

Vaccination among youth:
Results from a national survey

Janet L. Howard

Presented at the University of Michigan - Flint
in partial fulfillment of the requirements for
the Master of Public Health

2020

University Advisor: Gergana Kodjebacheva, Ph.D.



Community Advisor: Erica Harding, MD



**Vaccination among youth:
Results from a national survey**

BY

JANET L. HOWARD

PHS 595

Table of Contents

Abstract.....	3 - 4
Statement of Problem.....	5
Public Health Significance.....	6
Literature Review.....	6 – 34
State of the Research.....	35 - 37
Study Purpose.....	37
Methodology.....	38 – 39
Analysis.....	40
MPH Competencies.....	40 - 43
Results.....	43 - 45
Discussion.....	46 – 58
Conclusion.....	58 - 59
Resources.....	60 – 61
Table 1.....	62
Table 2.....	63
Table 3 and Table 4.....	64

Abstract

Background: Vaccines are developed to stimulate a person's immune system to produce immunity to specific disease thus providing protection from a particular disease. Reasons that parents have provided for refusal to vaccinate are religious reasons, philosophical or personal beliefs, safety concerns, and desire for additional education. The most common reason parents give for refusal to vaccinate are safety concerns with regard to any short or long term adverse effects. As of December 31, 2019, 3.4% of school-aged children had parents who waived their use of vaccines and while this may not seem like a large number, this is enough to cause an outbreak of an infectious disease that could be prevented with vaccination. The study focuses on socio-demographic factors, breastfeeding, and vaccination among youth in a national survey.

Methods: The method used is a phone survey conducted by the National Center for Immunization and Respiratory Diseases, a division of the Centers for Disease Control and Prevention. The survey is used to collect data on vaccination coverage rates for child aged 19 -35 months and 13 – 17 years. The surveys are conducted in all 50 states as well as the District of Columbia and some of the U.S. territories. The survey has changed in recent years from using landline phone numbers to mobile telephone numbers. The parent/guardian's mobile telephone number is randomly selected and then calls are placed in order to enroll into the study one or more age-eligible child or teen that lives in the household. Consent is obtained from the parent/guardian to contact the child's vaccine provider in order to obtain exact information regarding the type of vaccine, number of doses administered, date(s) of administration, and other administrative data about the health care facility. A questionnaire is mailed to the vaccine provider to obtain this information. The Center for Disease Control and Prevention provided information on any and exclusive breastfeeding, race/ethnicity, and poverty income ratio, among children born in 2016.

Results: The results of the survey showed that approximately 42% of the children were up-to-date on vaccinations. The majority of respondents were breastfed, non-Hispanic white, and above poverty level (at or above \$75,000). The majority of Hispanic, non-Hispanic white, non-Hispanic black, and those of 2 or more races children surveyed were all determined to have been breastfed at some point in infancy but not exclusively breastfed. When looking at whether a child was ever breastfed or exclusively breastfed and poverty income ratio, it was determined that the majority of children were ever breastfed and came from a household with a poverty income ratio of 600 or greater. When it comes to children who are ever breastfed or exclusively breastfed by looking at race/ethnicity or poverty income level, we can conclude that the largest percentage of children who are ever breastfed or who are exclusively breastfed through 6 months of age are of non-Hispanic Asian ethnicity.

Conclusion: The vast majorities of children were up-to-date on their vaccinations, of non-Hispanic ethnicity, were breastfed, and were at or above poverty level. It can also be concluded that children who are ever breastfed are in the upper class income level and that children who are exclusively breastfed through 6 months of age. Children who are in families who are in the poverty level are the least likely to be breastfed exclusively for the first 6 months of life. Asians tended to have an increased likelihood for breastfeeding and lessons can be learnt from this racial/ethnic group on promoting breastfeeding among other groups. The information gained in this study enables the public health sector to determine what areas need improvement when it

comes to public health policies and/or practices to ensure that every child has access to vaccinations. Based on the results, it can be concluded that the public health sector needs to focus its practices on educating families on the importance of breastfeeding and vaccinations for children. The more education that people have in regards to something the more likely they are to participate in an activity. Interventions are also needed to promote simultaneous education on the importance of both breastfeeding and vaccinations (not only one of the two). Interventions that promote both breastfeeding and vaccinations may focus on offering written, audio and video educational materials for parents of different literacy levels and cultural/religious groups.

Statement of Problem

Non-vaccination rates among children

Vaccines were developed to prevent the spread of infectious diseases by stimulating a person's body to create immunity to the disease. When parents choose not to vaccinate their children, they put them at risk for contracting these infectious diseases as well as spreading them to others. Many of the diseases that vaccines have been created to prevent the spread of have been deemed eradicated. With the increasing number of parents choosing not to vaccinate their children, these diseases are making a comeback resulting in outbreaks such as the measles outbreak of 2019 that included 46 people in Michigan as well as those in 19 other states (www.michigan.gov/mdhhs, 2019). Other diseases that have been seen in recent years are polio and pertussis, also known as whooping cough (Facciola, Visalli, Orlando, Bertuccio, Spataro, Squeri, Picerno, Di Pietro, 2019).

Certain vaccines are required for a child to enroll in school. The requirements set forth by the State of Michigan are for a child to enter kindergarten they are to have received 4 doses of diphtheria, tetanus and pertussis, 4 doses of polio, 2 doses of measles, mumps and rubella, 3 doses of Hepatitis B and 2 doses of varicella (chicken pox). The State of Michigan also requires children to have certain vaccines prior to starting 7th grade. Those required vaccines are 4 doses of diphtheria, tetanus, and pertussis, 4 doses of polio, 2 doses of measles, mumps and rubella, 3 doses of Hepatitis B, 1 dose of meningococcal conjugate and 2 doses of varicella (chicken pox).

Public Health Significance

The significance that this topic presents to the Public Health sector is that a lack of vaccination in children could cause outbreaks of infectious diseases that have thought to have been deemed eradicated or at least rare in occurrence. According to a pediatrician in Denver, Colorado, “as the number of unvaccinated children increases, he wonders if he is assisting in creating a risky environment for vaccine-preventable infections in his community” (Insel, 2012).

Literature Review

Overview

In this section, I will explain what vaccines and immunity are, how and where vaccines are administered, what diseases vaccines can prevent and reasons that parents give for not vaccinating their child. According to an article in Family Medicine in 2004, approximately 73% of children in the United States are vaccinated leaving 27% of children unvaccinated (Fredrickson, Davis, Arnold, Kennen, Humiston, Cross, Bocchini, 2004). I will discuss racial/ethnic and other differences in vaccinations in both children and adults as well as reasons for the differences.

What are vaccines and immunity?

According to the Centers for Disease Control (CDC), a vaccine is defined as a product that stimulates a person’s immune system to produce immunity to a specific disease, protecting the person from that disease. The administration of a vaccine results in immunity which is defined as protection from an infectious disease. This means that a person can be then be exposed to a particular infectious disease without becoming infected with it.

How and where are vaccines administered?

Vaccines can be administered intramuscularly, orally or via intranasal route. Vaccines are generally administered on a schedule as recommended by the CDC starting at birth all the way into adulthood with routine booster vaccines. Vaccines can be administered at your physician's office or at the local health department, depending on insurance coverage.

What diseases are preventable by vaccines?

The vaccines that are preventable with the administration of vaccines are Chickenpox (also known as Varicella), Diphtheria, Hib, Hepatitis A, Hepatitis B, Human Papillomavirus, Influenza, Measles, Meningococcal disease, Mumps, Pertussis, Polio, Pneumococcal disease, Rotavirus, Rubella, and Tetanus. Many of these diseases have been eradicated but in recent years re-emerged in part due to lack of vaccinations.

Reasons parents choose not vaccinate

Parents have numerous reasons they provide for why they choose not to vaccinate their children or use a delayed vaccination schedule. Those reasons include religious reasons, personal beliefs or philosophical reasons, safety concerns, and desire for additional education (McKee & Bohannon, 2016). When it comes to religious reasons, only 4 out of the 50 states in the United States do not recognize religious reasons as an exemption for vaccine refusal. There has been an increase in the number of parents seeking to use religious reasons as their justification for not vaccinating their child thus resulting in lawmakers enacting guidelines that require parents to demonstrate "their genuine and sincere religious belief" (McKee, et al., 2016).

When it comes to personal beliefs or philosophical reasons, there are very few states who recognize this as a valid reason to either not vaccinate or to delay vaccinations. Some of the

parents who use this reasoning have stated that there is a benefit to a person contracting certain preventable diseases and that this will provide their child better immunity than a vaccination (McKee, et al., 2016). Other parents have expressed that those diseases that it is recommended we vaccinate against are not as prevalent and therefore their child is at a minimal risk for contracting that disease (McKee, et al., 2016). These parents also believe that any possible negative side effects outweigh any benefits of the vaccines. Parents also stated that their reasons for not vaccinating are that vaccines are putting unnecessary chemicals in their children's bodies, the preventable diseases are not serious or life-threatening, if their child has a healthy diet and lifestyle then they will be at a decreased risk for contracting vaccine-preventable diseases, and that if by chance their child did contract one of these diseases it could be easily treated (McKee, et al., 2016).

The most common reason parents give for not vaccinating their children are safety concerns. Concerns about the safety of vaccines are usually due to something the parent heard in the media or from someone they know resulting in them being unable to make their own decision free of influence from others. The short term as well as any possible long term adverse effects causes parents to refuse to vaccinate their children (McKee, et al., 2016). Some of the long term effects that parents have heard and have concerns about are autism, brain damage and behavioral problems (McKee, et al., 2016). Some parents choose to delay vaccines so that their child only receives one vaccine at a time for fear that administering multiple vaccines at the same time can cause adverse effects.

The last reason that parents give for not vaccinating or delaying vaccinations is that they want more information regarding the vaccines and any adverse effects so that they may make an informed decision. Parents would like to have access to more detailed information as they feel it

is difficult to talk to their child's physician about their fears due to judgement (McKee, et al., 2016). Often when parents do not feel that their questions have been answered by their child's healthcare provider, they seek answers elsewhere and thus receive misleading information.

According to data collected by the Michigan Department of Health and Human Services (MDHHS) as of December 31, 2019, there are 3.4% of school-aged children whose parents waived vaccinations. While this may not seem like a large amount, this is enough to cause an outbreak of an infectious disease that can be prevented with vaccination. The county quarterly immunization report card put out by the MDHHS lists the state of Michigan average for vaccines reported to the Michigan Care Improvement Registry, also known as MCIR, as below the goal set by Healthy People 2020 for all vaccines and age groups. This same immunization report card shows that Genesee County ranks below Michigan for the average of vaccines reported to MCIR in the age group 19 months through 35 months. In the age group of 13 years through 17 years, Genesee County ranks above the Michigan average for diphtheria, tetanus and pertussis as well as polio and the first dose of meningococcal.

Previous Studies

Previous studies have been conducted to obtain data regarding numerous variables that contribute to parent refusal or delay of the administration of vaccinations to their child. The following is a description of the methodology used, results, and limitations to these previous studies in order to try to understand the reasoning behind parent vaccination refusal. See Table 1 for a summary of previous studies. The common factor that all of the studies seem to share is with regard to concerns over the safety of vaccinations. Many parents have concerns over the safety of vaccines whether it is from information that they obtained from someone they know or

the media. They also have expressed concerns over short as well as long term adverse effects from vaccinations. Parents felt that when it came to the safety of vaccinations, that it was actually safer for their child to contract the illness that is vaccine-preventable than to receive the vaccine itself. Another factor that all the studies have in common is that they all share some of the same limitations. For instance, some form of bias seems to be the most common limitation among the studies whether it is parent recall or the adult participant in the survey regarding disparities in adult vaccinations. Some studies have the limitation of recall bias meaning that the parent may not accurately recall if or when their child had certain vaccinations. Some studies note socially-desirable bias as a limitation due to parents giving answers that they feel are socially expected and not what their true beliefs or attitudes are regarding vaccinations.

Childhood Immunization Refusal: Provider and Parent Perceptions Study

Methodology of Provider and Parent Perception Study

One previous study that was conducted consisted of focus groups consisting of parents and healthcare providers and surveys that were mailed to those healthcare providers who participated in the focus groups. The focus groups and surveys conducted with healthcare providers included family physicians in the private sector, pediatricians in the private sector and public health nurses at local health departments. There were 32 focus groups conducted in the cities of Albuquerque, New Mexico; Cleveland, Ohio; Shreveport, Louisiana; Rochester, New York; Santa Fe, New Mexico; and Wichita, Kansas. The selection of these particular cities was based on their geographic representation, ethnic and socioeconomic diversity, and the presence of academic collaborators. The focus group team consisted of a psychologist trained in group dynamics, a physician, a note taker from the research team, and the session was audiotaped. The

majority of the participants were mothers although some fathers did accompany the mother to the focus group and consisted of a wide variety of ethnic and socioeconomic backgrounds. The focus groups that consisted of the parents who refuse vaccinations were white with various income levels.

. The focus group part of the study was conducted after approval by the Louisiana State University Health Sciences Center – Shreveport’s Institutional Review Board for the Protection of the Rights of Human Research Subjects while the mail survey was a questionnaire that was approved by a steering committee made up of representatives from 15 federal and private agencies (Appendix 1). The mail survey consisted of questions asking providers to give an estimate of how many children under the age of 18 were vaccinated per week, how many parents refused to vaccinate their children per year, the reasons parents gave for refusal, and what specific vaccines were refused (Appendix 2). The survey consisted of 3 mailings that occurred between March 1998 and September 1998.

The provider focus groups asked questions regarding their experience with parents who were either hesitant to vaccinate or refused some or all vaccinations. The providers were asked if there were specific concerns that the parents mentioned how the provider responded to the concerns and if the child was eventually vaccinated. The providers were also asked to demonstrate what they would say and how they would say it and then what the parents’ response was. The parent focus groups included questions regarding where they obtained information regarding vaccinations including all sources and what their most trusted sources were. Parents were also asked what information they needed or wanted regarding vaccinations, how they wanted to obtain this information and whether or not they had refused any vaccinations for their child and what the reason was they gave for refusal. If parents expressed concerns about

vaccinations, they were asked to provide further information regarding their concerns. With regard to the 2 focus groups of parents who refused to vaccinate their child, they were asked about their beliefs on not obtaining vaccines or medications for their child, their belief on the protective value of breastfeeding their child until 4 to 6 months of age, and the efficacy of alternative medicine. These questions were asked with a non-judgmental but curious tone in the voice as the focus group leaders were not trying to convince the participants to change their thoughts or beliefs on vaccinations and only to obtain knowledge.

Results of Provider and Parent Perception Study

A qualitative analysis was completed on the data collected from the focus groups on the basis of ground theory and was accomplished through the examination of transcripts as well as through the notes that were taken during the focus group by the facilitators. All of the audiotapes that were recorded were transcribed in verbatim into a computerized database of text documents that could be searched when seeking specific content information. Researchers were able to distinguish themes based on the focus group discussions from the scripted questions as well as the unexpected questions that arose and these themes were analyzed and recorded along with the participants' responses

All data from the surveys was entered into a Microsoft Excel spreadsheet and then re-coded and analyzed using Statistical Analysis Software SAS 8.01. Data was grouped by provider type (family physician, pediatrician, public health nurse), practice location (divided into 4 regions – Southeast, Northeast, Mid-west, and West), and office volume (grouped in 4 groups by number of children vaccinated per week). The number of vaccinations given per week was multiplied by 52 to get the annual vaccination count estimate. The estimated rate of refusals was

calculated by dividing the annual number of refusals by the annual number of vaccinations and then converted to the annual refusal rates per 1,000 children vaccinated. The refusal rates were stratified based on provider type, region, and vaccination clinic volume while the means were compared in bivariate fashion across strata using ANOVA, Duncan's test, and Scheffe multiple comparison procedures and categorical variables were compared across the strata using chi-square. The surveys were completed by 70.4% of the physicians and 92.5% of the public health nurses that were asked to participate resulting in an overall response rate of 77% and there was no statistically significant difference in response rates based on the region of the country where participants live. The demographic characteristics of the participants are provided in Table 2 and consisted of mid-career providers and the public health nurses were mainly female and performed more vaccinations per week than family physicians. Of the providers who participated, it was reported that refusals were rare. The mean number of children vaccinated annually by each provider was 3,536 or a median number of 1,560 children while the mean number of refusals is 7.2 or a median of 0.4 refusals per 1,000 children under the age of 18. The number of refusals per 1,000 children did not vary significantly based on region, specialty, or clinic volume.

Based on the responses from the focus groups, it was determined that there were 4 pertinent themes to parent refusal to vaccinate (Table 1):

1. Concerns and refusals
2. Sources of information that influence refusal
3. Trusted sources of information
4. Doctor-patient refusal communication

When it comes to concerns and refusals, providers in the focus groups reported that parents rarely refused all vaccines and occasionally refused the administration of certain vaccinations. These providers believe that the resistance or refusal is based on the parents' lack of understanding about the importance of vaccines for their child's health. Providers also reported that the majority of parents that refuse vaccines based on cultural differences are recent immigrants. The physicians and public health nurses reported that after providing concerned parents with education materials, that the parents ultimately decided to vaccinate their child. Some of the parents in the groups that vaccinate their children reported concerns about vaccinating a sick child or vaccinating a healthy baby but were reassured by the health care providers about vaccinations. Other parents reported they were concerned about only certain vaccines such as Hepatitis B or varicella (chicken pox) and did not believe that Hepatitis B was necessary for infants and those with concerns about varicella reported that they did not believe that chicken pox was that big of a problem. Of the parents in the groups that refuse to vaccinate, most of the group refuses vaccinations on a philosophical basis while one participant refused them based on religious beliefs. Some of the parents in the refusal group reported that they do not believe that medical science/pharmacology should interfere with nature and that they believe that it is normal and natural for a child to experience a fever and childhood diseases as this enables them to have a healthier immune system throughout their life and that they immunity that the child would acquire from the disease is preferred over the immunity that is obtained from the vaccine. The parents in the refusal group also reported that they believe that breast-feeding their baby into childhood, keeping them out of daycare centers, and keeping them home from school during any outbreaks would provide their child protection from vaccine-preventable diseases. With regards to sources of information that might influence refusal, the majority of

parents reported that they had seen television reports of children that had been diagnosed with autism or brain damage after obtaining vaccinations but did admit that they were aware that media reports may distort the truth. Those parents in the vaccine refusal group reported that they believe the information on vaccines provided by the Centers for Disease Control (CDC) and some anti-vaccination websites was biased and that the CDC was promoting vaccinations and that anti-vaccination websites provided inaccurate or alarming information to promote vaccine refusal. Parents who refuse vaccines reported that want factual information delivered without any bias. All focus group parents, both pro-vaccination and anti-vaccination, agreed that they prefer spoken information from their child's health care provider and reported that they consider them to be the most trusted source for information. Even the parents in the refusal group saw the information provided by their child's provider as being credible and honest even if they chose not to follow the recommendations. Many of the parents wanted to know if their child's provider gives the vaccines to their own child and were reassured when hearing that they had. Providers reported that that is the bottom line is when parents hear that they provided the vaccines to their own child. All the focus group parents also reported that they wanted a personal relationship with the health care provider and for the provider to understand that their child is the most important to them. Parents reported that they prefer a positive approach from the provider as opposed to expressing disapproval for their decision and want the provider to listen to their concerns without judgment and then provide them with information regarding all vaccines that they have questions and concerns regarding. Parents in the refusal group reported that when their provider listened nonjudgmentally to their concerns and provided them with educational information, they were more likely to consider the possibility of vaccinations.

The most commonly refused vaccine in 1998 was varicella with 71% of the respondents reporting refusals then followed by diphtheria-tetanus-pertussis (DTP/DTaP) at 63% and Hepatitis B at 61%. The least commonly refused vaccine is Haemophilus influenza type B (Hib) at 41% and the inactivated polio vaccine (IPV) at 40%. The most common reason (55%) that was reported by providers for parent refusal of vaccinations was negative messages from a third party such as television, radio or word of mouth. Parental belief that the disease was not harmful to their child accounted for 33% of refusals, philosophical reasons accounted for 30% of refusals, religious reasons accounted for 28% of refusals, concerns about medical contraindications accounted for 19% of refusals and anti-government sentiment accounted for 8% of vaccine refusals.

Limitations of Provider and Parent Perception Study

Some of the limitations to this study are that the explanation that parents give for vaccination refusal is not their true beliefs. Parents who do not bring their children to private physicians or public health immunization clinics may be omitted from the survey results. This would likely be a small number of families but would be a high percentage of those parents who do not vaccinate their children. Another limitation is that the surveys are unable to determine if vaccination refusals are more or less prevalent in rural settings. When looking at refusals, parents were not asked if they refuse all vaccines or only specific ones. Further studies need to include parents in rural settings to determine if there is more or less prevalence of refusals. Future studies also need to inquire if refusals are of all vaccines or only specific ones such as HPV, influenza, varicella, and MMR.

Healthy Styles Survey 2009

Methodology of Healthy Styles Survey 2009

In 2009, the Healthy Styles survey was conducted in order to look at vaccine-related attitudes, concerns, and information sources for parents of young children living in the United States. The Consumer Styles survey is sent to a stratified random sample of 21,420 households and focuses on a wide variety of consumer purchasing and media attitudes and behaviors. The Healthy Styles survey was created as a subset that focused specifically on health-related attitudes and behaviors and was sent to 7,004 of the Consumer Styles respondents as a follow-up survey. The Healthy Styles survey included questions related to vaccine attitudes, concerns and information sources. The survey was sent out between August and September and included questions formatted 5- and 10-point Likert-type scale, yes/no, and multiple-choice questions. Demographic information was taken from previous surveys that the participants had completed (Kennedy, Basket, and Sheedy, 2010).

Results of Healthy Styles Survey 2009

The results were calculated using SPSS 14.0 and a 95% confidence interval for demographic characteristics and vaccine-related attitudes, concerns, and information sources of parents. The US Census Current Population Survey was used as a representative of the U.S population for gender, age, income, race, and household size. Of the 7,004 surveys that were mailed out, 4,556 were completed and returned for a completion percentage of 65% (Kennedy, et al., 2010). The analysis was then conducted using only the participants with at least 1 child aged 6 years or younger that resulted in 475 of the surveys being analyzed (Kennedy, et al., 2010).

Females accounted for 60.2% of the respondents while males accounted for 39.8% and 63.8% reported that they had an education level of some college or higher (Kennedy, et al., 2010).

When asked if their child had received or would receive all their recommended vaccines, 74.5% reported that their child had received all recommended vaccines and 18.9% reported that their child would receive all recommended vaccines. Most parents reported (79%) that they were either confident or very confident with the safety of vaccines and 79.8% reported that they believed that vaccinations were an important part of their children's health (Kennedy, et al., 2010). When it came to whether the benefits of vaccines outweigh the risks, 73% of parents reported that they somewhat or strongly agree with that statement. When asked about the number of vaccinations a child receives at one doctor's visit, 72.7% of parents reported they were either comfortable or very comfortable with the number received at one visit while 21.9% of parents reported that they were either somewhat or strongly agree that they were concerned about the number received at one visit and it resulting in damage to the child's immune system (Kennedy, et al., 2010). A follow-up question was then asked regarding how many vaccines the parent would be comfortable with their child receiving at one time with 42.2% of parents reporting they were comfortable with 1 – 2 vaccinations, followed by 33.6% of parents reporting 3 - 4 vaccination at one time, and 22.5% reporting they were comfortable with "whatever the doctor recommended" (Kennedy, et al., 2010).

The next section of the survey asked about 11 potential vaccine-related concerns or parents had an option of stating that they had not vaccine-related concerns. Parents who reported that they had no concerns accounted for 20.8% of the responses. The concern that most parents (44.2%) had was that it was too painful for their child to receive multiple vaccinations at one doctor's visit. Other concerns asked about where a child receiving too vaccinations at one

doctor's with 34.2% of parents that this was indeed a concern, concerns about vaccinations causing fevers in their child was reported by 28.3% of parents, concerns about their child receiving too many vaccinations in the first 2 years of life was reported by 27.8% of parents, and 26.2% of parents reported that they were concerned that vaccinations would result in learning disabilities such as autism (Kennedy, et al., 2010).

The survey then asked parents to respond to questions about where they receive information regarding vaccinations and how their child's doctor communicated with them regarding vaccinations. The majority of parents (81.7%) reported that their child's doctor or nurse was the most important source of information regarding vaccinations (Kennedy, et al., 2010). Parents who reported that their child's health care provider strongly recommended vaccinating their child accounted for 83.3% of parents and 86.5% of parents reported that they either somewhat or strongly agreed that they follow the health care provider's recommendations (Kennedy, et al., 2010). Most parents (60.7%) reported asking their child's health care provider 1 - 3 questions about vaccinations and 84.0% reported that they trust the advice that the provider gives them (Kennedy, et al., 2010).

When it comes to vaccination safety, most parents reported that they have any overall high confidence in the safety of the vaccinations and feel that vaccinations are an important part of their child's health. Only 1 out of 5 of the parents surveyed were not completely confident in the safety or importance of vaccinations, the education they received about the benefits or vaccinations, or the potential dangers of the illnesses that vaccinations prevent (Kennedy, et al., 2010). The parents who expressed concerns about vaccine safety stated that they felt there was a low perceived susceptibility to or severity of any illnesses that the vaccinations would prevent and therefore this reasoning has been associated with vaccination refusal (Kennedy, et al., 2010).

Since communication by the health care provider has been reported by parents to be the preferred and most trusted source of information regarding vaccinations, the American Academy of Pediatrics, the American Academy of Family Physicians, and the Center for Disease Control and Prevention have formed a partnership to develop the “Provider Resources for Vaccine Conversations With Parents” (Kennedy, et al., 2010). The partnership obtained input from parents regarding effective ways that vaccination providers can communicate with them as well as information about the illnesses that vaccinations prevent and the safety of the vaccinations (Kennedy, et al., 2010). The CDC provides education materials that include information on vaccination benefits and risks including common vaccine reactions such as fever, called Vaccine Information Statements that are required by law to be provided to each child’s parent or guardian before the administration of any vaccination that is covered by the National Vaccine Injury Compensation Program to the child. Other resources are provided by the California Department of Health on how to reduce pain and anxiety due to vaccinations in infants and children and by the American Academy of Pediatrics in order to provide explanation to parents about the reasons for the number of doses and the timing of vaccinations on the recommended schedule along with a description of the safety of the administration of multiple vaccinations at one time (Kennedy, et al., 2010).

Limitations of Healthy Styles Survey 2009

One limitation of this program is that since parents are self-reporting their answers may be socially-desirability biased and they may give responses that they feel are socially expected instead of their true beliefs and attitudes about vaccinations with regards to their child’s health. Another limitation is that there is no verification if a respondent’s child actually received vaccinations or not so it is unknown if their expressed attitudes and beliefs had an actual impact

on their decision. The last limitation is that there was only a 65% response rate so it is possible that those who did not respond would have had responses that were systematically different (Kennedy, et al., 2010). Future studies need to include additional questions in order to try to verify if the parents attitudes and beliefs on vaccinations indeed had an impact on the decision to agree to or refuse vaccinations for their child.

Racial and ethnic disparities in vaccination coverage among adult populations

Background

While most studies regarding vaccinations focus on children, this study focuses on reducing racial/ethnic disparities in vaccination rates among the adult population since every year there are thousands of adult who become ill with illnesses that could have been prevented with a vaccination. This study used data from the National Health Interview Survey (NHIS) that was conducted in 2012 by the National Center for Health Statistics and the Centers for Disease Control and Prevention (Lu, O'Halloran, Williams, Lindley, Farrall, Bridges, 2015).

Methodology of Racial and Ethnic Disparities in Adult Populations

The survey obtains health information on citizens of the United States who is in the non-institutionalized population. The sampling is selected using stratification, clustering, and multistage sampling. The survey is then conducted using face-to-face interviews each week throughout the year. The adults interviewed are asked whether they have received the recommended adult vaccinations.

In 2014, an analysis was conducted of the data collected in 2012 from the NHIS. The survey focused on adults receiving vaccinations for influenza, pneumococcal, tetanus-diphtheria,

shingles, and HPV and then the information was stratified using race/ethnicity. The analysis was conducted using SUDAAN statistical software with data being weighted for age, sex, and race/ethnicity (Lu, et al., 2015). Multivariable logistic and predictive marginal analysis were used on the stratified samples by age, sex, race/ ethnicity, marital status, education, employment status, number of physician contacts in the previous year, routine place of care, health insurance status, self-reported health status, duration of residence in the United States, and region of residence. The category that I focused on was race/ethnicity and it was divided into sub-categories of non-Hispanic white, non-Hispanic black, Hispanic, Asian, and other race.

Results of Racial and Ethnic Disparities in Adult Populations

There were a total of 34,218 participants that were divided into two age groups (19 – 64 and >65 years) with the distribution of race/ethnicity differing significantly by all demographic and access to care characteristics (Lu, et al., 2015). The study found that vaccination coverage was significantly lower in the non-Hispanic black population compared to the non-Hispanic white population except for when it came to the pneumococcal vaccination among those in the age group 19 – 64 years and with high-risk medical conditions (Lu, et al., 2015). For all vaccinations inquired about, Hispanics had a significantly lower vaccination coverage rate than non-Hispanic whites and non-Hispanic Asians had a significantly lower vaccination coverage rate for all vaccinations except influenza compared to non-Hispanic whites (Lu, et al., 2015). Vaccination coverage rates were found to be similar among Hispanics and non-Hispanic blacks except for the pneumococcal vaccination in the aged 19 – 64 years with high-risk conditions and with the HPV vaccination in females aged 19 – 26 years (Lu, et al., 2015). The study found that there were fewer racial/ethnic disparities in the group aged 19 – 64 years than in the over 65 age group.

Findings of Racial and Ethnic Disparities in Adult Populations

Studies have found that there has been a significant reduction in racial/ethnic disparities in childhood vaccinations; however there are still racial/ethnic disparities when it comes to adult vaccinations. It is believed that some of the contributing factors in the reduction of racial/ethnic disparities in childhood vaccinations are the requirement of vaccinations to enter school and the Vaccines for Children program that provides vaccinations for children who are uninsured, on Medicaid, or other selected children. Factors that have been found to contribute to racial/ethnic disparities in adult vaccinations are the differences in attitudes regarding vaccinations and preventive care, an inclination to seek and receive vaccinations, variations in providers recommending adult vaccinations, the differences in the quality of care received by racial/ethnic populations, and differences in concerns about vaccinations such as vaccination safety (Lu, et al., 2015).

Limitations of Racial and Ethnic Disparities in Adult Populations

Limitations to this study are that vaccination coverage was self-reported by the adults interviewed which could result in recall bias therefore further studies need to be conducted for accuracy of the recall by the younger adult age group with regard to vaccinations they may have had as a child or adolescent. Other limitations were that other factors associated with vaccination disparities were not measured by the NHIS and therefore could not be ascertained in the analysis and it may be more difficult to identify disparities with low vaccination rates such as the shingles vaccination that a rate of <30% (Lu, et al., 2015).

Reduction of Racial/Ethnic Disparities in Vaccination Coverage, 1995 – 2011

Background of Reduction of Racial/Ethnic Disparities Study

When a resurgence of measles occurred in the United States from 1989 – 1991, the CDC decided to look at trends in health disparities in vaccination rates between non-Hispanic white children and children of other racial/ethnic groups. In order to evaluate these disparities, the CDC looked at data from the National Immunization Survey for 1995 – 2011. During the measles outbreak there were 55,622 reported cases, roughly 11,000 hospitalizations, and 123 deaths (Walker, Smith, Kolasa, 2014). Data showed that those affected were disproportionately inner city or were American Indian, Hispanic, non-Hispanic black, and low-income children aged <5 who had not been vaccinated with racial/ethnic minority children being at three to sixteen times higher risk of contracting measles than non-Hispanic white children (Walker, et al., 2014).

In 1993, the Childhood Immunization Initiative was created in order to address the gaps in vaccination coverage among young children in the United States that led to the measles outbreak. An entitlement program was developed by the CDC in order to eliminate the barrier of the costs associated with vaccinations was the Vaccines for Children program (VFC) and since 1994 has enabled parents to obtain vaccinations for their children at no cost to them who may not have otherwise been able to afford the vaccinations. The vaccines are purchased by the CDC and then distributed at no cost to private physician's offices and public health clinics that are registered as VFC providers for use in eligible children.

One of the main goals of Healthy People 2010 was to reduce or eliminate health disparities and remains one of the main goals of Health People 2020 and reducing disparities in childhood vaccinations is a key component in obtaining the goal. A health disparity is “a particular type of health difference that is closely linked with social, economic, and/or environmental disadvantage” and “adversely affect groups of persons who have systematically

experienced greater obstacles to health because of their racial/ethnic group; religion; socioeconomic status; sex; age; mental health; cognitive, sensory, or physical disability; sexual orientation or sex identity; geographic location; or other characteristics historically linked to discrimination or exclusion” as defined by Healthy People 2020 (Walker, et al., 2014).

Intervention of Reduction of Racial/Ethnic Disparities Study

The report focuses on the progress of reducing racial/ethnic disparities among children aged 19 – 35 months with a focus on the vaccinations that are recommended prior to the Childhood Immunization Initiative and the creation of the VFC. Children are eligible to receive vaccinations through a VFC-enrolled provider, Federally Qualified Health Center, or Rural Health Clinic if they meet certain criteria – Medicaid-eligible, uninsured (not covered by any health insurance that covers doctor visits or hospital stays), American Indian/Alaska Native, or are underinsured (covered by private health insurance that does not cover the costs of all recommended vaccinations) (Walker, et al., 2014).

Methodology of Reduction of Racial/Ethnic Disparities Study

This study looks at racial/ethnic disparities with regard to the measles-mumps-rubella vaccination (MMR), poliovirus vaccination (polio), and diphtheria-tetanus-pertussis vaccination (DTP/DTaP) as these were the vaccinations that were recommended for children to receive prior to the establishment of the VFC in 1994. Estimates of the vaccination coverage between selected racial/ethnic groups and non-Hispanic whites are reported in percentage-point differences with annual coverage estimates being based on the recommendation that a child receives one or more doses of MMR, three or more doses of poliovirus, and four or more doses of DTP/DTaP.

Legislation by the Vaccines for Children program to provide annual population-based estimates

of vaccination coverage for each state and urban areas lead to the establishment of the National Immunization Survey in 1994 to assess the progress in the reduction of racial/ethnic disparities in childhood vaccination coverage.

The report compares estimated vaccination coverage rate for children who were reported as being Hispanic, non-Hispanic white, non-Hispanic black, non-Hispanic American Indian/Alaska Native, and non-Hispanic Asian (Walker, et al., 2014). Those children who were reported as being other or multiple reported races were not included due the small sample size. The estimated percentage point differences in vaccination coverage between a racial/ethnic group and the non-Hispanic white group were considered statistically significant when using a statistical z test to compare coverage rates with a p value of <0.05 with the differences being considered a disparity when they were statistically significant and the vaccination coverage rate for the minority racial/ethnic group was lower than that of the non-Hispanic white group (Walker, et al., 2014). In order to get an estimate of the trends in disparities in coverage rates between the two groups, a weighted linear regression was used to evaluate how the estimated differences in estimates coverage rate changed linearly over time with it being determined that the disparity in estimated vaccination coverage rates had declined significantly over time if the slope of the linear regression was negative and a statistical z test of the estimates slope had a p value of <0.05 (Walker, et al., 2014).

Results of Reduction of Racial/Ethnic Disparities Study

According to VFC program data in 2011, there were 54.3% of children aged 19 – 35 months that were entitled to receive their vaccinations through the program – 48.3% were Medicaid-eligible, 4.7% were uninsured, 3.5% were American Indian/ Alaska Native, and 0.4%

were underinsured and able to receive vaccinations at a Federally Qualifies Health Center or Rural Health Clinic (Walker, et al., 2014). In 2011, 52.1% of the children aged 19 – 35 months who were entitled to receive vaccinations through the VFC program belonged to a racial/ethnic group other than non-Hispanic white (Walker, et al., 2014).

Since 2005, there has been an absence of disparities in MMR vaccination coverage for Hispanic, non-Hispanic black, and American Indian/Alaska Native children compared to non-Hispanic white children (Walker, et al., 2014). There was an increase from 87.9% in 1995 to 92.4% in 2011 for MMR vaccination coverage among Hispanic children while non-Hispanic white children remained at greater than or equal to 90% for the same time period. Since 2003, there have not been any disparities in poliovirus vaccination coverage between Hispanic children and non-Hispanic white children. Vaccination coverage rates for poliovirus in all racial/ethnic groups have consistently met or exceeded the goal of 90% set by Healthy People for most years since 2000 (Walker, et al., 2014). Between 1995 – 2011, disparities in DTP/DTaP vaccination coverage have varied by racial/ethnic groups. From 1995 – 2005, there was a significantly lower vaccination coverage of the 4-dose DTP/DTaP in Hispanic children compared to non-Hispanic white children except for in 2001 when the difference was not statistically significant between the groups. The estimated DTP/DTaP vaccination coverage for Hispanic children has been >80% since 2003 with the number of statistically significant disparities decreasing since 2005 (Walker, et al., 2014). Vaccination coverage for DTP/DTaP did not reach the goal of 90% that was set by Healthy People (Walker, et al., 2014).

Discussion of Reduction of Racial/Ethnic Disparities Study

Since 1995, there has been an increase in the vaccination coverage of both MMR and poliovirus among children aged 19 – 35 months in all racial/ethnic groups with disparities between racial/ethnic minorities and non-Hispanic white children being non-existent since 2007. In order to reduce vaccination-preventable illnesses, there needs to be high vaccination coverage among all racial/ethnic groups. The U.S. immunization program has been deemed successful due to the sustainment of high MMR coverage levels contributing to the end of the 2000 measles outbreak and preventing further outbreaks. The decline in the disparities have demonstrated the impact that the Vaccinations for Children program by increasing access and eliminating cost barriers in order to obtain vaccinations (Walker, et al., 2014). Both MMR and poliovirus has achieved the 90% goal that was set by Health People 2020 for children aged 19 – 35 months while the coverage for DTP/DTaP has increased but has not yet reached the goal set.

Limitations of Reduction of Racial/Ethnic Disparities Study

There are two limitations that were noted regarding this report. The first is that there were moderate response rates of the National Immunization Survey that provide potential for selection response in estimates of vaccination coverage derived from the survey although analysis of all sources of error associated with non-coverage of the target population of children found that this bias might be no more than approximately 1.7 percentage points (Walker, et al., 2014). The other limitation is that certain vaccination providers of children with multiple vaccination providers might not have replied to the NIS mail survey resulting in bias estimates of vaccination coverage but not in estimates of disparities (Walker, et al., 2014).

Understanding the perceived logic of care by vaccine-hesitant and vaccine-refusing parents: A qualitative study in Australia

Methodology of Perceived Logic of Care Study

Between 2013 – 2016, studies were conducted in Fremantle, Western Australia and Adelaide, South Australia that involved the conduction of 29 in-depth interviews with non-vaccinating and/or vaccine-hesitant parents in order to obtain an understanding of their refusal or hesitation to vaccinate their child. The interviews took place with parents talking about their decision not to vaccinate their children in an open and non-judgmental manner with all interviews being transcribed and analyzed using inductive and deductive processes. The three main reasons that parents were asked about regarding refusal of vaccinations were: their capacity to reason, their rejection of Western medicine, and their participation in labor intensive parenting practices, also known as salutogenic parenting (Ward, Attwell, Meyer, Rokkas, Leask, 2017). Salutogenic parenting promotes health promoting activities which parents state boost the natural immunity of their children and protects them from illnesses therefore reducing or negating the perceived need for vaccinations. This style of parenting practice includes breastfeeding, eating organic and/or homegrown food, cooking from scratch to reduce preservative consumption and reducing exposure to toxins (Ward, et al., 2017). The studies used an interpretative, qualitative, methodological approach. The parents in Adelaide were deemed a target population due to their low immunization coverage rates and were recruited at a suburban organic community market and by snowballing. The parents in Fremantle were also deemed a target population due to their low immunization coverage rates and were recruited via posters, advertisements in local newspapers, social media, and snowballing. Both studies looked at parents' broad perceptions regarding different vaccinations, vaccine-preventable illnesses, different vaccine related

information sources including social media, health professionals as well as family and friends. Parents were also allowed to take about various parenting practices they had developed which are the focus of this writing. There was no intention of the interviews to look at parenting practices but this topic came out when parents were discussing their ways of keeping their children healthy.

There were 29 parents who participated with 9 being from Fremantle and 20 being from Adelaide with the majority (25) being women and 19 of the parents being between the ages of 36 and 42. Of the 29 parents, 13 had never vaccinated their child, 5 had ceased vaccinations, 7 were delaying or partially vaccinating, and 4 had previously delayed vaccinations but their child was now up-to-date (Ward, et al., 2017). The interviews were transcribed verbatim, coded, and then analyzed using the NVivo 10 software.

Results of Perceived Logic of Care Study

The parents interviewed provided three general and interconnected reasons for their refusal or delay of either some or all vaccinations for their child. These reason are: “capacity” – their perception of their own cognition and abilities to make and keep their child healthy; “knowledge” – their specific engagement with the scientific evidence and government recommendations; and “salutogenic parenting” – their comprehensive preventative and health promoting practices that they believe replace the need for vaccinations (Ward, et al., 2017).

Salutogenic parenting is the result we are looking at for the purposes of this project. Parents who participate in salutogenic parenting promote a variety of health practices and illness-preventing activities that do not include vaccinating their children. Such activities include managing nutritional intake during pregnancy, breastfeeding, feeding their children organic

and/or home-grown food, cooking from scratch to reduce preservative consumption, reducing their child's exposure to chemicals and toxins and promoting physical activity and play-based learning styles (Ward, et al., 2017). One mother responded that the lack of chemicals in her daughter's diet goes along with not vaccinating in order to avoid the chemicals in vaccines. Numerous parents discussed 'bad chemicals' and pollutants in items such as food, clothes, mattresses, sunscreens, paints, chairs, and weed killers (Ward, et al., 2017). Participants also spoke specifically about breastfeeding as a promotion of health and illness-preventing activity for their child that improves natural immunity and negates the need for vaccinations. It was found that women who intended to breastfeed are less likely to trust vaccinations and opt for the "natural immunity" their child will receive from breastfeeding.

Limitations of Perceived Logic of Care Study

Limitations to this study are that this study analyzed data from two different studies from two different researchers and makes merging the data less than optimal. The other limitation is that even though the parents interviewed refused or delayed vaccinations, they do not represent the views of all parents who refuse or delay vaccinations.

Vaccine Hesitancy Survey

Methodology of Vaccine Hesitancy Survey

Another study took place in the Sicilian city of Messina in Italy and entailed the distribution of surveys at six lower secondary schools between January – June 2017. The current mandatory vaccines in Italy include 3 doses in the first year after birth of a hexavalent vaccine that protects against diphtheria, tetanus, poliomyelitis, and Hepatitis B, as well as vaccines for pertussis, and haemophilus influenza type B and at 13 – 15 months to obtain the first dose of

either trivalent measles-mumps-rubella or tetravalent measles-mumps-rubella-varicella (Facciola, Visalli, Orlando, Bertuccio, Spataro, Squeri, Picerno, Di Pietro, 2019). It is also strongly recommended that a person receives a conjugated pneumococcal vaccine at the same time as the hexavalent vaccine. Once a child reaches between 13 – 15 months of age, it is also strongly recommended that a child receive 1 dose of meningococcal C vaccine and in the first year of life receives 4 doses of the meningococcal B vaccine (Facciola, et al., 2019). From 2013 – 2016, vaccination coverage rates decreased for both poliomyelitis (95.7% down to 93.3%) and measles (87.3%). Italy saw outbreaks in vaccine-preventable diseases such as measles, poliomyelitis, and pertussis due to a decline in vaccination coverage rates of both the mandatory and recommended vaccinations. Due to the recent to the recent outbreaks, research was conducted to investigate the reasoning for this and to obtain information about parent beliefs with regard to vaccines in general and the specific types of vaccines children were given (Facciola, et al., 2019). The research sought to look at vaccine acceptance and the role that vaccine information sources played in the parent's decision-making.

The survey was given to parents of children aged 13 – 14 years of age as it is by this age that all vaccines per Italy's vaccination schedule should have been completed. Parents were given the survey questions at an initial meeting and then the surveys were picked up 20 days later. There were 1,300 surveys distributed with 84% (1,093) being returned completed. The questions listed on the survey included:

1. Age and parents' educations
2. Personal opinions about vaccinations
3. Vaccines carried out on children
4. Booster doses made

5. Opinions of the physicians
6. Information received by the physicians
7. Sources of information that convinced parents not to vaccinate their children
8. Reasons why they are opposed to vaccinations
9. Specific questions about personal views on meningococcal and pneumococcal vaccinations and information received from their physician about the importance of these vaccines
10. Specific questions about their personal views regarding HPV vaccination and information received from their physician about the importance of this vaccine
11. Direct or indirect knowledge of people harmed by vaccines

Results of Vaccine Hesitancy Survey

The data was analyzed using Prism 4.0 software with descriptive statistics used to find the percentages and the 95% Confidence Interval (CI) (Facciola, et al., 2019). Data distribution patterns were determined by evaluating the collected values of each parameter using the Lilliefors and Shapiro-Wilk normality tests and they showed no significance. The Pearson test was used to determine any correlations and significance was assessed at the $P < 0.05$ level.

The results showed that 86% of parents favored vaccinations, 6.6% were indifferent and 7.4% of parents were contrary. Data was also able to determine that both the parents' age and education level was a negative factor when it came to vaccinations. The vaccine coverage rates for MMR and DTP vaccines were both high while coverage rates for the pneumococcal, meningococcal, HPV, and Hib vaccines were all very low (Facciola, et al., 2019). The majority of parents surveyed answered "yes" to obtaining their child booster vaccines (90.2%) while 9.8%

answered “no.” Parents were also asked if the child’s physician favored or unfavored vaccines with 79.5% answering the physician was favorable while 18.1% were favorable for compulsory vaccines, and 2.4% were unfavorable regarding vaccinations (Facciola, et al., 2019). The data was able to help researchers determine that having a physician who is favorable about vaccination aides in the number of children who are fully vaccinated. When it comes to the amount of information regarding vaccines that the physician provided the parents with, the answers were: a lot of information was provided (26.7%), enough information was provided (56.3%), a little bit of information was given (10%), and no information was provided at all accounted for 7.0%. When it came to the specific vaccines meningococcal and pneumococcal, 81.1% of parents were favorable while 18.9% stated that vaccines were not necessary. Of those parents opposing those particular vaccines, the fear of side effects accounted for 44.4%, poor information received accounted for 30.3%, and doubts about the actual effectiveness of the vaccines accounted for 13.1%. When it came to the HPV vaccine, 74.8% of parents favored the vaccine while 25.2% did not favor it. The largest reason for this was a lack of information at 32.2%, fear of side effects at 26.6%, and doubts about the effectiveness of the vaccine at 17.5%.

This study determined that a lack of knowledge and perception about the benefits of vaccinations along with incorrect information on the internet, as well as a strong anti-vaccination movement accounts for the influence on the decision made by parents to vaccinate their child. It was able to determine that parental age and educational level play a role in the decision to obtain vaccinations for their child. Parents who are young and had a lower level of education were more likely to vaccinate their child while parents who are older with a higher level of education are 4 times more likely to have vaccine hesitancy due to concerns about safety as well as more likely to refuse all childhood vaccines (Facciola, et al., 2019).

Limitations of Vaccine Hesitancy Survey

Limitations to this study are that the results are solely based on data reported by the parent and therefore could be the result of poor recollection. Further studies would need to include looking at the vaccination registry compared to parent recollection to check for accuracy in parental reporting.

State of the research

While there have been numerous studies conducted as to the reason for parent refusal of vaccinations, I feel that further research still needs to be done. The majority of the studies I found all point to the same four general reasons for vaccination refusal: religious reasons, personal beliefs or philosophical reasons, safety concerns, and desire for additional education. There are very few studies, I only found one that included it as part of a study, that have been done regarding breastfeeding or a child receiving breastmilk and vaccination refusal. I feel that the correlation between these two variables needs to be explored further since the study I did find only included breastfeeding along with other variables and therefore it was not the main focus of the study. There are a lot of mothers who feel that breastfeeding or feeding their child breastmilk provides a natural immunity to illnesses and therefore the need for vaccinations is rendered null.

Each of the previous studies discussed had their own limitations. In the study conducted regarding provider and parent perceptions, the limitations are that the reasoning parents give for vaccination refusal may not be their true beliefs, parents who do not bring their child to a private physician or public health immunization clinic may be omitted from the survey results, the surveys are unable to determine if the number of vaccination refusals are more or less prevalent in rural areas, and that the surveys do not ask if the parent refuses all vaccinations or only

specific ones. Limitations of the Healthy Styles Survey 2009 are that parents are self-reporting their answers and therefore they may give responses that they feel are socially expected and not their true beliefs and attitudes, there was not any verification as to whether the child actually received vaccinations so it is unknown if their expressed beliefs and attitudes actually impacted their decision to vaccinate their child, and there was only a 65% response rate so it may be possible that those who did not respond would have had systematically different responses. When it comes to limitations of the study on race/ethnic disparities in adult vaccinations, the biggest limitation is recall bias of vaccinations that the younger age group may have received as a child. The National Immunization Survey to reduce racial/ethnic disparities only had moderate response rates and therefore has the potential for selection response in estimates of vaccination coverage and certain vaccination providers of children with multiple vaccination providers may not have replied to the mail survey they received resulting in bias estimates of vaccination coverage but not in estimates of disparities, which means both of these result in limitations. The limitations to the qualitative study in Australia for understanding perceived logic of care by vaccine-hesitant and vaccine-refusing parents are that analyzed data was from two different studies from two different researchers therefore making merging the data less than optimal and the interviewed chose to delay or refuse vaccinations, their views are not representative of the views of all parents who refuse or delay vaccinations. The limitation to the Vaccine Hesitancy Survey are that the results are solely based on data reported by the parent and could be the result of poor recollection on their part.

My research will use a large, nationally representative survey in order to obtain information with the least amount of limitations. The research of a national survey will provide data that has fewer limitations than a survey that was conducted on a smaller scale. After looking

at previous studies, we can form the hypothesis that living below poverty, race/ethnicity and/or being breastfed or fed breastmilk lead to a parent's refusal or hesitation to vaccinate their child.

The questions that were asked of participants were:

- Has (name of child) ever received an immunization that is a shot or drops?
- Some children who do not receive other vaccinations still get vaccinated for the flu. Since July, 2008, has your child had a flu vaccination?
- Is (name of child) of Hispanic or Latino/a origin (includes Mexican, Mexican-American, Chicano/a, Puerto Rican, Cuban, Central American, South American, or another Hispanic, Latino/a, or Spanish origin)?
- Now, I will read a list of categories. Please choose one or more of the following categories to describe (name of child)'s race. Is (name of child) White, Black or African American, American Indian, Alaska Native, Asian, Native Hawaiian, or other Pacific Islander?
- Please think about your total combined income during 2017 for all members of the family. Include money for jobs, social security, retirement income, unemployment payments, public assistance, and so forth. Also include income from interest, dividends, net income from business, farm, rent or any other money income received. Can you tell me that amount before taxes?
- You may not be able to give us an exact figure for your total combined family income but was your total family income during 2017 more or less than \$20,000?
- Was (name of child) ever breastfed or fed breastmilk?
- If so, how old was your child when they completely stop receiving breastmilk?

Study Purpose

The purpose of the study was done in an attempt to determine if certain variables such as socioeconomic status – specifically living below poverty, race/ethnicity, and a child being breastfed or receiving breastmilk played a key factor in the decision on whether to refuse vaccinations.

Methodology

The National Immunization Surveys (NIS) are sponsored and conducted by the National Center for Immunization and Respiratory Diseases which is a subset of the Centers for Disease Control and Prevention (CDC). The NIS are a group of phone surveys that are conducted in order to monitor vaccination coverage among children aged 19 – 35 months and teens aged 13 – 17 years as well as influenza vaccines for children 6 months – 17 years. These surveys are conducted by NORC at the University of Chicago and completed under the direction of the CDC.

The NIS uses a standard survey methodology in order to obtain information that is current and population-based and includes state and local estimates of vaccination coverage for both children and teens. The surveys are conducted using cell phone interviews with the parent or guardian and are done in all 50 states as well as the District of Columbia and some of the U.S. territories. The surveys used to be conducted using landline phone numbers but have most recently been conducted using cell phone numbers since many residents no longer have landlines. The parent/guardian's mobile telephone number is randomly selected and then a call is placed in order to enroll in the survey one or more age-eligible child or teen that lives in the household. Consent is also obtained in order to contact the child's vaccination provider in order to obtain accurate information regarding the type of vaccine, number of doses administered,

date(s) of administration, and other administrative data about the health care facility. This data is obtained via a questionnaire that is mailed to the provider. Vaccination coverage estimates are then calculated for both children and teens vaccinations by the Advisory Committee on Immunization Practices (ACIP). Once a child or teen has received the ACIP-recommended number of doses for each vaccine, they are considered up to date.

The first NIS conducted is the NIS-Child and was conducted in April 1994 and using a combination of data from a telephone survey and a mail survey of vaccination providers called the Immunization History Questionnaire. Those children who are 19 – 35 months of age within a few weeks being selected for participation and live in the United States are the target population. Vaccination coverage data is looked at within national, state, selected local levels, as well as some U.S. territories. Vaccine coverage is looked at is for diphtheria and tetanus toxoids and pertussis (DTaP/DT/DTP), poliovirus (Polio), measles or measles-mumps-rubella (MMR), haemophilus influenza type B (Hib), hepatitis B (Hep B), varicella zoster (chickenpox) (VAR), pneumococcal conjugate (PCV), rotavirus (ROT), hepatitis A (Hep A), and influenza (Flu).

In 2006, the NIS-Teen was introduced for the target population of teens aged 13 – 17 years living in the United States. This data looks at vaccination coverage at the national, state, selected local levels as well as some U.S. territories. The vaccination coverage that is looked at includes coverage of tetanus, diphtheria, pertussis (Tdap), meningococcal conjugate (MenACWY), human papillomavirus (HPV), and influenza (Flu). The survey is conducted using both a telephone survey and a mail survey that is sent to the vaccination provider call the Immunization History Questionnaire.

For the purposes of the project, I will use information from the NIS-Child regarding childhood vaccinations and socioeconomic status along with race/ethnicity and breastfeeding/fed breastmilk. The variables and questions that were variables used are provided in Table 1.

Analysis

Data was collected on a total of 28,971 children. The variables that were analyzed were child being non-vaccinated, race/ethnicity, socio-economic status, and whether the child was breastfed or fed breastmilk. The independent variable used was is a child not being up-to-date on vaccinations and the dependent variables used were race/ethnicity, socio-economic status, and was the child breastfed or fed breastmilk.

MPH Competencies

The Master of Public Health – Health Education competencies that were demonstrated are:

1. Select quantitative and qualitative data collection methods appropriate for a given public health concept.

Quantitative data was obtained from the National Immunization Survey that is conducted using cell phone surveys. The variables that were examined were socioeconomic status, race/ethnicity, and breastfed/received breastmilk and the role they play in the decision to obtain vaccinations for children. The children in the survey were aged 19 – 35 months and reside in the United States, the District of Columbia and some of the U.S. Territories.

2. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate.

The quantitative data was retrieved from the National Immunization Survey – Child division of the Center for Disease Control and Prevention website and analyzed to calculate the percentages of each variable. The dependent variable is a child not being up-to-date on vaccinations and the independent variables are race/ethnicity, socio-economic status, and was the child breastfed or fed breastmilk.

3. Interpret results of data analysis for public health research, policy or practice.

The interpretation of the results provides information on what percentage of children are up-to-date on their vaccinations, what race/ethnicity that majority of the participants of the survey are as well as if the child was breastfed or fed breastmilk and whether they are at, above or below poverty. By obtaining this information, we can determine what changes need to be made with regard to public health policies and/or practices to ensure that more children are receiving the necessary vaccinations. Based on these results, we are able to conclude that the vast majority of children are up-to-date on their vaccinations, are of non-Hispanic ethnicity, were breastfed, and are at or above poverty level.

4. Explain behavioral and psychological factors that affect a population's health.

A behavioral factor that may influence a population's health is breastfeeding. Parents who choose to exclusively feed their child breastmilk may feel that this provides their child the immunity from the mother that they need against certain illnesses and therefore refuse vaccinations.

Psychological factors that can affect a population's health can come into play with there is a contributing variable such as low socioeconomic status. This can result in a parent be more concerned about how they are going to feed their child than having to pay a bill

from the physician's office. The parent may also be experiencing depression or anxiety with regard to their low socioeconomic status and not having enough money to pay their bills.

5. Examine factors that impede the process of health education/promotion and influence the process to which people learn.

Factors that can impede the process of health education/promotion can occur when someone has a low socioeconomic status. When someone has a low socioeconomic status, they may not have a vehicle or the money for an office visit in order to take their child to see a physician where they would obtain educational information or receive the vaccinations. The parent also may not have access to the internet where they would be able to conduct research and obtain information about vaccines.

Another factor that can impede the process of health education/promotion is when a mother chooses to either breastfeed or feed her child breastmilk exclusively. These mothers may believe that their child receiving breastmilk provides them natural immunity against illnesses and diseases and therefore they decline obtaining vaccinations for their child. A breastfeeding mother may not have the knowledge that she may provide passive immunity to her child but only for 6 – 12 months after birth (Jackson, Nazar, 2006).

Research has suggested that children actually have an increased immune response to vaccinations when combined with breastfeeding (Jackson, et al., 2006). It is widely emphasized for new mothers that breastfeeding is the best option for the health of their child but this can also result in the disadvantage that the mother believes that breastmilk will protect her child from illnesses that one only receives immunity against from a vaccine. Breastmilk provides essential vitamins such as vitamin B12, vitamin B6, folate,

and vitamin K as well as lactoferrin that aids in iron absorption and digested amino acids (Dieterich, Felice, O'Sullivan, Rasmussen, 2013). Breastmilk also contains hormones, neuropeptides, and growth factors that play a role in a child's growth, development, and self-regulation of food intake. Observational research has found that breastfed babies had a lower risk of infection and illness such as gastrointestinal infections than non-breastfed babies (Dieterich, et al., 2013). In an article in *Social Science and Medicine*, when asked about immune promotion, one mother was quoted as saying "Immunization through breastmilk" (Reich, 2016). While breastmilk does provide a form of protection against some infections and illnesses, it has not been proven to provide immunity against vaccine-preventable illnesses.

Results

The results of the survey show that of the 28,971 interviews conducted that 3,503 or 12.1% of the children were not up-to-date of their vaccinations while 12,154 or 42.0% of the children were up-to-date on their vaccinations. There were 13,314 or 46.0% of the responses that were missing.

Participants who completed the survey were asked if they child was ever breastfed or fed breastmilk. The number of participants who responded that yes the child had been breastfed or fed breastmilk was 24,944, which equals 86.1% while 3,912 responded with a response of no providing for 13.5% of the responses. A small number of participants responded do not know (106 responses or 0.4%) and 9 participants responded that they refused to answer which is a 0%.

The next question that participants were asked was in regards to their race/ethnicity. The largest group of participants was non-Hispanic white and accounted for 15,740 or 54.3%

followed by those who responded as Hispanic at 6,712 or 23.2%. Those participants who responded that they were either of other ethnicity or multiple ethnicities accounted for 3,922 or 13.5% while 2,597 or 9.0% responded that they were non-Hispanic black.

The final variable that was analyzed was with regard to poverty level. Participants were asked if they were above poverty level which is considered at or above \$75,000 or below poverty level. The number of participants who responded that they were at or above poverty level was 21,381 or 73.8% while 5,917 or 20.4% of participants responded that they were below poverty level. There were 1,673 participants or 5.8% who responded that they were unsure if they were at, above or below poverty level. (See Table 3).

The Center for Disease Control and Prevention also looked at rates of any and exclusive breastfeeding by socio-demographics among children born in 2016. The socio-demographic factors that were looked at were gender, race/ethnicity, maternal education, maternal age, poverty income ratio, marital status, birth order, and whether or not they are receiving WIC. The factors we are focusing on are the rates of breastfeeding based on race/ethnicity and poverty income level and all percentages are with a 95% confidence interval.

The observed number of Hispanic children who were ever breastfed was 4,030 with a percentage of 82.9% +/- 3.0 and the observed number of Hispanic children who were exclusively breastfed through 6 month so of age was 3,954 with percentage of 42.0 +/- 3.9. The observed number of non-Hispanic white children that were ever breastfed was 9,667 with a percentage of 86.6 +/- 1.2 and the observed number of non-Hispanic white children who were exclusively breastfed through 6 months of age was 9,310 with a percentage of 29.1 +/- 1.7. When it comes to non-Hispanic black children, the observed number is 1,587 that were ever breastfed with a

percentage of 74.0 +/- 3.6 while the observed number of exclusively breastfed through 6 months of age was 1,555 with a percentage of 20.7 +/- 3.2. The observed number of children who were of 2 or more races and ever breastfed was 1,304 with a percentage of 84.2 +/- 3.4 while the observed number of children who were exclusively breastfed through 6 months of age was 1,260 with a percentage of 46.6 +/- 5.5.

The poverty income ratio looks at the ratio of self-reported family income to the federal poverty threshold value depending on the number of people in the household. The observed number of children who were ever breastfed and from a household that has a poverty income ratio of less than 100 is 3,940 with a percentage of 74.5 +/- 2.8 while the observed number of children who were exclusively breastfed through 6 months of age was 3,866 with a percentage of 17.1 +/- 2.3. The observed number of children who were ever breastfed and from a household that has a poverty income ratio of 100 – 199 was 3,331 with a percentage of 81.6 +/- 2.6 and the observed number of children who were exclusively breastfed through 6 months of age was 3,244 with a percentage of 23.9 +/- 2.8. Children who were ever breastfed and from a household that has a poverty income ratio of 200 – 399 had an observed number of 4,528 with a percentage of 87.9 +/- 1.6 and the children who were exclusively breastfed through 6 months of age had an observed number of 4,372 with a percentage of 54.9 +/- 2.9. A poverty income ratio of 400 – 599 was in an observed number of 2,787 children who were ever breastfed with a percentage of 90.5 +/- 1.9 and an observed number of 2,661 children who were exclusively breastfed through 6 months of age were 2,661 with a percentage of 29.5 +/- 3.4. The observed number of children from a household with a poverty income ratio of 600 or greater was 3,018 with a percentage of 93.5 +/- 1.4 while the observed number of children who were exclusively breastfed through 6 months of age was 2,916 with a percentage of 31.0 +/- 3.5. (See Table 4).

Discussion

The results of the survey showed that approximately 42% of the children were up-to-date on vaccinations. The majority of respondents were breastfed, non-Hispanic white, and above poverty level (at or above \$75,000). The majority of Hispanic, non-Hispanic white, non-Hispanic black, and those of 2 or more races children surveyed were all determined to have been breastfed at some point in infancy but not exclusively breastfed. When looking at whether a child was ever breastfed or exclusively breastfed and poverty income ratio, it was determined that the majority of children were ever breastfed and came from a household with a poverty income ratio of 600 or greater. When it comes to children who are ever breastfed or exclusively breastfed by looking at race/ethnicity or poverty income level, we can conclude that the largest percentage of children who are ever breastfed or who are exclusively breastfed through 6 months of age are of non-Hispanic Asian ethnicity.

Many people do not realize that importance and benefits of vaccinations and in fact believe that vaccinations may cause more harm than good to their child. Vaccines were developed to help eradicate certain diseases and illnesses by stimulating the body's immune system into emitting an immune response in order to keep a person from becoming ill with the disease. Vaccinations are administered via oral, intramuscular or nasal route and based on a schedule recommended by the CDC from birth through adulthood, which is when one receives boosters for certain vaccines in order to maintain immunity. Diseases that a person becomes immune to due to vaccinations are chickenpox (varicella), diphtheria, Haemophilus influenza type B, Hepatitis A, Hepatitis B, Human Papillomavirus, influenza, measles, meningococcal disease, mumps, pertussis, polio, pneumococcal disease, rotavirus, rubella, and tetanus.

Comparison of the findings to those of prior research

There have been numerous previous studies conducted regarding vaccinations and the refusal of parents to have them administered to their child. The reasoning that parents/guardian regarding refusal to vaccinate were religious reasons, personal beliefs or philosophical reasons, safety concerns, or a desire for additional education/information. While religious reasons if the number one reason given for vaccination refusal, only 4 out of the 50 states recognizes this as a legitimate reason for the rejection. Very few states recognize personal beliefs or philosophical reasons as a reason for refusal. Parents who cited safety concerns as their reason for refusal deemed that the negative side effects outweighed the benefits of the vaccine and that the disease itself only posed a minimal risk to the child. Another safety concern expressed by parents is the fear that they are introducing unnecessary chemicals in to their child's body with the administration of vaccines. The last reason provided for refusal is that the parent/guardian would like to receive more information regarding the vaccines in order to make what they feel is the most educated decision. According to the Michigan Department of Health and Human Services, there are approximately 3.4% of school-aged children whose parents presented a vaccine waiver to the school. While this may not seem like a large number, this is enough to cause an outbreak of a vaccine-preventable disease.

Previous studies that have been conducted involving focus groups of parents and healthcare providers and took place in several states around the country including New Mexico, Ohio, Louisiana, New York, and Kansas. The cities that were selected were based on their geographic representation, ethnic and socioeconomic diversity, and the presence of academic collaborators who could conduct the focus groups. The healthcare providers came from the private as well as the public sector so that information could be obtained from both perspectives.

This particular study used a qualitative analysis based on the data collected from the focus groups and surveys. The data obtained was able to provide researchers with a good understanding of the reasons parents refuse to vaccinate as well as the commonly reasoned vaccines. One major limitation to this study was the idea that the answers were providing were not their true beliefs and therefore resulted in a bias. Another limitation was that children whose parents brought them to private care physicians or public health immunization clinics would be omitted from these results. Parents also were not asked if they refused only specific vaccines or if they refused all of them.

Another survey conducted in the United States called the Healthy Styles survey selected people based on a variety of consumer purchases as well as media attitudes and behaviors. This particular survey chose participants on a random basis and asked them questions related to their vaccine attitudes, concerns, and beliefs. This survey was only completed by 4,556 of the 7,005 that were mailed out and then were reduced down to just 475 surveys based on the ones completed by a household with at least 1 child aged 6 years of younger. The survey asked questions regarding on if the child had or would receive all their recommended vaccinations, vaccine-related concerns the parent had, where the parent receives information regarding vaccinations and how their child's physician communicates with them regarding vaccinations. As with the previous study mentioned, a limitation of these surveys is that the parents are self-reporting their answers and therefore may be responding with what they feel are the socially expected answers and results in a socially-desirability bias.

I did find a study that used data from the National Health Interview Survey and focused on reducing racial/ethnic disparities in vaccination rates among the adult population. It was found that many adults become ill with diseases that are vaccine-preventable. The adult

participants are interviewed on a weekly basis about whether they have received the recommended adult vaccinations such as influenza, pneumococcal, tetanus-diphtheria, shingles, and HPV. The results were then weighted for analysis using age, sex, and race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, Asian, and other race). This study was able to determine that while there has been a reduction in racial/ethnic disparities when it comes to childhood vaccinations, there are still disparities among the adult population. The limitation to this study is the same as the others mentioned; answers are self-reported by participants and could result in recall bias.

During an outbreak of measles that occurred between 1989 and 1991, the CDC looked at the health disparities between non-Hispanic white children and children of other racial/ethnic groups. The data from this was able to identify that those children who lived in the inner city or were American Indian, Hispanic, non-Hispanic black, and low-income children <5 years old who had not been vaccinated. This led to the creation of the Childhood Immunization Initiative in 1993 in order to address the gaps in vaccination coverage that contributed to the measles outbreak. This initiative included a program that would eliminate the cost of vaccines being a barrier to obtaining them. Healthy People 2010 included a goal to reduce or eliminate health disparities and this has been extended as part of Healthy People 2020. A health disparity is defined as “a particular type of health difference that is closely linked with social, economic, and/or environmental disadvantage” and “adversely affects groups of persons who have systematically experienced greater obstacles to health because of their racial/ethnic group; religion; socioeconomic status; sex; age; mental health; cognitive, sensory, or physical disability; sexual orientation or sex identity; geographic location; or other characteristics historically linked

to discrimination or exclusion.” Limitations noted based on the report are there could be a bias centered on response rates as well as bias on the estimates of vaccination rates.

There have also been studies conducted in several countries throughout the world that the United States can learn from based on the data from these studies in order to find ways to help investigate the reasons that the population in this country chooses not to vaccinate their children. For instance, the parents who were interviewed as part of a study in Australia provided investigators with three main reason for why they choose not to vaccinate their children including that they have the perception that their own cognition and abilities will keep their child healthy, the knowledge of their specific engagement with the scientific evidence and government recommendations as well as their comprehensive preventative and health promoting practices that are believed to replace the need for vaccinations (Ward, et al., 2017). The parents who participated were willing as they did not feel as they were being judged by their responses but treated as though they were providing important information so that there can be a better understanding of why parents make the choices about vaccinations that they do. A study administered in Italy was done in order to determine the reason for outbreaks in vaccine-preventable diseases such as measles, polio, and pertussis as Italy has strict rules about mandatory vaccinations. It was determined that this outbreak was due to a decline in vaccination coverage rates in both mandatory and recommended vaccinations. The study was able to discover that the reason for the decline in vaccination coverage was due to vaccine acceptance and the role that information sources play in the parent’s vaccine decision-making process. This study along with the majority of the ones conducted in the United States has all been deemed to have some sort of bias. The Italian study results could have been skewed due to the fact that the response are solely reported by the parents and could be the result of poor recollection.

Research has shown that much can be learned from the Asian population with regards to breastfeeding and the health as well as financial benefits. One such study looked at the number of breastfeeding women in Bangladesh, Indonesia, Sri Lanka, and the Republic of Korea in 1970 compared with the number of women breastfeeding in these countries in 1986 (Thapa, et al., 1990). Asian mothers are the only racial/ethnic group to meet the breastfeeding initiation goal of Healthy People 2020 as well as have the highest breastfeeding rates at 6 and 12 months of age (Jones, et al., 2015). The modern health sector in Asia has been found to have had a major influence in the increase in breastfeeding (Thapa, et al., 1990). One study of Asian-Pacific children who were breastfed and lived in areas that had poor hygiene environments and were less economically developed is less likely to experience the detrimental effects of their surroundings (Shah & Khanna, 1990). There has been evidence found that there is a link between breastfeeding and a reduction in infant morbidity and mortality from health conditions that are common in Asian countries such as diarrheal diseases, infections, for instance acute respiratory illnesses, and malnutrition (Shah, et al., 1990). Women from South Asian countries state that they are supported and encouraged by their families to breastfeed as it is considered “a gift from God” or “nature’s way” in their culture (DaCosta, 2012). These women are encouraged to eat a special diet in order to help them to produce enough breastmilk to feed their infant. The South Asian culture also holds their physicians in high regard and is willing to follow their recommendations on practices such as breastfeeding. The articles I found regarding some of the research that has been done with regards to breastfeeding in Asian countries did not provide the total number of people that were looked at when investigating the percentages involved. The United States can learn from this by being more open to women choosing to breastfeed their child. Sometimes it seems that breastfeeding, especially out in the open, is deemed as being

taboo. If more places had areas set aside for breastfeeding mothers there may be an increase in the number of women willing to participate in the act.

The Centers for Disease Control and Prevention conducts surveys every year to look at the vaccination rates along with factors that contribute to whether or not parents opt to vaccinate or not to vaccinate their child. Those contributing factors include race/ethnicity, poverty level, and whether or not the child was breastfed or fed breastmilk. The data I was able to find provides information in regards to the number of children who are up-to-date on vaccinations and those who are not up-to-date on vaccinations, the race/ethnicity of the child whose parent was surveyed, poverty level, and whether or not the child was breastfed or fed breastmilk. Additional data I found provided information regarding whether a child was ever breastfed or exclusively breastfed through 6 months of age along with their race/ethnicity or poverty level. Unfortunately this information did not include data on whether or not the children were up-to-date or not up-to-date on their vaccinations.

Those mothers with lower rates of breastfeeding tend to be young, low-income, African American, unmarried, less educated, participate in the Supplemental Nutrition Program for Women, Infants, and Children (WIC), are overweight or obese before pregnancy, and are more likely to report that their pregnancy was unintended (Jones, Power, Queenan, Schulkin, 2015). These same mothers may also be more likely not to vaccinate their children due to a lack in education regarding the benefits.

Another benefit that has been discovered about breastfeeding is the financial advantages. In the country of Indonesia, the value of a woman's breast milk is estimated to be at least \$US520 million per year (Thapa, et al., 1990). Research has found that if a mother is not

breastfeeding her child, that the financial ramifications from purchasing infant formula could use a substantial portion of a family's income. The only information that is able to provide a glimpse of the size of Indonesia is that the article states that it is the fifth largest country in the world.

Needs for future research

Further interventions are also needed in order to provide parents/guardians with educational information regarding the importance of vaccinations and the infectious diseases that they prevent. These interventions can provide data regarding the number of cases of infectious diseases contracted by children who have not received vaccinations compared with children who have received their vaccinations. There also needs to be information provided the dangers of a child contracting one of the preventable diseases versus any side effects that they may experience from a vaccine. In order to increase the number of children who receive their vaccinations along with being breastfed, interventions would need to be created that could be altered depending on race/ethnicity as well as socioeconomic status. Interventions need to be able to address the different disparities that people are experiencing in order to provide them the necessary assistance. For instance, women who are low-income may not have a vehicle or transportation to get to appointments with a physician where there would receive education about things such as vaccinations and breastfeeding. An intervention could help address these issues by providing mobile clinics that go out into neighborhoods to reach community members. Any interventions also need to ensure that any language being used in educational materials is at an elementary age level as some participants may not have received a high level of education and would have trouble understanding more complex wording and explanations. The wording may also need to be translated into a different dialect depending on the participant's race/ethnicity and what their primary language spoken is. The data shows that there is a need for interventions in order to

provide additional education about breastfeeding in order for there to be an increase in exclusively breastfeeding through 6 months of age for all race/ethnicities since the highest percentage is among the non-Hispanic Asian ethnicity at 31.8 +/- 7.9. The percentages are significantly low among all races/ethnicities. With educational interventions, these numbers could increase to over 50% of children being exclusively breastfed through 6 months of age. These educational interventions need to be available to everyone without regard to their race/ethnicity or socioeconomic status. Adjustments may need to be made in order to be able to reach as much of the population as possible such as changing the language if the majority of participants speak a foreign language. For instance, education materials may need to be offered in Spanish for the Hispanic population in case is the primary language spoken. There may also need to be adjustments made that include more visuals to convey information as the participants may not read very well or not at all. The intervention needs to provide educational information regarding the importance and health benefits of breastfeeding a child through 6 months of age.

In order to gain a better understanding of the relationship between breastfeeding and vaccination administration, I would conduct focus groups within the community. Participants would be recruited from local WIC offices, public health clinics, and physician offices. They would also be provided an incentive for their participation. Focus groups questions would include:

- Is your child currently or have they ever been breastfed or fed breastmilk?
- If they were breastfed/fed breastmilk, were they exclusively fed breastmilk or was there also supplementation with formula?
- Has your child ever received vaccinations?
- If they have received vaccinations, are they up-to-date on their vaccines?

- If they have never received vaccinations, why have you chosen not to obtain vaccines for you child?
- If you were provided additional information regarding vaccines, do you think you would reconsider your decision on administering them to your child?
- What factor provided the biggest influence in your decision to breastfeed/not breastfeed and to vaccinate/not vaccinate?

I would also contact local medical professionals at physician offices as well as public health clinics and ask them to participate in a survey that included open as well as closed-ended questions regarding their suggestions on interventions to promote breastfeeding and vaccinations.

Implications for Health Promotion Practice

Without the promotion of the benefits of breastfeeding and vaccinations together, there is a tremendous risk of an outbreak of a once eradicated disease. If public health professionals work together to educate the community we can ensure a safe and healthy future for the children of the world. In order to promote these practices, there must be a collaborative effort between public health professionals and physicians to provide education to parents regarding the benefits and risks of breastfeeding and vaccinations.

I want to implement interventions that bring together people of different races/ethnicities as well as a variety of religious groups to educate them simultaneously and not separately about the importance of breastfeeding and vaccinations. By bringing together people of different races/ethnicities and religious groups, they can share their knowledge and beliefs in order for everyone in participation to obtain information.

Competencies: Lessons learned

What I learned from the competencies that I chose was:

- Select quantitative and qualitative data collection methods appropriate for a given public health concept:

I learned how to obtain quantitative data and compare variables to see how the independent and dependent variables affect each other. One of the greatest lessons I learned was that it can be very challenging to obtain the data you are looking for in order to compare variables as there is not always research that includes the exact variables you are looking to compare so you must find data for each variable and then conduct your own analysis.

- Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate:

I learned how to use the quantitative data obtained to calculate the percentages for each variable and how they compare among the values for each variable. One of the lessons I learned regarding this competency is that it is not always simple biostatistics that are used in order to perform data analysis.

- Interpret results of data analysis for public health research, policy or practice:

When interpreting the results of the data analysis, I was able to learn how to draw a conclusion based on the results and therefore able to attempt to determine what type of interventions would be the most beneficial. The interpretation is not necessarily easy to

obtain a conclusion from and there takes some effort in order to decide what interventions would be best suited based on the results.

- Explain behavioral and psychological factors that affect a population's health:

After studying the research, I was able to determine what behavioral and psychological factors may influence a population's health based on the information they have received or other influences. The behavioral and psychological factors that affect a population's health may be obvious but they can also be difficult to distinguish and have to be investigated carefully so that the proper conclusions can be drawn and interventions developed.

- Examine factors that impede the process of health education/promotion and influence the process to which people learn:

I learned how to examine the contributing factors that may impede the process of health education/promotion and the influences on the process for how people learn in order to determine the best type of intervention to overcome those causes. Just like behavioral and psychological factors, factors that impede the process of health education/promotion and influence that process to which people learn also need to be investigated carefully in order to develop the proper intervention that will help change the way those people learn.

Limitations

The data that I was able to obtain shows the need for further studies in order to run statistical analyses with regards to whether children are up-to-date or not up-to-date on their vaccinations based whether they have been breastfed along with their race/ethnicity, and socioeconomic status. One of the major limitations to the data I obtained was that they did not

compare vaccination rates based on race/ethnicity, socioeconomic status, or whether or not the child was breastfed. While information is available in this topic, there needs to be more research conducted in order to gain more knowledge and make comparisons in order to develop more expansive interventions. My recommendation is that future studies collect data on vaccination rates among the different races/ethnicities as well their socioeconomic status and/or whether or not the child was ever breastfed/fed breastmilk.

Conclusion

In conclusion, there is some correlation between breastfeeding and the choice on whether or not to vaccinate a child. Research shows that the largest numbers of breastfed children are of non-Hispanic Asian descent and live above poverty level. There has also been research to show that the lowest number of children who are not breastfed are of African-American ethnicity, have mother who are unmarried, less educated, participate in the Supplemental Nutrition Program for Women, Infants, and Children, are overweight or obese prior to their pregnancy, and are more likely to report that their pregnancy was unplanned. These same children are also less likely to be unvaccinated due to the mother having a lack of education regarding the benefits of vaccines.

Parents who choose not to vaccinate their children give a number of reasons for their decision. The main reasons are religious reasons, personal beliefs or philosophical reasons, safety concerns, and the need to additional education regarding vaccinations. Parents have said that they trust the information that they are able to obtain from their child's healthcare provider when making their decision and find it helpful when the provider listens to them without being judgmental.

The great percentages of children who are breastfed among the non-Hispanic Asian ethnicity are in a large part due to the acceptance of this practice among the Asian culture. The support provided by one's family plays a role in the decisions a person makes when it comes to important life choices. The Asian culture also believes in the health benefits of breastfeeding to prevent certain illnesses in children.

The percentage of children who are not breastfed and are also not vaccinated is due to the lack of education of their mothers. While the reasons behind this may not directly be the mother's fault, her inequalities are then passed on to her child as health disparities. The health disparities may then be passed down to that child's children once they become an adult as it seems to be a cycle that is very hard to break. In order to make an attempt at breaking this sequence, there needs to be interventions developed to provide as much education and information as we can as public health professionals.

Resources

Anstey, Erica H., Chen, Jian, Elam-Evans, Laurie D., Perrine, Cria G. *Racial and Geographic Differences in Breastfeeding – United States, 2011 – 2015*. Morbidity and Mortality Weekly Report. 2017, July 14; Vol, 66, No. 27.

DaCosta, Sharon. *Ethno-Cultural Factors That Influence Infant Feeding Among South Asians in the Region of Peel: Findings From Stakeholder Consultations*. Region of Peel - Public Health, Family Health Division. March 2012.

Dieterich, Christine, Felice, Julia, O’Sullivan, Elizabeth, Rasmussen, Kathleen. *Breastfeeding and Health Outcomes for the Mother-Infant Dyad*. *Pediatr Clin North Am*. 2013 February; 60 (1): 31 – 48.

Edwards, Kathryn M., Hackell, Jesse M. *Countering Vaccine Hesitancy*. *Pediatrics*, 2016, September; Vol. 138, No. 3.

Facciola, Alessio, Visalli, Giuseppa, Orlando, Annalisa, Bertuccio, Maria Paola, Spataro, Pasquale, Squeri, Raffaele, Picerno, Isa, Di Pietro, Angela. *Vaccine Hesitancy: An overview on parents’ opinions about vaccination and possible reasons of vaccine refusal*. *Journal of Public Health Research* 2019, volume 8:1436.

Fredrickson, Doren, Davis, Terry, Arnold, Connie, Kennen, Estela, Humiston, Sharon, Cross, J. Thomas, Bocchini Jr, Joseph. *Childhood Immunization Refusal: Provider and Parent Perceptions*. *Fam Med* 2004; 36(6): 431-9.

Insel, Kimberly. *Treating Children Whose Parents Refuse to Have Them Vaccinated*. *American Medical Association Journal of Ethics*, January 2012, Volume 14, Number 1: 17-22.

Jackson, Kelly, Nazar, Andrea. *Breastfeeding, the Immune Response, and Long-term Health*. The Journal of the American Osteopathic Association, April 2006, Vol 106, 203 – 207.

Jones, Katherine M., Power, Michael L., Queenan, John T., Schulkin, Jay. *Racial and Ethnic Disparities in Breastfeeding*. Breastfeeding Medicine, 2015, November 5; Vol. 10.

Kennedy, Allison, Basket, Michelle, Sheedy, Kristine. *Vaccine Attitudes, Concerns, and Information Sources Reported by Parents of Young Children: Results From the 2009 Healthy Styles Survey*. Pediatrics, 2011, May; Vol. 127, No. 1.

McKee, Chepra, Bohannon, Kristin. *Exploring the Reasons Behind Parental Refusal of Vaccines*. J Pediatr Pharmacol Ther, 2016 Vol. 21 No. 2.

Shah, Iqbal, Khanna, Jitendra. *Breastfeeding, Infant Health, and Child Survival in the Asian-Pacific Context*. Asian-Pacific Journal, Vol 5, No 1.

Thapa, Shyam, Williamson, Nancy E. *Breastfeeding in Asia: An Overview*. Asian-Pacific Journal, Vol 5, No 1.

Ward, Paul R., Attwell, Katie., Meyer, Samantha B., Rokkas, Philippa, Leask, Julie. *Understanding the perceived logic of care by vaccine-hesitant and vaccine-refusing parents: A qualitative study in Australia*. PLOS One, 2017, October 12.

Walker, Allison T., Smith, Philip J., Kolasa, Maureen. *Reduction of Racial/Ethnic Disparities in Vaccination Coverage, 1995 – 2011*. <http://www.cdc.gov/mmwr>. Retrieved on 2020, April 16.

Table 1

Reference	Population	Methodology	Primary Findings
Walker, Smith, Kolasa	Children aged 19 -35 months of different racial/ethnic groups	Phone survey	After the implantation of the Vaccinations for Children Program, there was a reductions in the disparities associated with MMR, polio, and DTP/DTaP vaccinations.
Fredrickson, Davis, Arnold, Kennen, Humiston, Cross, Bocchini, Jr.	Parents of young vaccination age children, vaccination providers	Focus groups and mail surveys	Refusal to vaccinate is rare and usually specific to certain vaccines. Provider and parent communication is the key to addressing parental concerns.
Kennedy, Basket, Sheedy	Parents of at least 1 child 6 years of age and younger	Stratified randomly selected mail surveys	A holistic approach that includes the provider listening and understanding along with providing resources is necessary to address parent concerns.
Ward, Attwell, Meyer, Rokkas, Leask	Parents of vaccination aged children	In-depth interviews	Parents who practice salutogenic parenting believe that breastfeeding provides natural immunity for their child therefore negating the need for vaccinations.
Facciola, Visalli, Orlando, Bertuccio, Spataro, Squeri, Picerno, Di Pietro	Parents of children 13 – 14 years of age	Survey distributed in six lower secondary school	Parents favor vaccinations but need education and communication to ensure that they have the information in order to make an informed decision.

Table 2

Independent Variable	Question asked
Up-to-date on vaccinations	Has (name of child) ever received an immunization that is a shot or drops? Some children who do not receive other vaccinations still get vaccinated for the flu. Since July, 2008, has your child had a flu vaccination?
Dependent Variable	Question Asked
Race/ethnicity	Is (name of child) of Hispanic or Latino/a origin (includes Mexican, Mexican-American, Chicano/a, Puerto Rican, Cuban, Central American, South American, or another Hispanic, Latino/a, or Spanish origin)? Now, I will read a list of categories. Please choose one or more of the following categories to describe (name of child)'s race. Is (name of child) White, Black or African American, American Indian, Alaska Native, Asian, Native Hawaiian, or other Pacific Islander?
Socio-economic status	Please think about your total combined income during 2017 for all members of the family. Include money for jobs, social security, retirement income, unemployment payments, public assistance, and so forth. Also include income from interest, dividends, net income from business, farm, rent or any other money income received. Can you tell me that amount before taxes? You may not be able to give us an exact figure for your total combined family income but was your total family income during 2017 more or less than \$20,000?
Breastfed/fed breastmilk	Was (name of child) ever breastfed or fed breastmilk? If so, how old was your child when they completely stop receiving breastmilk?

Table 3

	Up-to-date on Vaccinations	Breastfed/Fed Breastmilk	Race/Ethnicity	Poverty Level
Yes	12,154	24,944		
No	3,503	3,912		
Do Not Know	13,314	106		
Refused		9		
Hispanic			6,712	
Non-Hispanic White			15,740	
Non-Hispanic Black			2,597	
Other/Multiple races/ethnicities			3,922	
Above Poverty >\$75k				11,990
Above Poverty <= \$75k				9,391
Below Poverty				5,917
Unknown				1,673

Table 4

	n	Ever Breastfed % +/- half 95% Confidence Interval	N	Exclusively Breastfed through 6 months % +/- half 95% Confidence Interval
Hispanic	4,030	82.9 +/- 3.0	3,954	20.4 +/- 2.9
Non-Hispanic White	9,667	86.6 +/- 1.2	9,310	29.1 +/- 1.7
Non-Hispanic Black	1,587	74.0 +/- 3.6	1,555	20.7 +/- 3.2
Multiple Races	1,304	84.2 +/- 3.4	1,260	24.1 +/- 4.2
Less than 100	3,940	74.5 +/- 2.8	3,866	17.1 +/- 2.3
100 – 199	3,331	81.6 +/- 2.6	3,244	23.9 +/- 2.8
200 – 399	4,528	87.9 +/- 1.6	4,372	31.8 +/- 2.7
400 – 599	2,787	90.5 +/- 1.9	2,661	29.5 +/- 3.4
600 or Greater	3,018	93.5 +/- 1.4	2,916	31.0 +/- 3.5