

**The Implementation of a Webinar Strategy for Sharing Health Messaging
to Improve Vaccination Rates for Adults in Rural Communities of Michigan**

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August 2022

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Abstract

Background/significance: Immunization rates in rural communities are lower than in the general population. This has led to higher rates of vaccine preventable diseases in rural populations. Low immunization rates are a multifaceted issue and require an evidence-based approach to provide education for the public in an effort to combat vaccination hesitancy and misinformation with a goal of ultimately increasing vaccination rates in rural areas. Rural populations face different barriers than other populations which is an important factor to consider when choosing which educational techniques to employ.

Purpose: The purpose of this Doctor of Nursing Practice (DNP) quality improvement project is to provide adults in rural Michigan with information regarding barriers to routine immunizations, specifically, vaccine hesitancy.

Methods: Education regarding vaccine hesitancy is being provided to adults who receive services from Michigan State University (MSU) Extension, in selected rural Michigan counties. The information has been recorded and is available online.

Implementation plan/procedure: In collaboration with MSU Extension, DNP students developed a recorded webinar. The webinar focused on the barrier of vaccine hesitancy. The webinar was approximately 25 minutes long with a brief pre- and post-assessment. Deidentified demographic information was collected as a part of the survey taken by participants.

Implications/conclusion: Data review demonstrates that webinars are an effective way to communicate with the public. Special consideration must be given to the wording of webinars and questionnaires to ensure comprehension and data validity.

Keywords: Vaccine, hesitancy, immunization, adults, rural, vaccine hesitancy, barriers to vaccination

The Implementation of a Webinar Strategy for Sharing Health Messaging to Improve Vaccination Rates for Adults in Rural Communities of Michigan

Public health data indicates an increase in the emergence of new cases or replacement strains of vaccine-preventable diseases (VPD) throughout the last several decades (Centers for Disease Control and Prevention [CDC], 2021). However, data from CDC found that vaccination rates for recommended routine vaccines continue to decline (CDC, 2021). This problem has been amplified by the Covid-19 pandemic as many individuals experienced mistrust in the Covid-19 vaccine, ultimately affecting routine vaccination uptake (Shapiro et al., 2022). Rural communities are particularly at risk of lower vaccination rates as it has been found to generally be more challenging to change the belief and attitudes of this population when compared to the general population. This ultimately leads to higher rates of VPD in rural populations (Budhwani et al., 2022). Vaccine hesitancy remains a complex public health concern that needs urgent attention to prevent VPD outbreaks. It is imperative to incorporate evidence-based immunization education strategies that address barriers to immunization to improve health outcomes in rural areas, including rural Michigan. Specifically, education addressing the barrier of vaccine hesitancy is important to provide to the public.

Background and Significance

The CDC recommends that all adults receive routine immunizations, except when contraindicated. These include the Covid-19 vaccine with a booster when indicated, Influenza annually, Tdap every 10 years and with each pregnancy, MMR if born later than 1957, Varicella if born later than 1980, Zoster recombinant, Haemophilus influenzae type B, Human papillomavirus, Hepatitis A, Hepatitis B, Meningococcal ACWY, Meningococcal B and Pneumococcal (CDC, 2022). Recommendations may vary based on individual risk factors and

age. Therefore, individuals should work with their health care provider to maintain an up-to-date immunization schedule.

Routine immunization is a pressing current health issue which has been compounded by a lack of routine primary healthcare received by many people due to the Covid-19 pandemic. The national average adult vaccination rate decreased from 59.1% in 2019 to 48.9% in 2020 (CDC, 2021). Missed routine immunizations have led to a resurgence of VPD and hospitalization, worldwide. (Shapiro et al., 2022). Vaccines are essential as they have reduced and, in some instances, eliminated diseases (CDC, 2016). It is imperative that health care providers become well-versed in different educational techniques to provide patients with evidence-based information highlighting the importance of maintaining immunization schedules to mitigate the gap in care. The Office of Disease Prevention and Health Promotion (ODPHP) states that vaccines are the most cost-effective clinical preventive measures (ODPHP, 2014). However, adult immunizations amongst the underserved population remain a challenge in society. The Healthy People 2030 initiative has a goal of reaching 70% overall immunization rates and reduce preventable infectious diseases (ODPHP, 2020). Despite increased access to immunizations, adult immunization rates remain low and do not yet meet these goals.

The CDC estimated the healthcare burden of adult vaccine-preventable diseases at about \$26.5 billion, annually (CDC, 2022). Additionally, hospitalizations related to flu within the U.S have increased from 140,000 to 710,000 over the last 13 years. Approximately 320,000 individuals suffer from pneumococcal pneumonia every year, which has ultimately led to several thousand deaths and over 150,000 hospitalizations. There are upwards of 880,000 people that live with chronic hepatitis B; over 27,000 cancers in women and men can be attributed to HPV each year and more than 4,000 women will die yearly from cervical cancer (CDC, 2022). In the

U.S. nearly 42,000 adults and 300 children die each year from VPD, despite continued progress in vaccine production and distribution (ODPHP, 2014). These startling morbidity and mortality rates are in part due to the dissemination of misleading and inaccurate information.

In Michigan, despite the recommendation from medical experts on vaccine safety and effectiveness, the adult immunization rate is below the national average of 48.9% in the year 2020 (CDC, 2021). Michigan counties with a large proportion of rural residents have even lower rates. According to the Michigan Department of Health and Human Services (MDHHS), in the year 2020, 68.6% of persons aged 19 – 64 years received Tdap, 56.1% aged 65 and older received PPVS23, 27.9% aged 50 years and older received Zoster, and most surprisingly, 31.5% aged 19 years and older received annual influenza (MDHHS, 2022). Rural residents are 1.4 times less likely than urban residents to be vaccinated (Budhwani et al., 2022). The rural areas are disproportionately affected by VPD morbidity and mortality. The public health focus on overcoming vaccine misinformation in rural Michigan is a high-priority public health concern. It is significant because communities with high unvaccinated rates are at increased risk for outbreaks of vaccine-preventable diseases.

Clinical Question and Problem Statement

In the year 2020, the average routine immunization rates were lower in Michigan (46%) when compared to the national average of 48.9% (MDHHS, 2022). This problem has been magnified and worsened due to the Covid-19 pandemic as preventative care has been delayed (Shapiro et al., 2022). This project initially sought to explore which evidence-based information sharing techniques are most effective in improving immunization rates in adults, in the rural communities in Michigan. Gaps and barriers in vaccine education were reviewed and evidence-based strategies for sharing of vaccine information were provided. As a result of this review,

MSU DNP students, working closely with the MSU Extension teams, were asked to develop a webinar to launch publicly that discusses the barrier of vaccine hesitancy. The goal of this webinar is to increase public awareness and knowledge surrounding vaccine hesitancy. While increased vaccination rates are the ultimate goal, those numbers will not be changed immediately, nor will they be available prior to the end of this project. However, the aim of the DNP project is to deliver an evidence-based educational webinar regarding vaccinations, to adults who receive MSU Extension services, in selected rural Michigan Counties. Potentially, findings from this project will be distributed throughout Michigan, with a focus on rural communities, with the intention of increasing immunization rates in adults.

Gap Analysis

After identifying the problem of low rates of adult vaccination uptake in rural Michigan, the project team completed a root cause analysis (RCA) to identify the causes of the issue. Team members found a complex multifactorial problem, with issues stemming from the people, government/policy, limited supplies, environment, and clinic sites. Identified causes for the issue included, attitudes and beliefs of individuals, hesitancy, a lack of staff to educate or provide vaccinations. Process or policy problems that may cause confusion for the patient including varied guidelines and conflicting recommendations in some instances. Environmental barriers include a long distance to travel for healthcare and a lack of transportation, as well as living in a lower risk area which may lead to the belief that vaccination is not important. Physical barriers identified may include a lack of storage for vaccinations also. An RCA fishbone diagram was created to identify the root cause in these domains (Appendix A). After a thorough examination and review of the RCA, the project team found that decreased vaccine uptake in the rural communities of Michigan is a practice issue to focus on to decrease the prevalence of vaccine-

preventable diseases. Decreased vaccine rates impact the State of Michigan's goal of reaching $\geq 70\%$ in adult vaccination rates (MDHHS, 2022).

Identification of Practice Model

The health belief model (HBM) was used to develop our strategy which aimed at improving vaccination education and immunization rates. The health belief model outlines six constructs that help to guide change. These include: "risk susceptibility, risk severity, benefits to action, barriers to action, self-efficacy, and cues to action" (Jones et al., 2015). The HBM is appropriate as it addresses many of the underlying issues found through research that led to vaccine hesitancy. Personal beliefs and attitudes towards vaccination are an area with great potential for change, and the HBM provides a structure for healthcare professionals to disseminate this information. As vaccine hesitancy is a multifaceted issue, a practice model that addresses different opportunities for change is a well-suited model. Specifically, the DNP project focuses on the constructs of risk susceptibility, risk severity, benefits to action and barriers to action. Risk susceptibility examines if an individual perceives themselves to be at risk of an adverse outcome if unvaccinated. If they do feel that they would be at risk, how severe is the risk of being unvaccinated? This answers the question of risk severity. Benefits to action appraise an individual's understanding of the benefits of vaccination. Vaccine hesitancy is the barrier that the DNP project is addressing as the barrier to action (Jones et al., 2015).

Review of the Literature

The project team members conducted a literature search to answer the following clinical question: (P) In adult patients, aged 18 years and older in Rural Michigan, (I) effective strategies to improve vaccination rates, (C) usual care, standard care, no care, (O) improve vaccination rates, (T) within one year?

In order to gather evidence, databases including PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Cochrane Library, and Google Scholar were searched. The main key search terms used were “immunization” and “vaccine”; then multiple terms were included with the “OR” and “AND” tools to narrow the search using “vaccine interventions” “rural” “education” and “hesitancy” and “information.” The search led to 702 total articles from PubMed, CINAHL, Google Scholar, and/or Cochrane Library. A filter was placed to include articles related to adult vaccination while considering the hierarchy of intervention evidence. Articles were included if they had information relevant to the project: included information on vaccine hesitancy, vaccine education, and vaccination in rural settings. Articles were excluded if they were specific to a population not applicable to this project and if they contained outdated information. Generally, articles from the past five years were considered, though a few older studies were used if they were still pertinent.

Articles included in the literature search were written in English, published within the last ten years, had full text available, focused on elements of the PICOT, and were published by scholarly and reputable sources. Articles excluded were those written in languages other than English, not from scholarly sources, published more than ten years ago, and did not have full text available.

A total of twelve articles met the study criteria (from the original total of 702 article titles found) (Appendix B). Overarching themes were identified from the literature, and contrasts were drawn, in an attempt to develop the strongest strategies for increasing immunization rates by use of evidence-based health sharing. The themes found between studies included: reasons for vaccine hesitancy, possible educational strategies, lower vaccination rates in rural areas, evidence-based interventions, outcome measures, and findings in vaccination rates.

Reasons for Vaccine Hesitancy

Individuals hold their own beliefs and attitudes toward vaccination. Due to varying personal beliefs, along with a wide array of physical, logistical, educational, and socio-economic factors, a wide variety of information-sharing strategies should be considered and employed when aiming to increase vaccination rates. A low level of trust in the government must also be taken into account (Hudson & Montelpare, 2021; Ebrahimi et al., 2021). Individual concerns and questions regarding vaccine safety should be addressed, while higher priority should be placed on community vaccination rates given the potential for greater impact (Ebrahimi et al., 2021). A meta-analysis that was reviewed states that individual behaviors, societal norms, and attitudes are some of the biggest predictors of vaccination hesitancy (Xiao & Wong, 2020). In understanding the reasons for a person to be vaccine hesitant, we can better create education that is beneficial to them. One narrative review found that race, employment status, education level, religion, and political affiliation can all affect vaccine attitudes (Troiano & Nardi, 2021).

Potential Strategies for Vaccine Education

When compared with the above studies, another systematic review found that historically, most strategies have targeted individual education rather than public or community levels (Jarrett et al., 2015). Again, a comprehensive approach typically yields the greatest results. However, it was also noted that there may not be sufficient data on the specific types of interventions that work best when doing vaccine education (Jarrett et al., 2015). Strategies focused on individuals versus community improvement may look different. Another randomized intervention study tried utilizing text message surveys and appointment reminders to increase follow-up for the HPV vaccine series in rural areas and found no improvement in the intervention group versus the control group (Richman et al., 2016).

Vaccination Uptake in Rural Areas

Although vaccination provides health benefits to the community, vaccination among adults is generally low in rural areas, leaving many adults without protection against VPD (Richman et al., 2016). Vast disparities exist partly due to limited access to care and misinformation. Worldwide, many cases of severe illness and death are caused by VPD (Regan et al., 2017). Unfortunately, vaccine intake has been disproportionate among the underserved population putting them at higher risk of eventually requiring hospitalization (Regan et al., 2017; Richman et al., 2016). It is apparent that although each of the studies occurred in different places, there are more similarities than differences in terms of vaccine uptake and how it varies based on geographical locations. Therefore, the suboptimal uptake of adult vaccines in rural communities is a high burden of morbidity and mortality from VPD.

Evidence-based Interventions to Improve Vaccination Rates

Interventions suggested to improve the vaccination rate include those that target the recipients of vaccination, providers of immunization, and health systems (Richman et al., 2016; Lau et al., 2012; Jaca et al., 2021; Jacobson et al., 2018; Odone et al., 2015; Regan et al., 2017). The patient-focused interventions include education on vaccine safety, reminder messages, electronic messages, health education programs, motivational interviewing, incentives, and Information-Motivation-Behavioral Skills theory (Richman et al., 2016; Jacobson et al., 2018; Odone et al., 2015; Regan et al., 2017). The provider-focused interventions include training, provider reminder, audit and feedback, and standing vaccinations orders (Richman et al., 2016; Lau et al., 2012; Jaca et al., 2021; Jacobson et al., 2018; Odone et al., 2015; Regan et al., 2017). Additionally, due to misinformation and varied beliefs amongst patients, it is essential that providers are educated on immunization schedules, provide patients with clear

recommendations, educate them about vaccination at all appointments, and have appropriate follow-through (Jacobson et al., 2015). Lastly, the system-level interventions include changing practices in the healthcare settings, use of electronic health records, systemic vaccination screening, vaccine mandate for employment, and providing vaccination in non-traditional sites. (Richman et al., 2016, Lau et al., 2012, Jaca et al., 2021; Jacobson et al., 2018; Odone et al., 2015; Regan et al, 2017). These interventions could be more effective if the barriers to vaccines access and the spread of misinformation in rural areas are eliminated.

Findings on Vaccination Rates

Statistically, no significant differences in vaccination rates were discovered between the experimental and control groups in several of the studies reviewed; however, an increase in vaccination knowledge and motivation was noted (Richman et al., 2016; Regan et al, 2017). Alternatively, studies found that interventions such as news media led to an increase in vaccination rates in areas where smartphones are rampant and less impact in rural areas with limited internet access (Odone et al., 2015). SMS is cost-effective (it costs \$3.48 for every 29 SMS sent, which led to one additional high-risk patient being vaccinated) and shown to decrease influenza hospital admission by 20% in the high-risk population (Regan et al., 2017). One study found a significant increase in the vaccination rate, especially with the team change approach that includes training nurses, medical assistants, pharmacists, and pharmacist technicians on techniques to administer vaccines (Lau et al., 2012). While another emphasized that addressing barriers to access can amplify the intervention process and thus have positive outcomes on vaccination uptake (Jaca et al., 2021). The findings suggested that the implementation of a multi-faceted approach to vaccine improvement could have significant effects on the overall health of the rural population in Michigan.

Though much of the current focus is on the Covid-19 pandemic and vaccine, it was found that those living in rural areas are less likely to be vaccinated than those living in urban areas and interestingly, student status may also affect vaccination rates (Mann et al., 2022). For the purpose of this project, we have focused on strategies that should positively impact vaccination rates in adults in rural areas.

Methods

Project Site and Population

This project was conducted in conjunction with Michigan State University (MSU) Extension's Michigan Vaccine Project targeting Michigan, with a specific focus on rural communities. Working in tandem with MSU faculty and MSU extension employees, MSU Doctor of Nursing Program (DNP) students worked to develop evidence-based techniques that were then employed to increase vaccine education in rural populations. MSU faculty provided oversight and project guidance while MSU extension employees worked alongside MSU students to complete this project. The U.S. Census Bureau defines rural as any area outside of an urban area (U.S. Census Bureau, 2010). Current resources in the community were reviewed and ultimately, MSU Extension asked the DNP students to create a webinar addressing vaccine hesitancy. On December 2, 2022, this webinar was aired live over Zoom to a public audience for those that registered via the Zoom link.

Ethical Considerations

Before this project began, Michigan State University DNP students put an application into the Michigan State University Internal Review Board (IRB). This project was determined by the IRB to not be research. Ethical considerations included accessibility and protecting individual privacy. Accessibility was limited due to needing the internet to access the webinar.

MSU Extension and MSU College of Nursing (CON) promoted the webinar using paid promotion through their social media channels. However, having a recorded webinar as well as a live webinar, allows for increased accessibility as individuals can view it at a later date or a different location when the internet is available. Individual privacy was protected, and only de-identified demographic information was collected. Demographics collected included race, ethnicity, gender, and Michigan county of residence, for those willing to respond.

SWOT

A SWOT, strengths, weaknesses, opportunities, and threats diagram was developed (Appendix C). Strengths include a robust project budget due to a grant received from MSU for the project. The grant is a seven-million-dollar grant and is a three-year project focusing on immunizations. This DNP student-run project only details one component of the project (McKendry, 2021). Another strength is the collaboration with experts through MSU and MSU Extension that have begun work on similar micro projects within the same macro project. Educational techniques may be low-cost to implement. Weaknesses include physical barriers limiting access to rural communities-including limited staff for outreach, and community members lacking transportation and other resources needed to obtain education. Another weakness is identifying and employing new educational techniques that have not already been exhausted and lack of data collected. The greatest opportunity within this project is the chance to improve vaccine knowledge and ultimately, vaccination rates in adults in rural communities. Additional opportunities include prevention of vaccine preventable diseases and prevention of outbreaks. A threat is the potential of losing key team members before the project is completed and possibly requiring more funding before the project is completed.

Current State and Desired States

The national average adult vaccination rate decreased from 59.1% in 2019 to 48.9% in 2020. (CDC, 2020). The adult immunization rate in Michigan is below the national average of 48.9% in the year 2020 (CDC, 2021). In the year 2020, the average routine immunization rate in Michigan is 46% when compared to the national average of 48.9% (MDHHS, 2022). Michigan Counties with a large proportion of rural residents have even lower rates. The lack of routine care, Covid-19 pandemic, and misinformation are contributing factors in the current lower rates in Michigan. The desired goal would be achieved by implementing evidence-based immunization education strategies. This approach gives individuals the autonomy to make informed decisions and eventually increase the vaccination rate to an above national level through education.

Proposed Intervention and Outcomes

Recent evidence suggests that compliance with routine adult immunization can prevent or decrease VPD (CDC, 2021). Immunizations are cost-effective and recommended by all medical experts as a preventive measure to reduce hospitalization and healthcare burden. Data from MDHHS indicates that increased morbidity and mortality correlate with low vaccination rates in Michigan, especially in the underserved communities (MDHHS, 2022). After reviewing Michigan vaccination data and literature synthesis, the task team proposed a multifaceted educational approach, including increased accessibility to information, and motivation as opposed to the current standard of practice. Utilizing multiple strategies that are feasible in different settings and address barriers may offer the best approach to increase vaccination rates. Additionally, the intervention could positively impact the community's overall well-being by

decreasing the rate of hospitalization, and healthcare costs, preventing disease transmission, and outbreaks.

Intervention

Science-Based Education

Healthcare providers are recognized as trusted sources of information and providing recommendations is a well-known strategy to increase vaccine uptake in adults (Richman et al., 2016; Lau et al., 2012; Jaca et al., 2021; Jacobson et al., 2018; Odone et al., 2015; Regan et al., 2017). For healthcare providers to make an effective vaccine recommendation, it is necessary to provide personalized educational resources to the recipients about the emerging VPD and the rationale for vaccinating adults. Therefore, to maximize impactful communication, utilizing educational campaigns in a congregate and clinic setting consisting of posters, letters, hand-out, brochure, and podcasts have been identified as useful strategies (Richman et al., 2016; Budhwani, et al., 2022). To combat the low level of trust in vaccines, providing science-based information can be conveyed through mass media (television, radio, academic publications) and social media (Facebook, Instagram, and Twitter). The provision of education is a significant initial step; however, studies have shown only small improvements in vaccine uptake with education (Richman et al., 2016; Lau et al., 2012). However, a significant increase in knowledge gain was noted (Richman et al., 2016) Considering this, it is beneficial to combine education with other intervention strategies to achieve increased uptake.

Project Outcome Measures

The effectiveness of the clinical interventions is determined by establishing specific outcome measures. When searching for evidence-based strategies that could potentially improve adult immunization, literature related to outcome measures was explored. The vaccine

administration rates have served as measurable outcome measures to analyze the level of effectiveness. (Richman et al., 2016; Lau et al., 2012; Jaca et al., 2021; Jacobson et al., 2018; Odone et al., 2015; Regan et al., 2017). The vaccination rate before the implementation phase compared to the vaccination rate post-implementation phase is typically analyzed. Similarly, some studies measuring outcomes were based on cost-saving, hospitalization rate, and knowledge learned (Regan et al., 2017; Richman et al., 2016). As long-reaching effects from this education, such as vaccination rates, may be hard to track short-term, this project provides a pre- and post-assessment to individuals who attend the webinar to assess attitudes towards vaccination both pre- and post-webinar.

Project Implementation

Vaccine hesitancy and misinformation are ongoing issues, and their complexity is partly due to factors that influence decisions about vaccination uptake; this includes and is not limited to an individual's knowledge, beliefs, and attitudes (Arede et al., 2019). Increased access to the internet facilitates the spread of true and false information and consequently a rise in vaccine hesitancy (Arede et al., 2019). The most efficient options were explored, to identify measurable strategies to counteract hesitancy. After an extensive literature review and discussion with the MSU Extension team, the team provided an evidence-based educational session for the public using recorded webinar-voiceover PowerPoint as a method to transmit information to the targeted population.

The team addressed vaccine hesitancy and misinformation by focusing on adults in rural Michigan. This audience is of interest as literature regarding vaccine hesitancy found that there were challenges to changing attitudes in adults living in rural areas (Budhwani et al., 2022). Also, counties in Michigan with a large proportion of rural residents have even lower vaccination

rates (MDHHS, 2022). A study showed that educating adults about vaccine awareness can influence the vaccine attitude of the next generation, as these adults will eventually influence their children and other family and close friends (Arede et al., 2019).

During the implementation phase, the team provided a structured webinar voiceover PowerPoint for individuals, addressing topics related to vaccine hesitancy with routine immunizations. Collaborative, web-based information offers a real-world perspective regarding knowledge, attitudes, and beliefs in the era of misinformation. The webinar session included delivery of a short pre- and post-test survey to assess the impact of the webinar on vaccination knowledge.

Measurement Tools

Participants' attitudes towards vaccination were measured both pre- and post-webinar to gather data and assess the effectiveness of the webinar intervention. The Michigan Vaccine Project (MVP) team collected the following demographics: race, ethnicity, gender, and county of residence. The Vaccine Hesitancy Scale (VHS) was used in this study. The ten questions on this vaccination survey were adapted from a larger tool that was developed in conjunction with the World Health Organization by the Strategic Advisory Group on Experts (SAGE) working group. SAGE developed this tool after reviewing other available tools to create a more universal assessment tool related to vaccine hesitancy (Larson et Al., 2015). The tool was originally developed for use with parents of children at home. We adapted the tool from a study that used the tool to score vaccine hesitancy for parents.

They studied the vaccine hesitancy tool and used Cronbach's alpha and Composite Reliability to determine validity and reliability (Wang et Al., 2022). A Composite Reliability of > 0.7 in the scale and the Cronbach's α of > 0.7 indicated that the VHS has acceptable internal

consistency (Wang et Al., 2022). Answers to questions 5, 9, and 10 were worded negatively, while other questions were worded positively. Possible scores ranged from 1-5 for each question, with higher scores representing lower vaccine hesitancy and lower scores representing high vaccine hesitancy (Wang et Al., 2022). Inconsistent data was located on obtaining a summative score of all 10 questions, as well as having a cut-off value of low versus high scores was not found in the study. In addition, to be able to obtain a summative score, reverse coding would have had to occur for three questions, and only minimal information was provided for that process, in the literature. Therefore, no summative score will be used in our project. For the survey being used in our project, we are using the ten questions about immunization knowledge, and have adapted them for use in adults (Appendix D). The VHS survey uses a 5-Point Likert Scale.

Data Analysis

Exploratory analysis was done on demographic data. The VHS was analyzed by assessing the ten items at two separate times (pre- and post-webinar). A paired t-test was used to analyze the mean differences in pre-test and post-test scores for each question. The statistical significance of $\alpha = 0.05$ was used. If the calculated p -value < 0.05 , it will then be concluded that there is a statistically significant difference between the pre- and post-scores for each of the individual questions.

Procedures

The Plan-Do-Study-Act (PDSA) model complemented the DNP project process and provided a framework for procedures. The main benefit of using a PDSA model is that it allows users to implement change while following a simple structure (Corry et Al., 2017).

Plan

MSU DNP students were paired in a group of two. They worked in tandem with MSU faculty and MSU extension staff to create a plan to address the problem of vaccine hesitancy with the intentions of improving vaccination rates in adults in rural Michigan. An intervention was developed-MSU DNP students presented information on vaccine hesitancy via a recorded webinar.

Do

MSU DNP students developed a webinar, in conjunction with MSU extension that addressed vaccine hesitancy. The webinar was presented live on December 2, 2022. Pre- and post-surveys were collected from willing participants.

Study

Results from pre- and post-surveys were matched when possible, using a four-digit PIN that the participant selected. Review of the data shows that many participants filled out the pre survey but not the post survey, and even fewer respondents that completed both surveys were from rural Michigan counties. Data was compiled in an Excel spreadsheet and findings discussed as follows.

Act

Based on the data from pre- and post-surveys, data review demonstrates that the webinar was effective in that it had a positive effect on attitudes and understanding related to vaccine hesitancy.

Projected Timeline

This project is spanning over three semesters, from May 2022 through April 2023. The project has been further divided into three sections, one per semester. Semester one focused on

the project planning process and development of the proposal. The project proposal was completed and submitted to the MSU Institutional Review Board (IRB) in August 2022. Semester two focused on the development of the intervention, a webinar focused on addressing vaccination hesitancy, and implementation. The webinar was implemented in December 2022. Lastly, semester three focused on the evaluation and documentation of the project and noted outcomes. Data was gathered during semester two and was analyzed in semester three. Findings were then presented in a final project presentation in April 2023. Refer to Appendix E for further details.

Projected Budget & Cost/Benefit Analysis

As previously stated, this project is funded through grant money received by MSU. All of the costs associated with the project will be in-kind donations from DNP students and MSU faculty, refer to Appendix F for a further breakdown of costs associated with this project. According to the U.S. Bureau of Labor Statistics, a Registered Nurse working in the Detroit area would make approximately \$37.11/hour (U.S. Bureau of Labor Statistics, 2022), this was used in calculating costs. The potential benefits of this project can reach beyond the current project application and include educating the public, especially rural populations, about vaccine hesitancy and ultimately decreasing vaccine hesitancy. Due to the low projected cost of this project, all work is in-kind donations, and the grant is covering associated technology, the project does have a cost/benefit ratio that allows the project to continue moving forward.

Low immunization rates continue to be a public health issue, specifically in rural Michigan. Literature reviews have shown that the problem is multifaceted and therefore requires innovative approaches for healthcare providers when addressing vaccine-hesitant individuals. The DNP project seeks to provide one approach, that of education for the public regarding

vaccine hesitancy through evidence-based educational sharing techniques. A webinar addressing vaccine hesitancy provides a cost-effective and accessible platform that individuals are able to view from the privacy of their own homes.

Intervention Plan

This QI project focuses on providing education in rural communities in Michigan by addressing the barrier of vaccine hesitancy regarding routine adult vaccinations. The inclusion criteria for participants are rural adults 18 years and older who live, recreate, attend school, or work in Michigan. According to the US Census Bureau, there are 57 rural counties in Michigan and an additional 10 ZIP codes in non-metro areas defined as rural by the census (2021). The project involved collaboration with the MSU Extension team. The individual's knowledge, beliefs, and attitudes toward vaccine hesitancy are then measured utilizing pre- and post-project implementation surveys.

After making recommended amendments, the project team obtained Institutional Review Board (IRB) approval on October 18th, 2022. The project team began the development process of the webinar that focused on educating the public on vaccination hesitancy. The webinar also includes the ten questionnaires VHS pre- and post-survey with a 5-Point Likert Scale administered through Qualtrics. This measurement tool enables the project team to assess the impact of the webinar on vaccine hesitancy.

Prior to implementation, the project team completed a detailed literature review of scholarly journal databases on evidence-based strategies to combat vaccine hesitance. The webinar went live on December 2nd, 2022 via Zoom. In order to recruit participants, the MSU Extension staff assisted the project team with online registration using a shareable sign-up link. The MSU Extension staff, MSU College of Nursing marketing team, faculty, and project team

members were intensively involved in sharing flyers to different platforms such as Facebook, text messages, email, Instagram, and Twitter. The project team goal focused on 30 or more participants, in rural counties.

Recruiting Participants

Registration was open to the public three weeks before the webinar went live. The registration process utilized open-ended responses to be inclusive. It includes the participant's race, ethnicity, gender, Michigan County of residence, and unique four-digit PIN (number specific to the participant, such as the last four digits of their phone number). Data is de-identified by using these assigned participants' unique four-digit pins. The demographics collected are optional for participants to answer, as is the survey. At the end of the registration, a Zoom link to register for the webinar was available.

Results

Characteristics of Participants

The webinar was accessible to the public; though geared towards rural residents. Table 1 (Appendix G) shows the number of participants who completed the pre-survey (N = 32). The sample size includes both the rural and urban populations. As illustrated in Table 1, most participants were White at (84%) followed by Black/African American at 13%, and Other or Not Answered at (3%). We also asked participants to identify their ethnicity. The majority (72%) chose not to disclose their ethnicity by answering Other or did not answer. Interestingly, 69% of our participants were female, while 31% were male or other/not answered. In terms of counties, participants were 50% urban and 50% rural.

Table 2 (Appendix G) reflects demographics from all participants that completed the pre- and post-survey and matched as a pair using a four-digit PIN. The table demonstrates all pre- and

post-paired answers from urban and rural counties (N=14). Although it was stated in the registration section and during the webinar that participants should complete pre- and post-surveys, we only had matched 14 pairs, as 18 people completed only the pre-survey data. DNP students decided to analyze all of the available data. As illustrated in Table 2, 93% of our matched participants were White, 7% were Black/African American, and 72% selected other or did not answer regarding ethnicity. Remarkably, 71% were female, while 29% were male. Interestingly, from our matched pairs, 57% of participants resided in rural counties, while 43% resided in urban counties.

Comparison of Pre- and Post-test Answers for the Routine Vaccine Survey Accompanying the Webinar

Before analyzing the data, the DNP students met with the project adviser and statistician to discuss the data analysis. As a result of having a small sample size, the project team decided to analyze the results in all three groups of matched pairs (Total [Urban + Rural], Rural only, and Urban only) (see Table 3). In the first four questions, the results were statistically significant for the total sample and rural residents only ($p < 0.05$). However, no significant results were found for urban residents due to the t -value not being able to be computed because the standard error of the difference was zero. In question 6 the results were statistically significant ($p < 0.05$) for the total sample but not in the rural or urban groups. Questions 7 and 8 were statistically significant ($p < 0.05$) for total and rural residents. However, there were no significant results in questions 7 and 8 were found for urban residents due to t -value cannot be computed due to the standard error of the difference being zero. It is imperative to note that questions 1 - 4 were focused on vaccine importance while questions 6 - 8 were focused on vaccine awareness. Therefore, the webinar was effective in improving knowledge regarding vaccine importance and awareness.

Questions 5, 9 -10 were negatively worded and noted some unpredicted results. Interestingly, the only statistically significant results in question 5 were found in the urban population. Whereas, question 9 was statistically significant in the total population only and question 10 was not statistically significant in any population. The project team speculated that the reason there was no improvement in the urban residents was partly due to the webinar not being tailored for this group. Also, the project team speculated that having three negatively worded questions in a 10 questions survey where the majority were positively worded questions, may have confused readers (Zeng et al., 2020).

Recommendation / Sustainability

The result of this study has demonstrated that webinars are an effective strategy to communicate with patients, colleagues, and the public. Literature review results have shown that patient-focused interventions such as internet-based education and health education programs could improve vaccine hesitancy if effectively implemented (Richman et al., 2016; Odone et al., 2015). Additionally, webinars are a low-cost and accessible way of communicating with a larger audience. Therefore, further education on strategies for sharing health messages to improve the vaccination rate in rural Michigan would be useful. To further improve the vaccine knowledge of this population, health education can be provided by DNP students in different targeted rural counties in Michigan. It is crucial to avoid the negatively worded question. As this question type may lead to confusion in non-scholarly settings (Zeng et al., 2020). The project team should avoid combining positively and negatively worded questions in the same survey panel as it may skew the results and validity of the study.

Discussion / Implications for APRN Practice

This project serves to standardize the NP process in incorporating evidence-based strategy into practice. A low vaccination rate is a public health concern that negatively impacts our community. The missed routine immunizations have led to a resurgence of VPD, outbreaks, and hospitalization (Shapiro et al., 2022). Vaccines are essential as they have reduced and, in some instances, eliminated diseases (CDC, 2016). Nurse practitioners play a crucial role in mobilizing vaccination education and outreach to underserved communities. To combat misinformation, vaccine hesitancy, attitudes, and beliefs, APRNs continue to be a source of information for their patients and the public. Therefore, nurse practitioners need to become well-versed in different educational techniques to provide patients with evidence-based information regarding the importance of maintaining the recommended immunization schedules.

Furthermore, this project highlights the importance of clear directions when communicating with patients and the public. It is important to note that when collecting pertinent information that entails completing questionnaires or scales from patients in clinical practice or community settings, clinicians must ensure that the wordings are clear and easy to understand. The intervention may also serve as a guide for future DNP projects to evaluate an effective educational strategy to improve vaccination knowledge, hesitancy, attitudes, and awareness.

Conclusion

Although vaccination provides health benefits to the community, vaccination among adults is generally low in rural areas, leaving many adults without protection against VPD (Richman et al., 2016). The vast disparities exist partly due to limited access to care, vaccine hesitancy, and misinformation. Unfortunately, vaccine intake has been disproportionate among

the underserved population putting them at higher risk of eventually requiring hospitalization (Regan et al., 2017; Richman et al., 2016).

This quality improvement project sought to implement a webinar strategy for Sharing Health education to improve adults' vaccination rates in Rural Communities of Michigan. After implementing the webinar intervention, statistically significant results in knowledge, importance, and awareness regarding vaccination were noted with many of the survey questions. Although it is unknown if this strategy will improve vaccination rates for adults in rural communities of Michigan, this project does demonstrate that the webinar affects evidence-based information about vaccinations. Though the project indicates webinars are an effective teaching tool when used appropriately, the rural population continues to be challenging to reach. This challenge has been exacerbated by limited technology, internet access, and access to care. This quality improvement project could be adapted to be a part of future interventions aimed at decreasing vaccine hesitancy through community outreach.

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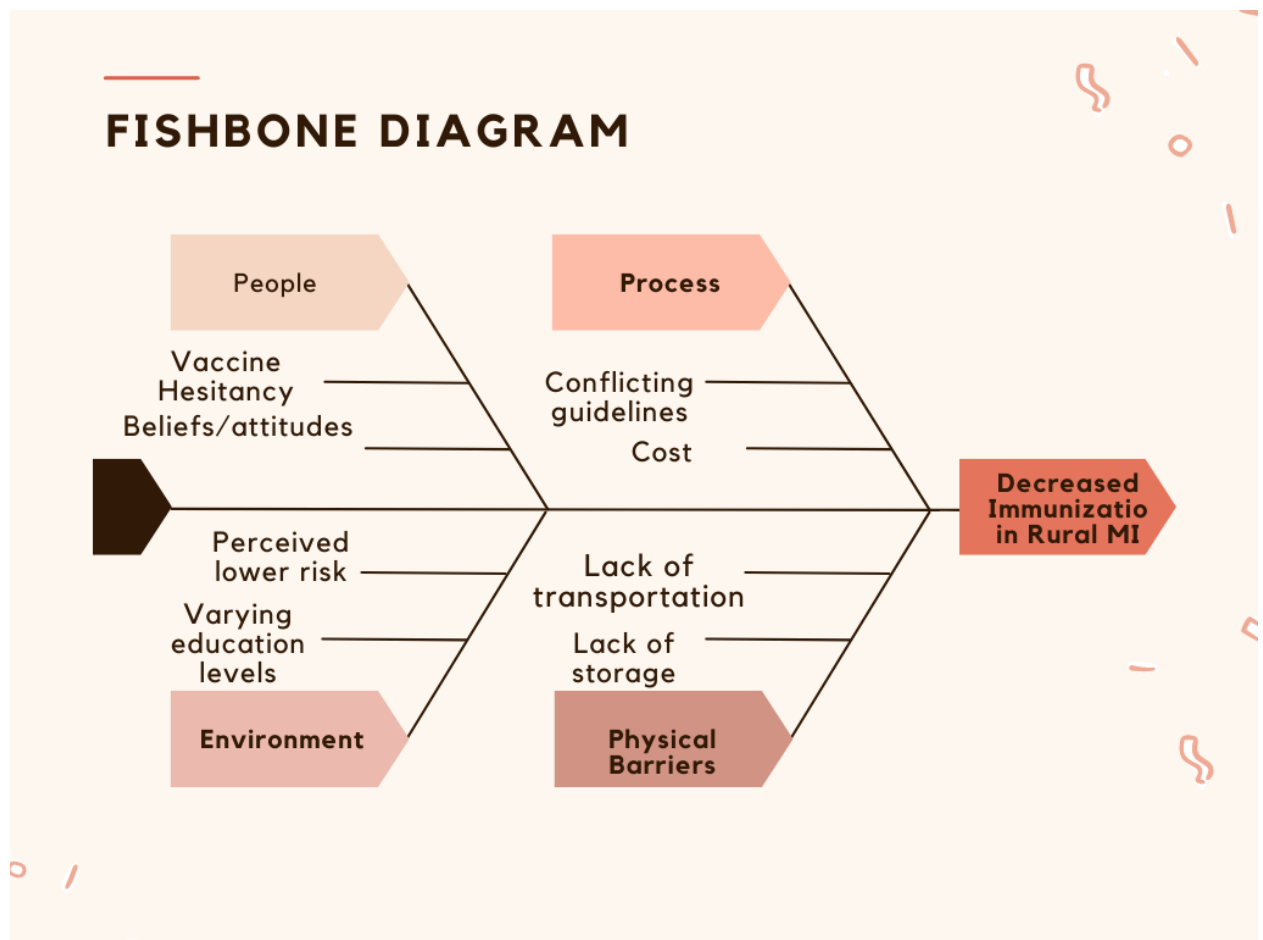
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Appendix A: Fishbone Diagram



(Canva, 2022a)

Appendix B: Literature Review Table

Citation	Design	Sample	Intervention	Measure- ment	Findings	Limitations (L)/ Strengths (S)
Hudson A, Montelpa re WJ, 2021	Literature review	Included articles if in English and relevant to vaccine hesitancy from 2006- 2021	N/A	N/A	Public health campaigns will benefit the vaccine hesitant only	L-Limited peer reviewed sources S-examine vaccines as a whole prior to covid as well
Ebrahimi OV et. al., 2021	Cross- sectional study	4,571 people	Online survey to identify vaccine hesitancy	Yes vs. No	Variables associated with vaccine hesitancy will require a multi-	L-not totally randomized S-Large sample size, evaluation

					faceted approach	of multiple variables
Mann S et. al., 2022	Cross-sectional online survey	2,937 young adults	Self-administered survey	Covid vaccine hesitancy, rurality, covariates,	Student and rural status may affect vaccination attitude	L-excluded those without internet, gift cards? S-large sample size
Jarrett C et. al., 2015	Systematic review	166 peer-reviewed articles 15 grey literature evaluation studies	N/A	Monitoring increase in vaccine uptake	There are few strategies to improve vaccine hesitancy	L-Publication bias S-More likely to have success with multifaceted approach

Xiao X, Wong RM, 2020	Meta- analysis	5,149 participant s 17 studies	Data review	Predictors of intention to vaccinate	Attitude and behavior control effect vaccine behaviors	L-Smaller sample size, language constraints S- applicability in practice
Richman et al., 2016	Randomiz ed control trial	264 male and female college student aged 18 - 26 who were receiving HPV vaccine dose 1	Electronic messages (phone, text, email appointment and education messages)	HPV vaccine completio n (2 doses and 3 doses)	-Vaccine completion was not significantl y different dose 2 (53% vs 52%) and dose 3 (34% vs 32%) - knowledge score was significantl	L- Clinical site ran out of vaccine, some participant claim did not receive text messages, Sample size limited to college student S - Increased

					y higher at (P =0.01)	provider knowledge
Troiano, Nardi, 2021	Narrative Review	15 studies included in the review	Data review	Covid-19 and Influenza vaccinatio n rates	77.6% covid vaccination rate in general population, 69% influenza vaccination rate general population rate	L-focused on Covid- 19 and Influenza S-Reasons for refusal are likely applicable to other vaccines
Lau et al., 2012	Systemati c review and meta- Analysis	177 studies involving adults and older adults primary	NA	Measuring effectivene ss of interventio ns to improve vaccinatio n rates	Interventio ns improve vaccination rates most especially team change (nonphysici	L - Publication bias, economic value of intervention does not address

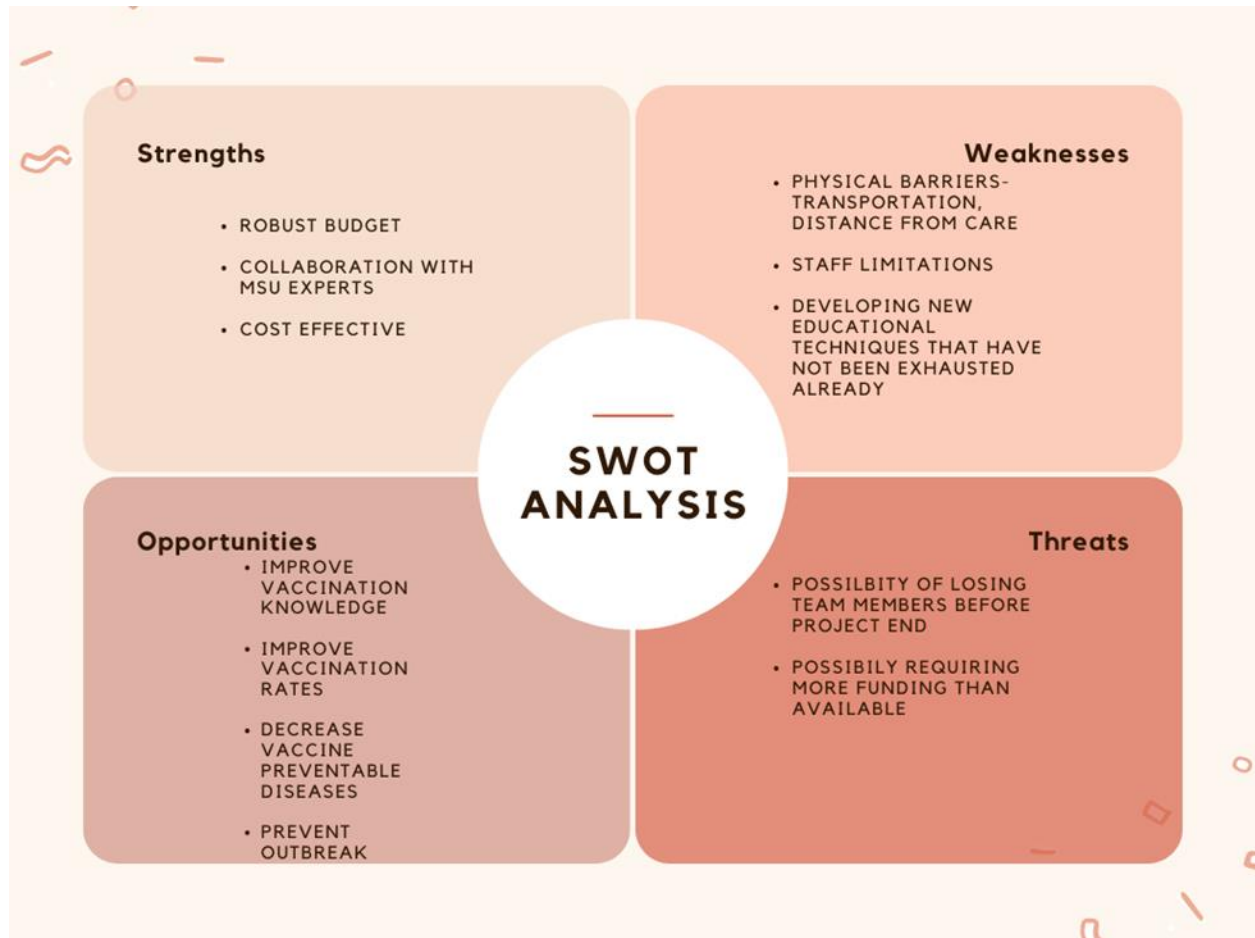
		care patients			an personnel)	S - Inclusion of wide range of study
Jaca et al., 2021	Systematic Reviews	Randomized trial article irrespective of publication status and language	NA	Assess interventions to improve uptake of routine vaccine in adults	Interventions that address barriers to access are more effective	L - Publication bias, exclude adult traveler's vaccine
Jacobson Vann et al., 2018	Systematic review	75 studies included involving child, adolescent, adults in primary care settings	Patient reminder or recall intervention (phone calls, letters, postcard, text messages,	Vaccination rates	Increased vaccination rates among children, adolescents, and adults	L - Publication bias, limited to studies published in English, change in technologies

			recall with outreach			S - diverse study population
Odone et al., 2014	Systematic Review	19 studies included (published from 1999 - 2013)	New media (text messages, internet-based intervention, smart phones applications, standing vaccination order, computerized reminder for provider)	Vaccination rates	Impact of interventions are higher where prevalence of new media use is high	L - high degree of heterogeneity, limited data, limited sample size, publication bias S - diverse study population
Regan et al., 2017	Randomized control trial	12,354 participants (at high risk of infection who have	Short message service (SMS) reminder	Cost-saving and influenza vaccination rate	Interventions led to a 39% relative increase. Every 29 SMS sent	L - study limited to only patient with active cell phones number on file,

		cell phones)			cost \$3.48, 1 additional high-risk patient was immunized. Cost- effective in improving influenza vaccination rate in high-risk patients	inaccurate criteria for selecting high- risk patients S - cost- effective, decrease hospitalizati on of high- risk patient
Jacobson, et. al., 2015	Expert opinion?	N/A	Know vaccination schedule, use every visit to discuss vaccination, use standing order set, check state	N/A	Due to varied reasons for vaccine hesitancy, clinicians should use a multifacete	S-Expert opinion, easy to follow, applicable many practice settings, reviewed

			vaccination record, make clear recommendatio ns, use C.A.S.E. to address hesitancy		d approach to address and have a strong stance on immunizati on	reasons for vaccine hesitancy L-No study, no new data gathered, opinion only
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Appendix C: SWOT



(Canva, 2022b)

Appendix D: Routine Vaccine Survey

This survey is being collected to measure attitudes and beliefs surrounding vaccinations. Data collected will be used to assess the effectiveness of the education provided.

We ask that you fill out the survey both before and after viewing the webinar. Participation in either survey is optional, you may refuse to answer any question. By completing the survey, you are agreeing to voluntarily participate.

Please check one answer for the following five questions, using this scale:

1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4= agree, 5=strongly agree

	1	2	3	4	5
1. Routine vaccines are important for my health.					
2. Routine vaccines are effective.					
3. Being vaccinated is important for the health of others in my community.					
4. All vaccines offered by government program in my community are beneficial.					
5. New vaccines carry more risk than older vaccines.					
6. The information I receive from the vaccine program is reliable and trustworthy.					
7. Getting vaccines is a good way to protect myself from disease.					
8. Generally, I do what my doctor or healthcare provider recommends about vaccines.					
9. I am concerned about serious adverse effects of vaccines.					
10. I do not need vaccines for diseases that are not common anymore.					

The following demographic information will also be collected with the survey, voluntarily. All data gathered will be deidentified.

- Demographics collected may include age, gender, occupation, and education level.

Appendix E: Timeline



(Canva, 2022c)

Appendix F: Budget

Resources	Amount Needed	Cost	Total
DNP student time	Approximately 240 hours (per student)	\$30/hour	\$14,400 (in-kind donation)
Technology for webinar	Already have	\$0	\$0
Promotional materials	Advertising provided through MSU	\$0	\$0
Data collection	Will be assisted by MSU	\$0	\$0
Pre/post assessment	Will use tool already developed	\$0	\$0
			Grand total= \$14,400 (in-kind)

Appendix G: Survey Data

Table 1. Characteristics of Participants that completed Pre-Test Data Responses (N=32)	
	Frequency/Percent
Race	
White	27 (84)
Black or African American	4 (13)
Other or Not Answered	1 (3)
Ethnicity	
Hispanic or Latino	5 (16)
Ethnicity not listed	1 (3)
Other or Not Answered	23 (72)
German Irish	1 (3)
Native Hawaiian	1 (3)
Maltese	1 (3)
Gender	
Female	22 (69)
Male	9 (28)
Other or Not Answered	1 (3)
County	
Rural Area	16 (50)
Urban Area	16 (50)

Table 2. Characteristics of Participants That Completed Pre- and Post-Test Data (N=14)	
	Frequency/Percent
Race (post)	
White	13 (93)
Black or African American	1 (7)
Ethnicity	
Hispanic or Latino	3 (21)
Ethnicity not listed	1 (7)
Other or Not Answered	10 (72)
Gender	
Female	10 (71)
Male	4 (29)
County	
Rural Area	8 (57)
Urban Area	6 (43)

Table 3. Comparison of Pre- and Post-test Answers for the Routine Vaccine Survey Accompanying Webinar (Total N=14, Rural n=8, Urban n=6)			
	Pre-test M (SD)	Post-test M (SD)	<i>p</i>
Questions*			
1. Routine vaccines are important for my health.			
Total	4.43 (0.51)	4.79 (0.43)	0.02
Rural	4.13 (0.35)	4.75 (0.46)	0.01
Urban	4.83 (0.41)	4.83 (0.41)	---***
2. Routine vaccines are effective.			
Total	4.50 (0.52)	4.79 (0.43)	0.04
Rural	4.25 (0.46)	4.75 (0.46)	0.03
Urban	4.83 (0.41)	4.83 (0.41)	---***
3. Being vaccinated is important for the health of others in my community.			
Total	4.50 (0.52)	4.79 (0.43)	0.04
Rural	4.25 (0.46)	4.75 (0.46)	0.03
Urban	4.83 (0.41)	4.83 (0.41)	---***
4. All vaccines offered by government program in my community are beneficial.			
Total	3.64 (1.22)	4.57 (0.86)	<0.01
Rural	3.38 (0.92)	4.38 (1.06)	0.05
Urban	4.00 (1.55)	4.83 (0.41)	0.14
5. New vaccines carry more risk than older vaccines.**			
Total	2.50 (1.16)	3.14 (1.51)	0.13
Rural	3.00 (1.07)	2.88 (1.64)	0.73
Urban	1.83 (0.98)	3.50 (1.38)	0.04
6. The information I receive from the vaccine program is reliable and trustworthy.			

Total	3.86 (1.10)	4.57 (0.65)	0.03
Rural	3.88 (0.99)	4.50 (0.76)	0.18
Urban	3.83 (1.33)	4.67 (0.52)	0.09
7. Getting vaccines is a good way to protect myself from disease.			
Total	4.43 (0.65)	4.71 (0.47)	0.04
Rural	4.13 (0.64)	4.63 (0.52)	0.03
Urban	4.83 (0.41)	4.83 (0.41)	---***
8. Generally, I do what my doctor or healthcare provider recommends about vaccines.			
Total	4.43 (0.65)	4.71 (0.47)	0.04
Rural	4.13 (0.64)	4.63 (0.52)	0.03
Urban	4.83 (0.41)	4.83 (0.41)	---***
9. I am concerned about serious adverse effects of vaccines.**			
Total	2.57 (1.02)	3.43 (1.09)	0.02
Rural	2.88 (0.84)	3.38 (1.06)	0.17
Urban	2.17 (1.17)	3.50 (1.23)	0.06
10. I do not need vaccines for diseases that are not common anymore. **			
Total	1.79 (0.89)	2.43 (1.40)	0.11
Rural	2.00 (0.93)	2.13 (1.36)	0.79
Urban	1.50 (0.84)	2.83 (1.47)	0.06
* Likert Scale: 1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4= agree, 5=strongly agree ** Negatively worded questions ***The correlation and <i>t</i> cannot be computed because the standard error of the difference is 0			