduced efficacy (Bazylevych, 2011). A retrospective study examining medical records found that many people inoculated during the Soviet era with a Russian-made mumps vaccine did not obtain adequate immunity, and contracted mumps in an outbreak in 2002-2006 (Hrynash, Nadraga, & Dasho, 2008). However, individuals exposed to mumps who had received a newer version of the mumps vaccine, made in Belgium, displayed full immunity against mumps (Hrynash et al., 2008).

Another study investigated the previously mentioned measles outbreak of 2005-2006, and found that those individuals who had received a Soviet era vaccination required a supplemental dose of measles vaccine to obtain adequate immunity (Velicko et al., 2008). Supporting the suggestion that the measles vaccine was at least partially ineffective, studies have shown that

despite similar vaccination rates in the US and USSR in 1982, the United States recorded 1,700 cases of measles, while the USSR saw 466,000 deaths from measles (Bazylevych, 2011). Ukraine was not the only former Soviet country to experience recent measles outbreaks (Bazylevych, 2011). Georgia, Kazakhstan, and Kyrgyzstan have also had notable measles epidemics since the end of the Soviet Union, casting further suspicion on the Soviet era measles vaccine (Bazylevych, 2011).

Finally, reporting officers who were charged with carrying out the Soviet vaccination plan, falsified documents to inflate vaccination numbers (Bazylevych, 2011). Additionally, many instances of poor vaccine transport practices during the Soviet era are recorded such as lack of refrigeration, which can cause breakdown of vaccines, making them ineffective (Bazylevych, 2011). Evidence that Soviet administered vaccines were unable to provide immunity from communicable diseases has contributed to suspicions towards vaccinations in Ukraine (Bazylevych, 2011). This experience with ineffective vaccines, combined with the fact that these vaccines were forcibly administered by a hostile government, propagates Ukrainian doubt in vaccination that continues to this day (Bazylevych, 2011).

Medical providers in Ukraine have been placed in a particularly difficult position. Healthcare workers Ukraine must navigate the perilous waters between an unstable government that mandates 100% vaccination, and a population who largely refuses to be vaccinated (Bazylevych, 2011). Bazylevych (2011) conducted a qualitative study in 2008 with 150 semi-structured interviews, conducted in the Ukrainian or Russian language with physicians and medical students. The goal of Bazylevych's (2011) survey was to determine how the social turmoil created by a post-socialist environment was affecting medical providers. Bazylevych (2011) found that many medical providers look back wistfully at the Soviet era as a time when

vaccines and other medications had some form of quality control (Bazylevych, 2011). The medical providers noted that the open market practices that exist in Ukraine today have resulted in cheap vaccines that may or may not contain the labeled ingredients (Bazylevych, 2011). Occasionally these unregulated vaccines cause terrible side effects suggestive of dangerous additives, such as mercury (Bazylevych, 2011). Most informants admitted to falsifying medical records to inflate reported vaccination rates, with some justifying this act as necessary to protect their patients from both the government and the non-quality controlled vaccines (Bazylevych, 2011).

The Ukrainian media has been another key player in the perfect storm, which has resulted in plummeting vaccine rates (Bazylevych, 2011). In response to the measles outbreak of 2007, a measles and rubella vaccination campaign was prepared by the Ukrainian Ministry of Health, and funded by WHO (Bazylevych, 2011). Widespread rejection of the campaign occurred on many levels (Bazylevych, 2011). Providers rejected the vaccine because it was manufactured in India, and they reasoned it could carry infections associated with third-world countries (Bazylevych, 2011). Newspapers ran numerous stories decrying all vaccines as a scam, claiming vaccines cause all types of illnesses, including cancer (Bazylevych, 2011). The vaccine campaign against measles and rubella was abruptly canceled, after the public outcry grew to a fever pitch over the sudden death of a teenager who received the vaccine (Bazylevych, 2011). Although the death was likely unrelated to the vaccination, large public protests occurred at the doors of the Ministry of Health, and the health official responsible for initiating the vaccination campaign promptly resigned (Bazylevych, 2011).

Although Ukrainian immigrants in the United States do not face the same current circumstances as those still living in Ukraine, understanding the common context that has shaped

those who grew up under the former Soviet Union is important. The forced vaccination practices of the Soviet Union are largely to blame as the cause of the current low rates of vaccination in Ukraine (Bazylevych, 2011). A person must consider that the Slavics living in the United States have faced the same experiences as Slavics who have remained in Ukraine, and may share some level of distrust in government vaccination programs (Bazylevych, 2011). Minnesota contains a large number of Slavic immigrants raised in the Soviet era, many of whom are now deciding whether to vaccinate their American-born children (Hirsi, 2016).

American Immigrants and Vaccinations

Before specifically addressing vaccination rates in the Slavic immigrant population, vaccination rates among all major immigrant groups in the United States must be considered and then compared to those vaccination rates of the general public. A study in New York City examined several factors (i.e. race, ethnicity, marital status, knowledge, and concerns about vaccinations) that may affect interest in vaccination (Vlahov, Bond, & Jones, 2012). The New York study found that being born outside of the US was the greatest predictor of disinterest in vaccination (Vlahov, Bond, & Jones, 2012). In the case of immigrants and vaccinations, disinterest and under-vaccination go hand in hand (Lu, Lainz, O'Halloran, Greby, & Williams, 2014). A 2012 national health interview survey of over 34,000 adults, including over 6,000 immigrants, compared U.S. born with foreign born vaccination rates for several vaccines (Lu et al., 2012). The national health survey found decreased vaccination rates among foreign born adults for all the vaccines studied: influenza, pneumococcal, Hepatitis A and B, Shingles, and HPV (Lu et al., 2012). Looking specifically at the seasonal influenza shot, the vaccination rate for US born adults was 40.4%, while foreign born was 33.8% (Lu et al., 2012). The most concerning demographic, however, is foreign born individuals who have been in the US for less

than 10 years, who had an influenza vaccination rate of 23% (Lu et al., 2012). Language was also found to play a role, with influenza vaccination rates for English speaking immigrants at 37.4%, versus those of non-English speaking immigrants at 26% (Lu et al., 2012).

Slavic Opinion on Vaccinations

In interviews with Slavic parents on various topics in public health, childhood vaccination was found to be a major concern in the Slavic community in Portland, Oregon (Reyes & Curry-Stevens, 2015). These concerns are important to address because they influence the decision of parents on whether or not to vaccinate their children (Reyes & Curry-Stevens, 2015). In the case of Slavic parents in Washington, the decision is commonly not to vaccinate, with data showing significantly lower vaccination rates in Slavic immigrants when compared to other immigrant groups or the general population (Wolf et al., 2016).

When Slavic parents were interviewed and asked to explain their hesitancy towards childhood vaccinations, one especially common reason was religious conviction (Reyes & Curry-Stevens, 2015). However, those interviewed typically did not expand on why or how their religious views influenced this decision (Reyes & Curry-Stevens, 2015). Another common concern with vaccinations mentioned by Slavic parents, was a lack of education and transparency from the medical community (Reyes & Curry-Stevens, 2015). Slavic parents noted concerns over feeling that they had not been given enough information about the chemical ingredients in the vaccines, explanation of possible side effects, and long term impacts on the immune system (Reyes & Curry-Stevens, 2015). Furthermore, Slavic parents expressed suspicion that the medical community was not being completely open and honest with them (Reyes & Curry-Stevens, 2015). The resulting attitude among Slavic parents was often frustration, stemming from the pressure to simply comply with the recommendation of the medical provider, without

adequate education to relieve their concerns (Reyes & Curry-Stevens, 2015). Another significant factor contributing to vaccine hesitancy that commonly surfaced in the interviews with Slavic parents was anecdotal evidence against vaccines (Reyes & Curry-Stevens, 2015). Any time a member of the Washington state Slavic community attributed a sickness or birth defect to vaccination, the news spreads very quickly and has a large emotional impact in this close-knit community (Reyes & Curry-Stevens, 2015). This trend of blaming vaccines for specific causes of illness was found to be common in the Washington Slavic community (Reyes & Curry-Stevens, 2015).

In light of the lower vaccination rates among immigrants in the United States, the vaccination crisis in Ukraine, and the vaccination concerns among Slavic immigrants, the under-vaccination of Slavic immigrants is a legitimate concern that necessitates further research. Furthermore, a study in Washington state examined measles, hepatitis A, pneumococcal, and diphtheria-tetanus-acellular pertussis vaccinations. The Washington state study found that children with at least one Russian or Ukrainian parent had consistently lower rates of vaccination than children of two U.S. born parents (Wolf et al., 2016). These children of Slavic parents were less likely to be vaccinated than any of the other immigrant groups studied: those from Somalia, Mexico, and India (Wolf et al., 2016).

Although no studies on the vaccine hesitancy level of Slavic immigrants in Minnesota have been done, a person should still be concerned. A review of available literature on Slavic vaccine hesitancy levels reveals significant predisposing factors for under-vaccination among Slavic immigrants, as well as findings of low vaccination among the Slavic population in Washington state.

Summary

Vaccinations are invaluable because they not only protect individuals from disease by strengthening the immune system, but also strengthen the wellness of the community (NIAID, 2016). Through community immunity, outbreak of vaccine preventable diseases is greatly decreased, and protection of those most vulnerable to disease can be obtained (NIAID, 2016). Today, vaccines for twenty communicable diseases are available, many of which (e.g. polio, measles) vaccination has eradicated in areas where vaccines are widely available (CPP, 2016). Community immunity is a delicate phenomenon, making the addressing of low vaccination rates an important public health concern (CPP, 2016). A large part of the United States population is made up of immigrants, which statistically have significantly lower rates of vaccination (Lu et al., 2012). Slavic immigrants have especially low vaccination rates, and tend to be more concerned with, and wary of vaccinations (Wolf et al., 2016). This research focused on the Slavic population in Minnesota will begin to identify the vaccination hesitancy level of this potentially under-vaccinated population (Wolf et al., 2016).

Chapter 3: Methodology

Introduction

The purpose of this study was to use survey methods to obtain data on the Minnesota Slavic immigrant population's level of vaccine hesitancy, and explore how likely Slavic immigrants in Minnesota were to vaccinate, when compared with other populations. This research assessed whether or not the Slavic population in Minnesota feels strongly against or for vaccinations, and will identify how the Slavic population compares to the general population when looking at vaccine hesitancy. Collecting a baseline of data regarding vaccine hesitancy levels within the Slavic community in Minnesota is important in beginning to identify and understand possible opposition to vaccinations in the Minnesota Slavic population. The eventual goal of this study was to identify factors that might be influencing the vaccine hesitancy levels of Slavic people of Minnesota, in order to maintain high vaccination rates across all subgroups in Minnesota. The research questions addressed in this study included the following:

1. What are the vaccine hesitancy level of the Slavic immigrant community in Minnesota?
2. How did the vaccine hesitancy level of the Slavic immigrant community compare to other non-Slavic populations when compared in previous research?

The purpose of chapter 3 is to discuss the research design and methods. The methodology section describes the specific place and population being surveyed, the tool, and how data collection will take place.

Study Design

This study was a descriptive study, meaning the study was designed to describe characteristics of a population. In the case of this particular study, the characteristics focused on included viewpoints regarding vaccinations, and whether these viewpoints are for or against vaccinations. Data was obtained from the population of Slavic immigrants that attended First

Ukrainian Evangelical Baptist Church. Since data was only collected at a single time point, this was a cross sectional study.

The PACV study was validated to show a positive correlation between low scores on the survey (indicating high vaccine hesitancy) and low compliance with recommended vaccination protocols (Opel, et al., 2013). After the PACV scores of the participants in this research study was collected, the scores were averaged. The average PACV score from this study was then compared to average PACV scores from several previously published studies on non-Slavic individuals in the United States. No national average PACV score was currently available with which to compare the Minnesota Slavic immigrants. However, the comparison of average PACV scores revealed whether the Minnesota Slavic immigrants were more or less likely to comply with recommended vaccination regimens, when compared to several non-Slavic populations.

Population

The population chosen for this study was attendees of the First Ukrainian Evangelical Baptist Church. The survey was also only given to individuals 18 years of age and older. Inclusion criteria includes those who attended the First Ukrainian Evangelical Baptist Church, and were a first generation Eastern Slavic immigrant. Participants in this study completed demographic questions concerning age (over 18 years old), marital status, number of children in the household, race/ethnicity (first generation Eastern Slavic), and country of birth. The data collection was from those in attendance at the time of survey administration at First Ukrainian Evangelical Baptist Church in St. Louis Park, Minnesota, United States of America. Permission to use the First Ukrainian Baptist Church facility for this study was obtained from the pastor and can be found in Appendix A. The First Ukrainian Baptist Church has approximately 150 individuals that attend Sunday services and the goal number of participants was 30.

Experimental Procedures

During the conclusion of a Sunday morning worship service at First Ukrainian Evangelical Baptist Church, the pastor made an announcement from the pulpit. The pastor announced that an optional survey was being conducted in the narthex by three physician assistant students on vaccination attitudes in Slavic immigrants in Minnesota. The researchers positioned themselves by the main sanctuary exit, and handed out an informed consent form, the survey, and a writing utensil to all adult congregants who were willing to participate, as they left the sanctuary. Willing participants read and signed a letter of informed consent in their preferred language (Appendix B and Appendix C) before continuing on to the survey in their preferred language (Appendix D and Appendix E) where he or she answered questions that pertained to our research in the language they were most comfortable. Those who choose to take the survey completed it in the narthex, and handed it back to the researchers before leaving the church building. No names were collected at any point, ensuring the survey results remained confidential.

After all the surveys were collected, the surveys were scored according to the procedure outlined by the authors of the Parent Attitudes about Childhood Vaccines (PACV) survey. For detailed methodology on scoring of the PACV, see Appendix F. As currently no national average PACV results were available, the scores of the participants of this research project were compared to the PACV scores of past studies with non-Slavic participants that used the PACV. After the surveys were scored and entered into an Excel spreadsheet, the paper surveys were destroyed, further ensuring the confidentiality of the participants of this study. This Excel spreadsheet was kept on personal, password protected laptops of the researchers. Then this data was loaded on a thumb drive and kept in a PA program office for the next five years. The

individual results of the survey remained anonymous, relieving any anxiety or concern that participants might have that their views made public or shared. Participants could opt out of taking or completing the survey at any point with no consequences. This study design was approved by the Bethel University Institutional Review Board (IRB). The information gained in this study was only be shared with those outside the authorship committee in the form of aggregate data, with no personally identifiable characteristics.

Data Analysis

Using the data contained on the Excel spreadsheet, a two-tailed T-test was used to statistically analyze the results of this study. The T-test will compared the results of this study with the results of other studies that also used the PACV, but did not survey Slavic immigrants. This analysis determined the Minnesota Slavic immigrants' overall vaccination hesitancy for those who took the PACV survey and then compared to non-Slavic populations who have previously taken the PACV survey.

Variables

The independent variable in this study was the inclusion/exclusion criteria of the participants: attendees of First Ukrainian Evangelical Baptist Church, who are18 years of age or older, and are first generation Eastern Slavic immigrants. The dependent variables were as follows: how likely participants were to follow vaccination recommendations, how favorable or unfavorable their view of vaccinations was, and how knowledgeable they were about vaccinations.

Limitations and Delimitations

The study was limited to first generation East Slavic Immigrants attending a Sunday morning service at First Ukrainian Evangelical Baptist Church in St. Louis Park, who could read and fill out a survey in either English or Russian. Since this study was conducted in a specific church, this research was limited to the specific demographics of this church. The data collected from the attendees of First Ukrainian Evangelical Baptist Church may not perfectly represent the diversity of the Slavic population in Minnesota.

This survey was offered in both English and Russian. The translation of the English PACV survey into Russian may not have matched up perfectly, possibly influencing how the participants chose to answer the questions. Other limitations included the literacy of the population, a potentially imperfect survey tool, the response rate, and any suspicion of our motives in conducting this survey.

As a small quantitative survey, with a limited number of questions on a Likert scale, the scope of what was discovered from this collection of data was limited to finding out the general trends on vaccination views in the Minnesota Slavic population. This survey did not explore the underlying motives or reasons that might explain those trends. Undertaking the explanation of vaccine hesitancy trends in the Minnesota Slavic population would have required a qualitative study with an in-depth interview of each participant, and was outside the scope of this study. However, before in-depth qualitative research was conducted, it was important to first assess for discrepancies in the area of vaccine hesitancy between the Minnesota Slavic immigrant population, and the general population.

Instrumentation

The survey used in this research project was a minimally modified version of the PACV survey from the Seattle Children's Research Institute, Department of Pediatrics, University of Washington, School of Medicine (Opel et al., 2011). Permission to use this survey is found in Appendix H. The original PACV survey asked demographic questions about age, number of children in the household, and race/ethnicity. Income and education questions from the original PACV were excluded from the survey of this study, and the ethnicity question was modified to specifically ask for country of birth. The survey used in this project contained 15 fill-in-the-bubble questions from the original PACV survey, in three formats:

1. Yes, No, or I don't know
2. Likert scale: Strongly Agree, Agree, Not Sure, Disagree, or Strongly Disagree
3. Confidence rating: 0 (not sure at all) to 10 (completely sure)

The survey used in the project and informed consent were translated into Russian, and offered in both English and Russian, based on primary language preference of the participant. The translator, Maksim Kozak, was a Ukrainian immigrant who has passed a Russian reading, writing and speaking proficiency exam at the University of Minnesota, and has translating experience in both Ukrainian and Russian at his local church. The translator was one of the researchers of this study.

The senior pastor of First Ukrainian Evangelical Baptist Church wrote a letter of consent for the survey in the research project to be distributed on church premises (Appendix A). Additionally, each questionnaire contained an introductory explanation of the survey, and an agreement of informed consent to continue the survey in their preferred language (Appendix B and Appendix C).

Validity and Reliability

Validity and reliability was ensured by using the pre-approved PACV survey from the University of Washington. The PACV survey was validated to show a positive correlation between a low PACV score (indicating high vaccine hesitancy) and future noncompliance with recommended vaccination regimens (Opel, et al., 2013). Validation studies for the PACV included around 600 participants in the states of Washington and Tennessee (Opel, el al., 2013; Williams, et al., 2015).

The minor changes made to the original PACV survey were made to allow for better identification of the specific target population of Minnesota Slavic immigrants, and to exclude several questions that were irrelevant to the focus of this study. The content of the questions on attitudes towards vaccinations were unaltered and were not factors in the original scoring matrix.

Conclusion

Chapter 3 discusses the data collection method, through which vaccine hesitancy level in Slavic immigrants in Minnesota will be assessed. This chapter also outlines the characteristics of the participants included in this study, the gathering and handling of data, the limitations and delimitations, and the details of the survey tool used. The next chapters discuss the data collected and the conclusion drawn from the statistical analysis of that aggregate data.

Chapter 4: Results

Introduction

Chapter 4 contains the data analysis results that attempt to determine vaccination hesitancy rates in the Minnesota Slavic immigrant population. Data collection consisted of surveying Slavic immigrants in Minnesota regarding their level of vaccine hesitancy, and was completed using the Parents Attitudes about Childhood Vaccines (PACV) survey tool. In chapter 4, the general data of the survey results is discussed, and then the research questions are directly answered using the statistical findings.

The discussion of the general data of this study on Slavic immigrants can be broken into two parts: an examination of the individual adjusted scores of the PACV surveys, and an analysis of the answers as a group. The last part of chapter 4 addresses the specific research questions of this study on the attitudes of Minnesota Slavic immigrants regarding vaccines. The first research question was: what was the vaccine hesitancy level of the Slavic immigrant community in Minnesota? The second research question was: how did the vaccine hesitancy level of the Minnesota Slavic immigrant community compare to other non-Slavic populations?

The scores of the PACV surveys that were distributed as outlined in chapter 3, were compared to previous studies performed in other populations, which also used the same PACV survey. The average PACV score from the Slavic immigrants surveyed in chapter 3 was calculated, and compared using a two tailed T test to the average PACV score of three other studies.

Demographics

In order to effectively survey a large number of first generation Slavic immigrants, the surveys were dispensed at a church where a large number of first generation Slavic immigrants regularly attend. First Ukrainian Evangelical Baptist Church conducts Sunday morning services exclusively in Ukrainian, resulting in a congregation that is largely made up of Slavic immigrants and their children. To accommodate this population, the survey was offered in Russian and English. Additionally, the first question asked on the dispensed survey was "How old are you?" with possible responses of "18-29" and "30 or older," as survey respondents were required to be over the age of 18 to participate. The second question on the survey was "Were you born in one of the following countries: Russia, Ukraine, or Belarus?" with checkboxes selecting "yes" and "no." By including the second question about place of birth all non-first generation Slavic immigrant members of the First Ukrainian Evangelical Baptist Church were excluded. No other demographic questions were included on the dispensed survey.

A total of 42 PACV surveys were distributed and completed following the church service at First Ukrainian Evangelical Baptist Church on Sunday, October 1st, 2017. Of the 36 surveys that were returned completed, 6 were not included in the final data analysis. Reasons for disqualification of a survey from the study included failure to fit the study population, and incompletion of three or more of questions 5-17 on the PACV survey. Several of the study participants who filled out a PACV survey indicated that they were not born in a Slavic country, which disqualified the information gathered on their surveys from being used. If a participant left three or more of questions 5-17 blank, then according to the PACV scoring guidelines (provided in appendix F) that survey cannot be scored.

After removing the disqualified surveys, the population comprising the basis for the final data analysis consists of 30 individuals who attend First Ukrainian Evangelical Baptist Church.

All individuals included in the population of this study on vaccine hesitancy in Slavic immigrants, were born in a Slavic nation before immigrating to the United States, where they eventually took up residency in Minnesota. All participants in the study population indicated on the survey that they were 18 years of age or older at the time of the survey distribution.

Raw Score and Adjusted Score

The authors of the original PACV study created a scoring method, by which the level of vaccine hesitancy of a study participant can be assigned a numerical value. The original complete instructions on scoring the PACV survey, as provided by the survey author and used by the authors of the study on Slavic immigrants, is detailed in appendix F. A complete lack of hesitance with regards to vaccinations would be awarded a raw score of 0, according to the PACV scoring system. The maximum level of vaccine hesitancy would be given a raw score of 30, when using the PACV scoring system.

However, questions 3 and 4 of the PACV survey ask if the participant has ever decided to decline receiving a vaccine for his or her child, for reasons other than illness or allergy. The possible answer choices for questions 3 and 4 of the PACV survey are “yes,” “no,” and “don’t know.” Questions 3 and 4 of the PACV survey hold considerable weight, as they reflect actions of the participant, as compared to later questions which reflect opinions. In order to reflect the high significance of question 3 and 4 of the PACV survey, the authors of the PACV survey created a method to adjust the score, which is detailed in appendix F.

A second scenario in which adjustment of a PACV score is necessary, is that of incomplete surveys. The authors of the PACV included a method by which a participant who leaves one or two incomplete answers to questions 5-17 of the PACV survey, may still have his or her survey included in the final study population. However, if a participant does not answer

three or more of questions 5-17, that survey must be removed from the final study population. The method of score adjustment in the case of incompletion of one or two of questions 5-17 is detailed in appendix F.

After adjustment of PACV participants' scores, complete vaccine hesitancy is valued at 100, and complete lack of vaccine hesitancy is valued at 0. All participant PACV raw scores and adjusted scores are detailed in appendix I.

Data Analysis

This study on the vaccine hesitancy level of Slavic immigrants in Minnesota contains two research questions. Research question number one is: what was the vaccine hesitancy level of the Slavic immigrant community in Minnesota? Research question number two is: how did the vaccine hesitancy level of the Minnesota Slavic immigrant community compare to other non-Slavic populations? Vaccine hesitancy in the Minnesota Slavic immigrant community was assessed via the PACV survey tool. The PACV has been previously validated to accurately assess vaccine hesitancy in parents, with regards to how likely they are to vaccinate their children (Opel, et al., 2013). A low PACV score by a parent correlates with low vaccine hesitancy, and high likelihood of parental assent to vaccination of the children for whom that parent is responsible. Conversely, a high PACV score by a parent correlates with high vaccine hesitancy, and subsequent low likelihood of vaccination of that individual's children. However, at the current time no generally accepted or validated benchmarks of what range of scores on the PACV constitute a high level of vaccine hesitancy exist. For example, while a PACV score of 10 is validated to correspond with less vaccine hesitancy than a score of 20, there is no data to allow conclusion to be drawn regarding whether a score of 15 corresponds with low vaccination rates in children.

In order to assess the vaccine hesitancy level in the Slavic immigrant population in Minnesota, the PACV scores of participants were calculated, adjusted as detailed above, and averaged. The average adjusted PACV score of the Slavic immigrants in Minnesota surveyed was found to be 59.87, answering the first research question. Figure 1 shows the adjusted PACV scores of the 30 participants in this study. The mean, median, mode, variance, and standard deviation of the PACV scores collected among the Slavic immigrants in Minnesota are detailed in table 1.

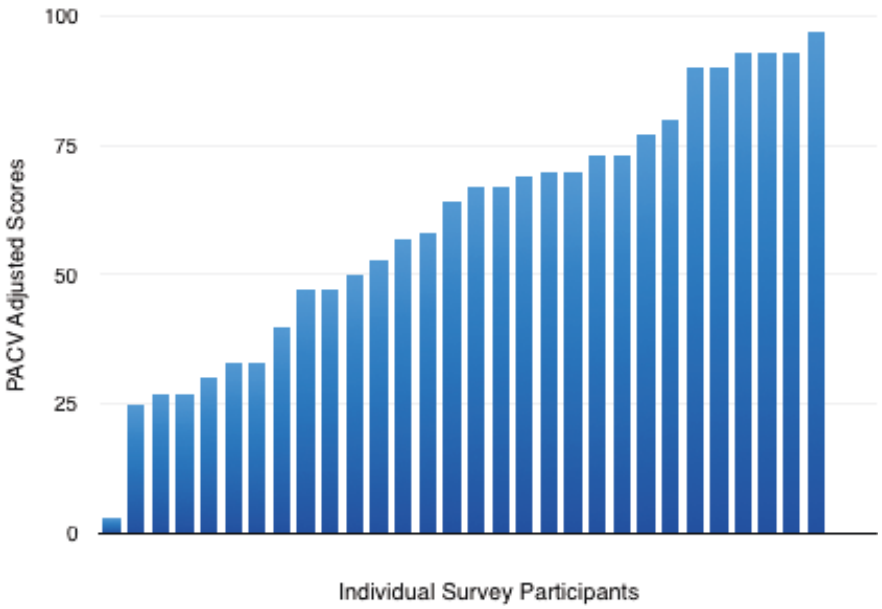

Figure 1. PACV Adjusted Scores of Slavic Immigrants in Minnesota.

Table 1

Adjusted PACV scores for the Minnesota Slavic immigrant population

Mean	59.86666667
Median	65.5
Mode	93
Variance	612.6712644
Standard Deviation	24.7519716

Answering the second research question: how the vaccine hesitancy level of the Minnesota Slavic immigrant community compared to other non-Slavic populations, required comparison of the average adjusted PACV score of this population of Slavic immigrant in Minnesota with the average adjusted PACV scores found by other research studies. The PACV vaccine hesitancy level of Minnesota Slavic immigrants had been found to be 60 when rounded. The next step was to find a way to determine the significance of a PACV value of 60, as the PACV survey tool has only been validated to show that a value of 60 means more vaccine hesitancy than a score of 30 (Opel, et al., 2013). At the current time no validated benchmarks of whether a single individual average PACV score will result in high or low vaccine hesitancy exist, it is only known that higher PACV scores result in higher vaccine hesitancy, which results in lower vaccination rates in a population (Opel, et al., 2013). Therefore, in order to best determine the significance of the average PACV score of 60, found in the Minnesota Slavic population, other studies that had previously used the PACV survey were identified. Comparative studies that had also reported the PACV scores of a population would provide a sense of what range of PACV scores were seen in other populations. By comparing the average PACV scores of the Minnesota Slavic population to those of other populations, it can be determined whether a score of 60, found in the Minnesota Slavic population, is about average in studied populations or an outlier.

Three studies that had previously completed the PACV survey among a non-Slavic population and reported their average adjusted PACV scores were identified, and will subsequently be referred to as the comparative studies. The mean average of this study on Slavic immigrants in Minnesota, as well as the mean averages of all three comparative studies are displayed in Figure 2. Comparison studies were performed in the states of Washington, Tennessee, and Arizona, and are identified by their respective state names. The only qualification required of the comparative studies was a reported average PACV score of the surveyed population. The comparative studies did not closely resemble the Minnesota Slavic immigrant population in any meaningful way, including populations that in all three cases do not consist of known immigrants (Eby, 2017; Williams, et al., 2015; Opel, et al., 2013). The purposes of all three comparative studies focused on vaccination hesitancy in parents of children within the range of ages that childhood vaccines are typically given in the United States (Eby, 2017; Williams, et al., 2015; Opel, et al., 2013). Because the PACV survey tool is fairly new, only published in 2013, at the current time no published studies that report the PACV level in immigrants exist, and therefore other published studies using the PACV were used as comparative studies (Opel, et al., 2013).

Two tailed T-tests were used to determine whether the average PACV score of 60 in the Minnesota Slavic population was significantly lower or higher than the average PACV score of the three comparative studies. A two tailed t test analyzes whether the mean difference between two groups is significant by calculating a p value. A significant p value in a t test would be a value smaller than .05. A summary of the t test results for the comparisons run between this study on Slavic immigrants in Minnesota and the three control studies, can be located in table 2.

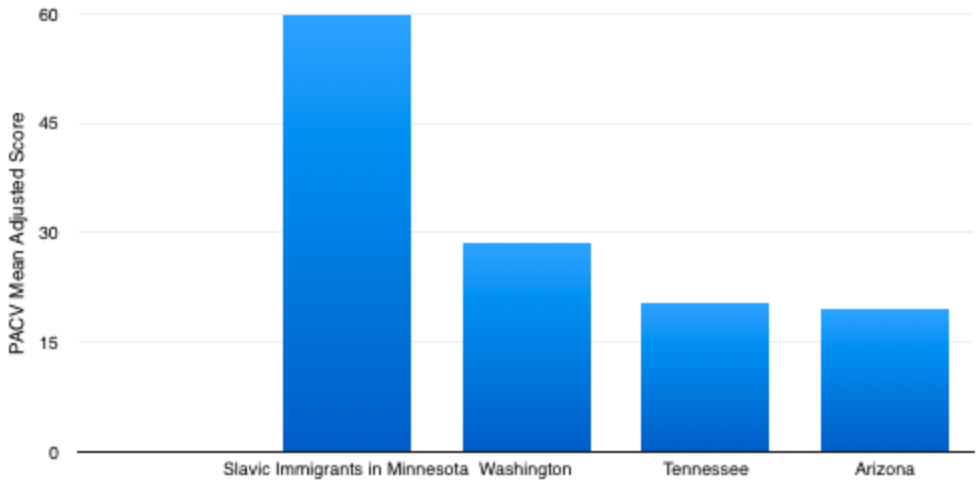

Figure 2. PACV Scores of the Slavic Immigrants in Minnesota and comparison studies.

Two tailed T-tests were used to determine whether the average PACV score of 60 in the Minnesota Slavic population was significantly lower or higher than the average PACV score of the three comparative studies. A two tailed t test analyzes whether the mean difference between two groups is significant by calculating a p value. A significant p value in a t test would be a value smaller than .05. Table 2 is a summary of three t test comparisons. The "Slavic vs. Washington" column compares the average PACV score of this study to the average PACV score of a study performed in the state of Washington in 2010 (Opel, et al., 2013). The "Slavic vs Tennessee" column compares the average PACV score of this study to the average PACV score of a study performed in the state of Tennessee (Williams, et al., 2015). The "Slavic vs Arizona" column compares the average PACV score of this study to the average PACV score of a study performed in the state of Arizona. (Eby, 2017). Table 2 includes the 95% confidence interval, the p values, degrees of freedom, t value, and the standard error of difference for each of the three t test analyses.

Table 2

Two-tailed T test analyses of vaccination hesitancy rates

Comparing populations	**Slavic vs. Washington**	**Slavic vs. Tennessee**	**Slavic vs. Arizona**
95% CI for difference	23.27808 to 39.45592	31.2854056959 to 47.4485943041	31.8288 to 48.6112
p values	0.0001	0.0001	0.0001
df	465	186	186
t	7.6201	9.6099	9.4559
Standard error of difference	4.116	4.097	4.253

The first study used as a comparison to the Slavic immigrant population in Minnesota, was performed in the state of Washington in 2010, had 453 participants, and will subsequently be referred to as the Washington study (Opel, et al., 2013). The average adjusted PACV score of the participants in the Washington study was 28.5 (Opel, et al., 2013). When the average adjusted scores of the Slavic immigrants in Minnesota were compared via a two tailed T test to the average adjusted scores of the participants in the Washington study, the value was 0.0001. A p value of anything less than 0.5 is significant, and therefore 0.0001 is considered to be extremely significant. The statistical data of both this study on Slavic immigrants in Minnesota and the Washington study are shown in table 3. The table includes the comparison of the mean score, standard deviation, standard error of the mean, and the n value of the two studies.

Table 3

Comparing the Slavic population and the Washington study population

Group	Slavic Immigrant Pop.	Washington
Mean	59.867	28.5
SD	24.75	21.6
SEM	4.519	1.033
N	30	437
Mean PACV score	59.87	28.5

The second study identified as a comparison to the Slavic immigrant population in Minnesota, was completed in the state of Tennessee, had 158 participants, and will subsequently be referred to as the Tennessee study (Williams, et al., 2015). The population of the Tennessee study were a group of parents of 19 month old children (Williams, et al., 2015). The site where surveys were completed was an urban pediatric clinic consisting of 5 practicing pediatricians (Williams, et al., 2015). 84% of the Tennessee study population identified as white, 9% as African American, 6% as other, and 1% chose not to answer (Williams, et al., 2015). The majority of the Tennessee study population reported an annual income of greater than $50,000, had 1 or 2 children, completed college or graduate school, and was privately insured (Williams, et al., 2015). The average adjusted PACV score of those surveyed in the Tennessee study was 20.5 (Williams, et al., 2015). The significance between race and average PACV score was not statistically identified in the Tennessee study (Williams, et al., 2015). The adjusted average scores of the Slavic immigrants in Minnesota and the Tennessee study were compared using a

two tailed t test, and had a p value of 0.0001. Again, a p value of anything less than 0.5 is significant, and therefore 0.0001 is considered to be extremely significant. The statistical data of both this study on Slavic immigrants in Minnesota and the Tennessee study are shown in table 4. The table includes the comparison of the mean score, standard deviation, standard error of the mean, and the n value of the two studies.

Table 4

Comparing the Slavic population and Tennessee study population

Group	Slavic Immigrant Pop.	Tennessee
Mean	59.867	20.5
SD	24.75	19.7
SEM	4.519	1.56724
N	30	158
Mean PACV Score	59.87	20.5

A third study, carried out in two pediatric clinics in the state of Arizona, was also used as a comparison to the Slavic immigrant population in Minnesota, and will subsequently be referred to as the Arizona study (Eby, 2017). The Arizona study contained a participant group of 158 parents (Eby, 2017). The survey site in the Arizona study was a set of two private pediatric clinics in suburban Phoenix, where the vast majority of patients are in the upper socioeconomic status bracket, and are privately insured (Eby, 2017). Demographic data was obtained, and included parental ethnicity and marital status, number of children in household, and insurance

(Eby, 2017). Data analysis was performed to determine whether the demographic data of a participant significantly affected that individual's PACV score, and no significant correlations were found, including no correlation between ethnicity and PACV score (Eby, 2017). The average adjusted PACV score of those surveyed in the Arizona study was 19.65. The adjusted average scores of the Slavic immigrants in Minnesota and the Arizona study were compared using a two tailed t test, which resulted in a p value of 0.0001, which is extremely statistically significant. The statistical data of both this study on Slavic immigrants in Minnesota and the Arizona study are shown in table 5. The table includes the comparison of the mean score, standard deviation, standard error of the mean, and the n value of the two studies.

Table 5

Comparing the Slavic population and the Arizona study population

Group	**Slavic Immigrant Pop.**	**Arizona**
Mean	59.867	19.650
SD	24.75	20.67
SEM	4.519	1.644
N	30	158
Mean PACV Score	59.87	19.65

Conclusion

Data analysis was completed using the PACV survey to determine the vaccination hesitancy rate of the Slavic immigrant population in Minnesota. PACV surveys were completed by 30 Slavic immigrants who attended a church service at First Ukrainian Evangelical Baptist Church on October 1st, 2017. All participants included in the results of this study are immigrants from a Slavic nation, as well as at least 18 years of age. The mean PACV adjusted score of the surveyed population of Slavic immigrants in Minnesota was calculated and found to be 59.87. Average adjusted PACV scores from three other studies that had used the same survey tool were compared to this value of 59.87 using a two tailed t test, and the results were found to be extremely statistically significant.

Chapter 5: Discussion

Introduction

Chapter 5 contains a discussion of the results of this study on the vaccine hesitancy level of Slavic immigrants in Minnesota outlined in chapter 4, and conclusions that can be drawn from the results gathered from the statistical analyses performed in the previous chapter. Additionally, chapter 5 contains details on the limitations of this study, as well as recommendations for further research of the vaccine hesitancy levels of Slavic immigrants in Minnesota.

Summary of Results

Two research questions have driven this study on Slavic immigrants in Minnesota. The first research question is: what was the vaccine hesitancy level of the Slavic immigrant community in Minnesota? The second research question is: how did the vaccine hesitancy level of the Minnesota Slavic immigrant community compare to other non-Slavic populations?

The PACV survey was used to answer the first research question: what is the vaccine hesitancy level of the Slavic immigrant community in Minnesota? The PACV is a survey developed specifically as a tool by which vaccine hesitancy in any population can be numerically quantified and measured (Opel, et al., 2013). The PACV survey gathers information from parents on how likely they are to vaccinate their children, which in turn allows researchers to draw conclusions on current attitudes on vaccines that will drive future actual vaccination rates in a population (Opel, et al., 2013). The PACV survey has been fully validated as an accurate means to measure vaccine hesitancy, and multiple studies have found that high scores on the PACV in a population predict subsequent low vaccination rates (Opel, et al., 2013). In the Slavic immigrant population in Minnesota, the average PACV score was found to be 59.67. However, this value of 59.67 by itself is not particularly helpful, leading to an examination of the second research

question: how did the PACV scores of the Minnesota Slavic immigrant community compare to other populations who have taken the PACV?

Although the PACV is a new tool, released five years ago in 2013, it has already been used in several large, published studies (Eby, 2017; Williams, et al., 2015; Opel, et al., 2013). In order to understand the meaning behind the average PACV score of the surveyed Minnesota Slavic immigrant community, three other studies that used the PACV were used as comparison studies. The mean PACV scores in each of the comparison studies, as well as standard deviation, standard error of mean, and number of participants, were identified. Subsequently, a t test was completed that analyzed the significance of the mean PACV score of the Minnesota Slavic immigrants, in comparison to the three other studies.

The first study used as a comparison was completed in Washington among 437 parents of young children, who had an average PACV score of 28.5 (Opel, et al., 2013).). The population of the Washington study consisted of English speaking parents of two month old infants who were part of a large American company that provides health care in the city of Seattle, Washington (Opel, et al., 2013). Demographic information collected in the Washington study, included the age, marital status, education, income level, and race of the parents, as well as household size and relationship of the survey taker to the two month old child (Opel, et al., 2013). Demographic data was cross analyzed for significance with PACV scores, and no significant correlation was found between any of the demographic identifiers, including race, and participant PACV scores (Opel, et al., 2013).

The second comparison study was completed in Tennessee among 158 parents, and had a mean PACV score of 20.5 (Williams, et al., 2015). The population of the Tennessee study were a group of parents of 19 month old children (Williams, et al., 2015). The site where surveys were

completed was an urban pediatric clinic consisting of 5 practicing pediatricians (Williams, et al., 2015). 84% of the Tennessee study population identified as white, 9% as African American, 6% as other, and 1% chose not to answer (Williams, et al., 2015). The majority of the Tennessee study population reported an annual income of greater than $50,000, had 1 or 2 children, completed college or graduate school, and was privately insured (Williams, et al., 2015). The average adjusted PACV score of those surveyed in the Tennessee study was 20.5 (Williams, et al., 2015). The significance between race and average PACV score was not statistically identified in the Tennessee study (Williams, et al., 2015).

The third study used in comparative analysis surveyed 158 parents in Arizona, and found that the average PACV score was 19.65 (Eby, 2017). The survey site in the Arizona study was a set of two private pediatric clinics in suburban Phoenix, where the vast majority of patients are in the upper socioeconomic status bracket, and are privately insured (Eby, 2017). Demographic data was obtained, and included parental ethnicity and marital status, number of children in household, and insurance (Eby, 2017). Data analysis was performed to determine whether the demographic data of a participant significantly affected that individual's PACV score, and no significant correlations were found, including no correlation between ethnicity and PACV score (Eby, 2017).

All three comparison studies used the same PACV survey as completed by the Minnesota Slavic immigrants, and none of the three comparative populations included any recorded Slavic immigrants (Eby, 2017; Williams, et al., 2015; Opel, et al., 2013).

The results of the t tests comparing the mean PACV scores of the Minnesota Slavic immigrants with the participants in the three comparative studies were all statistically significant. Three t tests were run, one between the Minnesota Slavic immigrants and the Washington study

population, one between the Minnesota Slavic immigrants and the Tennessee study population, and one between the Minnesota Slavic immigrants and the Arizona study population. All three t tests had p values of <0.0001, with a statistically significant p value set at <0.05. Clearly, the PACV scores of the Minnesota Slavic immigrants were higher than those of the comparative populations by a statistically significant margin. The conclusion may be drawn that the Minnesota Slavic immigrants' community is more suspicious and hesitant of vaccines than other subpopulations in the United States, and therefore are less likely to vaccinate their children.

In chapter 2, the vaccination rates of many Slavic countries have dropped in the last ten years (UNICEF, 2013). In the last decade, the country of Ukraine has experienced outbreaks of measles and polio, as dropping vaccination rates allow for these communicable diseases to spread throughout the population (WHO, 2016b; Bazylevych, 2011). Chapter 2 outlined possible reasons for the dropping vaccination rates seen in Slavic countries, including suspicion of vaccination programs by the government based in past experience with the former USSR (Bazylevych, 2011). It is very likely that the same fears and distrust seen in Slavic countries in Eastern Europe, are shared by the Slavic immigrants in Minnesota, explaining the high PACV scores in this population (Bazylevych, 2011).

As discussed in chapter 2, herd immunity requires a very high percentage of the population to receive a vaccine against a particular disease, in order to protect the entire population (NIAID, 2016). The high level of vaccine hesitancy in the Minnesota Slavic immigrant community must be further explored and addressed. High levels of vaccine hesitancy in adults leads to low vaccination rates in their children, which can set the groundwork for a future epidemic of vaccine preventable illness in the United States (NIAID, 2016).

Also discussed in chapter 2 was the link between being an immigrant and statistically lower rates of vaccination that has been shown in multiple studies. (Lu et al., 2012; Wolf et al., 2016; Lu, Lainz, O'Halloran, Greby, & Williams, 2014). A New York study even found that being born outside of the US was the greatest predictor of disinterest in vaccination (Vlahov, Bond, & Jones, 2012). Furthermore, a study in Washington showed that Slavic immigrants showed significantly lower vaccination rates when compared to other immigrant groups or the general population (Wolf et al., 2016). Another study interviewing Slavic immigrants for their thoughts on childhood vaccinations found that there was an attitude of hesitancy and frustration, stemming from the pressure to simply comply with the recommendation of the medical provider, without adequate education to relieve their concerns (Reyes & Curry-Stevens, 2015). Some of the common concerns were religious convictions against using vaccines, anecdotal evidence against vaccines, and a general distrust of the medical system attributed to a lack of education and transparency from the medical community (Reyes & Curry-Stevens, 2015).

Limitations

As discussed in chapter 3, several limitations of this study on the vaccine hesitancy level of Minnesota Slavic immigrants exist, largely due to its small and specific population. There were 30 qualifying participants who attended the Slavic church where this survey was conducted. One major limitation is that the data collected may not be representative of the overall Slavic immigrant population of Minnesota, but rather reflects the views of a small, like minded community within the Slavic population. The Minnesota Slavic immigrants surveyed may not be an accurate representation of the whole group, and demographic similarities, such as religion and socioeconomic status have skewed the results**.** The population of Slavic immigrants in Minnesota

not included in the community attending First Ukrainian Evangelical Baptist Church may have very different views on vaccinations from those surveyed.

Another limitation is that this study on vaccine hesitancy in Minnesota Slavic immigrants offered participants both the original English PACV survey and a Russian translation, while the comparison studies only used the original English. There could be a factor of an imperfect translation, or translator bias in the wording, that could have influenced how the participants answered the questions. Research collected on the vaccine hesitancy level in Minnesota Slavic immigrants may also be limited by an imperfect research tool, the PACV, which may not accurately measure the complexity of vaccine hesitancy. For example, a participant who was hesitant about one vaccine would be required to answer yes or no questions about all vaccines, skewing the final PACV score of that participant regarding hesitancy about vaccines in general. The literacy of the population surveyed at First Ukrainian Evangelical Baptist Church may also be a limitation, especially in their knowledge of the United States' vaccination guidelines and what vaccines were being discussed.

Another significant limitation of this study on the vaccine hesitancy in Minnesota Slavic immigrants is the available comparative studies that have also used the PACV consist of vastly different populations. All three of the comparative studies consist largely of white, privately insured, suburban or urban parents of young children, who are in the upper socioeconomic status bracket (Eby, 2017; Williams, et al., 2015; Opel, et al., 2013). Additionally, Slavic immigrants tend to identify as "white" when asked to identify their race, which results in the masking of Slavic immigrant views by a large group of Caucasians that fall into the same demographic group (TMF, 2004). The large difference in average PACV score of Minnesota Slavic immigrants and that of wealthy, young, suburban, whites allows for the conclusion to be drawn

that the vaccine hesitancies of these two groups are largely different. However, it does not follow that the difference in average PACV score is due to difference in ethnicity or status as an immigrant. Non-immigrants in lower socioeconomic status brackets or immigrants ethnicities other than Slavic may well both show high levels of vaccine hesitancy if surveyed via the PACV. Due to the new nature of the PACV tool, published in 2013, no studies were available for comparison that had surveyed immigrants or less wealthy populations (Opel, et al., 2013).

A final limitation is the possibility of participant's suspicion of the researchers' bias or alternative motives. A participant could be influenced by fears or hopes about what the researchers will think about the Minnesota Slavic community and their views as a result of this study. Another participant may not feel he or she understands what the researchers are hoping to accomplish with this study on vaccine hesitancy in Minnesota Slavic immigrants, and what this data may be used for. Participant fears or distrust may have influenced not only the PACV scores among those surveyed, but also who chose to participate in this study on vaccine hesitancy in Minnesota Slavic immigrants, skewing the final data collected.

Recommendations for further research

This research focused on vaccine hesitancy rates in Minnesota's Slavic immigrant population. Vaccine hesitancy rates have been researched previously in other sub populations to some extent, with little to no focus on the Slavic population. With such little research done in this area, there is room for further research. Here are a few suggestions for future research on vaccine hesitancy in Slavic immigrants.

The next step would be to break down the average PACV score among the Minnesota Slavic immigrant community, and look at the different demographics that create this population. The survey used in this research on vaccine hesitancy in the Minnesota Slavic community

limited identifiers to Slavic immigrants, 18 years of age and older, residing in Minnesota. Identifying different age groups and comparing the calculated averages between these varied generations would take this research on Minnesota Slavic immigrants to a deeper level. A PACV survey that asked participants for their exact age, or asked for them to check their respective age bracket would allow the surveys to be sorted into group based on age. Subsequently, the average PACV score could be calculated for each age bracket, and compared via t tests to one another. Comparing averages separated by age brackets could answer the question: does age influence a participant's choice to vaccinate? The decision to vaccinate children falls on the population of childbearing ages, making it important to know whether this key demographic within the Slavic community is hesitant to vaccinate.

The length of time a Minnesota Slavic immigrant has spent in the United States is another demographic to consider when breaking down the population's calculated average. A PACV survey that contained a blank space or several brackets to indicate years lived in the United States, would allow for organization of the surveyed Minnesota Slavic immigrant community into several groups. Average PACV scores among the Minnesota Slavic immigrants surveyed could be calculated based on years lived in the United States, answering the question: does the length of time in the United States influence one's choice to vaccinate?

Similarly, further studies using the PACV survey that were performed in a greater variety of sample populations would allow for the average PACV score in the Minnesota Slavic immigrants to be better understood. Studies using the PACV in other immigrant populations, as well as those of all ethnicities in lower income brackets would allow for better comparison of the Minnesota Slavic population with other populations.

Creating a qualitative study, where individual Minnesota Slavic immigrants are interviewed and asked to explain their answers on the PACV survey, would identify specific areas that keep this community from vaccinating. Gathering underlying motivators and fears that keep Minnesota Slavic immigrants from accepting vaccinations would create the groundwork to better educate individuals on the benefits of vaccinations and the risks with undervaccination.

Once the high vaccine hesitancy in the Minnesota Slavic population is better understood, further studies on Slavic immigrants should be completed in other states. Surveys of Slavic immigrant communities in other places in the United States would give a better representation of the true vaccination hesitancy level in the entire Slavic immigrant population. Further research on the vaccine hesitancies of Slavic immigrants should be completed to prevent the risk of future epidemics secondary to undervaccination.

Conclusion

In conclusion, this research study set out to determine the vaccine hesitancy level of Slavic Immigrants in Minnesota using the PACV survey, and compare these results to the PACV scores of other non-Slavic populations. The average PACV score of Slavic immigrants in this study was 59.67, significantly higher than the PACV scores of the three comparison studies: 19.65 (Eby, 2017), 20.5 (Williams, et al., 2015), and 28.5 (Opel, et al., 2013). The results were found to be statistically significant in t-tests comparing the scores of this study on vaccine hesitancy in Minnesota Slavic immigrants to the three comparison studies.

However, this study had several limitations. The primary limitation was the small population size of participants, originating from a single church, as it may not be representative of the Slavic immigrants in Minnesota as a whole group. In addition, translating the survey into Russian, suspicion of researcher motives, and the limitations of the PACV survey are all

limitations to this study on vaccine hesitancy in Minnesota Slavic immigrants. The limited number of other reported studies using the PACV survey meant all comparative studies were completed in young, wealthy, whites, making it difficult to know if the difference in PACV scores was due to Slavic immigrant status, or other demographic differences.

Some potential for further research in the topic of vaccine hesitancy in Minnesota Slavic immigrants is possible. Reproducing this study on vaccine hesitancy in Minnesota Slavic immigrants on a larger scale would aid in better understanding the true attitudes regarding vaccines held by the entirety of the Minnesota Slavic immigrant community. Further research with more demographic questions, including age and how long participants have been living in the United States, would allow for identification of other important variables driving vaccine hesitancy in the Minnesota Slavic community. Finally, this study on vaccine hesitancy in Minnesota Slavic immigrants can also be reproduced to measure Slavic immigrant vaccine hesitancy throughout the United States.

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APPENDIX A

First Ukrainian Evangelical Baptist Church Approval

BETHEL UNIVERSITY

Maksim Kozak <mak26522@bethel.edu>

survey
2 messages

Igor Melnichuk <melnii67@gmail.com> Sat, Jan 21, 2017 at 1:53 PM
To: mak26522@bethel.edu

Hello Max. I think it is ok to do this. Here is a letter.

for Max Kozak.docx
15K

January 21, 2017

To whom it may concern:

On behalf of First Ukrainian Evangelical Baptist Church, I Igor Melnichuk give permission to Bethel University Physician Assistant students Maksim Kozak, Rachiel Van Heest, and Hannah Roy to conduct their Master's research at this church with permission being granted to give a survey to church attendees.

Pastor,

Igor Melnichuk

APPENDIX B

Participant Letter of Informed Consent

(English Version)

Informed Consent

Dear Research Study Participant:

We are physician assistant students from Bethel University's Physician Assistant Program, conducting research in partial fulfillment of the requirements for a Master's Degree in Physician Assistant Studies. This study is investigating the attitudes of Slavic immigrants in Minnesota on vaccines. We hope to learn how likely Slavic immigrants in Minnesota are to vaccinate themselves and their children.

You were selected as a possible participant in this study because you attend a Slavic church in Minnesota. If you decide to participate, participation involves completing the attached survey. If you feel uncomfortable in any way while taking the survey, you have the right to decline to answer any question or refuse to hand in the survey with no penalty. Your participation is completely voluntary and will not impact your relationship with First Ukrainian Evangelical Baptist Church.

Any information obtained in connection with this study that can be identified with you will remain confidential and will be disclosed only with your permission. In any written reports or publications, no one will be identified or identifiable and only aggregate data will be presented. The paper surveys will be destroyed after the data is collected, and no names will remain attached to the survey answers.

Your decision whether to participate will not affect your future relations with Bethel University or First Ukrainian Evangelical Baptist Church in any way. If you decide to participate, you are free to discontinue participation at any time without affecting such relationships.

This research project has been reviewed and approved in accordance with Bethel University's Levels of Review for Research with Humans. If you have any questions about the research and/or research participants' rights, please call Maksim Kozak at (612) 242-6608, Hannah Roy at (218)348-4405, or Rachel Van Heest at (952) 836-5298. You will be offered a copy of this form to keep.

We understand that you have an extremely busy schedule and your time is limited. Your participation is vital for our research. Thank you for your participation.

Max Kozak, PA-S Hannah Roy, PA-S Rachel Van Heest, PA-S

Appendix C

Participant Letter of Informed Consent

(Russian Version)

Информированное согласие

Дорогой участник:

Мы, студенты в програме ассистента доктора в Bethel University, и проводим исследование для выполнения требований программы высшего образования. Наше исследование изучает отношения к прививкам славян в Миннесоте. Мы надеемся узнать мнение славян о прививках: себе и своим детям.

Вы избраны как возможный участник в этом изучении потому что вы посещаете Славянскую церьковь в Миннесоте. Если вы решили принять участие, вам надо ответить на вопросы. Если вам не комфортно отвечать, у вас есть право не отвечать на вопросы. Ваше участие полностью добровольное. Ваше участие или нет, Никоим образом не повлияет на ваше отношение к Первой Украинской Евангельской Баптистской Церкви.

Любая информация, будет оставаться в секрете и будет раскрываться только с вашего позволения. В любом докладе или публикации, никто не сможет определить ничего, мы будем использовать только общую информацию. После того, как мы соберем все ответы и заключения, ваша бумага будет уничтожена и никто не узнает ваших имён.

Ваше решение участвовать в опросе не будет никак влиять на ваше отношение к церкви. Если вы решили участвовать, вы свободно можете остановится в любое время, когда вы решите.

Это проэкт исследования был одобрен Bethel University's Соответствующим обзором Исследования с людьми. Если у вас будут какие то вопросы Об исследовании, или о прав участников пожалуйста подзвоните Максиму Козак 612 242 6608, Hannah Roy 218 348 4405, или Rachel Van Heest 952 836 5298. Вы можете получить копию этой формы и можете ее сохранить.

Мы понимаем что вы очень заняты, Ваш ответ очень важен для нашего исследования. Спасибо за ваше участие.

Максим Козак, PA-S Hannah Roy, PA-S Rachel Van Heest, PA-S

APPENDIX D

Parental Attitudes About Childhood Vaccines Survey (PACV)

(English Version)

Attitudes about Childhood Vaccines

READ THIS FIRST:

We are interested in your opinions about childhood shots (vaccines). Your child's doctor or nurse gives shots like MMR (measles, mumps and rubella) or Polio at check-ups to help keep your child from getting sick.

THIS SURVEY IS NOT ABOUT SEASONAL FLU OR SWINE FLU (H1N1) SHOTS.

If the questions about children do not apply, please respond with how you would proceed if they did.

Please check only one answer to each of the questions below.

1. How old are you?

- ☐ 18-29 years old
- ☐ 30 years or older

2. Were you born in one of the following countries: Russia, Ukraine, or Belarus?

- ☐ Yes
- ☐ No

	Yes	No	*Don't Know*
3. Have you ever delayed having your child get a shot (not including seasonal flu or swine flu (H1N1) shots) for reasons other than illness or allergy?	☐	☐	☐
4. Have you ever decided not to have your child get a shot (not including seasonal flu or swine flu (H1N1) shots) for reasons other than illness or allergy?	☐	☐	☐

5. How sure are you that following the recommended shot schedule is a good idea for your child? Please answer on a scale of 0 to 10, where 0 is *Not at all sure* and 10 is *Completely sure*.

Not at all Sure										Completely Sure
0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
6. Children get more shots than are good for them.	☐	☐	☐	☐	☐
7. I believe that many of the illnesses that shots prevent are severe.	☐	☐	☐	☐	☐
8. It is better for my child to develop immunity by getting sick than to get a shot.	☐	☐	☐	☐	☐
9. It is better for children to get fewer vaccines at the same time.	☐	☐	☐	☐	☐

	Not at all Concerned	Not too Concerned	Not Sure	Somewhat Concerned	Very Concerned
10. How concerned are you that your child might have a serious side effect from a shot?	☐	☐	☐	☐	☐
11. How concerned are you that any one of the childhood shots might not be safe?	☐	☐	☐	☐	☐
12. How concerned are you that a shot might not prevent the disease?	☐	☐	☐	☐	☐

	Yes	No	*Don't Know*
13. If you had another infant today, would you want him/her to get all the recommended shots?	☐	☐	☐

	Not at all Hesitant	Not too Hesitant	Not Sure	Somewhat Hesitant	Very Hesitant
14. Overall, how hesitant about childhood shots would you consider yourself to be?	☐	☐	☐	☐	☐

	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
15. I trust the information I receive about shots.	☐	☐	☐	☐	☐
16. I am able to openly discuss my concerns about shots with my child's doctor.	☐	☐	☐	☐	☐

17. All things considered, how much do you trust your child's doctor? Please answer on a scale of 0 to 10, where 0 is *Do not trust at all* and 10 is *Completely trust*.

Do Not Trust at All										Completely Trust
0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Thank You!

Appendix E

Parental Attitudes About Childhood Vaccines Survey (PACV)

(Russian Version)

мнение о детских прививках

Ми хотим знать ваше мнение о детских уколах (вакссинаций). Доктор вашего ребёнка даёт уколы против кори, эпидемического паротита (свинки) и коревой краснухи (MMR), или полит на детских обследовонях чтоб помочь сберечь их от болезни.

Ета анкета не о сезоном гриппе или о свинном гриппе, против кори, эпидемического паротита (свинки) и коревой краснухи.

Если вопросы о детях не относятся к вам, пожалуйста ответьте как бы вы поступили если они бы относились к вам.

Пожалуйста отметте только один ответ на каждый вопрос.

1. Сколько вам лет?

☐ 18-29 лет
☐ 30+ лет

2. Родились ли вы в одной из (сегодняшних): Украины, России, или Беларуси?

☐ Да
☐ Нет

3. Отставляли ли вы когда-то дать вашему ребёнку укол (не щитая сезонный грипп или свинный грипп (H1N1) из за причины кроме болезни или аллергии?

Да ☐ Нет ☐ Я не знаю ☐

4. Отказывались ли вы когда-то дать вашему ребёнку укол (не щитая сезонный грипп или свинный грипп (H1N1) из за причины кроме болезни или аллергии?

Да ☐ Нет ☐ Я не знаю ☐

5. На сколько вы уверенны что следовать рекомендованный график детских уколов есть хорошая идея для вашего ребёнка?

совсем не уверен — вполне уверен

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

	Строго согласен	Согласен	Не уверен	Не согласен	Строго не согласен
6. Детям дают больше уколов чем им полезно.	☐	☐	☐	☐	☐
7. Я верю что много из болезней которых уколы предохраняют являются серьёзными	☐	☐	☐	☐	☐
8. Лучше моему ребёнку развивать иммунитет через заболевания чем через укол.	☐	☐	☐	☐	☐
9. Лучше моему ребёнку получать меньше уколов за один раз.	☐	☐	☐	☐	☐

	Совсем Не обеспокоен	Не Обеспокоен	Не уверен	Обеспокоен	Очень обеспокоен
10. На сколько вы обеспокоены что ваш ребёнок может получить нежелательные эффекти от прививок?	☐	☐	☐	☐	☐
11. Насколько вы обеспокоены, что некоторые детские прививки не безопасны?	☐	☐	☐	☐	☐
12 .Насколько вы обеспокоены что некоторые прививки не предотвратят болезни?	☐	☐	☐	☐	☐

	Да	Нет	Я не знаю
13. Если б у вас был еще один младенец сегодня, вы бы хотели что бы он получил все рекомендуемые прививки?	☐	☐	☐

	Совсем нет	не очень сомневаюсь	не знаю	сомневаюсь	очень сомневаюсь
14. В общем, на сколько сильни вашы сомнение о детских прививок?	☐	☐	☐	☐	☐

	Строго согласен	Согласен	Не уверен	Не согласен	Строго не согласен
15. Я верю информации, которую я получаю насчет прививок.	☐	☐	☐	☐	☐
16. Я способен открыто дискусировать мои переживания насчет прививок с моим детским доктором.	☐	☐	☐	☐	☐

17. В общем, насколько вы можете доверять своему детскому врачу? *Оцените шкалой с 0 до 10.*

совсем не верю — полностью доверяю

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Спасибо!

Appendix F
PACV Scoring Instructions

PACV Scoring Instructions

1. Score each of the 15 PACV survey items (Q3-Q17). Hesitant responses are assigned a 2, 'don't know or not sure' a 1, and non-hesitant responses a 0. The two items in which the 'don't know' response was excluded as missing data (Q3 and Q4) are scored as 2 for the hesitant response and 0 for the non-hesitant response.
2. Calculate the raw total PACV score by simply summing each item. The total raw score will range from 0 – 30 if all items have responses and Q3 and Q4 are not excluded as missing data. If there is at least one item without a response or Q3 or Q4 are answered as 'don't know' and therefore are excluded as missing data, the total raw score needs to be adjusted. For instance, if there is one response missing or excluded, the total raw score will range from 0 – 28; if there is two responses missing or excluded, the total raw score will range from 0 – 26; etc.
3. Convert the raw score to a 0 – 100 scale using simple linear transformation accounting for items with missing values (see score conversion chart below).

A		**B**		**C**	
If both Q3 and Q4 are Yes or No and items Q5-Q17 have no missing responses		If either Q3 or Q4 are Don't Know or Q5-Q17 has one missing response		If both Q3 and Q4 are Don't Know or Q5-Q17 has two missing responses	
Raw Score	Converted Score	**Raw Score**	Converted Score	**Raw Score**	Converted Score
0	0	**0**	0	**0**	0
1	3	**1**	4	**1**	4
2	7	**2**	7	**2**	8
3	10	**3**	11	**3**	12
4	13	**4**	14	**4**	15
5	17	**5**	18	**5**	19
6	20	**6**	21	**6**	23
7	23	**7**	25	**7**	27
8	27	**8**	29	**8**	31
9	30	**9**	32	**9**	35
10	33	**10**	36	**10**	38
11	37	**11**	39	**11**	42

12	40	**12**	43	**12**	46
13	43	**13**	46	**13**	50
14	47	**14**	50	**14**	54
15	50	**15**	54	**15**	58
16	53	**16**	57	**16**	62
17	57	**17**	61	**17**	65
18	60	**18**	64	**18**	69
19	63	**19**	68	**19**	73
20	67	**20**	71	**20**	77
21	70	**21**	75	**21**	81
22	73	**22**	79	**22**	85
23	77	**23**	82	**23**	88
24	80	**24**	86	**24**	92
25	83	**25**	89	**25**	96
26	87	**26**	93	**26**	100
27	90	**27**	96	⊠	⊠
28	93	**28**	100	⊠	⊠
29	97	⊠	⊠	⊠	⊠
30	100	⊠	⊠	⊠	⊠

Appendix G
IRB Approval

August 25, 2017
Hannah, Maksim, & Rachel;

As granted by the Bethel University Human Subjects committee as the program director, I write this letter to you in approval of Level 3 Bethel IRB of your project entitled: "Attitudes Towards Vaccinations in the Minnesota Slavic Community." This approval is good for one year from today's date. You may proceed with data collection and analysis. Please let me know if you have any questions.

Sincerely;

Wallace Boeve, EdD, PA-C
Program Director
Physician Assistant Program
Bethel University
w-boeve@bethel.edu
651 308-1398 cell
651 635-1013 office
651 635-8039 fax
http://gs.bethel.edu/academics/masters/physician-assistant

CC: Bethel IRB Chair
Faculty Chair Advisor
PA Program Research Coordinator

Appendix H
Permission to Use PACV Survey


Request to use the PACV survey tool 2017 x

Rachie Van Heest <rev76682@bethel.edu> Jan 24

to douglas.opel

Dear Dr. Opel,

Appendix I
Adjusted Raw PACV Scores

APPENDIX I

Raw score	Adjusted score
21	70
18	64
28	93
17	57
22	73
23	77
14	47
20	67
24	80
7	27
15	58
1	3
29	97
20	67
27	90
27	90
21	70
28	93
10	33
14	47
10	33

14	50
16	53
9	30
12	40
18	69
7	25
7	27
22	73
28	93