Identifying COVID-19 Vaccine Hesitancy Among Providers

Yahnique J. Richards

SUNY Downstate Health Sciences University, College of Nursing

A DNP Project Presented in Partial Fulfillment

of the Requirements for the Degree

Doctor of Nursing Practice

Faculty Mentor:	Annie Rohan, PhD, RN, CPNP-PC, NNP-BC, FAANP, FAAN

Clinical Mentor:	Aluem Tark, PhD, RN, FNP-BC, CHPN

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Abstract

Background: The overarching goal of this project is to better understand the factors that contribute to healthcare provider vaccine hesitancy. The specific aim for this project is to examine the relationship between providers' knowledge of the COVID-19 vaccine and concerns they had prior to vaccination. Such relationship may impact future practice protocols to enhance immunization and influence policy change that will optimize COVID-19 vaccine uptake.

Local Problem: New York City has had over 1,113,762 reported cases and 34,502 deaths as a result of the COVID-19 pandemic. The catastrophic event has led to extreme public health measures and restrictions such as COVID-19 vaccinations and mask mandates. Many are still hesitant about getting vaccinated against COVID-19 including healthcare providers.

Methods: A quantitative survey was designed using SurveyMonkey consisting of 11 questions. The survey was disseminated among providers of two regions within a retail health organization with questions targeting knowledge, attitudes and beliefs. Descriptive statistics and the chi-square test were used to statistically analyze the data.

Results: Descriptive statistics revealed that majority of the participants identified as female (96.67%), were between 25-34 years of age (50%) and were of White/Caucasian (40%) race/ethnicity. Chi-square analysis revealed there was no statistical significance noted between the providers' knowledge and documented concerns with getting vaccinated, $p = .234$.

Conclusion: There was great value in identifying barriers and facilitators of COVID-19 vaccine among providers within this retail health organization. This framework can be used to address COVID-19 vaccine hesitancy within the organization through interventions, practice protocols changes or revised policies.

Keywords: COVID-19, vaccine, hesitancy, providers, barriers

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First, I would like to acknowledge God for the favor placed on my life throughout this journey toward obtaining my DNP. It is through his grace and righteousness that I have done all that I have done throughout my life.

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Background and Significance

The COVID-19 pandemic has profoundly affected society on a global, national and local level. This disease has disproportionately affected people of color alongside individuals living under the social determinants of health and has led to an increase in morbidity and mortality rates (Centers for Disease Control and Prevention [CDC], 2020a; Price-Haywood et al., 2020). Vaccination is said to be one of the most safe and effective tools in preventing disease and improving public health (CDC, 2020d). With COVID-19 vaccines receiving approval for emergency use, many are still hesitant about getting vaccinated against COVID-19 including healthcare providers (Smith, 2021).

Problem Description

COVID-19 infection, which is caused by the coronavirus SARS-CoV-2, is primarily transmitted by respiratory droplets (CDC, 2020b; National Cancer Institute, 2011). The first cases were identified in China in December 2019 and by March 2020, the World Health Organization declared the infection a pandemic (Ludwig & Zarbock, 2020; WHO, 2020b). The coronavirus pandemic has caused millions of infections, deaths worldwide and has had a devastating impact both in the United States and in New York City (WHO, 2021; CDC, 2020b; New York Times, 2021; NYSDOH, 2021). Currently, there are over 45,235,796 total cases and 731,931 total deaths in the United States. The current level of community transmission is listed as "High" with a 5% 7- day positivity rate (CDC, 2021g). While the infection is often mild and asymptomatic, it causes severe disease in over 13% of people (Stokes EK et al., 2020). Age and medical comorbidities such as chronic cardiac or lung disease, diabetes and obesity increase the risk of severe disease, hospitalization, intubation and death. The development of the COVID-19 vaccine is an essential tool in eliminating the pandemic. Yet, vaccine hesitancy remains a hurdle

throughout various populations.

The CDC (2021f) collected and analyzed data from the U.S Census Bureau's Household Pulse Survey (HPS) to estimate COVID-19 vaccine hesitancy across the nation. Estimates revealed hesitation ranging from hesitant to strongly hesitant. Falls Church City, Virginia had low concern for the vaccine roll-out and had the lowest estimate of strong hesitation (1.86%) of all states. Toole County, Montana along with several other counties of Montana ranked the highest in percentage for those who documented strong hesitation (18.24%) (CDC, 2021f). Only 77.5% of people that are at least 12 years of age and older have received at least one COVID-19 vaccination and "national polls conducted before vaccine distribution began suggested that many persons were hesitant to receive COVID-19 vaccination" (Nguyen et al., 2021). Those who did not intend to receive vaccination were younger adults, women, Black persons, adults living in nonmetropolitan areas, lower educational attainment, lower income or those without insurance (Nguyen et al., 2021).

Local Problem

In March 2020, New York City experienced a coronavirus surge (Gonzalez-Reiche et al., 2020). This catastrophic event was anticipated which led to extreme public health measures and restrictions, including New York State on PAUSE, being put into place (New York State, 2020). As of this writing, New York City has had over 1,113,762 coronavirus cases and more than 34,502 deaths (New York Times, 2021). The coronavirus vaccine became available for front line health care workers in New York State mid-December 2020. As there were significant supply limitations, the subsequent vaccine roll-out occurred in phased groups; these groups were designated by the state government.

A retail health organization that provides health services throughout various communities

across the nation utilizes Nurse Practitioners (NPs) and Physician Assistants (PAs) as their sole

providers. The current COVID-19 vaccination rate of those who completed the voluntary

COVID-19 vaccine attestation is at 80% but remained at less than 50% for months at a time

regardless of vaccine availability, convenience or risk of exposure. During Phase 2 of the

COVID-19 Vaccine Rollout, COVID-19 vaccination was made available to providers of this

retail health organization without any mandation. Although provided with the opportunity to

receive the vaccine through local store partners, the vaccination rate remained at less than 50%.

With ongoing daily operation and nearly all health services returning to the patient population,

there was a likelihood of increased exposure to COVID-19 virus transmission working in the

outpatient setting. As the COVID-19 vaccine roll-out progressed from Phase 1 to Phase 5, the

percentage of COVID-19 vaccination among those working within the organization slowly

increased to 80%. This vaccination rate was sustained for several months with no substantial

increase to $\geq 90\%$.

Available Knowledge

The principal method of transmission of SARS-CoV-2, which is the disease that causes

the COVID-19 virus is spread through respiratory droplets. The droplets are spread through

contact, droplet and airborne transmission. Person to person transmission occurs via coughing,

sneezing, breathing, and singing. Transmission is more likely to happen when individuals are

less than six feet apart in unventilated spaces.   Transmission is also likely to occur during close

contact with an infected individual less than 30 minutes to multiple hours in an enclosed space

(CDC, 2020c). Social distancing, limiting contact time (i.e.: less than 15 minutes), avoiding

crowds, wearing face masks, engaging in hand hygiene, and disinfecting surfaces are all

recommended to limit the spread of the virus. Scientific understanding of how this new virus behaves remains ongoing. (CDC, 2020c)

Coronavirus testing can determine current or past infection. There are two types of viral tests which can determine if someone has a current infection; these tests are antigen tests and nucleic acid amplification tests (NAATs). Reverse transcription-polymerase chain reaction (RT-PCR) laboratory-based testing is the most specific and sensitive; it is considered to be gold standard for diagnosis. Antigen tests are immunoassays that are often conducted as rapid tests. These point of care tests require confirmatory laboratory based NAATs to confirm diagnosis (CDC, 2021a).

Antibody (serology) testing is conducted in order to determine the presence of past infection. Antibody tests will become positive 1 to 3 weeks after infection (CDC, 2020c). While it is likely to test positive for antibodies after vaccination, antibody testing is not currently recommended to assess for immunity after COVID vaccination or to assess the need for vaccination in unimmunized persons (CDC, 2021b).

The CDC (2018) identifies vaccines as products that provide immunity to a specific disease by stimulating the immune system; they are commonly administered orally or through injectables. In order to administer vaccines to the general public, trial vaccines must go through general stages of development which include exploratory, pre-clinical, clinical development, regulatory review and approval, manufacturing and quality control. Within the clinical development stage, there is a three-phase process. In Phase I, a small number of people receive the trial vaccine. The vaccine is then given to an expanded number of people with similar characteristics of those who the vaccine is intended for in Phase II. Safety and efficacy testing take place in Phase III where the vaccine is offered to a much larger group. Regulation of the

newly developed vaccine is regulated and monitored through the U.S. Food and Drug

Administration's (FDA) Center for Biologics Evaluation and Research after completing a multi-

step approval process (CDC, 2014).

Here in the United States, the FDA has approved three different vaccines for Emergency

Use Authorization (EUA) that will help protect many from contracting COVID-19, decrease

their risk of hospitalization and prevent death (CDC, 2021c). These vaccines are known as

Pfizer-BioNTech, Moderna and Janssen COVID-19 Vaccines. Using messenger RNA (mRNA)

through a 2-dose series, Pfizer-BioNTech and Moderna have both developed COVID-19 mRNA

vaccines that "give instructions for our cells to make a harmless piece of what is called the

"spike protein" (CDC, 2021c). Unlike many other vaccines that supply a weakened or

inactivated germ, both the Pfizer and Moderna vaccines teach the cells of those vaccinated to

make a particular protein which triggers an immune response. Pfizer-BioNTech obtained EUA

approval on December 11, 2020 with Moderna obtaining EUA approval approximately 7 days

later (FDA, 2021). In comparison to Pfizer-BioNTech and Moderna, Janssen uses a different

approach in how their vaccine is developed. Requiring only one shot, the Janssen COVID-19

vaccine uses parts of the COVID-19 virus as antigens that will trigger an immune response

without causing a serious reaction upon immunization (Janssen, 2020). The U.S. FDA issued

EUA for Janssen on February 27, 2021 (FDA, 2021).   As of April 3, 2021, there have been over

207,866,645 doses of COVID-19 vaccine distributed throughout the United States with

approximately 161,688,422 of those doses administered (CDC, 2021d). Current research shows

that the Janssen COVID-19 vaccine was 66.3% effective in clinical trials and the Moderna

COVID-19 vaccine was 94.1% effective at preventing COVID-19 illness (CDC, 2021c).

Each vaccine goes through a rigorous clinical trial before being approved for the general public; therefore, vaccines are considered to be safe (WHO, 2020c). Yet, providers and the public are reluctant to receive vaccines. As a result, vaccine hesitancy has become one of the top ten global health threats as of 2019 (WHO, 2020a). Vaccine hesitancy requires "detection, diagnosis and tailored intervention" (MacDonald, Butler & Dube, 2017). Not knowing enough about vaccine preventable diseases, lack of consistent information from sources considered to be credible, utilizing the internet as a source for information, perception, beliefs, and mislead information have been major contributions identified here in the United States (WHO, 2020b; Facciola et al., 2019).

The CDC reports data of fully vaccinated persons at the national level routinely. As of April 25, 2021, 67.7% of persons fully vaccinated were White, 9.8% were Hispanic, 8.4% were Black, 8.3% were Mixed Race, 4.5% were Asian, 1.1% were American Indian/Alaska Native, and 0.3% were Native Hawaiian/Pacific Islander (CDC, 2021e). With African American communities being disproportionately affected by the COVID-19 pandemic here in the United States, the lack of vaccination among this community is alarming (Vasquez Reyes, 2020). The U.S. Department of Health and Human Services' Office of Minority Health reports that African American adults are less likely to receive the flu and pneumonia vaccine when compared to Non-Hispanic White adults (HHS, 2020); there is an indication that vaccine hesitancy or anti-vaccination remains an issue among this community.

Kaiser Family Foundation's (KFF) ongoing COVID-19 Vaccine Monitor is conducting an ongoing research project that tracks the public's attitude and experiences with COVID-19 vaccination and has interviewed over 11,000 adults across the nation. KFF's study presents data that shows a correlation between persons vaccinated or those who have not been vaccinated as it

relates to demographics such as age, sex, race, political party, education and job title. In March 2021, data showed that those 65 years of age and older had the highest percentage of COVID-19 vaccination and 32% of those already vaccinated identified as females. (KFF, 2021)

Rationale for Conducting this Project

The literature supports that identifying barriers such as knowledge, misled information, perception, beliefs and more will improve vaccine uptake. A retail health clinic has set a goal to have at least 80% of their providers vaccinated against COVID-19. Through vaccination, expanded services that have been put to a halt or provider attitude towards safety during patient interaction can be improved. There is also a chance to decrease COVID-19 infection or hospitalization among the providers working within retail health settings.

Specific Aims

The overarching purpose of this project is to identify barriers and facilitators of COVID-19 vaccination among healthcare providers, such as Nurse Practitioners (NPs) and/or Physician Assistants (PAs), in a retail health setting. The specific aim for this project is to examine the relationship between providers' knowledge of the COVID-19 vaccine and concerns they had prior to vaccination. Such relationship may impact future practice protocols to enhance immunization and influence policy change that will optimize COVID-19 vaccine uptake. The long-term goal of this project is to improve COVID-19 vaccination rates for providers at retail health clinics.

Expected Outcomes

Expected outcomes from this project include identifying knowledge gaps, perception, beliefs, attitude and behavior of the COVID-19 vaccine among NPs and/or PAs to be used for future interventions in improving COVID-19 vaccine uptake.

Project Framework

The PDSA cycle involves four major stages: Plan, Do, Study and Act. These phases are widely accepted and used in quality improvement strategies (Knudsen et al., 2019). It guides project leaders on how to improve the quality of developments. The planning stage involves identifying the tests and developing data collection plans. Objectives are stated and predictions about potential outcomes are established. The first step involves developing a Plan to test the project changes, identifying what, who, where, and when of the project, and the type of data to be collected.

The second stage is Do, which involves trying the test on a small scale (Crowfoot & Prasad, 2017). A "pilot" test is conducted, and unexpected observations and challenges are recorded; collected data can be analyzed later. This step imitates the actual study but on a manageable scale to develop insights on the potential strengths and weaknesses of conducting the study. The "Do" is closely followed by the Study step where time is set aside to enable the completion of data analysis. The data is compared to predictions to identify associations between them. The act is followed by a reflection on what was learned. The last step is to Act, which is a stage that seeks to refine the change based on the lessons from the test. In this step, areas that need modifications are identified together with the types of modification that can be implemented. The PDSA cycle seeks to refine proposed changes before they can be implemented on a larger scale.

Figure 1.

PDSA Cycle.
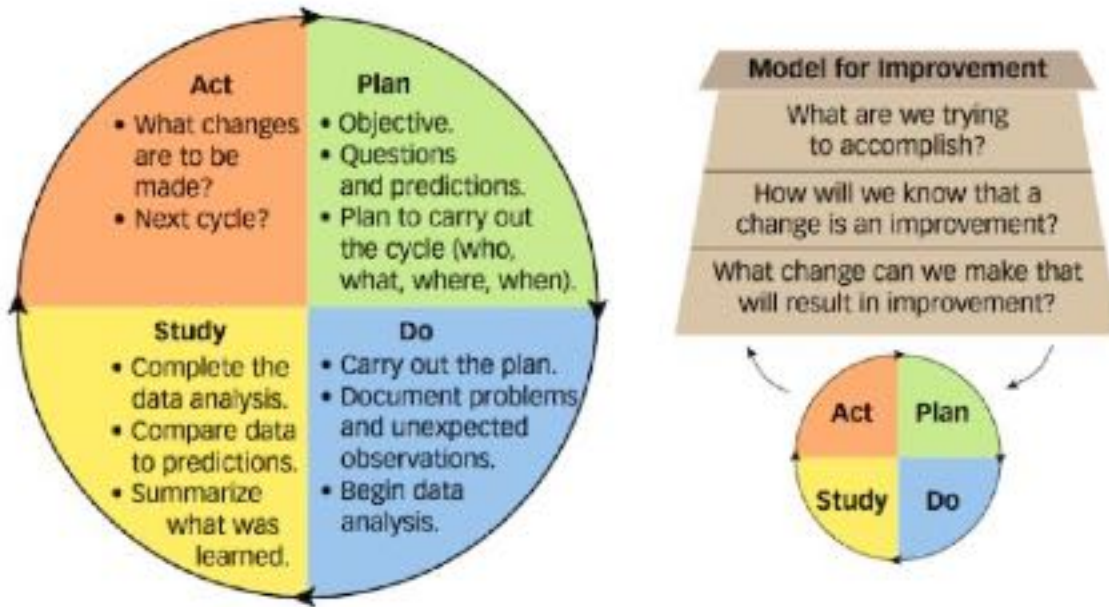
This project will be focusing on the planning stage. In the planning stage, the project leader will develop a strategic approach to assess provider attitudes toward COVID-19 vaccinations, identify barriers, and determine provider learning needs to inform for future interventions.

Methods

This Quality Improvement (QI) project will be implemented within a retail health organization consisting of providers who hold a NP or PA license. Data will be collected using a quantitative survey designed using SurveyMonkey and consisting of 11 questions. The survey will be distributed over a 1-month period to identify barriers and facilitators of the COVID-19 vaccine with close attention to statistical significance. There is no intervention during the implementation phase of this project. Data will be analyzed when at least 20 participants have completed the survey using descriptive statistics and the chi-square test through SPSS.

Definition of Relevant Terms (Conceptual Definitions)

Table 1

Conceptual Definitions

Term	Conceptual Definition
Barriers	An obstacle that prevents movement or access.
COVID-19	An infectious disease caused by the SARS-CoV-2 virus.
Provider	A health care professional (NP, PA) that provides direct patient care within the retail health organization.
Retail Health Setting	A walk-in clinic conveniently located in retail stores, supermarkets and pharmacies that provide treatment of minor illnesses or injuries
Vaccine	Containing weakened or inactive parts of a particular organism (antigen) that triggers an immune response within the body. Newer vaccines contain the blueprint for producing antigens rather than the antigen itself
Vaccine Hesitancy	Delay in acceptance or refusal of vaccines despite availability of vaccine services

Assumptions

Providers working in the outpatient setting may be unknowingly exposed to the COVID-19 virus increasing the likelihood of viral transmission. With an increase in COVID-19 exposure and transmission, providers will be more likely to get vaccinated against COVID-19.

Proposed Setting and Sample

The project will be implemented within a retail health organization. This retail health organization has over 1,100 clinics conveniently located across the nation that provides high quality care for common illnesses. The target population includes any NP and/or PA working within the retail health organization. The providers will receive a uniquely developed survey consisting of 11 questions via email using SurveyMonkey that can be completed on an electronic device such as an iPad, laptop, computer, tablet or cellphone. There are no exclusion criteria.

Recruitment

An email requesting approval to distribute the survey to providers among three Senior Practice Managers was sent. Each manager replied to the email giving approval to distribute the survey within their region to all providers listed and provided the provider email distribution list.

Interventions

There is no intervention during the implementation of this project. This project is being conducted to identify barriers and facilitators of vaccine hesitancy towards the COVID-19 vaccine and providers within a retail health setting.

Pre-Implementation Plan

Organizational Approval Process.

The recruitment process involved discussion and coordination with the DNP Project Committee via email and telephone. The DNP student completed the DNP Project Approval

application process by notifying the committee and assigned manager about the proposed project and interests in conducting it within the organization. This was followed by confirming a colleague as a DNP mentor. A DNP project attestation was reviewed, signed and submitted to the project committee alongside the DNP PICOT Project Proposal Application. All members of the committee gave valuable input and provided support for project development and implementation. The Chief Nurse Practitioner Officer (CNPO) and student's faculty mentor were collaborative partners in the survey approval process. The need for Institutional Review Board (IRB) approval was discussed with committee chair members prior to project approval. It was determined that project approval from the project committee was the only requirement. Application for determination letter was submitted to SUNY Downstate Health Sciences University's IRB. Upon IRB review, the project was deemed not to be research. IRB's determination letter was submitted to the project committee for filing. An affiliation agreement has been drafted by the university's affiliation clinical coordinator and submitted to the retail health organization's senior advisor of clinical contracts for approval.

Implementation Plan

The proposed Quality Improvement (QI) project will use a uniquely designed survey consisting of 11 quantitative questions that will be disseminated using SurveyMonkey in August 2021 via the NP's and/or PA's employee email address. Upon project approval and approval from practice managers, surveys will be distributed to providers within two regions of the retail health organization via email. The email will include an introductory communication to participate prior to proceeding with questions as this survey is voluntary. The introductory communication email will also include information on the QI project's purpose and DNP student's university. The email will clearly state that the information collected within the survey

remains confidential and that all information will be de-identified as it is anonymous.

Participants will be notified of the survey's intended use which will be used to guide future

interventions needed to address vaccine hesitancy within the workplace and to influence policy

change that will optimize COVID-19 vaccine uptake. The email will also include a "clickable"

link that will take each participant directly to the survey for completion in addition to the URL

that can be copied and pasted into any internet browser. The URL to the survey is listed as:

https://www.surveymonkey.com/r/RDHRGRQ

The items in the survey include demographics based on age, biological sex, race/ethnicity

and the participants' flu vaccination status within the last 2 years. The remaining questions

within the survey identify the attitude, knowledge and beliefs of each participant as it relates to

COVID-19 vaccination. The survey was designed to gather information from the perspective of

participants who have been vaccinated or are unvaccinated for COVID-19. Data collected from

those who have or who have not received at least one dose of the COVID-19 vaccine will

provide further insight on facilitators of vaccine hesitancy. NPs and PAs are expected to

complete the survey via cellphone, tablet, iPad, laptop or computer in efforts to decrease physical

contact or spreading of COVID-19 virus. Each survey is expected to take approximately 2 to 4

minutes to complete. Reminders for survey completion will be sent to all NPs and/or PAs

weekly on Mondays. Routine monitoring of SurveyMonkey will occur of collected responses.

The data analysis will begin when at least 20 participants have completed the survey.

Figure 2

Flow Chart of Project Procedures
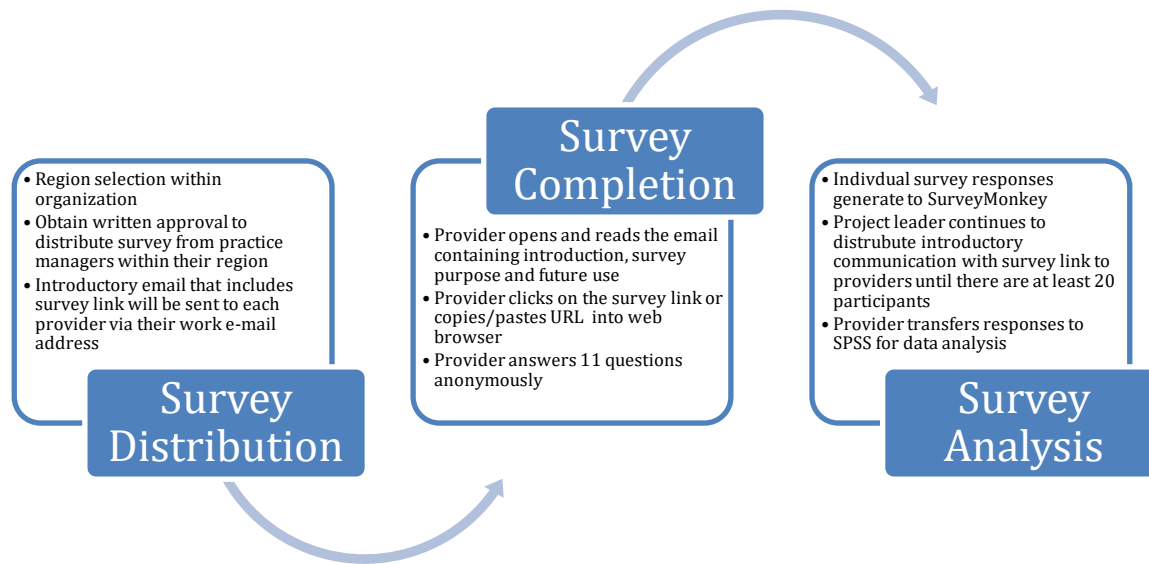
Project Timeline

Table 2

Timeline of Project

TASK	NDNP 7102 (Jan-May 2021)	NDNP 7104 (June-Aug 2021)	NPNP 7201 (Sept-Dec 2021)
Develop Background and significance	X		
Finalize study aims	X		
Develop Project methods	X		
Develop instruments (survey) and database (SPSS)	X		
Endorsement day approval	X		
Recruit DNP Mentor	X		
Apply for and obtain institutional and other approvals		X	
Finalize survey		X	
Distribute surveys		X	
Enter survey results into SPSS for analysis		X	
Analyze data – develop Results			X
Develop Discussion/Conclusions			X
Prepare poster/manuscript			X
Disseminate project results			X

Key Measures and Summary of Variables

In order to measure the outcomes of this DNP Project, a quantitative survey designed by the DNP student consisting of 11 questions using SurveyMonkey was used to collect data on variables listed below. Each expected participant received the survey via their work email

address associated with the retail health organization. The designed survey was generalized for

persons who were vaccinated or unvaccinated, allowed for data to come from multiple

participants and sources at once, served as a practical solution for data collection and was

inexpensive.

Table 3

Summary of Study Variables and Measures

Variable	Data type	Measurement units (Categories)
Age Group	Categorical	18-24, 25-34, 35-44, 45-54, 55-64, 65+
Sex	Categorical	Male, Female, Rather not disclose
Race/Ethnicity	Categorical	American Indian or Alaskan Native, Asian/Pacific Islander, Black or African American, Hispanic, White/Caucasian, Prefer not to answer, Multiple ethnicity/other
Flu Vaccinated	Categorical	Yes, No
COVID Mandate	Categorical	Yes, No
Concern Type	Categorical	I had no concern, I am/was concerned about safety, I am/was concerned about side effects, I am/was concerned about something else, other
Side Effects	Categorical	Yes, No
Pandemic halt	Categorical	Extremely confident, Very confident, Somewhat confident, Not so confident, Not at all confident
Knowledge	Categorical	Yes, No
Risk	Categorical	Low Risk, Moderate Risk, High Risk, Very High Risk
Level of concern	Categorical	No, my level of concern is the same, Yes-I am MORE concerned about safety/side effects, Yes-I am LESS concerned about safety/side effects. I am not sure

Data Management and Analysis Plan

Data analysis

Data analysis will proceed in a stepwise fashion, moving from descriptive examination to bivariate procedures as indicated and supported by the data. Taking into consideration the small sample size, emphasis was placed on these univariate and bivariate analyses.

Using descriptive statistics, the DNP student can determine frequencies among demographic data entries such as age groups, sex, race/ethnicity and flu vaccination status. Visual inspection of distribution will be conducted with close attention to determine skewed distribution.

The next phase of the data analysis will be to address the specific project aim. In this case, bivariate analysis will be conducted to address the project question/hypothesis of, "is there statistical significance or association between various participant's knowledge and concern prior to vaccination as it relates to the COVID-19 vaccine?" Chi-square testing will be applied to examine this difference.

Finally, after addressing the specific project question/hypothesis, exploratory analyses will be conducted based upon their support by the data.

Data management

The IBM SPSS statistical software Version 27 will be used for all data analysis procedures. The DNP student will enter the information populated in SurveyMonkey into SPSS for analysis. A password-protected computer and SUNY Downstate Health Sciences University, College of Nursing private drive will keep all data secured throughout the project. None of the data collected includes protected personal information or patient health information (PHI), therefore there is no possibility for privacy violations.

Anticipated Facilitators and Barriers

Obtaining project approval from the DNP project committee of the retail health organization will serve as a barrier and setback to project implementation with such a short timeframe. Revision of documents, consultations with both faculty and clinical mentors along with resubmission of documents to the Chief Nurse Practitioner Officer (CNPO) are essential in overcoming such a roadblock.

Access to such a large number of participants will serve as a facilitator in project implementation. With access to multiple regions holding over 100 providers, the likelihood of getting at least 20 providers to participate in the survey will be undemanding.

Ethical Considerations and Institutional Approval

This project will not proceed until approved by course faculty, Downstate University and the retail health organization's DNP Project Committee. After obtaining course faculty approval, the DNP student will submit an application to conduct a DNP project within the organization to the project committee. Upon obtaining project approval, an application to the Downstate University Office of Research Compliance to request a Letter of Determination designating the project as a quality improvement project (non-research) will be made. Once the Letter of Determination has been received, the DNP student will ensure that an affiliation agreement is in place between Downstate University and the organization prior to conducting the project.

Results

The purpose of this project was to identify barriers and facilitators of COVID-19 vaccination among healthcare providers, such as Nurse Practitioners (NPs) and/or Physician Assistants (PAs), in a retail health setting.

The specific aim for this project is to examine the relationship between providers' knowledge of the COVID-19 vaccine and concerns they had prior to vaccination. Baseline data included demographics and assessing each participant's reported knowledge, attitudes and beliefs.

Description of Setting and Sample

Two-hundred providers of two regions within a retail health organization were invited to complete the survey. The survey was disseminated to each provider via their work e-mail address using SurveyMonkey and consisted of 11 questions. A total of 30 providers participated in the survey which met the target goal of obtaining at least 20 participants.

Univariate Analyses

Age Group

All survey participants were asked their age group and were given six choices. Majority of the providers were aged 25-34 years (50%) or 35-44 years (33%). Only four providers indicated that they were between the ages of 45-54 years of age (13.3%) and the remaining provider documented an age group of 55-64 years. Of the 30 participants, not a single provider was between the ages of 18-24 or indicated that they were 65 years of age or older.

Figure 3

What is your age group?
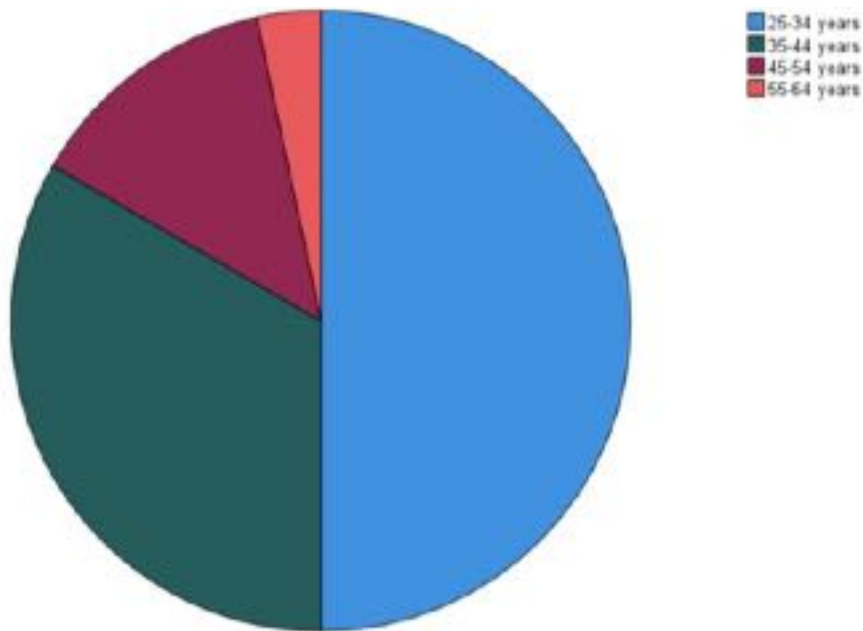
Sex

Every provider was asked their biological sex and given choices of female, male or rather not disclose. Nearly all of the participants were female (96.7%) with only one participant (3.3%) noting that they rather not disclose their biological sex.

Table 4

*What is your biological sex?*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	29	96.7	96.7	96.7
	Rather not disclose	1	3.3	3.3	100.0
	Total	30	100.0	100.0	

Race

  To assess race and/or ethnicity within the sample, each participant was asked to select a race/ethnicity that best described them. Fourteen of the 30 participants selected White/Caucasian (40%). Black/African American followed with 9 responses making up 30% of the sample. The remaining participants were Asian/Pacific Islander (16.67%), Hispanic (6.67%), preferred not to answer (3.33%) or identified with multiple ethnicities (3.33%). There were no persons of American Indian or Alaskan Native race/ethnicity within the sample. The responses as displayed in Figure 4 do not show normal distribution.

Figure 4

Which race/ethnicity best describes you?
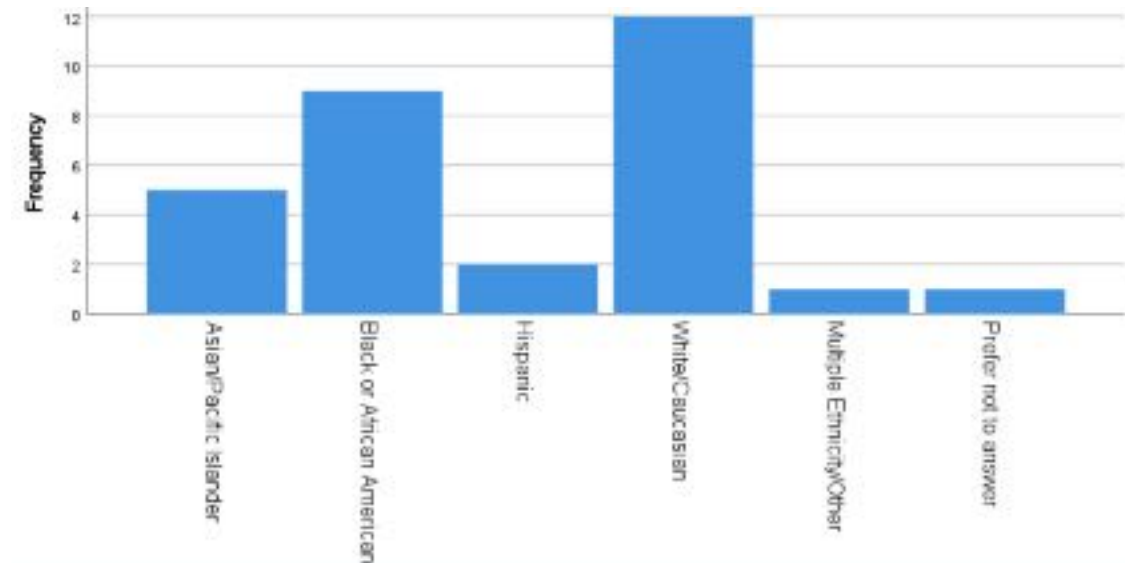
Flu Vaccinated

  Prior flu vaccination status was identified. Of the 30 participants, 27 participants documented that they received the flu vaccine within the last 2 years leaving 3 participants who responded "no."

Figure 5

Have you been vaccinated for the flu within the last 2 years?
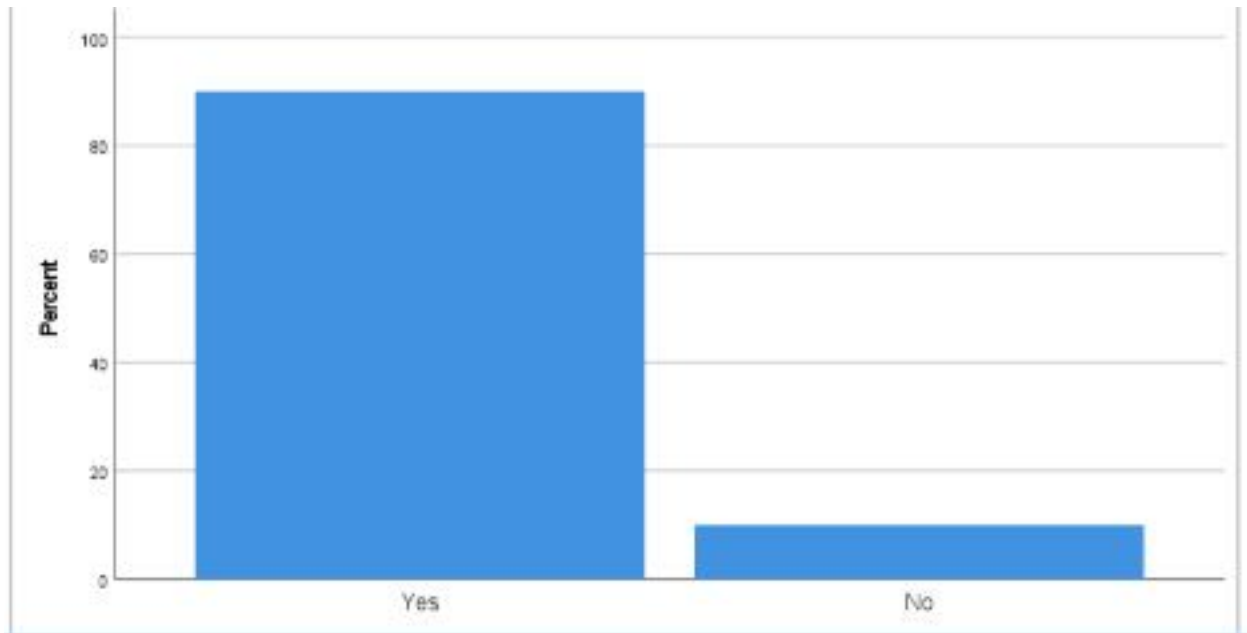
COVID Mandate

Differences in COVID-19 vaccine mandate beliefs were evaluated within the survey.

Each participant was asked whether the COVID-19 vaccine should be required for all health care

providers. All 30 participants responded to the question, 20 participants (66.7%) responded

"yes" while the remaining 10 participants (33.3%) responded "no."

Figure 6

Do you think that the COVID-19 vaccine should be required for all health care providers?

Concern Type

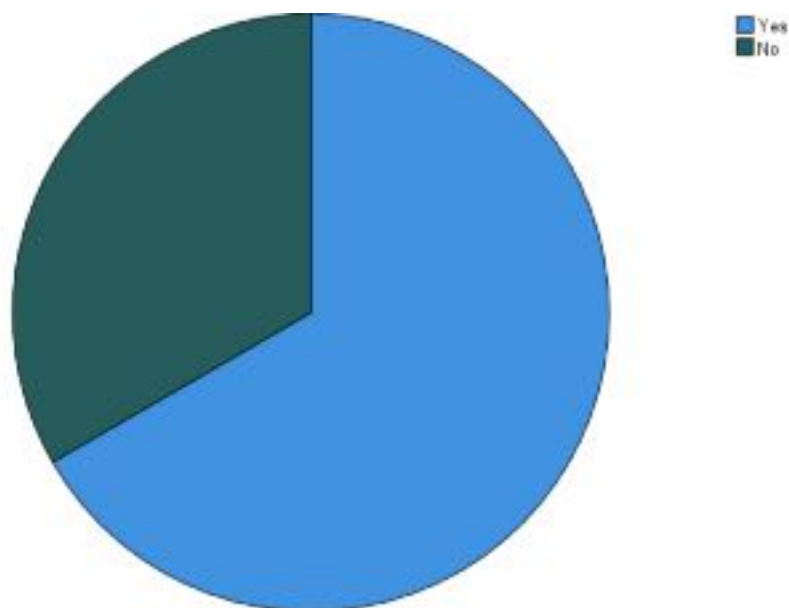To identify the types of concern providers may have as it relates to the COVID-19 vaccine, survey participants were asked their concerns about taking the vaccine. Of the 30 participants, majority (43.33%) responded that they were most concerned with safety. Eleven (36.67%) reported that they were concerned with side-effects while 5 (16.67%) noted that they had no concerns. Only 1 participant (3.33%) documented that they were concerned about something else. Figure 7 displays the results showing a bell-shaped histogram presenting normal distribution.

Figure 7

Do/did you have any concerns about taking the COVID-19 vaccine, and if so, what were they?
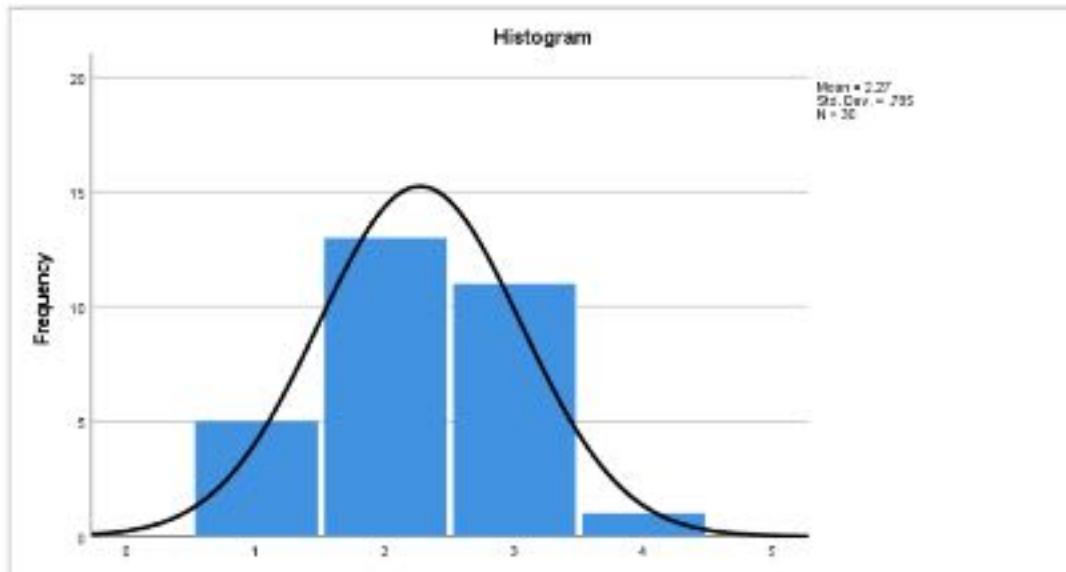
Side Effects

Each participant was asked whether or not they knew someone who experienced

debilitating side effects post COVID-19 vaccination. Nearly all participants (96.7%) answered

"no" to this question leaving only 1 person (3.3%) who responded "yes."

Table 5

Do you know anyone who has received the COVID-19 vaccine and later experienced debilitating side effects (i.e., could not participate in normal activities for more than two days)?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	1	3.3	3.3	3.3
	No	29	96.7	96.7	100.0
	Total	30	100.0	100.0	

Pandemic Halt

Participants were asked to identify their confidence level on the COVID-19 vaccine's

ability to halt the pandemic if more than 90% of the population was vaccinated. Thirty percent

of participants felt either "extremely confident" or "very confident". Twenty-six percent noted

that they were "somewhat confident." Only 10% selected "not so confident" as an answer and 1

participant (3.33%) documented that they were "not at all confident." Figure 8 presents data that

is positively skewed showing skewed distribution to the right.

Figure 8

How confident are you that the COVID-19 vaccine currently available could halt the pandemic if accepted by >90% of the eligible population?
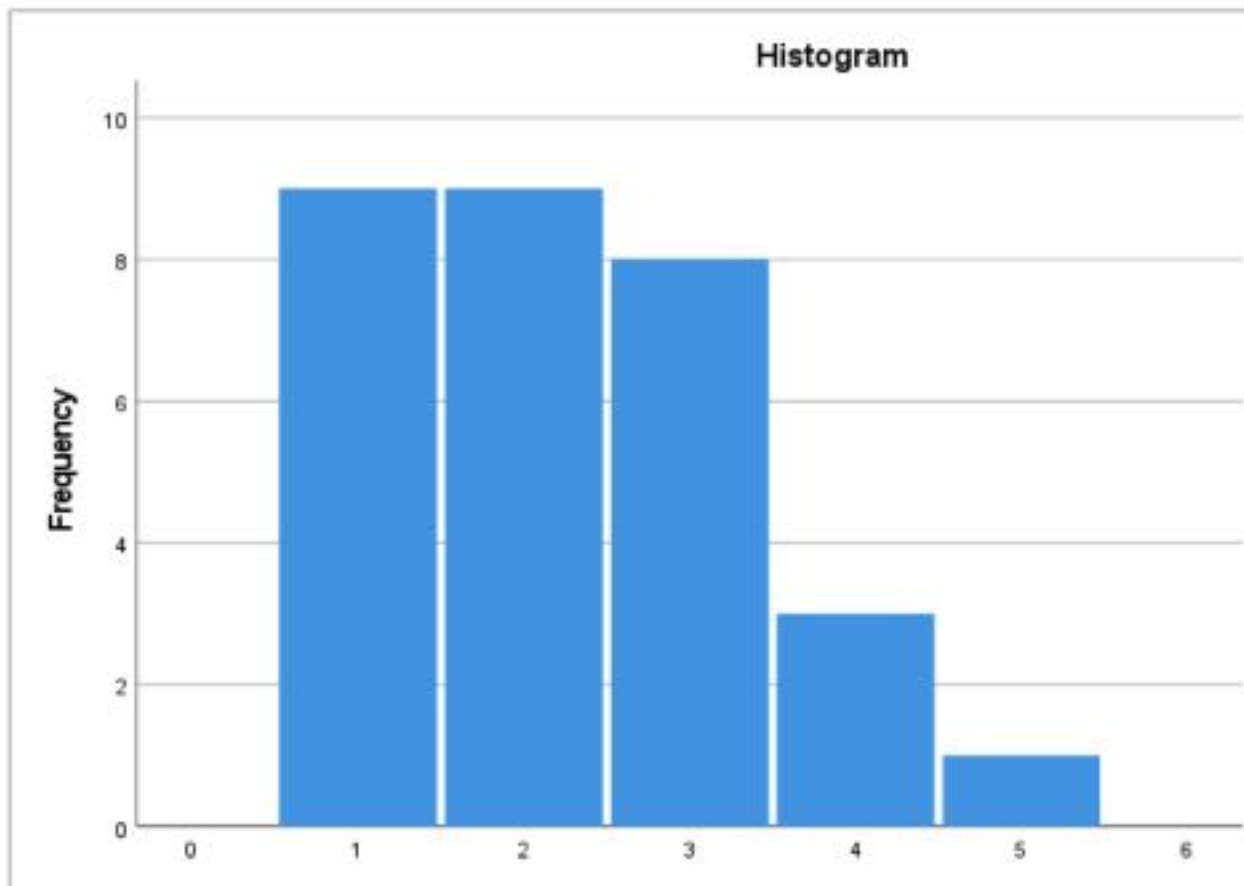
Knowledge

The question "do you consider yourself to be adequately informed about the COVID-19 vaccine?" was asked to assess knowledge. All 30 participants answered the question "yes" or "no." Of the 30 participants, 27 (90%) answered "yes" while only 3 (10%) answered "no."

Figure 9

Do you consider yourself to be adequately informed about the COVID-19 vaccine?
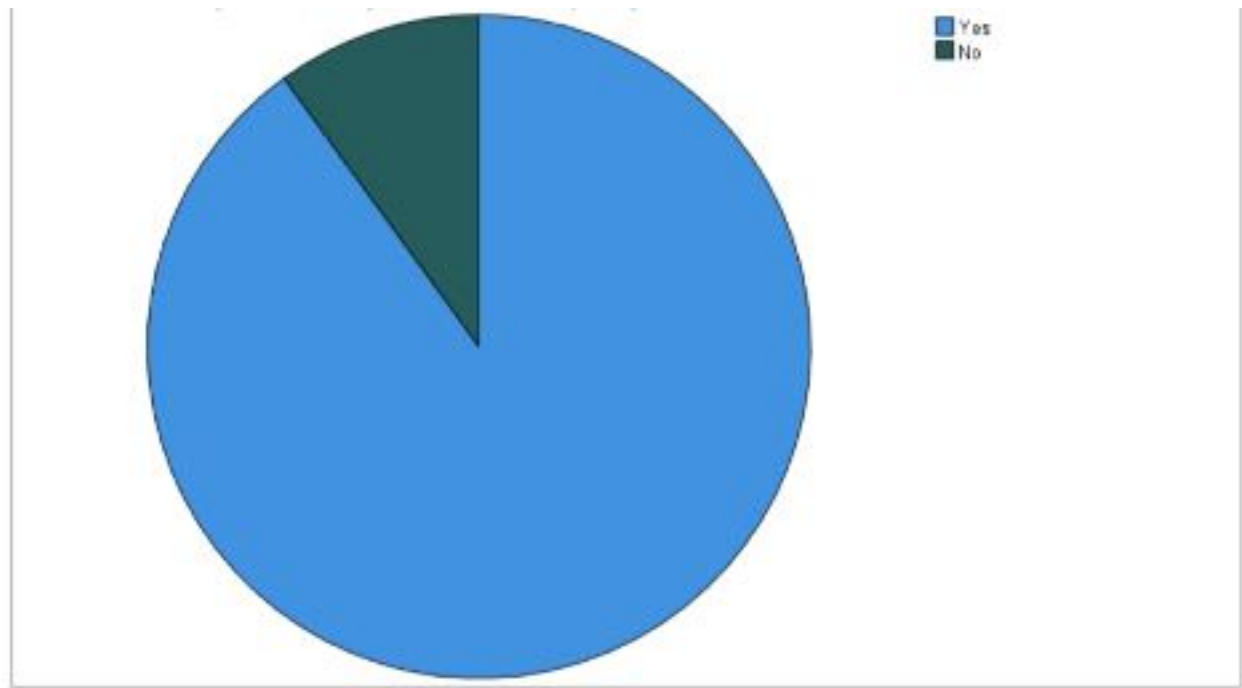
Risk

Perceived risk of contracting COVID-19 was assessed by asking each participant to select amongst low, moderate, high or very high risk. Half of the participants noted that they considered themselves to be at "moderate risk." Twenty percent reported a "very high risk," 16.67% reported "moderate risk" and 13.3% reported "low risk." With a skewness between -0.5 and 0.5 (.443), data in Table 6 presents fairly symmetrical.

Table 6

What is your perceived risk of getting the COVID-19 infection?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low Risk	4	13.3	13.3	13.3
	Moderate Risk	15	50.0	50.0	63.3
	High Risk	5	16.7	16.7	80.0
	Very High Risk	6	20.0	20.0	100.0
	Total	30	100.0	100.0	

Level of Concern

More than 50% of the participants documented that they felt less concerned about safety/side effects of the COVID-19 vaccine when asked if their level of concern changed since January 2021 until current. Eleven (36.67%) of the 30 participants documented no change, 1 person documented that they were more concerned, and 1 person noted they were not sure. Data does not show normal distribution.

Figure 10

Has your level of concern changed about the COVID-19 vaccination between January 2021 and now?
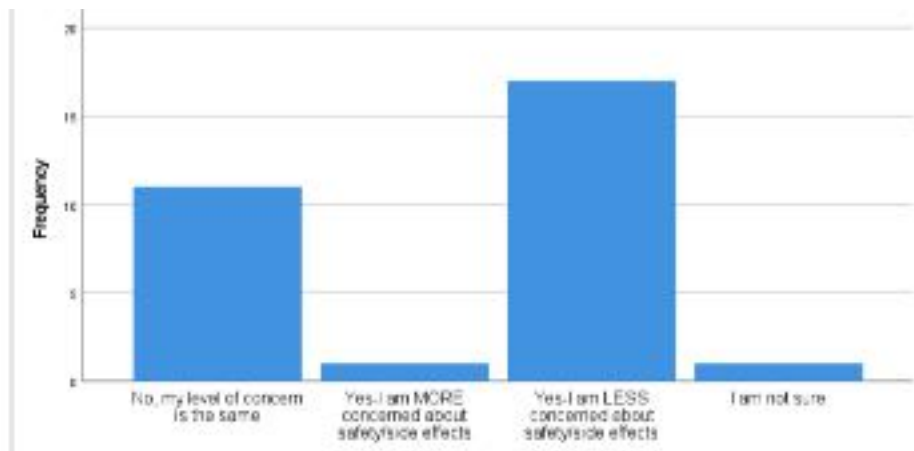
Bivariate Analyses for Project Specific Aim

A chi-square test was performed to identify significant association in the 30 participants' knowledge of the COVID-19 vaccine and their concerns with taking the COVID-19 vaccine, two categorical variables. With 6 expected frequencies at less than 5 and a small sample size, close attention was given to Fisher's Exact Test to determine statistical significance. The null hypothesis was excepted and there was no statistical significance noted between the providers' knowledge and documented concerns with getting vaccinated, $p = .234$.

Table 7

Do you consider yourself to be adequately informed about the COVID-19 vaccine? *Has your level of concern changed about the COVID-19 vaccination between January 2021 and now? Crosstabulation

			Has your level of concern changed about the COVID-19 vaccination between January 2021 and now?				
			No, my level of concern is the same	Yes-I am MORE concerned about safety/side effects	Yes-I am LESS concerned about safety/side effects	I am not sure	Total
Do you consider yourself to be adequately informed about the COVID-19 vaccine?	Yes	Count	10	1	16	0	27
		Expected Count	9.9	.9	15.3	.9	27.0
	No	Count	1	0	1	1	3
		Expected Count	1.1	.1	1.7	1	3.0
Total		Count	11	1	17	1	30
		Expected Count	11.0	1.0	17.0	1.0	30.0

Table 8

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	9.441[a]	3	.024	.193		
Likelihood Ratio	5.197	3	.158	.234		
Fisher-Freeman-Halton Exact Test	6.036			.234		
Linear-by-Linear Association	.518[b]	1	.472	.569	.285	.080
N of Valid Cases	30					

a. 6 cells (75.0%) have expected count less than 5. The minimum expected count is .10.
b. The standardized statistic is .720.

Exploratory Analyses

Race and Knowledge

Bivariate analysis using chi-square testing was used to examine if there were any relationship between race and knowledge on the COVID-19 vaccine. Sex was not examined in this bivariate analysis because nearly all participants (96.7%, n=27) were females. Data analysis of these two variables showed no statistical significance, $p = .349$.

Table 9

Which race/ethnicity best describes you? (Please choose only one.) *Do you consider yourself to be adequately informed about the COVID-19 vaccine? Crosstabulation

			Do you consider yourself to be adequately informed about the COVID-19 vaccine?		
			Yes	No	Total
Which race/ethnicity best describes you? (Please choose only one.)	Asian/Pacific Islander	Count	3	2	5
		Expected Count	4.5	.5	5.0
	Black or African American	Count	9	0	9
		Expected Count	8.1	.9	9.0
	Hispanic	Count	2	0	2
		Expected Count	1.8	.2	2.0
	White/Caucasian	Count	11	1	12
		Expected Count	10.8	1.2	12.0
	Multiple Ethnicity/Other	Count	1	0	1
		Expected Count	.9	.1	1.0
	Prefer not to answer	Count	1	0	1
		Expected Count	.9	.1	1.0
Total		Count	27	3	30
		Expected Count	27.0	3.0	30.0

Table 10

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig (2-sided)	Exact Sig (1-sided)	Point Probability
Pearson Chi-Square	6.481[a]	5	.262	.297		
Likelihood Ratio	5.891	5	.317	.384		
Fisher-Freeman-Halton Exact Test	6.310			.349		
Linear-by-Linear Association	1.563[b]	1	.211	.279	.146	.072
N of Valid Cases	30					

a. 10 cells (83.3%) have expected count less than 5. The minimum expected count is .10

b. The standardized statistic is -1.250

Risk and Mandate

Test of association between each participant's risk of contracting COVID-19 infection and their belief on whether the COVID-19 vaccine should be required for all health care providers was examined through chi-square testing. Bivariate analysis showed that the two variables had no correlation, *p* = .088.

Table 11

*Do you think that the COVID-19 vaccine should be required for all health care providers (barring contraindications)? *What is your perceived risk of getting the COVID-19 infection? Crosstabulation*

			What is your perceived risk of getting the COVID-19 infection?				
			Low Risk	Moderate Risk	High Risk	Very High Risk	Total
Do you think that the COVID-19 vaccine should be required for all health care providers (barring contraindications)?	Yes	Count	1	10	3	6	20
		Expected Count	2.7	10.0	3.3	4.0	20.0
	No	Count	3	5	2	0	10
		Expected Count	1.3	5.0	1.7	2.0	10.0
Total		Count	4	15	5	6	30
		Expected Count	4.0	15.0	5.0	6.0	30.0

Table 12

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	6.225[a]	3	.101	.106		
Likelihood Ratio	7.867	3	.049	.080		
Fisher-Freeman-Halton Exact Test	5.948			.088		
Linear-by-Linear Association	4.521[b]	1	.033	.043	.024	.017
N of Valid Cases	30					

a. 6 cells (75.0%) have expected count less than 5. The minimum expected count is 1.33.

b. The standardized statistic is -2.126.

Knowledge and Mandate

Assessing whether a participant's knowledge on the COVID-19 vaccine affected their belief as to whether it should be mandated for all health care providers was considered. Chi-square testing was performed to note statistical significance between the two variables. The analysis showed that there was no statistical significance between the two variables, $p = .251$.

Table 13

*Do you consider yourself to be adequately informed about the COVID-19 vaccine? *Do you think that the COVID-19 vaccine should be required for all health care providers (barring contraindications)? Crosstabulation*

			Do you think that the COVID-19 vaccine should be required for all health care providers (barring contraindications)?		
			Yes	No	Total
Do you consider yourself to be adequately informed about the COVID-19 vaccine?	Yes	Count	19	8	27
		Expected Count	18.0	9.0	27.0
	No	Count	1	2	3
		Expected Count	2.0	1.0	3.0
Total		Count	20	10	30
		Expected Count	20.0	10.0	30.0

Table 12

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig (2-sided)	Exact Sig (1-sided)	Point Probability
Pearson Chi-Square	1.667[a]	1	.197	.532	.251	
Continuity Correction[b]	.417	1	.519			
Likelihood Ratio	1.556	1	.212	.532	.251	
Fisher's Exact Test				.251	.251	
Linear-by-Linear Association	1.611[c]	1	.204	.532	.251	.222
N of Valid Cases	30					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.00.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.269

Discussion and Conclusions

Synthesis of Results

This project explored attitudes, beliefs and knowledge associated with vaccine hesitancy and the COVID-19 vaccine among providers within a retail health organization. Vaccine hesitancy rates range widely amongst different populations, countries, regions and local communities. Data from this DNP project assessed demographics, COVID-19 vaccine mandate, concerns with taking the vaccine, side effects, knowledge, risk, and changes in level of concern of a small sample (n=30).

Data analysis showed there was no statistical significance between a provider's perceived knowledge on the COVID-19 vaccine (90%) and their concerns. Questioning a provider's knowledge on the COVID-19 vaccine was rather vague and did not clearly define a reference or measurement of knowledge. The word "knowledge" in the context of the survey could have been interpreted by any provider as when, how, where and why the COVID-19 vaccine was manufactured and for whom it was made to protect. There was no clear indication that a provider's perceived "knowledge" of the COVID-19 vaccine would include where/how they received information on the vaccine or whether timing and additional clinical research data had an effect on the providers knowledge perception. Therefore, it was not surprising to find that knowledge did not necessarily impact a provider's decision to get the COVID-19 vaccine or not based solely on what they knew and what most concerned them.

While the COVID-19 vaccines available were approved for EUA, they were not fully approved for commercial use by the FDA during the implementation of this project. In review of the literature, speed of COVID-19 vaccine development and receiving EUA were safety and efficacy concerns for some health care workers (American Academy of Family Physicians

[AAFP], 2021). It is suggested that increased availability of data on safety and efficacy may increase acceptance in recent months (AAFP, 2021).

Surprisingly, there was no statistical significance between the provider's perceived risk and their view on a potential vaccine mandate. The survey self-report of perceived risk of getting the COVID-19 infection could have potentially impacted the results by more providers stating they felt they were working in a moderate risk setting. Perhaps perception, potential employment background and consideration of front-line workers and their risk exposure may have influenced a provider's rating of their personal risk exposure. In fact, a provider's perceived risk could influence their desire to concur a vaccine mandate. Evidence suggests there is higher vaccine acceptance among healthcare workers who cared for hospitalized COVID-19 patients "presumable because of an accurate perception of the severity of the disease" (AAFP, 2021).

Unexpected Impacts/Outcomes of Project

Nearly all participants of this DNP project were female, and this was an unexpected outcome. A study conducted on Japanese citizens aged 20-65 years showed that men (41.8%) were more willing to get the COVID-19 vaccine when compared to women (33%) (Ishimaru et al., 2021). It would have been interesting to examine statistical significance between gender/sex and concern type during the exploratory analysis as findings can give insight to identifying target groups, more specifically gender groups, and needed intervention.

During survey distribution, the DNP student received two emails from colleagues requesting results of project upon completion and desire to collaborate with the DNP student for future projects and potential publishing.

Challenges and Limitations

Timeframe

Short-time frame was both a challenge and limitation for this project. Delay in project

approval and establishing an affiliation agreement led to a delay in the distribution of the survey

and data collection. The project was implemented within a one-month period with heavy

dependence on provider participation. With a goal of at least 20 participants prior to beginning

data analysis, the one-month time frame would have to be extended leading to a delay in

completion of associated assignments and meeting target deadlines.

Sample size

Small sample size served as a limitation for this project. Only 30 providers participated

in the survey which does not represent the entire population of providers within the retail health

organization. This led to a disadvantage in variability. There is difficulty in determining

standard deviation; it would be hard to tell how far the true results of the survey is from the

results collected from the small sample (n=30).   Bias is another disadvantage to a small sample

size. With only a small number of people having access to or knowledge about the survey in

comparison to the entire retail health organization, the results may be skewed to reflect the

opinion of those who may have interest in the topic.

Development of instrument

Successful development and approval of the survey instrument was a challenge as there

was a delay in finalizing an appropriate set of questions to address the specific aim of this

project. The DNP student faced challenges with establishing reputable survey questions. Upon

data analysis, it was noted that all questions used in the data collection instrument were identified

as categorical with no scaled measurements. This limited the DNP student's ability to conduct

analyses using various tests such as t-test and limited the project to only assessing statistical significance or association.

COVID Vaccine

Between the start and end of this project, components such as COVID-19 vaccine mandate have changed the landscaping around provider vaccination. At the start of this project, providers had a choice in choosing to get vaccinated and their employment status did not rest heavily on this decision. By the end of the project, government mandates ponderously influenced vaccination rates among the population with considerable focus on those working in healthcare. COVID-19 vaccine mandates among healthcare workers served as a limitation as it influenced vaccine rates, may not take into account factors of vaccine hesitancy and limited the potential use of this project serving as a framework to address barriers and facilitators of vaccine hesitancy

Comparison of Results with Expected/Published Findings

Providers from two regions within a retail health organization were used as the convenience sample for providers within the entire retail health organization. While the study results are useful and meaningful in understanding providers knowledge, attitude, beliefs, perception and barriers to COVID-19 vaccination, data collected is not necessarily generalizable. The data may only represent those who voluntarily participated in the survey.

With regard to the DNP project's specific aim which intended to identify statistical significance between a provider's knowledge of the COVID vaccine and their concerns, the DNP project showed no significance. When compared to expected/published findings of New York City public hospitals healthcare workers, others found a strong correlation. "A strong correlation was seen between participants' knowledge about COVID-19 infection and positivity attitude

towards receiving COVID-19 vaccination (r=0.18, p < 0.001)" (Ciardi, 2021). Although attitude

toward the COVID-19 vaccine may have been asked differently in comparison to the published

study, it is interesting to see how different results are within a much larger sample (n=428).

Majority of the participants (43.33%) documented that they were or had concerns about

COVID-19 vaccine safety within the DNP project. The term safety in the context of the survey

was rather vague and left to the providers perception of what safety meant to them. In

comparison to published findings, the most frequent reason for hesitation included pregnancy

(31%), concerns about long-term effects (20%) or low trust (16%) in the COVID-19 vaccine

(Gilboa et al., 2021). This study merely coincides with the findings of this DNP project.

The findings of this project sought the flu vaccination status of providers who

participated in the survey within the last 2 years. The question was asked to assess a possible

link between a provider's perception of the COVID-19 vaccine and their willingness to get the

flu vaccine. Nearly all providers (90%) who completed the survey documented that they

received the flu vaccine within the last 2 years with majority of them concurring vaccine

mandate for healthcare workers. This data corroborates a recent study conducted by Paris et al.

(2021) that showed a strong correlation between influenza vaccination and COVID-19 vaccine

profiles among healthcare workers. Those regularly vaccinated for the flu vaccine (89.3%)

intended to get the COVID-19 vaccine in comparison to those never flu vaccinated (46.4%)

(Paris et al., 2021).

 Sustainability Plan and Next Steps

Referring back to the framework used to guide this project, a strategic approach was used

to assess provider attitudes towards COVID-19 vaccinations, identify barriers, and determine

provider learning needs to inform for future intervention using the planning stage of the PDSA

cycle. The planning stage of the PDSA cycle includes establishing an objective, developing a

question or prediction and making a thorough plan to carry out the cycle.

     An objective was established through the development of the specific aim. The specific

aim's question/hypothesis included assessing statistical significance between a provider's

knowledge and their concerns with taking the COVID-19 vaccine. With a small sample size,

bias, instrument that needs revision and several limitations to the study, there is not enough data

to move forward with a larger group and/or intervention. The project leader and organization

would benefit from revising the project including revision of the data collection instrument,

increasing the sample size, extending the timeframe of the project and consider new knowledge

on the COVID-19 vaccines and recent mandations.

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Appendix A: Institutional Approval

July 26, 2021

Dear Yahnique Richards,

Your DNP Capstone project PICOT submission and survey were formally approved by the MinuteClinic Projects Committee on 7/14/2021.

Please reach out to us with any questions you might have.

Thank you!

Rachel Mineshima,

MinuteClinic Projects Committee Chair

Appendix B: Data Collection Tool

1. What is your age group?

◯ 18 - 24 years   ◯ 45 - 54 years

◯ 25 - 34 years   ◯ 55 - 64 years

◯ 35 - 44 years   ◯ 65+ years

2. What is your biological sex?

◯ Male

◯ Female

◯ Rather not disclose

3. Which race/ethnicity best describes you? (Please choose only one.)

◯ American Indian or Alaskan Native

◯ Asian / Pacific Islander

◯ Black or African American

◯ Hispanic

◯ White / Caucasian

◯ Prefer not to answer

◯ Multiple ethnicity / Other (please specify)

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[                                    ]
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4. Have you been vaccinated for the flu within the last 2 years?

◯ Yes

◯ No

5. Do you think that the COVID-19 vaccine should be required for all health care providers (barring contraindications)?

◯ Yes

◯ No

6. Do/did you have any concerns about taking the COVID-19 vaccine, and if so, what were they?

○ I had no concerns

○ I am/was concerned about the safety

○ I am/was concerned about the side-effects

○ I am/was concerned about something else

7. Do you know of anyone who has received the COVID-19 vaccine and later experienced debilitating side effects (i.e., could not participate in normal activities for more than two days)?

○ Yes

○ No

8. How confident are you that the COVID-19 vaccines currently available could halt the pandemic if accepted by >90% of the eligible population?

○ Extremely confident   ○ Not so confident

○ Very confident   ○ Not at all confident

○ Somewhat confident

9. Do you consider yourself to be adequately informed about the COVID-19 vaccine?

○ Yes

○ No

10. What is your perceived risk of getting the COVID-19 infection?

○ Low Risk

○ Moderate Risk

○ High Risk

○ Very High Risk

11. Has your level of concern changed about the COVID-19 vaccination between January 2021 and now?

○ No, my level of concern is the same

○ Yes - I am MORE concerned about safety/side effects

○ Yes - I am LESS concerned about safety/side effects

○ I am not sure

Appendix C: IRB Letter of Determination

**Institutional Review Board &
Privacy Board**

FWA#:00003624 · IORG#:0000064

DATE: August 4, 2021

TO: Yahnique Richards
FROM: SUNY Downstate IRB & Privacy Board

IRBNet ID & TITLE: [1794773-1] Identifying COVID-19 Vaccine Hesitancy among Providers
SUBMISSION TYPE: New Project
REVIEW TYPE: Administrative Review
DECISION: Not Research
STATUS: Not Research
EFFECTIVE DATE: August 4, 2021

The following items were included in this submission:

- Abstract/Summary - Richards Y Abstract .docx
- Action Plan - Yahnique Richards Approval letter.pdf
- Action Plan - Richards Y Survey Introductory Communication.docx
- Application Form - Application for determination letter Y.Richards UPDATED (4).docx
- Questionnaire/Survey - Richards.Y SURVEY PDF.pdf

This project does not meet the definition of research as defined by applicable federal regulations. Therefore, Downstate IRB approval is not required.

No additional actions are required at this time. Submit any proposed change for an updated determination if the proposed change makes the activity human research or makes Downstate engaged in human research, prior to making such changes.

This determination is based on the following:

- The activity is an Operations Activity (e.g., quality improvement activity) without any intent to develop or contribute to generalizable knowledge.

Please comply with Downstate Policy IRB-01 and other relevant Downstate policies that apply to the activity. This IRB determination does not necessarily constitute final approval to carry out the activity. All other necessary requirements must be met before the activity can begin (e.g., ancillary reviews, executed agreements, other approvals, HIPAA training, etc.).

**450 Clarkson Avenue, Box 1284, Brooklyn, NY 11203-2098
(718) 613-8480 · FAX: (718) 613-8497 · IRB@downstate.edu**