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Examining Factors Associated With COVID-19 Full Vaccination Rates Among Healthcare Workers

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This is to certify that the doctoral dissertation by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Abstract

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Abstract

The slow uptake of the COVID-19 vaccine in the United States, with a 44.7% vaccination rate across the general population as of June 2021, is a major public health concern. Despite widespread availability of COVID-19 vaccines, some healthcare workers remain resistant to vaccination, and there is a need for further research that explores COVID-19 vaccine behaviors and reasons for those behaviors. The purpose of this quantitative correlational, cross-sectional study was to examine the associations between healthcare worker job title, race, years in practice, perceptions of vaccine safety, perceptions of vaccine efficacy, vaccine potential side effects, household size, marital status, number of school age children, interpersonal motivations, community connections, news source, and full COVID-19 immunization while controlling for age and gender. Bronfenbrenner's social ecological model was used to interpret study findings. Key findings from this study emphasized the significance of perceptions of vaccine safety ($p < .001$), interpersonal motivations ($p < .001$), and race ($p = .038$) were the most influential factors in the decision-making process of receiving full COVID-19 immunization among these healthcare worker study participants. Healthcare workers have a critical role in mitigating the COVID-19 pandemic through demonstrating preventive role-modeling behavior and proactively educating the benefits of being fully COVID-19 vaccinated. These results are potential areas for positive social change, offering insight into predictors of COVID-19 full vaccination uptake that can be used to design and implement public health policies that improve vaccine uptake, thus increasing strategies and actions to promote the public's protection against viruses and future pandemics.

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Chapter 1: Introduction to the Study

Vaccine reluctance or refusal has recently become a major public health concern and topic of argument (Kose et al., 2020). The most recent vaccination adherence concern is that of the COVID-19 full vaccination, which is a central measure for controlling the global COVID-19 pandemic (Hamel et al., 2020). According to several researchers, the best way to control COVID-19 is through herd immunity, which would require a vaccination rate of 80% (Biswas et al., 2021; Hamel et al., 2020; Kose et al., 2020; Li et al., 2021). However, many people have delayed in receiving the COVID-19 vaccine or rejected it all together for several reasons, making it impossible to achieve herd immunity (Li et al., 2021). Although the general publics' attitude toward the COVID-19 vaccine is important for success, the COVID-19 vaccine attitudes and behaviors of essential workers, such as healthcare workers, are of utmost importance because of their proximity to individuals who have contracted COVID-19 and their ability to have a positive influence on the people in their care (Li et al., 2021). The aim of this study was to explore the various factors that influence healthcare workers decisions to receive the COVID-19 vaccine. Examining the factors associated with COVID-19 vaccine acceptance may lead to designing future successful communications and educational pathways that lead to improved vaccine acceptance among healthcare workers.

This chapter includes a background to the research problem, problem statement, purpose of the study, research questions, definitions, and significance of the study. Additionally, this chapter will present the nature of the study, including a brief introduction to the research design, population, method of data collection, scope,

delimitations, assumptions, and limitations. Finally, this chapter concludes with a summary.

Background

The effectiveness of a vaccine is dependent on its use (Piltch-Loeb & DiClemente, 2020). Individuals' intentions and behaviors associated with vaccines have been a focal point of health policy research for decades (Murti et al., 2019). Many researchers devote time and attention to vaccine behavior research because hesitancy toward vaccine uptake is a public health concern (Li et al., 2021). Existing research results have revealed several factors that influence peoples' decisions to receive or not receive a vaccine in a variety of settings (Murti et al., 2019; Stead et al., 2019). For instance, Murti et al. (2019) found that providing education and positive messages about the influenza vaccine improved vaccine uptake.

Recently, there has been a rise in the antivaccine movement in the United States, which has reduced herd immunity and increased the likelihood of an epidemic for several diseases (Piltch-Loeb & DiClemente, 2020). For instance, research has shown hesitancy toward receiving the recent COVID-19 vaccine (Hamel et al., 2020). In the healthcare field, 29% of healthcare workers were reluctant to get COVID-19 vaccines (Hamel et al., 2020). Biswas et al. (2021) acknowledged that while there is limited information about the COVID-19 vaccine hesitancy of healthcare workers worldwide, research has shown some reasons for COVID-19 vaccine hesitancy were concerns for perceptions of vaccine safety, perceptions of vaccine efficacy, and potential side effects from the vaccine.

Researchers and practitioners have indicated their readiness to advocate amendments in health policy, communication, and educational approaches to decrease the possibility of unvaccinated individuals contracting diseases (Gostin et al., 2019). However, a focus on gaining insight into the variety of socio-behavioral factors that can influence vaccine uptake is absent from the calls for future research and literature on vaccination motivation (Piltch-Loeb & DiClemente, 2020). The study aimed to explore the demographic and personal characteristics that influence COVID-19 vaccine uptake among healthcare workers.

Problem Statement

The situation or issue that prompted me to search the literature was the concerning slow uptake of the COVID-19 vaccine in the United States, with a 44.7% vaccination rate across the general population as of June 2021 (Centers for Disease Control and Prevention [CDC], 2022a). Before the vaccine was available, a low morale and acceptance among healthcare worker toward receiving the futuristic COVID-19 vaccine was reported (Kose et al., 2020). According to research from Li et al. (2021), nurses were less willing to receive the COVID-19 full vaccination before it was available compared to other healthcare workers. This lack of COVID-19 vaccine acceptance, especially among healthcare workers, has cause for concern in the advocacy and promotion of the benefits for receiving the vaccine. Healthcare workers who are hesitant about receiving vaccinations can weaken trust in the general population (Karafillakis et al., 2016). In some areas, vaccine mandates have been formulated enforcing populations to receive the COVID-19 full vaccination or face consequences (Washington Governor

Jay Inslee, 2020). This prompted the question of what factors are associated with the reasons behind healthcare workers agreeing to receive the COVID-19 vaccine.

The specific research problem that will be addressed through this study was aimed at examining the factors associated with the COVID-19 full vaccination uptake among healthcare workers using binary logistic regression analysis. Although researchers have investigated the issue of vaccine acceptance in the past, the topic has not been explored in this way; that is, no research could be found at the time of this study that specifically explored the factors associated with COVID-19 full vaccination uptake among healthcare workers. While studies have investigated factors associated with healthcare workers perceived hesitant attitude toward the intention of receiving a future COVID-19 full vaccination, Li et al. (2021) suggested the need for further research that explores COVID-19 vaccine behaviors and reasons for those behaviors. This study aimed to identify the reasons associated with why healthcare workers chose to receive the COVID-19 full vaccination. Researching this gap in the literature has potential to highlight areas of strengths and concerns when examining pathways directed to increase overall community adherence for the COVID-19 full vaccination. Furthermore, examining the factors associated with COVID-19 vaccine acceptance may lead to designing future successful communications and educational pathways that lead to improved vaccine acceptance in other populations.

Purpose of the Study

The purpose of this quantitative study was to examine the associations between healthcare worker job title, race, years in practice, perceptions of vaccine safety,

perceptions of vaccine efficacy, perceptions of vaccine potential side effects, household size, marital status, number of school age children, interpersonal motivations, community connections, news source, and full COVID-19 immunization while controlling for age and gender. For this study, healthcare workers are individuals employed in the healthcare setting and who provide care to a registered patient, including but not limited to the physicians, therapists, and nurses. The independent variables in this study are healthcare worker job title, race, years in practice, perceptions of vaccine safety, perceptions of vaccine efficacy and perceptions of potential side effects, household size, number of school age children, interpersonal motivation, community connections, news source and marital status. The dependent variable in this study was full immunization with the COVID-19 vaccine. Finally, the control variables in this study are age and gender.

Research Questions

RQ1 – What is the association between healthcare worker's individual influences and COVID-19 full vaccination when controlling for age and gender?

$H_0$1: There is no association between healthcare worker's individual influences and COVID-19 full vaccination when controlling for age and gender.

H_a1: There is an association between healthcare worker's individual influences and COVID-19 full vaccination when controlling for age and gender.

RQ2 – What is the association between healthcare worker's interpersonal influences (Interpersonal motivations and household size and COVID-19 full vaccination when controlling for age and gender?

$H_0$2: There is no association between healthcare worker's interpersonal influences (Interpersonal motivations and household size) and COVID-19 full vaccination when controlling for age and gender.

H_a2: There is an association between healthcare worker's interpersonal influences (Interpersonal motivations and household size) and COVID-19 full vaccination when controlling for age and gender.

RQ3 – What is the association between healthcare worker's organizations influences (Healthcare worker job title) and COVID-19 full vaccination when controlling for age and gender?

$H_0$3: There is no association between healthcare worker's organizations influences (Healthcare worker job title) and COVID-19 full vaccination when controlling for age and gender.

H_a3: There is an association between healthcare worker's organizations influences (Healthcare worker job title) and COVID-19 full vaccination when controlling for age and gender.

RQ4 – What is the association between healthcare worker's community and environment influences (Community connections) and COVID-19 full vaccination when controlling for age and gender?

$H_0$4: There is no association between healthcare worker's community and environment influences (Community connections) and COVID-19 full vaccination when controlling for age and gender.

H_a4: There is an association between healthcare worker's community and environment influences (Community connections) and COVID-19 full vaccination when controlling for age and gender.

RQ5 – What is the association between healthcare worker's society and public policy (News source) and COVID-19 full vaccination when controlling for age and gender?

H_05: There is no association between healthcare worker's society and public policy (News source) and COVID-19 full vaccination when controlling for age and gender.

H_a5: There is an association between healthcare worker's society and public policy (News source) and COVID-19 full vaccination when controlling for age and gender.

RQ6 – What is the association between healthcare worker's individual, interpersonal, organizations, community and environment, society/public policy influences and COVID-19 full vaccination when controlling for age and gender?

H_06: There is no association between healthcare worker's individual, interpersonal, organizations, community and environment, society/public policy influences and COVID-19 full vaccination when controlling for age and gender.

H_a6: There is an association between healthcare worker's individual, interpersonal, organizations, community and environment, society/public policy influences and COVID-19 full vaccination when controlling for age and gender.

Theoretical Framework

The theory that grounds this study is Bronfenbrenner's (1979) social ecological model. The social ecological model is a framework developed from the ecological systems theory (EST), which posits that a person's development is influenced by their surrounding environment and social interactions (Bronfenbrenner, 1979). EST comprises five layers of influence, each having an overlapping relationship with the next level and consisting of distinct developmental processes and interactions (Cross, 2017). The five layers include the microsystem, mesosystem, exosystem, macrosystem, and chronosystem (Neal & Neal, 2013). In the social ecological model (SEM), these systems take more specific shape when applied to understanding individuals' health behaviors (Ohri-Vachaspati et al., 2015). In SEM, these levels are described as individual, interpersonal, community, institutional, and societal. Interpersonal-level influences include an individual's demographic characteristics (e.g., age, race, gender); interpersonal-level influences include one's peers and others the individual knows personally. Broader influences exist at the community level, which consists of the shared attitudes and accepted behaviors among the communities to which the individual belongs (Ohri-Vachaspati et al., 2015). Formal and informal social structures, including workplace structures, are included at the institutional level, and the societal level includes governmental policy and laws, economic conditions, social norms, and other forces that influence behavior and decision-making (Ohri-Vachaspati et al., 2015).

The logical connections between the framework presented and the nature of this study include understanding the predictors of COVID-19 full vaccination acceptance in

healthcare workers through recognizing the factors associated with the vaccine intervention. Healthcare workers have a critical role in mitigating the COVID-19 pandemic through demonstrating preventive role-modeling behavior, including proactively educating the benefits of being fully COVID-19 vaccinated so their patients understand and ideally receive the vaccine. This study used the social ecological model as a basis for the framework establishing the factors associated with the behaviors the healthcare worker considers when engaging in the intervention. The social ecological model outlines the complex intersections of individual, relationship, community, and societal factors and the uptake of the COVID-19 full vaccination. The model allows examination of the factors experienced by healthcare workers as they made the personal decision to receive the COVID-19 full vaccination. In addition to aiding in clarifying these factors, the model has potential to suggest a pattern of factors that are likely to predict a healthcare worker's decision to receive the COVID-19 full vaccination.

Nature of the Study

This study used quantitative research methodology because the quantitative approach focuses on collecting numeric data to make inferences about a population (Apuke, 2017). The specific research design used in this quantitative study was a correlational design. Correlational research is used to explore the associations between variables (Apuke, 2017). The independent variables in this study are healthcare worker job title, race, years in practice, perceptions of vaccine safety, perceptions of vaccine efficacy, perceptions of vaccine potential side effects, household size, number of school age children, interpersonal motivations, community connections, news source, and

marital status. The dependent variable in this study was full immunization with the COVID-19 vaccine. Finally, the control variables in this study are age and gender. The independent and covariate variables in this study are measured at the categorical level of measurement and the COVID-19 vaccine-related variables are measured dichotomously.

An electronic survey tool (e.g., SurveyMonkey) will be used to distribute demographic questions confidentially and anonymously to 500 direct care providers within a healthcare organization. To address the research questions in this quantitative study, data was analyzed using descriptive and inferential statistics computed through SPSS. The descriptive statistics will include measures of central tendency to describe characteristics of the population. The inferential statistics will include binary logistic regression analysis to test the association between the independent variables and the dichotomous dependent variable.

Definitions

Age: For this study, age was defined as the number of years since birth and was measured using a discrete value (CDC, 2022a). The question was: How old were you on your last birthday?

Attitudinal factors: For this study, attitudinal factors are the beliefs tendencies of an individual toward the idea of receiving the COVID-19 vaccine.

Community connections: For this study, community connections refer to the community-related reasons for receiving the COVID-19 vaccine. This variable is measured on a scale of 0-5, where 0 = not true and 5 = very true. The following statements will be rated using this scale: I received monetary incentive for my COVID-19

vaccination; Members in my church are pro COVID-19 vaccination; My family members are pro COVID-19 vaccination; My closest friends are pro COVID-19 vaccination; My personal primary care provider is pro COVID-19 vaccination; My employment requires COVID-19 vaccination; and COVID-19 vaccine status allows for easier access to venues (concerts).

Full immunization with the COVID-19 vaccine: Full immunization with the COVID-19 vaccine refers to whether or not a person received 2 or more of the COVID-19 vaccine. This variable was dichotomous and coded as 1 = yes and 2 = no.

Gender: In this study, gender was defined as the sex for which you identify with. Gender will be coded as 1 = male, 2 = female, 3 = nonbinary, 4 = transgender, and 0 = prefer not to say.

Healthcare worker job title: Healthcare worker job titles include the positions that are most commonly found in the healthcare field. The healthcare worker job titles included in this study are: 0 = non-health professionals, 1 = healthcare receptionist, 2 = dietician, 3 = healthcare technician, 4 = social worker, 5 = counseling professional, 6 = dentist/hygiene professional, 7 = medical doctor/nurse practitioner, 8 = pharmacist, 9 = medical assistant, and 10 = nurse, and 11 = other.

Household size: Household size was defined as the number of individuals residing in the home, including the respondent. This variable was measured by a discrete variable equal to the number of individuals who live in the home.

Interpersonal motivations: In this study, interpersonal motivations refer to the interpersonal reasons for receiving the COVID-19 vaccine. This variable was measured

on a scale of 0-5, where 0 = not true and 5 = very true. These ratings were applied to the following statements: I received a COVID-19 vaccination to protect my family; I received a COVID-19 vaccination to protect my neighbors; I received a COVID-19 vaccination to protect my co-workers; and I received a COVID-19 vaccination to protect my patients.

Marital status: Marital status was defined as the type of relationship a person is involved in. For this study, marital status was coded as 1 = married, 2 = cohabitating with a partner, 3 = divorced, 4 = separated, 5 = single, and 0 = prefer not to say.

News source: News source refers to where individuals receive their COVID-19 vaccine-related information. This variable was measured on a scale of 0-5, where 0 = not true and 5 = very true. Respondents were asked if they received information about COVID-19 vaccination from CDC, CNN, BBC, WHO, Fox News, Employer communications, TikTok, LinkedIn, YouTube, Twitter, Instagram, or Facebook.

Number of school age children: The number of school age children was measured using a discrete value equal to the number of children who live at home.

Potential side effects: In this study, potential side effects refer to the perceived side effects associated with the COVID-19 vaccine. This variable was measured at the nominal level of measurement, where 0 = not true and 1 = true. Respondents rated their agreement to the statement 'I am not concerned about experiencing side effects from the COVID-19 vaccination.'

Race: Race refers to the categories of social groups based on perceived similarities and differences. For this study, race was coded as 1 = White/Not Hispanic, 2

= Pacific Islander, 3 = Asian, 4 = Native American = 4, 5 = Latinx/Hispanic, 6= African American, and 0 = prefer not to say.

Risk aversion: For this study, risk aversion was the tendency to avoid risk

Vaccine efficacy: In this study, vaccine efficacy refers to the perceived effectiveness of the COVID-19 vaccine at preventing people from contracting the virus. This variable was measured on a scale of 0-5, where 0 = not true and 5 = very true. Respondents rated their agreement to the statement 'I believe the COVID-19 vaccination to be an effective preventative measure for contracting COVID-19.'

Vaccine safety: In this study, vaccine safety refers to the perceived safety of the COVID-19 vaccine. This variable was measured on a scale of 0-5, where 0 = not true and 5 = very true. Respondents rated their agreement to the statement 'I believe the COVID-19 vaccination is safe to receive.'

Years in practice: For the purpose of this study, years in practice was defined as the number of years the person has been in their current job position. This variable was measured using a discrete value equal to the number of years in current practice.

Assumptions

It was assumed that the participants in this study would answer the survey questions honestly and to the best of their ability. Another assumption of this study was that a sample size of 500 would be sufficient for binary logistic analysis with twelve independent variables and two control variables. Finally, it was assumed that the independent variables were not highly correlated with one another. Multicollinearity, or

high correlation among independent variables, can weaken statistical power in binary logistic regression (Bender & Grouven, 1997).

Scope and Delimitations

The scope of this research study was to examine the associations between healthcare worker job title, race, years in practice, perceptions of vaccine safety, perceptions of vaccine efficacy, perceptions of vaccine potential side effects, household size, marital status, number of school age children, interpersonal motivations, community connections, news source, and full COVID-19 immunization while controlling for age and gender. Specifically, the independent variables in this study are healthcare worker job title, race, years in practice, perceptions of vaccine safety, perceptions of vaccine efficacy, perceptions of vaccine potential side effects, household size, number of school age children, interpersonal motivations, community connections, news source, and marital status. The dependent variable in this study was full immunization with the COVID-19 vaccine. Finally, the control variables in this study were age and gender.

This study was delimited to a sample of 500 healthcare workers. For this study, healthcare workers are individuals employed in the healthcare setting and who provide care to a registered patient, including but not limited to the physicians, therapist, and nurse. Individuals who do not work in the healthcare industry were not included in this study. The population of healthcare workers was chosen because the literature indicated the need to explore COVID-19 vaccine uptake within this specific population. This study is also delimited to data collected from a demographic survey. The survey responses were analyzed using binary logistic regression analysis.

Limitations

Anticipated challenges include getting the required sample size of healthcare workers to answer the questions in a timely manner. To mitigate this anticipated challenge, the survey was created with ease of use, efficiency, and clarity in explanation for the purpose of reducing potential confusion or frustration. Inclusion of the purpose for the study and statements of gratitude and set reminders for the goal of meeting the desired sample number was identified for the respondents. Another anticipated challenge was the length of timeline and requirements for approval from the IRB. A limitation of the study was the use of a correlation design. According to Creswell and Creswell (2018), correlational designs cannot be used to infer causation. Another limitation of this study was the use of self-report data, which is associated with response bias (Creswell & Creswell, 2018). These areas were mitigated of the potential influence of response bias by explaining in the informed consent document that all responses were anonymous.

Significance

This study was significant in that it aimed to answer a call from Li et al. (2021) for future research to explore COVID-19 vaccine behaviors and reasons for those behaviors. Furthermore, this study was significant in that it aimed to provide insight into the factors that influence healthcare workers' decisions to receive the COVID-19 vaccine. This new insight was anticipated to lead to an increased understanding of the reasons why healthcare workers hesitate to receive vaccines even though they work in an environment where the risk of contracting diseases is greatest. Gaining a better understanding of healthcare workers' vaccine hesitancy may provide useful information for future vaccine

campaigns to increase vaccine uptake. Vaccine uptake is critical to saving lives and improving the social and economic conditions affected by the COVID-19 pandemic. Increased awareness on factors in the decision to receive the vaccine creates opportunity to invest in areas that may establish community-wide improved uptake of COVID-19 full vaccination.

Summary

The purpose of this quantitative study was to examine the associations between healthcare worker job title, race, years in practice, perceptions of vaccine safety, perceptions of vaccine efficacy, vaccine potential side effects, household size, marital status, interpersonal motivations, number of school age children, community connections, news, source, and full COVID-19 full vaccination while controlling for age and gender. An electronic survey tool (e.g., SurveyMonkey) was used to distribute demographic questions confidentially and anonymously to the direct care providers within a healthcare organization of a minimum of 500 personnel. To address the research questions in this quantitative study, data was analyzed using descriptive and inferential statistics computed through SPSS. The descriptive statistics included measures of central tendency and chi square tests to describe characteristics of the population. The inferential statistics included binary logistic regression analysis to test the associations between the independent variables and the dichotomous dependent variable. Chapter 2 provides a review of the literature relevant to the research topic.

Chapter 2: Literature Review

Coronavirus disease termed COVID-19 by the World Health Organization (WHO, n.d.-a), first emerged in Wuhan, China in December of 2019 (Liu et al., 2020). The disease rapidly spread, reaching world pandemic status impacting people of all age groups (WHO, n.d.-b). In addition to causing illness and death, the pandemic has negatively impacted individuals both economically and mentally.

Despite containment efforts and the relatively fast roll-out of vaccines, the COVID-19 pandemic persists. One reason researchers provided to explain the persistence of COVID-19 is the slow rate of vaccine uptake throughout the world (Hlongwa et al., 2022; Sallam, 2021). For vaccination programs to be successful, large numbers of people must be vaccinated quickly to achieve herd immunity (Rane et al., 2022). Therefore, it is important to understand the factors that influence a person's decision to receive or refuse a vaccine. Delaying the decision to accept or refuse an available vaccine, known as vaccine hesitancy, has been studied extensively (Sallam, 2021). Yet, the reasons for vaccine acceptance, especially among healthcare workers, have not generated as much interest.

The problem addressed in this research is the slow uptake of the COVID-19 vaccine in the United States, with a particular interest toward healthcare workers. Healthcare workers who are hesitant about receiving vaccinations can weaken the trust of the general population (Karafillakis et al., 2016). The specific research problem that will be addressed through this study is aimed at examining the factors associated with the

COVID-19 full vaccination uptake among U.S. healthcare workers using binary logistic regression analysis.

The purpose of this research was to address an identified gap in the current literature: While studies have investigated factors associated with healthcare workers' hesitant attitudes toward the intention of receiving a future COVID-19 full vaccination, this study aimed to identify the reasons behind healthcare workers' decisions who chose to accept or receive the COVID-19 full vaccination. The purpose of this quantitative study was to examine the association between healthcare workers' job title, race, years in practice, household size, and marital status with the dependent variable, vaccine uptake, while controlling for age, gender, and full immunization with the COVID-19 full vaccination.

A thorough review of the literature revealed extensive research has been conducted on a wide variety of subjects surrounding COVID-19. Relevant studies were selected for inclusion in the current literature review. Many studies were found that examined factors related to vaccine hesitancy. Specifically, Coe et al (2022), Kreps et al. (2020), and Reiter et al. (2020) identified differences in gender as they related to vaccine hesitancy while Bogart et al. (2021) determined ethnicity was associated with uncertainty surrounding immunization. However, many of these studies were conducted in anticipation of vaccine rollouts and may not reflect changes in attitudes or perceptions once vaccines became available.

Several studies were found where researchers identified factors associated with vaccine hesitancy in the general population (Biswas et al., 2021; Bogart et al., 2021; Chu

& Liu, 2021; Ottewell et al., 2022; Troiano & Nardi, 2021). Additional studies examined factors related to vaccine hesitancy among healthcare workers, specifically (Hamel et al., 2020; Hlongwa et al., 2022; Kose et al., 2020; Li et al., 2022). In addition, some studies were found that investigated reasons for vaccine uptake in the general population (Chu & Liu, 2021; Kreps et al., 2020; Malik et al., 2020; Reiter et al., 2020) and in healthcare workers (Lucia et al., 2021; Li et al., 2021; Stead et al., 2019). These studies were also conducted prior to vaccine rollouts aimed to identify factors that may help to increase vaccine uptake. Further, while these studies sought to identify factors of vaccine uptake using similar methods to the current study, the studies examined populations of healthcare workers that were distinct from the current population of interest that focuses specifically on U.S. based healthcare workers. The current study intends to address this gap in the literature.

This chapter includes a thorough examination of the social-ecological model developed by Bronfenbrenner (1979) and a discussion of its applicability to the proposed study. In addition, a literature review of relevant studies is provided progressing from broad subject matter toward the identified gap in the existing literature. These subjects will include a brief history of COVID-19, its etiology, including symptoms, treatment, preventative measures, and the impact to various populations, as well as mitigation and immunization efforts. Additionally, efforts to promote immunization will be identified followed by reasons for vaccine hesitancy and acceptance among the general population and healthcare workers, specifically. Finally, a summary of the literature will be offered, and further rationale for conducting the proposed study.

Literature Search Strategy

A list of key search terms included *coronavirus* and *COVID-19* combined with *vaccine hesitancy, vaccine uptake/acceptance, vaccine campaigns/promotion, etiology, history, mitigation, immunization, healthcare workers, mandates,* and *social-ecological model/theory.* These keywords were used to generate articles from database searches including JSTOR, Google Scholar, PsychInfo, Health Services and Science Research Resources (HSRR), Healthcare Cost and Utilization Project (HCUP) and PsycArticles. Articles relevant to the proposed study were included in the literature review. Of the articles researched for this literature review, 85% were from 2018 to 2022.

Theoretical Foundation

Social Ecological Model

The framework for this study was Bronfenbrenner's (1979) social ecological model (SEM). SEM describes the interplay of nested factors related to experiences, decisions, and health behaviors (Bronfenbrenner, 1979). SEM was initially developed by psychologist Urie Bronfenbrenner (1979) to explain how child development is affected by everything the child encounters (Krebs, 2009). The theory was heavily influenced by Lewin's classic change theory that defined behavior as the result of interaction between a person and their environment (Krebs, 2009). Bronfenbrenner (1979) expanded on Lewin's theory by adding the dimension of time thereby changing the result of Lewin's original equation from behavior to development (Krebs, 2009). Tudge et al. (2009) contended that Bronfenbrenner's (1979) theory developed over 3 decades with the final version incorporating the concepts of process, person, context, and time.

Originally, Bronfenbrenner's (1977) ecological systems theory consisted of four complex concentric systems that were theorized to influence the development of an individual who is located within the innermost circle. An individual's immediate setting, and the innermost circle, is called a *microsystem* and consists of a physical environment, other people within the environment, activities occurring within the environment, and the role the individual assumes within that environment for a finite period of time (Bronfenbrenner, 1977). The variables in this study relate to the microsystem layer of EST because the microsystem consists of the environmental and influential factors related directly to the individual, such as one's home, children, colleagues, and job (Cross, 2017).

SEM theorizes that differences in individual outcomes are attributed not only to individual-level factors, such as age and gender, but are also interrelated with larger social, cultural, economic, and environmental contexts in which individuals live (Ohri-Vachaspati et al., 2015). These multilevel factors are described as concentric layers of influence and include intrapersonal, interpersonal, community, institutional, and societal domains (Bronfenbrener, 1979; Ohri-Vachaspati et al., 2015). The intrapersonal level refers to demographic characteristics such as age, race, or gender, whereas the interpersonal level considers influential relationships within peer networks (Latkin et al., 2021). Kolff et al. (2018) explained that the interpersonal level encompasses the knowledge, attitudes, and beliefs of the individual which are shaped by intrapersonal relationships between the individual and family, friends, or colleagues. The community level incorporates factors such as the prevalence of a disease or social norms that shape

the attitudes and behaviors of community members (Kolff et al., 2018; Latkin et al., 2021). The institutional level is comprised of the formal and informal social structures that influence individuals that may or may not interact with the individual (Bronfenbrenner, 1977). The societal level incorporates larger social contexts including government regulations, economic conditions and unemployment rates, elements of the media, social stigma, discrimination and prejudice, advertising campaigns, educational campaigns, and law enforcement (Jalali et al., 2020).

Evidence of the Social Ecological Model as a Theoretical Foundation

SEM has been applied as a theoretical foundation to a wide range of research pertaining to human health and wellbeing. For example, some researchers utilized SEM as a framework to better understand variables impacting individuals with mental health concerns (Smith et al., 2022; Tanhan & Francisco, 2019). Others applied SEM as a framework to identify factors affecting substance abuse (Alghzawi & Ghanem, 2021; Lee et al., 2019) For example, Lee et al. (2019) applied SEM as a framework to identify disparities in smoking patterns among rural and urban Chinese adults. The researchers determined that societal factors contributed to lower smoking rates among urban residents (Lee et al., 2019). Still others employed SEM to guide health promotion efforts toward policy and environmental changes (Golden et al., 2015).

The Social Ecological Model's Applicability to the Current Study

SEM has also been applied to research investigating vaccine hesitancy and uptake in various populations of interest. For example, Kumar et al. (2012) applied SEM as a framework for determinants of 2009 H1N1 influenza vaccine uptake in the United States.

In a survey of 2,079 adults, only 18.4% reported they had gotten the 2009 H1N1 vaccine. Results indicated vaccine acceptance was significantly associated with older adults with healthcare insurance and access to a regular healthcare provider while vaccine intent was associated with minorities and lower educated people (Kumar et al., 2012).. Important to the current study, Kumar et al. (2012) relied on SEM as a theoretical framework to examine variables at the intrapersonal, interpersonal, institutional, policy, and community levels. The researchers determined intrapersonal level variables, including attitudes and beliefs, predicted 53% of the variance in vaccine behavior (Kumar et al., 2012). The interpersonal level accounted for 47% of vaccine behavior variance and included measures of social influence. The institutional level recorded the amount of information received and influenced from a healthcare provider. 34% of variances were explained by the institutional level. Finally, the community level, which included the perception of risk to the community, predicted only 8% of the variance. Kumar et al. (2012) concluded that effective vaccination campaigns target multiple levels of the social ecological system.

Another study by Karapetyan and Nazaryan (2021) applied SEM to COVID-19 vaccine deniers and refusers in Sweden. SEM highlighted the effects of the individual socio-ecological factors on vaccine deniers and the individual, interpersonal/community, and public policy factors on vaccine refusers and deniers. The study applied a qualitative approach using semi-structured, in-depth interviews. Findings indicated participants' attitudes toward the vaccine were shaped by factors at each level. At the intrapersonal level, attitudes and beliefs were shaped by information gathered from news sources and the internet. Interpersonal factors included information received from personal

acquaintances and scientists deemed trustworthy. Prior negative experiences with vaccines as recounted by family members correlated positively with vaccine hesitancy. At the institutional level, participants expressed distrust of healthcare workers' recommendations as a result of the limited knowledge surrounding vaccine efficacy and possible side effects.

Finally, Kloff et al. (2018) applied SEM as a theoretical framework in their literature review to identify areas in which technology has been or may be leveraged to target under-vaccinated populations across individual, interpersonal, organizational, community, and society levels. Technology usage at the individual level centered on cell phones to communicate vaccination reminders through text messages or phone calls (Kloff et al., 2018). Informational websites and social media accessed from the internet provided vaccine information that was shared at the interpersonal level. On the organizational level, institutions were found to have influence on vaccination rates through the provision of clinical decision support tools, electronic health records, and vaccine registries. On the community level, search data trends were found to be useful to inform public health programming and to better understand educational needs of the public regarding vaccination. Finally, immunization information systems that consolidate vaccination records across a population were important tools used to facilitate vaccine management and inform assessments of vaccine coverage on the society level. Kloff et al. (2018) demonstrated that SEM can provide a useful framework to classify barriers and strategies to vaccination at the individual, interpersonal, community, organizational and society levels which is relevant to the current study.

More recently, researchers have employed SEM as a framework underpinning studies of COVID-19 vaccine uptake (Al-Jayyousi et al., 2021; Latkin et al., 2021; Riad et al., 2021). However, these studies varied in methodology and population of interest from the current study. Al-Jayyousi et al. (2021), for instance, conducted a scoping review of 50 studies. The researchers found that the factors influencing public attitudes toward COVID-19 vaccines were embedded within the different levels of the socioecological model. Latkin et al. (2021) employed a longitudinal survey design to examine attitudes of adults living in the United States and their intentions to obtain a COVID-19 vaccine. Data were provided by 592 respondents, including measures of demographics, vaccine history, social norms, perceived risk, and trust in sources of COVID-19 information (Latkin et al., 2021). In another study that employed survey data, Riad et al. (2021) performed a secondary analysis of data extracted from a multi-unit and multi-national cross-sectional study of dental students' attitudes toward COVID-19 full vaccination to elicit factors related to dental students' willingness to get the COVID-19 vaccine. These examples underscore the usefulness of SEM for identifying and understanding the factors related to vaccine uptake intentions and illuminate a gap in the research relating to health care workers' vaccine uptake intentions. Thus, SEM is an appropriate framework for the current study.

Literature Review Related to Key Variables and/or Concepts

History of COVID-19

COVID-19 emerged in Wuhan, China in December of 2019 (Liu et al., 2020). Initially, health officials diagnosed patients in Wuhan experiencing fever, malaise, dry

cough, and dyspnea with viral pneumonia (Liu et al., 2020). On January 9th, 2020, Chinese authorities reported that the outbreak occurring in Wuhan was caused by a novel coronavirus (WHO, n.d.-c). The first death attributed to COVID-19 occurred a few days later on January 11th, 2020 (WHO, n.d.-c). By the end of January 2020, the WHO (n.d.-c) declared the outbreak a global public health emergency.

As reported cases increased, concern grew that much of the world was not prepared mentally and materially to implement large-scale containment measures including lockdowns, case detection, quarantine efforts, and contact tracing (WHO, n.d.-c). By March 7, 2020, 100,000 cases of COVID-19 disease had been reported globally and a pandemic was declared less than a few weeks later (WHO, n.d.-c). Less than 1 month later, over 1 million cases of COVID-19 had been confirmed worldwide (WHO, n.d.-c).

The initial government response to the pandemic revealed that 183 countries moved to initiate lock-down measures within a 2-week period during the middle of March (Hale et al., 2021). Over the following 2 months, most governments introduced public information campaigns, international travel restrictions, and testing policies (Hale et al., 2021). Months later, as initial closure and containment policies eased, most countries' economic support measures and health and safety protocols remained (Hale et al., 2021). As subsequent variants of the virus emerged and new waves of illness occurred, some governments reimposed restrictions (Hale, 2021). However, these policy reversals did not follow the initial policy convergence across most countries but instead were tailored to the local progression of the disease (Hale, 2021).

The first vaccines approved for emergency use against COVID-19 became available in December of 2020 (WHO, n.d.-c). As of April 18th, 2022, over 11 billion doses of COVID-19 vaccines have been administered globally. However, despite containment efforts and the relatively fast rollout of vaccines, the COVID-19 pandemic persists. As of April 2022, more than 500 million confirmed cases and over 6 million deaths attributed to COVID-19 have been documented throughout the world (WHO, n.d.-b). In the United States alone, 1 million deaths have occurred, and over 80 million confirmed cases have been reported since the onset of the pandemic (WHO, n.d.-b). In comparison, seasonal influenza is attributed to three to five million cases of serious illness and up to 650,000 deaths per year globally (WHO, n.d.-b).

Etiology and Symptomology of COVID-19

Coronavirus disease, named Severe Acute Respiratory Sickness 2 (SARS 2) COVID-19: Coronavirus/Discovered in 2019 (WHO, n.d.-a), is caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2; CDC, 2022b; Rauf et al., 2020; Salian et al., 2021; WHO, n.d.-a). COVID-19 is believed to have emerged from an animal host as "the SARS-CoV-2 genome shares 96% similarity with beta-coronavirus isolated from a bat in 2013" (Salian et al., 2021, para. 5). Although, the origin of COVID-19 virus remains unknown (Dos Santos, 2020), according to research from Bennett et al. (2019), coronavirus named from the spikes that resemble a crown is a genus of several viruses related to severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS). The beta coronavirus 2, (SARS-CoV-2) has an enveloped spherical-

shaped virus with a nonstructural protein proofreading activity creating a low mutation rate (Vasireddy et al., 2021).

The virus is transmitted from person to person via infectious respiratory droplets spread by coughing and sneezing (Dos Santos, 2020; Rauf et al., 2021; Salian et al., 2021). Infectious respiratory droplets may be inhaled, land on the eyes, nose, or mouth through splashes or sprays from coughing or sneezing, or be transmitted by touching the nose, eyes, or mouth with hands that have the virus on them (CDC, 2022b). COVID-19 displayed higher transmission rates than earlier identified human Coronaviruses (Atiroğlu et al., 2022; Salian et al., 2021).

Symptoms

Symptoms range from mild to severe (WHO, n.d.-a). 13.5% of infected people do not show symptoms or are asymptomatic (Khan et al., 2022). The most common symptoms include fever, cough, and fatigue (Chutiyami et al., 2022; Dos Santos, 2020; Khan et al., 2022; Rauf et al., 2021; Salian et al., 2021; WHO, n.d.-b). Less common symptoms reported by the WHO (n.d.-b) include nasal congestion, conjunctivitis, chills, dizziness, and various forms of skin rashes.

Other less common symptoms reported by the WHO (n.d.-b) and supported by further research include sore throat (Dos Santos, 2020), headache (Chutiyami et al., 2022; Dos Santos, 2020; Khan et al., 2022), nausea (Dos Santos, 2020; Rauf et al., 2021; Salian et al., 2021), diarrhea (Dos Santos, 2020; Salian et al., 2021), aches, pains, or sore muscles (Khan et al., 2022), and loss of sense of taste or smell (Khan et al., 2022; Mølhave et al., 2022; Salian et al., 2021). Other less common symptoms not reported by

the WHO (n.d.-b) but found in other research include sneezing (Salian et al., 2021) and mental and physical fatigue (Khan et al., 2022; Mølhave et al., 2022; Rauf et al., 2021; Salian et al., 2021). Symptoms of severe COVID-19 disease include dyspnea or shortness of breath (Dos Santos, 2020; Mølhave et al., 2022; Salian et al., 2021; WHO, n.d.-b), cognitive impairment (Mølhave et al., 2022; WHO, n.d.), hypoxia (Salian et al., 2021), chest pain (Rauf et al., 2020; WHO, n.d.), and loss of appetite (WHO, n.d.-b).

Hypertension was the most commonly reported comorbidity (Chutiyami et al., 2022). Other comorbidities recorded in severe cases of COVID-19 included acute respiratory stress syndrome, arrhythmia, shock (Rauf et al., 2020), and bi-lateral pneumonia (Salian et al., 2021). Severe and rare neurological complications of COVID-19 were also reported and include stroke, brain inflammation, delirium, and nerve damage (WHO, n.d.-a). Intensive care unit (ICU) care was required with severe respiratory failure, cardiac complications, coagulopathy, risk of multi-organ failure and mortality, and acute inflammatory state (Salian et al., 2021).

Epidemiology of COVID-19

The SARS-CoV-2 virus has infected humans in at least 216 countries across the globe (Haidere et al., 2021; Rahimi et al., 2020). All humans are susceptible to the COVID-19 disease regardless of age, gender, or ethnicity (Han et al., 2021). However, some populations are more likely to develop serious illnesses or death (CDC, 2022a). Men, for example, experience more severe symptoms and higher rates of mortality than women (Wehbe et al., 2021). In addition, minority groups have a higher rate of infection

and mortality than Whites (Mathur et al., 2021). Following is a discussion of COVID-19's impact on the population in general and specific high-risk groups.

General Population

Eighty percent of laboratory-confirmed cases of the COVID-19 disease experience mild to moderate disease and recover without needing hospitalization (Dos Santos, 2020; Mølhave et al., 2022; WHO, n.d.-b). About 15% of infected people become seriously ill and require hospitalization (WHO, n.d.-b). Only five percent require intensive care for critical illness (WHO, n.d.-b). In healthy adults and young people, the mortality rate is less than half of one percent (Mølhave et al., 2022). Overall, the case fatality rate is estimated at 0.87 percent, or approximately 9 deaths per 1000 infections (Atiroğlu et al., 2022).

Long-term health issues have been reported in some cases following mild to severe COVID-19 infection (Mølhave et al., 2022). The term *long COVID* has been utilized to describe the persistence of symptoms weeks or months after the initial infection regardless of test outcomes (Raveendran et al., 2021). The reported symptoms of long COVID are fatigue, cough, chest tightness, breathlessness, palpitations, myalgia, and difficulty focusing (Nabavi, 2020; Raveendran et al., 2021; Sudre et al., 2020). Experts are uncertain of the causes of long COVID but believe cases are related to organ damage, post viral syndrome, or postcritical care syndrome (Raveendran et al., 2021).

Research has shown that women are twice as likely as men to suffer from long COVID (Nabavi, 2020). In addition, patients presenting with long COVID are generally older than those who recover from COVID quickly (Nabavi, 2020). Increased risk of

developing long COVID was also found to be associated with the presence of 5 or more symptoms during the acute stage of illness (Sudre et al., 2020). The most common symptoms observed during the first week of infection that were most predictive of long COVID included fatigue, headache, dyspnea, hoarse voice, and myalgia (Sudre et al, 2020).

Older Adults

People aged-60 years or older and those with underlying medical conditions experience a higher risk of developing serious illness or death as a result of COVID-19 disease (Balmford et al., 2020; CDC, 2022a; Mølhave et al., 2022; WHO, n.d.-b). Older adults with comorbidities were found more likely to be infected with COVID-19 as a result of already weakened immune systems (Atiroğlu et al., 2022). In addition, older adults living in close communal contact in facilities such as nursing homes are at an even greater risk of contracting the COVID-19 disease (Cohen & Tavares, 2020).

Older adults also suffered psychological symptoms as a result of the pandemic and mitigation measures including lockdowns. Older adults, especially women, demonstrated symptoms of emotional distress in a study by Garcia-Portilla et al. (2020). The most common psychological responses to the pandemic included avoidance behavior and depression (Garcia-Portilla et al., 2020).

Children

Most children infected with the COVID-19 disease experienced mild symptoms or were asymptomatic (CDC, 2022a). However, serious illness may still occur in babies younger than one and in children with underlying medical conditions (CDC, 2022a). A

rare, but serious condition associated with COVID-19 in children, called multisystem inflammatory syndrome (MIS-C), has also been reported (CDC, 2022a). In MIS-C, major organs of the body become inflamed which can lead to death (CDC, 2022a).

Children were also impacted by school closures as a result of mitigation efforts to control the spread of COVID-19. Zartier et al. (2022) found parents perceived their children suffered emotionally, physically, academically, and socially as a result of prolonged school closings. A study conducted by Bonal and Gonzalez (2020) of 35,419 families in Spain determined children of economically disadvantaged families received significantly fewer learning opportunities than children of families with higher incomes. Additionally, 57.4% children and 30.9% parents experienced depression symptoms during school closures (Geweniger et al., 2022).

Healthcare Workers

Globally, the infection rate among healthcare workers ranged from 3.9% to 11% (Chutiyami et al., 2022). Researchers reported the highest infection rates among healthcare workers were among individuals involved in screening ill patients (Chutiyami et al., 2022). The number of nurses and female healthcare workers infected was greater than the number of doctors and men infected. However, deaths occurred mainly among men and medical doctors (Chutiyami et al., 2022). Those who developed infection also resulted in poor sleep quality, work-related stress, and personal protective equipment-associated skin injuries (Chutiyami et al., 2022).

Research also showed mental health issues were prevalent among healthcare workers treating COVID-19 (Ariapooran et al., 2022; Braquehais et al., 2020; Kandemir

et al., 2022; Ruiz & Gibson, 2020). Healthcare workers experienced fear for their own health as a result of exposure to patients suffering from COVID-19 (Ruiz & Gibson, 2020). Over 50% of nurses were found to have secondary traumatic stress (STS) during the COVID-19 outbreak (Ariapooran et al., 2022). In addition, nurses with STS symptoms were more likely to experience higher levels of depression and anxiety than nurses without symptoms (Ariapooran et al., 2022). Nurses working in ICUs and critical care units experienced STS at a higher rate than nurses working in other wards (Ariapooran et al., 2022).

Healthcare workers also experienced burnout as a result of dealing with the COVID-19 emergency (Giusti et al., 2020). Burnout was predicted by lengthy work hours, psychological illnesses, fear of infection, and perceived social support (Giusti et al., 2020). In ICU nurses, stress, anxiety, depression, and insomnia at levels ranging from moderate to extremely severe were also associated with treating COVID-19 (Kandemir et al, 2022). In addition, depression and anxiety were associated with COVID-19 exposure, high case rates and inexperience dealing with disease outbreaks, shortages of personal protective equipment, excessive working hours, and personal factors such as gender or poor coping strategies (Braquehais et al., 2020).

Using precautionary measures and getting vaccinated are valuable efforts in the prevention of spreading the virus, however a continued challenge is the mutation of the virus. According to Vasireddy et al., while the mutation rate of COVID-19 is slow, the changes in the genetic sequence of the virus create new strains or variants of concern. These include variants of interest by the USA: B.1.526, B.1.525, and P.2; and those

included in the variant of concern by the USA are B.1.1.7, P.1, B.1.351, B.1.427, and B.1.429. These variants first reported in India resulted in a massive increase of positive cases (Vasireddy et al., 2021).

Treatment

Currently, there is no documented medical protocol for the treatment of COVID-19 disease (Mølhave et al., 2022; Salian et al., 2021). Treatments were based on symptom relief and rehabilitation (Mølhave et al., 2022). Close monitoring was recommended for mild cases (Salian et al., 2021). Other treatments were recommended on an individualized basis and included oxygen therapy (Dos Santos, 2020; Mølhave et al., 2022; Salian et al., 2021), anticoagulation therapy (Mølhave et al., 2022), steroids (Mølhave et al., 2022), antivirals (Mølhave et al., 2022; Rauf et al., 2021; Salian et al., 2021) and immunosuppressive drugs on special indications (Mølhave et al., 2022). For critically ill patients, ventilation and monitoring in an ICU were recommended (Dos Santos, 2020; Salian et al., 2021).

Preventative Measures

There is no known means of effective prevention of coronaviruses (Dos Santos, 2020; Salian et al., 2021). Oral antiviral prescription medications may prevent serious disease progression from the COVID-19 virus. Oral antivirals Paxlovid or Lagevrio taken by the unvaccinated clinically diagnosed COVID-19 adult patient at early onset yielded an 89% reduction in hospital admission (Roberts et al., 2022). Laboratory testing and clinical diagnosis are necessary to detect the COVID-19 disease in infected people (Chutiyami et al., 2022). Preventative measures included wearing adequate personal

protective equipment, such as face masks (CDC, 2022b; Chutiyami et al., 2022; Dos Santos), social distancing (CDC, 2022b; Dos Santos, 2020), avoiding crowds (CDC, 2022b), proper handwashing (CDC, 2022b; Dos Santos, 2020), and training/orientation for infection control (Chutiyami et al., 2022).

Despite recommendations and education campaigns promoting preventative measures, some groups did not practice preventative behaviors. In a study by Peacock et al. (2021) that examined adherence to prevention measures in the United States over the 2020 Thanksgiving and winter holidays, for example, most of the 26,841 participants surveyed did not adhere to preventative measures while celebrating with nonhousehold members. Other than handwashing or using hand sanitizer, participants largely did not follow preventative measures including wearing masks when in the presence of nonhousehold members or maintaining six feet between themselves and others. However, older participants and members of racial minority groups were less likely to gather with nonhousehold members and reported higher adherence to mask-wearing than younger or White participants (Peacock et al., 2021).

Another study that investigated the preventative behaviors of college students studying healthcare disciplines found infectious disease education and higher COVID-19 health beliefs had significant positive effects on the practice of prevention behaviors (Kim et al., 2022). However, these behaviors declined over time as the pandemic progressed. Online classes and social distancing provoked lifestyle changes that included increased smoking and drinking resulting in reduced prevention behaviors (Kim et al., 2022). Further, Lee et al. (2020) reported misinformation exposure through social

networking sites was associated with fewer preventative behaviors in higher educated, young people of low income through misinformation belief. Prior research has shown the detrimental effects misinformation can have on human behavior (Banerjee & Rao, 2020). Misinformation can lead to noncompliance with precautionary measures (Karlova & Fisher, 2013).

In addition to preventative measures, vaccines provided another way to mitigate the symptoms of COVID-19 and prevent hospitalization or death (Rosenberg et al., 2022). The first COVID-19 vaccine was not approved for emergency use until December 2020, close to 1 year since the first death from COVID-19 was recorded (WHO, n.d.-c). As of January 2022, there were two main types of COVID-19 vaccines: Messenger RNA (mRNA) vaccines and Viral vector vaccines (Rivers, 2022). According to Rivers (2022), mRNA vaccines "use genetically engineered mRNA to teach cells how to make a protein that triggers an immune response" (para. 1). Viral vector vaccines introduce a weakened form of the virus into the body so that cells will produce antigens (Rivers, 2022).

In total, 13 vaccines have been developed and authorized for use since the WHO (n.d.-c) declared the COVID-19 outbreak a pandemic (Rane et al., 2022). The median vaccine effectiveness against COVID-19 was 91.3% (Rosenberg et al., 2022). This effectiveness waned over time as new variants of the virus began to dominate. To remain effective, vaccines must continue to address new variants and mutations as they arise (Rivers, 2022).

The CDC (2022b) recommended vaccination and booster shots as the primary method for preventing serious illness, hospitalization, or death. Primary immunization,

consisting of two shots several weeks apart, provided limited protection against symptomatic disease (Andrews et al., 2022). Booster shots or primary inoculation significantly increased protection but that protection waned over time (Andrews et al., 2022; Rivers, 2022).

Mitigation and Immunization Efforts

Prior to the availability of vaccines, government agencies, working in accordance with WHO (n.d.-a) guidelines, implemented nonpharmaceutical interventions (NPIs) to mitigate the transmission of the virus (Sherman et al., 2021). According to James et al. (2020), "mitigation aims to allow a controlled outbreak to occur" (para. 1) with the intent to develop herd immunity without overwhelming the healthcare system. However, government responses to the pandemic were varied in their approach and levels of success (Baniman et al., 2020). The mitigation efforts of many governments included large-scale containment measures and awareness campaigns to promote health and safety protocols (Chaplin, 2020).

For example, the WHO (n.d.-b) teamed up with the Fédération Internationale de Football Association (FIFA) to call on people to protect themselves from COVID-19 by following health and safety protocols in their *Pass the Message to Kick Out Coronavirus* campaign in March of 2020 (WHO, n.d.-a). Famous soccer players from around the world posted videos on social media encouraging fans to wash their hands frequently, socially isolate, and follow all other WHO (n.d.-a) health and safety protocols (Abuín-Penas et al., 2020). Other sport figures acted independently to educate their fans: Steph Curry from the NBA Golden State Warriors, for example, interviewed Dr. Anthony Fauci

of the National Institute of Allergy and Infectious Diseases live on Instagram where he has 30.4 million followers to combat misinformation (Abuín-Penas et al., 2020).

In addition to public education campaigns, many government NPI responses to the pandemic included school closings, travel restrictions, contact tracing, and bans on public gatherings (Brodeur et al., 2021; Hale et al., 2021). However, governments substantially varied in what policies were enacted, the stringency of enforcement of the policies, and the length or duration of the policies (Brodeur et al, 2021). The most frequent policies enacted to mitigate the effects of COVID-19 efforts were border restrictions and restrictions on businesses deemed nonessential (Brodeur et al., 2021). School closures, mandatory business closures, and border restrictions had significant economic impacts (Balmford, 2020; Brodeur et al., 2021). Emergency legislation created new forms of social welfare provisions to manage the economic consequences of government actions to contain the spread of the virus (Hale et al., 2021).

A systematic review of 34 empirical studies revealed school closings were the most effective NPI against the spread of COVID-19 (Mendez-Brito et al., 2021). Workplace closings were also positively associated with controlling the spread albeit slightly less effective than school closings. Lockdowns, international border closures, and bans on social or public gatherings in groups of 10 or more were only moderately effective (Mendez-Brito et al., 2021). Public information campaigns and mask-wearing were found to be highly effective measures in disease containment (Mendez-Brito et al., 2021). However, recent studies have shown that face masks are not adequate for

protection against COVID-19. This was largely due to the poor fit of the face-covering that allowed as much as 30% of air to bypass the mask unfiltered (Robinson et al., 2022).

In the United States, government efforts to contain the pandemic were hampered by politicization (Kerr et al., 2021) which may have contributed to the spread of the virus. A study by Kerr et al. (2021) found members of the conservative party within the United States perceived a lower risk of the virus and were significantly less likely to trust scientists and recommendations provided by the WHO (n.d.-a). In addition, participants who identified as conservatives were less likely to engage in protective behaviors such as handwashing and wearing face masks which may have contributed to the spread of the virus (Kerr et al., 2021).

However, the United States was not the only country to experience the politicization of mitigation and immunization efforts. In Belgium, vaccine uptake intention was found to be predicted by government trust and conspiracism (Van Oost et al., 2022). In the Philippines, the use of emergency powers led to executive dominance over Congress which contributed to the erosion of trust in government-led immunization programs (Atienza, 2022). When Brazilian President, Jair Bolsonaro, publicly refused to take a COVID-19 vaccine and criticized face masks, his actions fueled already present political divisions within the country (Malta et al., 2020). A month following Bolsonaro's comments, a survey by pollster Datafolha found vaccine refusal had grown to 22% in Brazil (Valle, 2020). Critics of Bolsonaro claimed his poor leadership, in combination with a lack of infrastructure and corruption, created a public health disaster in Brazil (Malta et al., 2020).

Countries including China and South Korea were considered successful in their efforts to slow the number of cumulative cases of the COVID-19 disease over time (Baniman et al., 2020). These countries reacted quickly by enacting preventative strategies, such as contact tracing and lockdowns, to prevent the spread of the virus (Baniman et al., 2020). Findings from a study by Baniman et al. (2020) revealed successful countries employed tactics learned from prior experiences with epidemics such as SARS. In addition, successful countries had the capacity to test significant numbers of the population. Germany, for example, was testing 1096 per 100,000 citizens by late March of 2020. In comparison, the United States was testing only 348 per 100,000 during the same period (Baniman et al., 2020). Economic concerns delayed the response in many countries including Italy where politicians downplayed the severity of the virus (Belligonj, 2020).

One successful mitigation strategy, reported by Jokhdar et al. (2021), involved the Hajj, a religious event where Muslims make pilgrimages during specific days each year to the Great Mosque of Makkah and the Prophet's Mosque Madinah in Saudi Arabia. In preparation for the Hajj, the Saudi Arabian Ministry of Health announced specific eligibility requirements for entry to the event: Only pilgrims between 20- and 65-years of age with no underlying health conditions; negative results from a PCR test; and instructions to quarantine for 10 days before travel and 4 days before arrival at the event (Jokhdar et al, 2021). Quarantine was monitored and enforced pilgrims were required to wear an electronic tracing bracelet that generated alerts if quarantine was violated. In addition, the number of pilgrims was restricted to 1000 and all pilgrims were instructed to

maintain social distancing, wear face masks, practice hygienic handwashing, and report any symptoms or contact with a confirmed COVID-19 case. Prior signed, informed consent was required of each participant. As a result, no confirmed cases among the participants were reported during or after the event (Jokhdar et al., 2021).

Efforts to Promote Immunization

Most experts agree that vaccination is vital to protecting the public against COVID-19 (Batteaux et al., 2022). Yet there is some disagreement as to what percentage of the population should be vaccinated to achieve herd immunity. Percentages range from as low as 60% (Randolph & Barreiro, 2020) to as high as 90% (Dong et al., 2020). There was also disagreement among governments regarding which strategy would be most effective to promote vaccine uptake. Governmental strategies were varied in their approach and level of success. This section provides evidence-based strategies to promote vaccine uptake from prior research followed by actual government strategies employed in COVID-19 immunization campaigns in countries throughout the world.

Evidence-Based Strategies to Promote Vaccine Uptake

Prior to the onset of the pandemic, efforts had been underway to promote vaccine uptake throughout the world. The International Council on Adult Immunization (ICAI), for example, met in late 2018 to outline guidance for prioritizing adult immunization decision-making and implementation of vaccination worldwide (Privor-Dumm et al., 2021). The ICAI then tailored the findings of this meeting to the current health emergency. The group identified it would be necessary to build vaccine delivery platforms consisting of people, institutions, systems, and resources that were capable of

mass immunization to vaccinate entire populations against the COVID-19 disease. Further, the group acknowledged that political will and funding would be necessary, as well as broad communication strategies to inform the public of when and where vaccines would be available (Privor-Dumm et al., 2021).

Volpp et al. (2020) identified factors of effective vaccination strategies from prior research: Effective vaccination strategies should contain "simple, easy-to-understand language; messaging that emphasizes science over politics; endorsements by diverse and well-regarded celebrities and opinion leaders; and emphasis on facts and evidence over myths and disinformation" (para. 3). In addition, Volpp et al. cautioned that developing trust in communities where prior medical exploitation had occurred would be a necessary component of a successful COVID-19 vaccination strategy. Volpp et al. further recommended access to COVID-19 vaccine strategies should include the following: be free and easily accessible; make vaccination a requirement of free movement and use public endorsements from trusted leaders to increase uptake; and transform individual decisions to get vaccinated into a behavioral cue to others (e.g., I voted stickers or social media testimonials).

Cardenas (2021) further urged that immunization campaigns encompass strategies to combat widespread misinformation and conspiracy theories. A study by Kricorian et al. (2021) found participants who believed in COVID-19 myths were more likely to believe COVID-19 vaccines were unsafe and were less willing to receive the vaccine. In contrast to people who considered vaccines safe, those who believed in COVID-19 myths were

generally less educated, of lower socioeconomic status, and geographically located in rural areas (Kricorian et al., 2021).

There are many myths surrounding the COVID-19 pandemic from disbelief of its existence (Ullah et al., 2021) to beliefs in natural remedies such as increasing the consumption of hot peppers to prevent or cure the disease (WHO, n.d.-b). Myths concerning COVID-19 vaccines centered on conspiracy theories that vaccines do not work or are actively harmful (Ullah et al., 2021). One myth that spread further and faster than others concerned 5G technology (Nsoesi et al., 2020). The rumor claimed that 5G cellphone towers newly installed near Wuhan, China in 2019 were responsible for spreading COVID-19 (Nsoesi et al., 2020).

In an effort to debunk rapidly spreading misinformation, the WHO (n.d.-b) provided myth-buster graphics that could be shared on social media and other online platforms. However, myth-buster graphics alone were found to have no effect on combating the misperceptions about the prevention of COVID-19 (Vraga & Bode, 2021). Cardenas (2021) recommended a coordinated and combined effort by governments and health organizations to provide public health information on social media platforms, television, and radio to combat misinformation.

Finally, experimental research examined the effect of monetary incentives on vaccine uptake. Sprengholz et al. (2021) found offering a financial incentive had no significant effect on vaccine acceptance whilst Yuen et al. (2021) reported free vaccines with government subsidies reduced vaccine acceptance. Conversely, Serra-Garcia and Szech (2021) conducted an online experiment that determined vaccination intention

increased when cash incentives of $100 and $500 were offered to receive vaccinations. However, smaller compensation amounts had a negative effect on vaccination intentions. Compared to no compensation, small cash incentives reduced vaccination intentions by 5 percentage points (Serra-Garcia & Szech, 2021).

Current Strategies for COVID-19 Vaccine Uptake

At the beginning of vaccination roll outs, the priority focused on providing vaccine access to vulnerable populations, due to insufficient availability of vaccine doses (Stefanizzi et al., 2022). Communication efforts focused on disseminating vaccine roll-out timelines and group priorities (Warren & Lofstedt, 2021). In the United States, the Advisory Committee on Immunization Practices (ACIP) outlined recommendations for the roll-out of COVID-19 vaccines by groups (Dooling et al., 2021): The first group that the ACIP recommended being vaccinated included healthcare workers and residents of long-term care facilities, followed by citizens 75 years or older and frontline essential workers. The next group was recommended as persons 65-74 years and anyone 16-64 years with high-risk medical conditions. The final group, aged 16-64, consisted of the remaining population except for children under the age of 16, for whom emergency use of COVID-19 vaccines had not yet been approved (Dooling et al., 2021).

Since the approval for the emergency use of various vaccines in the prevention of COVID-19 in December of 2020, governments have applied various methods to encourage vaccine uptake among their citizens achieving mixed results. A study of vaccine roll-out strategies in European nations revealed governments did not do enough to promote informed consent amongst their citizens (Warren & Lofstedt, 2021). The

researchers recommended vaccination strategies should be cautious in optimism and manage expectations appropriately; follow scientific advice on vaccine rollout strategies; disseminate and administer the vaccine using local trusted doctors, general practitioners, and nurses; and be open and honest about when people will get a vaccine and the uncertainties associated with them (Warren & Lofstedt, 2021).

Incentive-Based Strategies

The Italian government employed an incentive-based model to promote vaccination among citizens (Stefanizzi et al., 2022). The Green Pass was given to citizens who had been vaccinated and allowed unrestricted movement for 1 year. Citizens who were immunized through natural infection were allowed free movement for 180 days after testing negative for the virus. All others were required to take a PCR or antigen test that allowed 48 to 72 hours of unrestricted movement (Stefanizzi et al., 2022). Oliu-Barton et al. (2022) estimated the announcement of the Green Pass strategy in Italy resulted in an increase in vaccine uptake of 9.7 percent. A similar strategy in France was estimated to increase vaccine uptake by 13% (Oliu-Barton et al., 2022).

The Green Pass strategy was also employed in Israel, however, unrestricted movement lasted only 6 months after completing full immunization or recovering from the COVID-19 disease (Wilf-Miron et al., 2021). In addition, the Israeli government ensured vaccines were easily accessible by deploying mobile vaccination units to areas with low uptake rates. These mobile units supplied refreshments and were staffed with experts tasked with educating people about COVID-19 and vaccines (Wilf-Miron et al.,

2021). By the end of March 2020, 81% of Israelis 16 and over had received at least one dose of the COVID-19 vaccine (Rosen et al., 2021).

In the United States, some states conducted vaccine lotteries, in which vaccinated persons become eligible to win a large cash prize, to incentivize the population to get vaccinated (Acharya & Dhakal, 2021). Research indicated vaccine lottery programs were associated with a 2.1% increase in vaccine uptake (Acharya & Dhakal, 2021). However, these results were mixed when states were analyzed individually.

Vaccine Mandates

Some countries have taken a more forceful approach. In Greece, for instance, the government began requiring its citizens 60 years or older to be vaccinated or face monthly fines (Burki, 2022). The Austrian government made similar plans to fine the unvaccinated after lengthy attempts to convince citizens to voluntarily receive immunizations (Burki, 2022). Costa Rica and Ecuador made vaccines mandatory for all citizens aged 5 years and older with the exception of medically approved exemptions (Dyer, 2022).

In the United States, the Department of Health and Human Services issued a vaccine mandate that required certified providers and suppliers of Medicare and Medicaid to be fully vaccinated including healthcare workers in hospitals and long-term care facilities (Adashi, & Cohen, 2022). Some states enacted vaccinate-or-test policies. Mississippi, for example, enacted a policy requiring nursing home employees to get vaccinated or show negative PCR test results two times per week (Syme et al., 2022). Syme et al. (2022) found the Mississippi policy achieved statistically greater gains in

vaccine uptake among nursing home staff compared to states with similar policies. However, these gains were small and did not move vaccination rates beyond the national average (Syme et al., 2022).

Critics of vaccine mandates argued that there is not enough scientific evidence to support their usefulness (Bardosh et al., 2022). Bardosh et al. (2022) cautioned that vaccine mandates may negatively impact future vaccine uptake including routine immunizations. However, Murti et al. (2019) reported education, positive messages, and easily accessible vaccines yielded improved compliance with vaccine mandates. Further, Murti et al. found healthcare workers who were mandated to receive influenza vaccines reported fewer sick days than those who abstained for religious or medical reasons.

Incentive-based strategies and vaccine mandates are not without controversy. Volpp et al. (2021), for instance, argued that monetary incentives, such as lotteries, might actually serve to perpetuate vaccine hesitancy by raising doubts about the safety of the vaccine. In Austria, protestors gathered in Vienna to show opposition to vaccine mandates (Burki, 2022). In the United States, the State of Missouri filed an injunction to block vaccine mandates for healthcare workers that would have prohibited the enforcement of vaccine mandates in 24 states had the Supreme Court not dissolved the case (Adashi & Cohen, 2022). Bardosh et al. (2022) questioned the ethics of vaccine mandates and vaccine passes. The researchers cautioned that these strategies impinge on human rights and promote social divisiveness (Bardosh et al., 2022).

This section provided details regarding elements of successful vaccination strategies from research conducted prior to the current health emergency. In addition,

current strategies from government responses to the pandemic demonstrate varied approaches with mixed results. The following section provides a review of research pertaining to vaccine hesitancy conducted during the COVID-19 pandemic. The research explored demographic characteristics and other factors relating to vaccine hesitancy.

Vaccine Hesitancy

Vaccine hesitancy refers to feelings an individual has who may refuse, delay, or be unsure of receiving a vaccine (Larson et al., 2014). The SAGE Working Group on Vaccine Hesitancy defined vaccine hesitancy as the "delay in acceptance or refusal of vaccination despite availability of vaccination services" (MacDonald, 2015, p. 4161). According to MacDonald (2015), vaccine acceptance involves complex decision-making relating to confidence, complacency, and convenience. Confidence involves trust in the safety and efficacy of vaccines, the systems that produce and deliver vaccines, and the motivations of decision-makers who determined the need for the vaccine (MacDonald, 2015). Complacency occurs when the perceived risk of a vaccine-preventable disease is low. Complacency is influenced by competing priorities, risks associated with vaccination, and self-efficacy (MacDonald, 2015). Finally, convenience is associated with the availability, affordability, and accessibility of vaccines. Geography, language, and culture may also influence vaccine hesitancy within the context of convenience (MacDonald, 2015).

Several studies were found relating to vaccine hesitancy during the COVID-19 pandemic. Troiano and Nardi (2021) reviewed data from 15 peer-reviewed articles and found vaccine acceptance or refusal was associated with descriptive characteristics

including gender, age, and ethnicity as well as political and religious associations. Vaccine hesitancy in the general population differed by race/ethnicity, age, income, and education (Rane et al., 2022). In the United States, females were less likely to receive a vaccine than males (Coe et al., 2022; Kreps et al., 2020; Reiter et al., 2020). In addition, adults suffering from anxiety or depression were found to be less willing to receive the vaccine due to concerns about side effects which put them at a higher risk of contracting the disease (Nguyen et al., 2022).

Black Americans were also less likely to receive a vaccine than Whites (Coe et al., 2022). Bogart et al. (2021) found an association between Black Americans living with HIV during the COVID-19 pandemic and vaccine hesitancy: Participants expressed a high level of medical mistrust across sociodemographic characteristics (Bogart et al., 2021). Mistrust stemmed from government response, uncertainty about the origins of the virus, and lack of confidence in treatment for the disease (Bogart et al., 2021). However, participants were more likely to believe information pertaining to COVID-19 and vaccines if the information was relayed by healthcare providers rather than received from elected officials (Bogart et al., 2021). In addition, vaccine refusal by Black Americans decreased over time (Rane et al., 2022).

Religiosity and political association were also associated with vaccine hesitancy (Troiano & Nardi, 2021). During times of uncertainty, religion offers a means of coping with stress or anxiety. Religious coping has been associated with an external locus of control in which believers may view the pandemic as an act of God that cannot be changed or prevented by man-made vaccines (Olagoke et al., 2021). Olagoke et al.

(2021) found religiosity was significantly and negatively associated with intent to immunize against COVID-19. An external locus of control mediated the relationship between religiosity and intent to immunize (Olagoke et al., 2021).

Political associations with vaccine hesitancy were mixed (Troiano & Nardi, 2021). Kreps et al. (2021) reported members of the conservative political party in the United States were more likely to refuse the vaccine than moderate or liberal identifying participants. Conversely, Pogue et al. (2020) found no evidence supporting the predictive effect of political affiliation on vaccine hesitancy.

Reasons for Vaccine Hesitancy

Several studies were found that examined factors relating to vaccine hesitancy. The most common factor relating to vaccine hesitancy found in the literature was a concern for the safety of the vaccine (Biswas et al., 2021; Chu & Liu, 2021; Troiano & Nardi, 2021). This concern was generally attributed to the speed at which the vaccine was developed (Biswas et al., 2021). Bogart et al. (2021) found participants who reported hesitancy to receive a COVID-19 vaccination were uncertain about the origins of the virus and lacked confidence in the treatments for the disease and the government responses to the pandemic.

Meanwhile, Troiano and Nardi (2021) reported the most given reasons found for vaccine refusal included a general refusal of vaccines, doubts about sources of vaccines, disbelief in the severity of the disease, and mistrust of the government. Other factors included potential side effects and doubts about the efficacy of the vaccine (Biswas et al., 2021). Ottewell et al. (2022) also found limited trust in medical establishments and

insufficient data available to explain potential racial and ethnic disparities in taking the vaccine were contributors to vaccine hesitancy.

Vaccine Hesitancy Among Healthcare Workers

Vaccine hesitancy among healthcare workers has been extensively studied (Afzal, 2022). The timing of studies relating to vaccine hesitancy of COVID-19 vaccines among healthcare workers ranged from prior to vaccine rollouts to late 2021. Prior to the availability of vaccines, approximately 29 to 31% of U.S. healthcare workers were reportedly reluctant to receive the vaccine (Hamel et al., 2020; Kose et al., 2020). The main reasons for vaccine hesitancy among healthcare workers were mistrust of the vaccine and concerns over side effects (Kose et al., 2020).

Contrastingly, up to 80% of Egyptian healthcare workers were hesitant about receiving the vaccine (Hlongwa et al., 2022). Vaccine hesitancy in Egyptian healthcare workers was primarily attributed to the novelty of the vaccine, concerns about side effects, and lack of trust in the government (Hlongwa et al., 2022). According to Li et al., (2021), nurses were the least willing to receive the COVID-19 vaccination when it became available compared to other healthcare workers. Reasons for vaccine hesitancy among healthcare workers were similar to those in other studies and included concerns for safety, efficacy, and effectiveness of the vaccine, in addition to distrust of the government (Li et al., 2021).

Vaccine Acceptance

Prior to the availability of vaccines, studies conducted in the United States determined slightly more than two-thirds of adults expressed a willingness to get a

COVID-19 vaccine (Malik et al., 2020; Reiter et al., 2020). Actual results were slightly lower: 56.9% of adults in the United States reportedly received at least one dose of a COVID-19 vaccine (Sallam, 2021). However, vaccine acceptance rates in the United States were one of the lowest worldwide (Sallam, 2021). In comparison, the highest vaccine acceptance rates were found in Ecuador (97.0%), Malaysia (94.3%), Indonesia (93.3%), and China (91.3%; Sallam, 2021).

In a study by Malik et al. (2020) of vaccine acceptance in the United States conducted prior to vaccine rollouts, 67% of participants surveyed indicated a willingness to receive a COVID-19 vaccine. The researchers found vaccine acceptance differed by demographic characteristics including gender, age, and ethnicity: males reported a higher willingness to receive the vaccine than females; adults 55-years or older were more willing compared to younger adults; and Asians were the most willing compared to other ethnic groups (Malik et al., 2020). Conversely, Chu and Liu (2021) found demographic factors had no significant effect on vaccine uptake intentions.

Reasons for Vaccine Acceptance

Several studies were conducted in advance of vaccine rollouts to measure willingness to receive vaccines and identify influential factors of vaccine intent. The research indicated reasons for vaccine acceptance were varied. The most common reason for vaccine acceptance was a belief in the effectiveness of the vaccine and the protection it offered from the virus (Kreps et al., 2020; Reiter et al., 2020).

Higher levels of perceived susceptibility to COVID-19 also positively influenced vaccine uptake intentions (Reiter et al., 2020). However, Chu and Liu (2021) found that

perceived susceptibility was only slightly associated with vaccine uptake intentions and did not reach levels of statistical significance. Research indicated that the participants understood the severity of COVID-19 but may have underestimated the risks of contracting and suffering from the disease and that may have negatively influenced their decisions to get vaccinated (Chu & Liu, 2021).

In a cross-sectional survey conducted by Reiter et al. (2020) prior to vaccine rollouts, 82% of participants that were willing to get a vaccine when they became available would do so because their healthcare provider recommended it. The researchers also found the number of confirmed cases and higher levels of perceived susceptibility to the virus due to underlying conditions were influential factors in vaccine acceptance in 72% of participants. Most participants willing to receive the vaccine would do so based on their age, health insurance coverage, travel plans, or the length of protection offered by the vaccine (Reiter et al., 2020).

Another study conducted in advance of vaccine rollouts by Kreps et al. (2020) found that 79% of the 1971 adults surveyed showed an intent to vaccinate. The results suggested moderate or liberal political leaning was positively associated with vaccine acceptance (Kreps et al., 2020). In addition, participants were more likely to report a willingness to receive a vaccination if it was recommended by then President-Elect Biden compared to then President Trump (Kreps et al., 2020). However, participants of either political party (Republican or Democrat) were significantly more likely to report a willingness to receive a vaccination if endorsed by the CDC or the WHO rather than either Biden or Trump (Kreps et al., 2020).

A longitudinal study by Rane et al. (2021) compared the willingness to accept COVID-19 vaccines in October 2020 with reported vaccine uptake by July of 2021. The researchers found the initial percentage of participants willing to accept the vaccine was 41 percent. Comparatively, 76.9% of participants reported they had received at least one dose of a vaccine by July of 2021. The largest difference was found in participants who initially reported reasons for delaying vaccinations. The number of delayers decreased from 51% in October 2020 to 6.7% in July 2021. Vaccine refusers decreased only slightly, from 8% to 6% (Rane et al., 2021). The researchers attributed the significant change in delayers to the increasing number of vaccinations that had occurred without incident and the mounting evidence supporting the efficacy of the COVID-19 vaccines (Rane et al., 2021).

Vaccine Acceptance Among Healthcare Workers

The number of studies pertaining to vaccine acceptance among healthcare workers was less exhaustive. Vaccine acceptance rates varied drastically based on geography. For example, vaccine acceptance rates among healthcare workers ranged from 27.7% in the Democratic Republic of the Congo to 78.1% in Israel (Sallam, 2021) prior to vaccine rollouts. A study among German emergency healthcare workers found only 57% reported a likelihood of receiving a COVID-19 vaccine upon accessibility (Nohl et al., 2021). This finding was concerning given conservative estimates needed to reach herd immunity required at least 60% of the population to be vaccinated (Randolph & Barreiro, 2020).

Additionally, vaccine acceptance rates varied based on role. Physicians, for instance, had a higher receptivity toward the intention to take the COVID-19 vaccine (Li et al., 2021) as did medical students (Lucia, 2021). As many as 77% of medical students indicated they would be willing to take the vaccine immediately upon FDA approval (Lucia et al., 2021). Only 45% of healthcare assistants working in nursing homes, hospitals, assisted living centers, or in-home care, however, reported that they intended to get the vaccine when it became available (Niznik et al., 2022). However, organizational leadership positively influenced healthcare assistants' confidence in COVID-19 vaccines (Niznik et al., 2022) and medical students were more willing to take the vaccine if they placed higher trust in public health experts (Lucia et al., 2021).

Vaccine uptake has also been associated with the race or ethnicity of healthcare workers. Choi et al. (2022) determined nurses identifying as East Asian were 14% more likely to receive a vaccination than White or Hispanic nurses. Predictors of vaccine uptake included involvement or management of COVID-19 cases (Hlongwa et al., 2022) and prior influenza vaccination (Li et al., 2021; Oliver et al., 2022).

A cross-sectional study of 1138 healthcare workers in Turkey revealed that 68.6% anticipated receiving a COVID-19 vaccine upon availability (Kose et al., 2020). Findings were mixed in comparison to other studies. Kose et al. (2020) found men were more likely than women to report vaccine willingness which aligned with research by Afzal et al. (2022) and Malik et al. 2020). Kose et al. (2020) also identified previous flu-vaccine uptake predicted COVID-19 vaccine acceptance which supported similar findings by Li et al. (2021). Contrary to other research, vaccine acceptance was associated with younger

age groups (Kose et al., 2020) whereas Malik et al. (2020) found older age groups more likely to accept vaccines, and Chu and Liu (2021) found demographic factors had no significant effect on vaccine uptake intentions.

Another cross-sectional study of healthcare workers employed at Health + Hospitals in New York City, NY was conducted by Afzal et al. (2022) to determine their attitudes and beliefs surrounding the COVID-19 vaccines. Data collection occurred during the months of February and March of 2021 when the vaccines were readily available to healthcare workers. Of the 3759 survey respondents, 71% had received at least one dose of a COVID-19 vaccine. Results were consistent with prior research where age, gender, and race were significantly associated with vaccine acceptance. Older adults aged 65 or older, men, and Asians were the most likely groups to receive the vaccine. Higher levels of education also predicted vaccine uptake. Results regarding participants' roles within the healthcare system differed slightly from prior research. While physicians were still found to be the most likely to receive a vaccination, nurses were not the lowest. 75% of nurses in this study were vaccinated compared to only 64% of community outreach tracers and 35% of hospital police.

Results from a longitudinal study conducted by Halbrook et al. (2022) found attitudes toward vaccine uptake increased overtime among frontline healthcare workers in California. Prior to vaccine rollouts, only 46.4% of participants expressed confidence in the vaccine's efficacy in protecting against the COVID-19 disease and only one-third of participants intend to receive the vaccine at their earliest opportunity. Within 3 months following authorization for emergency use of COVID-19 vaccines, confidence in vaccine

protection against COVID-19 rose to 90% and 96% of participants had been vaccinated. Halbrook et al. (2022) attributed the changes in attitude toward COVID-19 vaccine uptake to vaccine accessibility through employer-sponsored vaccine distribution, as well as growing evidence of vaccine efficacy and increased confidence.

None of the studies found attributed vaccine uptake to government mandates requiring healthcare workers to be vaccinated. Prior research indicated healthcare workers were more willing to accept vaccine mandates for diseases that were perceived to be more serious (Stead et al., 2019). Further, vaccine education campaigns that contained positive messages, along with easily accessible vaccines, yielded improved compliance with vaccine mandates (Murti et al., 2019).

A cross-sectional online survey was conducted by Papagiannis et al., across 340 physicians, dentists, and pharmacists in Central Greece aimed to evaluate these healthcare professionals' vaccination acceptability. The binary logistic regression study found 74% acceptance rate for influenza vaccine and 78.5% for the COVID-19 vaccine (Papagiannis et al., 2021). A cross-sectional study was conducted in Lebanon assessing national COVID-19 vaccine acceptance using binary logistic regression method (Hanna et al., 2022). The 47-questionnaire returned 1209 responses with 63.4% acceptance reported Hanna et al. (2022), with 43% of the population unregistered.

Conclusion

This chapter provided an extensive review of the literature surrounding SEM and the COVID-19 pandemic. COVID-19 is an ongoing health emergency. Currently, newly confirmed cases of COVID-19 disease remain high with over 2.9 million confirmed

between April 25th, 2022, and April 30th, 2022 (WHO, n.d.-a). A review of journal publications regarding the history and etiology of COVID-19 revealed the COVID-19 disease causes mild to severe symptoms and even hospitalization or death (WHO, n.d.-a). Populations most at-risk for severe infection are those aged 65-years or older with comorbidities (Atiroğlu et al., 2022). Currently, there is no documented medical protocol for the treatment of COVID-19 disease (Mølhave et al., 2022; Salian et al., 2021).

Prior to the development of COVID-19 vaccines, preventative measures were taken to control the rapid spread of the virus. Preventative measures included wearing adequate personal protective equipment, such as face masks (CDC, 2022b; Chutiyami et al., 2022; Dos Santos), social distancing (CDC, 2022b; Dos Santos, 2020), avoiding crowds (CDC, 2022b), and proper handwashing (CDC, 2022b; Dos Santos, 2020). Yet, despite recommendations and education campaigns promoting preventative measures, some groups did not adhere to recommendations (Peacock et al., 2021).

Before vaccines became available, many governments responded to the pandemic with nonpharmaceutical interventions that included school closings, travel restrictions, contact tracing, and bans on public gatherings (Brodeur et al., 2021; Hale et al., 2021). However, in many countries, these efforts were hampered by politics (Kerr et al., 2021) and conspiracy theories (Ullah et al., 2021). Myths surrounding the COVID-19 pandemic were disseminated on social media and included natural remedies for curing COVID-19 disease and suggestions that vaccines do not work or are actively harmful (Ullah et al., 2021).

Strategies for vaccine uptake have been varied in their approach and success. In addition to campaigns disseminating information about where and when prequalified groups could obtain a vaccine, governments implemented incentive-based strategies to promote vaccine uptake. These strategies included free-movement passes (Oliu-Barton et al., 2022; Stefanizzi et al., 2022), lotteries (Acharya & Dhakal, 2021), and fines (Burki, 2022). In addition, vaccine mandates were employed in several countries despite controversy.

Vaccine hesitancy was studied extensively in the literature. Prior research examined descriptive characteristics and other factors associated with vaccine hesitancy. Results indicated those who identified as vaccine-hesitant or vaccine refusers were generally younger, female, or Black in comparison to other age groups, genders, or ethnicities (Rane et al., 2022). In addition, those less willing to receive the vaccine were less educated and of a lower socioeconomic class (Rane et al., 2022). The most common reasons for being vaccine-hesitant were uncertainty about the safety and efficacy of COVID-19 vaccines because of their rapid development and emergency use authorization (Biswas et al., 2021). Healthcare workers who self-reported as vaccine-hesitant shared similar concerns: concerns regarding side effects were the most reported reasons for vaccine hesitancy among healthcare workers (Kose et al., 2020).

Vaccine acceptance has also been studied albeit to a lesser degree. Factors positively influencing vaccine acceptance included belief in the effectiveness of the vaccine and the protection it offered from the virus (Kreps et al., 2020; Reiter et al., 2020). In longitudinal studies, vaccine acceptance increased over time, especially among

those delaying decisions to receive a COVID-19 vaccine (Halbrook et al., 2022; Rane et al., 2021). Increased willingness to receive the vaccine was attributed to the increasing number of vaccinations that had occurred without incident and the mounting evidence supporting the efficacy of the COVID-19 vaccines (Rane et al., 2021). Among healthcare workers, age, gender, and race were significantly associated with vaccine acceptance. Older adults, men, and Asians were most likely to accept a COVID-19 vaccine (Afzal, 2022). Additionally, physicians were most likely to become vaccinated (Li et al., 2021).

The Coronavirus pandemic has been ongoing for more than 2 years affecting humans in at least 216 countries across the globe (Haidere et al., 2021; Rahimi et al., 2020). The slow uptake of vaccines has potentially thwarted efforts to reach herd immunity and prolonged the pandemic. The slow uptake of vaccines among healthcare workers is particularly troubling since their recommendations regarding vaccines are more trusted and hold more influence than endorsements from scientists or politicians (Bogart et al., 2021). Therefore, it is important to understand the factors associated with vaccine acceptance among healthcare workers. While this topic has generated interest in the field of vaccine uptake research, many studies were conducted prior to vaccine rollouts. Thus, further research is required to determine what factors ultimately caused healthcare workers to receive a COVID-19 vaccine.

The following chapter will describe the research design and rationale for the chosen tradition. In addition, the methodological approach will be outlined, including sampling and recruitment strategies, data collection instrumentation, and data analysis

plan. Finally, any applicable issues of trustworthiness or ethical concerns will be discussed.

Chapter 3: Research Method

The purpose of this quantitative study was to examine the associations between healthcare worker job title, race, years in practice, perceptions of vaccine safety, perceptions of vaccine efficacy, vaccine potential side effects, household size, marital status, number of school age children, interpersonal motivations, community connections, news source, and full COVID-19 full vaccination while controlling for age and gender. This chapter describes the research design and provides information about the study population, samplings strategy, and procedures for recruitment, participation, and data collection. Additionally, this chapter includes a description of the instrumentation and operationalization of constructs, the data analysis plan, threats to validity, and ethical procedures.

Research Design and Rationale

The independent variables in this study are healthcare worker job title, race, years in practice, perceptions of vaccine safety, perceptions of vaccine efficacy, perceptions of vaccine potential side effects, household size, number of school age children, interpersonal motivations, community connections, news source, and marital status. The dependent variable in this study is full immunization with the COVID-19 vaccine. Finally, the control variables in this study are age and gender. The research design selected for this study was a correlational design and was chosen because it is used to explore the strength and direction of relationships between two or more variables (Apuke, 2017). A correlational design aligns with the research questions in this study because they inquire about the relationships between demographic characteristics and vaccination

status (i.e., fully vaccinated/not vaccinated). Binary logistic regression analysis was used because it is the only statistical test that can be used to explore the relationship between categorical variables when the dependent variable is binary and control variables are included in the model (Pallant, 2016).

Other quantitative research designs were considered inappropriate for this study. For instance, an experimental design would not have been appropriate for this study because the research purpose was not to manipulate variables to establish causal relationships (Salkind, 2010). A casual-comparative design was also not well-suited for this study because it is used to establish the effect of an independent variable on a dependent variable by comparing two or more groups (Salkind, 2010). A correlational research design is consistent with research designs needed to advance the knowledge in the problem area because the factors associated with the COVID-19 full vaccination uptake among healthcare workers are unknown.

Methodology

This study used quantitative research methodology because the quantitative approach focuses on collecting numeric data to make inferences about a population (Apuke, 2017). The methodology section of this chapter provides information about the study population, samplings strategy, and procedures for recruitment, participation, and data collection. Additionally, this section includes a description of the instrumentation and operationalization of constructs.

Population

The population for this study is healthcare workers in the United States who provide direct and indirect care in the healthcare industry and are 18 years old or older. For this study, healthcare workers include the positions of healthcare receptionist, dietician, technician, social worker, counseling professional, dentist/hygiene professional, medical doctor/nurse practitioner, pharmacist, medical assistant, nurse, and healthcare administration. Because the population for this study is broad, the size is considered large and unknown. The study population of healthcare workers were accessed through the social media sites Facebook and LinkedIn. Specifically, permission from the administrators of healthcare-related social groups within these media platforms was received to post an invitation to participate in the group's forum.

Sampling and Sampling Procedures

A convenience sampling technique was used to secure the sample of healthcare workers. This sampling technique was chosen because participants were recruited using solicitation posts on social media. Therefore, only those who were available and willing to participate were included in the sample (Etikan et al., 2016).

Sample Size

The desired sample size for this study was 500 healthcare workers. However, data was collected from approximately 550 to account for possible attrition. A sample size of 500 was selected because Bujang et al. (2018) stated that the rule-of-thumb sample size for binary logistic regression analysis is 500.

Procedures for Recruitment, Participation, and Data Collection

The procedures for recruitment begin with obtaining permission from Facebook and LinkedIn group administrators to solicit members for participation. Permission was obtained from the administrators of four different groups, increasing the probability of reaching the desired sample size in a timely manner. Once written permissions were secured, an invitation was posted to participate in each of the group forums. The invitation described the purpose and participant goal of the study, the participant inclusion criteria, the nature of participation, the researcher's contact information, and a link to the survey. Invitations to participate remained posted until the desired sample size was reached.

Individuals who wanted to participate clicked the link or scanned the QR code to access the survey that was described in the invitation post. The link took the participant directly to the survey hosted on SurveyMonkey. The first page of the survey presented the informed consent form, which included information about participants rights, including the right to withdraw from the study without consequence, and how the data would be kept anonymous. The participant was prompted to agree or disagree to the terms of informed consent. Those who clicked "agree" were taken to the next page where the survey questions were hosted. Those who clicked "disagree" were redirected to a dismissal page.

The second page of the survey contained demographic questions. Ten demographic questions were collected from the participants. The demographic information included the control variables gender and age, inclusion criterion of full

immunization with the COVID-19 vaccine, as well as the independent variables healthcare worker job title, race, years in practice, household size, number of school age children, and marital status. The remaining pages of the survey contained ten Likert-type questions about perceptions of vaccine safety, perceptions of vaccine efficacy, perceptions of vaccine potential side effects, interpersonal motivations, community connections, and news source.

At the end of the survey, the participants were asked to create and type in a unique alphanumeric code and make note of it somewhere safe. The alphanumeric code would be used by the researcher to locate the surveys of participants who wished to withdraw after submitting a survey. The survey on average took less than 10 minutes to complete. Once at least 500 surveys were completed, it was closed, the survey data exported from SurveyMonkey downloaded and prepared for analysis. The survey is included in Appendix C.

Instrumentation and Operationalization of Constructs

I developed the survey used for data collection for this study. The survey included demographic questions as well as questions about participants perceptions of COVID-19 vaccine efficacy, safety, and side effects and their reasons for receiving the vaccination. The demographic and COVID-19 vaccine-related survey questions were selected to align with the research questions and identified gap in the literature. The demographic question response options were categorical and the response options for the COVID-19 vaccine-related questions were continuous, but treated as categorical, with scores ranging from 0-5. I conducted a panel review to evaluate, construct validity and ensure that the survey

was organized well. Additionally, after IRB approval I conducted a pilot study to test the logistics and flow of the survey. No changes were identified post the pilot data review.

The survey questions were hosted on SurveyMonkey, which is an online survey platform. The first page of the survey included the conditions of informed consent, which required agreement from participant to proceed to the next page where the 20 survey questions were hosted. A code book of variables and response options was created and used to assist with transferring data to SPSS (see Appendix D). The operational definitions for the constructs included in the survey are included below:

Age

For this study, age was defined as the number of years since birth and will be measured using a discreet value. The question was: "How old were you on your last birthday?" Participant responses were coded into age groups as follows: 1 = 16-24 years old, 2 = 25-34 years old, 3 = 35-44 years old, 4 = 45-54 years old, 5 = 55 years or older, 0 = prefer not to say.

Community Connections

Community connections refer to the community-related reasons for receiving the COVID-19 vaccine. This variable was measured using a Likert-type scale of 1-5, where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. The items assessing community connects are as follows:

- I received monetary incentive for my COVID-19 vaccination.
- Members in my church are provaccination.
- My family members are provaccination.

- My closest friends are provaccination.
- My personal primary care provider is provaccination.
- My employment requires vaccination.
- Vaccine status allows for easier access (e.g., to travel, concert venues).

Full Immunization With the COVID-19 Vaccine

Full immunization with the COVID-19 vaccine refers to whether or not a person received the COVID-19 vaccine and was measured with the question, "I have received 2 or more COVID-19 vaccine doses." This variable is dichotomous and coded as 1 = yes and 0 = no.

Gender

In this study, gender was defined as the sex for which the participant identified, assessed using the question, "Select one of the below options that most accurately matches how you identify." Responses were coded as 1 = male, 2 = female, 3 = nonbinary, 4 = transgender-male, 5 = transgender-female, and 0 = prefer not to say.

Healthcare Worker Job Title

Healthcare worker job titles include the positions that are most commonly found in the healthcare field. Participants' healthcare worker job titles was assessed with the question, "Select one of the below options that most accurately matches your current work occupation." The following options were included: 0 = nonhealth professional, 1 = health receptionist, 2 = dietician, 3 = technician, 4 = social worker, 5 = counseling professional, 6 = dentist/hygiene professional, 7 = medical doctor/nurse practitioner, 8 = pharmacist, 9 = health assistant, 10 = nurse, and 11 = healthcare administration.

Household Size

Household size was defined as the number of individuals residing in the home, including the respondent. This variable was measured using the question, “Including you, select one of the below options that most accurately matches how many people currently reside in your home,” with the following coded response options: 1 = one person, 2 = two people, 3 = three people, 4 = four people, 5 = more than four people, and 0 = prefer not to say.

Interpersonal Motivation

In this study, interpersonal motivations refer to the interpersonal reasons for receiving the COVID-19 vaccine. This variable was measured on 5-point Likert-type scale, where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. These ratings were applied to the following statements:

- I received a COVID-19 vaccination to protect my family.
- I received a COVID-19 vaccination to protect my neighbors.
- I received a COVID-19 vaccination to protect my co-workers.
- I received a COVID-19 vaccination to protect my patients.

Marital Status

Marital status was defined as the type of relationship a person is involved in and assessed using the question, “Select one of the below options that most accurately matches your current relationship situation.” Responses were coded as 1 = married, 2 = cohabitating with a partner, 3 = divorced, 4 = separated, 5 = single, and 0 = prefer not to say.

News Source

News source refers to where individuals receive their COVID-19 vaccine-related information. This information was measured using a series of items, each using a 5-point Likert-type scale, where 1 = not true, 2 = somewhat not true, 3 = neutral, 4 = somewhat true, and 5 = very true. The items were as follows:

- I most trust COVID-19 news and information coming from liberal media and news sources, such as MSNBC, CNN, etc.
- I most trust COVID-19 news and information coming from conservative media and news sources, such as FOX News, One America Network, etc.
- I most trust COVID-19 news and information coming from government sources, such as CDC, WHO, etc.
- I most trust COVID-19 news and information coming from social media sources, such as Twitter, TikTok, Facebook, etc.

Number of School-Age Children

The number of school age children were measured using a discreet value equal to the number of children who live at home. This variable was assessed with the question, "How many school age children live in your home?"

Potential Side Effects

In this study, potential side effects refer to the perceived side effects associated with the COVID-19 vaccine. This variable was measured at the nominal level of measurement, where 0 = not true and 1 = true. Respondents were asked to rate their

agreement to the statement, “I am concerned about experiencing side effects from the COVID-19 vaccine.”

Race

Race refers to the categories of social groups based on perceived similarities and differences, assessed in this study using the question, “Select one of the below options that most accurately matches your race.” Responses were coded as 1 = White/Not Hispanic, 2 = Pacific Islander, 3 = Asian, 4 = Native American, 5 = African American, 6=Latinx/Hispanic and 0 = prefer not to say.

Vaccine Efficacy

In this study, vaccine efficacy refers to the perceived effectiveness of the COVID-19 vaccine at preventing people from contracting the virus. This variable was measured on a 5-point Likert type scale, where 1 = not true, 2 = somewhat not true, 3 = neutral, 4 = somewhat true, and 5 = very true. Respondents were asked to rate their agreement to the statement, “I believe the COVID-19 vaccination to be an effective preventative measure for contracting COVID-19.”

Vaccine Safety

In this study, vaccine safety refers to the perceived safety of the COVID-19 vaccine. This variable was measured on a 5-point Likert type scale, where 1 = not true, 2 = somewhat not true, 3 = neutral, 4 = somewhat true, and 5 = very true. Respondents were asked to rate their agreement to the statement, “I believe the COVID-19 vaccination is safe for me to receive.”

Years in Practice

For this study, years in practice was defined as the number of years the person has been in their current job position. This variable was measured using a discreet value equal to the number of years in practice, which was assessed with the question, "How many years have you worked in your profession?"

Data Analysis Plan

The independent variables in this study are healthcare worker job title, race, years in practice, perceptions of vaccine safety, perceptions of vaccine efficacy, perceptions of vaccine potential side effects, household size, number of school age children, interpersonal motivations, community connections, news source, and marital status. The dependent variable in this study was full immunization with the COVID-19 vaccine. Finally, the control variables in this study were age and gender. The demographic variables in this study are measured at the categorical level of measurement and the COVID-19 vaccine-related variables are measured dichotomously.

Research Questions

The data analysis plan addressed the following research questions and hypotheses:

RQ1 – What is the association between healthcare worker's individual influences and COVID-19 full vaccination when controlling for age and gender?

$H_0$1: There is no association between healthcare worker's individual influences and COVID-19 full vaccination when controlling for age and gender.

H_a1: There is an association between healthcare worker's individual influences and COVID-19 full vaccination when controlling for age and gender.

RQ2 – What is the association between healthcare worker's interpersonal influences (Interpersonal motivations and household size and COVID-19 full vaccination when controlling for age and gender?

$H_0$2: There is no association between healthcare worker's interpersonal influences (Interpersonal motivations and household size) and COVID-19 full vaccination when controlling for age and gender.

H_a2: There is an association between healthcare worker's interpersonal influences (Interpersonal motivations and household size) and COVID-19 full vaccination when controlling for age and gender.

RQ3 – What is the association between healthcare worker's organizations influences (Healthcare worker job title) and COVID-19 full vaccination when controlling for age and gender?

$H_0$3: There is no association between healthcare worker's organizations influences (Healthcare worker job title) and COVID-19 full vaccination when controlling for age and gender.

H_a3: There is an association between healthcare worker's organizations influences (Healthcare worker job title) and COVID-19 full vaccination when controlling for age and gender.

RQ4 – What is the association between healthcare worker's community and environment influences (Community connections) and COVID-19 full vaccination when controlling for age and gender?

$H_0$4: There is no association between healthcare worker's community and environment influences (Community connections) and COVID-19 full vaccination when controlling for age and gender.

H_a4: There is an association between healthcare worker's community and environment influences (Community connections) and COVID-19 full vaccination when controlling for age and gender.

RQ5 – What is the association between healthcare worker's society and public policy (News source) and COVID-19 full vaccination when controlling for age and gender?

$H_0$5: There is no association between healthcare worker's society and public policy (News source) and COVID-19 full vaccination when controlling for age and gender.

H_a5: There is an association between healthcare worker's society and public policy (News source) and COVID-19 full vaccination when controlling for age and gender.

RQ6 – What is the association between healthcare worker's individual, interpersonal, organizations, community and environment, society/public policy influences and COVID-19 full vaccination when controlling for age and gender?

$H_0$6: There is no association between healthcare worker's individual, interpersonal, organizations, community and environment, society/public policy influences and COVID-19 full vaccination when controlling for age and gender.

H_a6: There is an association between healthcare worker's individual, interpersonal, organizations, community and environment, society/public policy influences and COVID-19 full vaccination when controlling for age and gender.

Pilot Study

A pilot study was conducted to establish the construct of validity of the survey. The pilot study involved administering the survey to thirty individuals who met the criteria for participation. However, the data from these individuals was not included in the final sample for the full study. The pilot study acted as a practice run of the question validity and data collection process. The purpose was to identify and make changes based on feedback from the pilot study participants before collecting data for the full study.

Descriptive Data Analysis

Data were analyzed using descriptive statistics, computed through SPSS, to describe characteristics of the population. First, the data was exported from SurveyMonkey into an Excel spreadsheet, where they were cleaned and coded. The descriptive statistical analyses included measures of central tendency, such as frequency, mean, median, minimum, maximum, and standard deviation. Additionally, a reliability analysis was conducted on the survey items using Cronbach's alpha. Below are some example tables that were used to prepare for presenting the results of the descriptive analysis.

Inferential Data Analysis

To address the research questions in this quantitative study, the data was analyzed using inferential statistics computed through SPSS. The inferential statistical analysis

included binary logistic regression analysis to test the association between the independent variables and the dichotomous dependent variable. Binary logistic regression analysis was selected because it was the only statistical test that can be used to explore the relationship between categorical variables when the dependent variable is binary and control variables are included in the model (Pallant, 2016). The relationships between variables were considered statistically significant if the level of significance, *p*-value, was less than .05. However, the Bonferroni correction was used to account for the potential Type I and Type II errors that could have occurred when tests were repeated because of the use of multiple variables (Pallant, 2016). According to Frane (2019), the Bonferroni correction is still recommended despite recent arguments against its use.

The assumptions for binary logistic regression analysis are that data are free from multicollinearity and outliers (Pallant, 2016). Multicollinearity was assessed through the variance inflation factor (VIF) by running a collinearity diagnostic. Variance inflation factors less than 10 indicate acceptable levels of multicollinearity. The presence of outliers was assessed using scatterplots, where the absence of outliers was confirmed when data points fell within the 3.3 and -3.3 range. Below are example figure tables that demonstrate the planned presentation of the binary logistic regression analysis.

Threats to Validity

The external validity of this study was diminished by using a convenience sampling method instead of a random sampling method. A potential threat to both external and internal validity of the study is associated with the specificity of the variables. Each variable in this study is represented by a single survey item developed by

the author—no validated instruments were used. Furthermore, the variable names and what they represent may be perceived differently for individuals. For instance, different meanings may be attached to the variable interpersonal motivations. Although construct validity was a consideration and attempts to identify and mitigate this was done by conducting a panel review of survey questions, and a pilot study for consensus validity of the data collection process.

Ethical Procedures

Several ethical procedures were followed throughout the research process. First, written permission from group administrators was obtained before soliciting its members for participation. Approval from Walden University's Institutional Review Board (IRB) was obtained before collecting any data for the pilot or main studies. Another measure was ensuring the study was conducted ethically included de-identifying the data and creating an exit strategy for those who changed their mind after submitting the survey. Specifically, the participants were asked to create and type in a unique alphanumeric code and make note of it somewhere safe. The alphanumeric code was explained to be used to locate the surveys of participants who wish to withdraw after submitting a survey. No personally identifiable information was collected throughout the survey. Finally, data will be kept on a personal computer in the researcher's home office and will not be accessible to anyone else. All data and research materials will be permanently deleted from the above-mentioned computer after 5 years. There are no identified conflicts of interest or incentives associated with this study.

Summary

I used a quantitative methodology and correlational design with binary logistic regression analysis to examine the associations between healthcare worker job title, race, years in practice, perceptions of vaccine safety, perceptions of vaccine efficacy, vaccine potential side effects, household size, marital status, number of school age children, interpersonal motivations, community connections, news source, and full COVID-19 full vaccination while controlling for age and gender. Survey data was collected from at least 500 healthcare workers in the United States. The sample of healthcare workers were recruited from social media group pages. The survey was developed and hosted on SurveyMonkey. Data was analyzed using descriptive statistics and binary logistic regression analysis. Chapter 4 includes the results of these analyses.

Chapter 4: Results

Introduction

The purpose of this quantitative, correlational study using a cross-sectional design was to examine the associations between the independent variables of healthcare worker job title, race, years in practice, perceptions of vaccine safety, perceptions of vaccine efficacy, perceptions of vaccine potential side effects, household size, marital status, number of school age children, interpersonal motivations, community connections, news source, and the dependent variable, full COVID-19 immunization while controlling for age and gender. For this study, healthcare workers are individuals employed in the healthcare setting and who provide care to a registered patient, including but not limited to the physicians, therapists, and nurses.

Research Questions

RQ1 – What is the association between healthcare worker's individual influences and COVID-19 full vaccination when controlling for age and gender?

$H_0$1: There is no association between healthcare worker's individual influences and COVID-19 full vaccination when controlling for age and gender.

H_a1: There is an association between healthcare worker's individual influences and COVID-19 full vaccination when controlling for age and gender.

RQ2 – What is the association between healthcare worker's interpersonal influences (Interpersonal motivations and household size and COVID-19 full vaccination when controlling for age and gender?

$H_0$2: There is no association between healthcare worker's interpersonal influences (Interpersonal motivations and household size) and COVID-19 full vaccination when controlling for age and gender.

H_a2: There is an association between healthcare worker's interpersonal influences (Interpersonal motivations and household size) and COVID-19 full vaccination when controlling for age and gender.

RQ3 – What is the association between healthcare worker's organizations influences (Healthcare worker job title) and COVID-19 full vaccination when controlling for age and gender?

$H_0$3: There is no association between healthcare worker's organizations influences (Healthcare worker job title) and COVID-19 full vaccination when controlling for age and gender.

H_a3: There is an association between healthcare worker's organizations influences (Healthcare worker job title) and COVID-19 full vaccination when controlling for age and gender.

RQ4 – What is the association between healthcare worker's community and environment influences (Community connections) and COVID-19 full vaccination when controlling for age and gender?

$H_0$4: There is no association between healthcare worker's community and environment influences (Community connections) and COVID-19 full vaccination when controlling for age and gender.

H_a4: There is an association between healthcare worker's community and environment influences (Community connections) and COVID-19 full vaccination when controlling for age and gender.

RQ5 – What is the association between healthcare worker's society and public policy (News source) and COVID-19 full vaccination when controlling for age and gender?

$H_0 5$: There is no association between healthcare worker's society and public policy (News source) and COVID-19 full vaccination when controlling for age and gender.

$H_a 5$: There is an association between healthcare worker's society and public policy (News source) and COVID-19 full vaccination when controlling for age and gender.

RQ6 – What is the association between healthcare worker's individual, interpersonal, organizations, community and environment, society/public policy influences and COVID-19 full vaccination when controlling for age and gender?

$H_0 6$: There is no association between healthcare worker's individual, interpersonal, organizations, community and environment, society/public policy influences and COVID-19 full vaccination when controlling for age and gender.

$H_a 6$: There is an association between healthcare worker's individual, interpersonal, organizations, community and environment, society/public policy influences and COVID-19 full vaccination when controlling for age and gender.

This chapter included a discussion of the pilot study data collection and analyses. This study also provides a discussion of the data collection procedures used for the study. The results presented in this chapter include the characteristics of study participants, assumptions of logistic regression, and logistic regression results. This chapter ends with a summary of the key results for the study.

Pilot Study

A pilot study was conducted to check the ease of use of the online survey and the clarity of content. A sample of 30 participants was collected from May 19, 2023, to May 24, 2023. Pilot study participants were asked to respond to the pilot study consent form to ensure that they agreed to participate in the study. Pilot study participants responded that the items were clear and easy to use. Thus, no changes were made to the items. The data from the pilot study participants were not used in the primary study.

Data Collection

The procedures for recruitment began with obtaining permission from Walden's IRB (#05-19-23-0037183) to conduct the study, followed by Facebook and LinkedIn group administrators to solicit members for participation. Permission was obtained from two different Facebook and LinkedIn groups. Once written permissions were secured, an invitation was posted inviting members to review and potentially participate. The invitation described the study, the participant inclusion criteria, the nature of participation, the IRB and my contact information, and a link to the survey. Invitations to participate remained posted until the desired sample size was reached. The data for the study were collected from May 25 to June 10, 2023.

Individuals who wanted to participate clicked the link to the survey that is included in the invitation post. The link directed the participant to the survey hosted on SurveyMonkey. The first page of the survey was the informed consent form, which included information about participants' rights, including the right to withdraw from the study without consequence, and how data will be kept anonymous. The participant was asked to agree or disagree to the terms of informed consent. Those who clicked "agree" were taken to the next page where the survey questions were hosted. Those who clicked "disagree" were taken to a dismissal page.

The second page of the survey contained demographic questions. Nine demographic questions were collected from the participants. The demographic information included the control variables gender and age, COVID-19 vaccine status, as well as the independent variables healthcare worker job title, race, years in practice, household size, number of school age children, and marital status. The remaining pages of the survey contained nine Likert-type questions about perceptions of vaccine safety, perceptions of vaccine efficacy, perceptions of vaccine potential side effects, interpersonal motivations, community connections, and news source.

At the end of the survey, the participants were asked to create and type in a unique alphanumeric code and make note of it somewhere safe. This allowed me to use the alphanumeric code to locate the surveys of participants who wished to withdraw after submitting a survey. Respondents were advised that the survey should take no more than 10 minutes to complete. Once at least 500 surveys were completed, I closed the survey and exported the data from SurveyMonkey to prepare for analysis. The data was cleaned

for missing values. Cases with missing values for the study variables such as community connections, interpersonal motivation, vaccine efficacy, vaccine safety, and potential side effects were excluded from the analyses.

Characteristics of the Sample

A total of 1,680 participants accessed the survey questionnaire. However, after cleaning the data and excluding participants who did not agree to participate in the study, participants who were not qualified for the study, and participants who did not complete the survey, a total of 856 participants were included in the study. Among the 856 participants, 235 were nonhealthcare professionals. Thus, the 235 participants were excluded from the analyses. A total of 621 participants were included in the analyses. Table 1 presents the frequencies and percentages of demographic characteristics of participants. As observed, there were 113 participants above 55 years old (18.2%), 144 participants from 45 to 54 years old (23.2%), 155 participants from 25 to 34 years old (25%), 107 participants from 35 to 44 years old (17.2%), and 77 participants from 16 to 24 years old (12.4%). The rest of the 4% did not respond to the item on age. In terms of gender, there were more females (n = 381, 61.4%) than males (n = 228, 36.7%). The rest identified as nonbinary or transgenders. For the race variable, majority of the participants were non-Hispanic Whites (n = 364, 58.6%). There were also 83 participants who were Latin or Hispanic (13.4%) and 80 participants who were Asians (12.9%). There were more married participants (n = 350, 56.4%) than singles (n = 137, 22.1%). For household size, there were 194 participants with two people in the household (31.2%), 140 participants with three people in the household (22.5%), 134 participants with four people

in the household (21.6%), 92 participants with only one person in the household (14.8%), and 52 participants with more than four people in the household (8.4%). For the healthcare worker job title, 118 participants are health receptionists (19%), 89 participants are technicians (14.3%), 85 participants are healthcare administrators (13.7%), and 78 participants are nurses (12.6%). Participants were also asked whether they have full immunization with COVID-19 vaccine. A total of 561 participants are fully vaccinated (90.3%) while 60 participants are not fully vaccinated with two doses of COVID 19 vaccine (9.7%).

Table 1

*Frequencies and Percentages of Participant Demographic Characteristics (*N = *621)*

		Frequency	Percent
Age	16-24	77	12.4
	25-34	155	25.0
	35-44	107	17.2
	45-54	144	23.2
	55+	113	18.2
	Total	596	96.0
Missing	System	25	4.0
Total		621	100.0
Gender	Male	228	36.7
	Female	381	61.4
	Nonbinary	7	1.1
	Transgender – Male	1	.2
	Transgender – Female	3	.5
	Prefer not to say	1	.2
	Total	621	100.0
Race	Prefer not to say	13	2.1
	White/Not Hispanic	364	58.6
	Pacific Islander	7	1.1
	Asian	80	12.9
	Native American	14	2.3
	African American	60	9.7
	Latinx/Hispanic	83	13.4
	Total	621	100.0
Marital Status	Prefer not to say	10	1.6
	Married	350	56.4
	Cohabitating with a partner	55	8.9
	Divorced	50	8.1
	Separated	19	3.1
	Single	137	22.1
	Total	621	100.0
Household Size	prefer not to say	9	1.4
	one person	92	14.8
	two people	194	31.2
	three people	140	22.5
	four people	134	21.6
	more than 4 people	52	8.4
	Total	621	100.0
Healthcare Worker Job Title	health receptionist	118	19.0
	Dietician	28	4.5
	Technician	89	14.3
	social worker	64	10.3
	counseling professional	46	7.4
	dentist/hygiene professional	14	2.3
	medical doctor/nurse practitioner	34	5.5
	Pharmacist	28	4.5
	health assistant	37	6.0

(table continues)

		Frequency	Percent
	Nurse	78	12.6
	healthcare administration	85	13.7
	Total	621	100.0
Full Immunization with COVID 19 Vaccine	No	60	9.7
	Yes	561	90.3
	Total	621	100.0

The demographic characteristics were also analyzed based on the full vaccination status of participants. Table 2 presents the demographic characteristics of participants who do not have full vaccination which composed about 9.66% of the total sample. Among the 60 participants, 19 were 25 to 34 years old (31.7%), 10 were 55 years old and above (16.7%), 11 were 45 to 54 years old (18.3%), 8 were 35 to 44 years old (13.3%), and 8 were 16 to 24 years old (13.3%). In terms of gender, there were more females (n = 37, 61.7%) than males (n = 17, 28.3.7%). For the race of participants, the majority were non-Hispanic Whites (n = 33, 55%). For the marital status, 25 participants were married (41.7%) and 17 participants were single (28.3%). In terms of the household size, 22 participants have two people in the household (36.7%), 12 participants have three people in the household (20%), 9 participants have four people in the household (15%), and 8 participants have more than four people in the household (13.3%). For the healthcare worker job title, 12 were health receptionists (20%), and 10 participants were healthcare administrators (16.7%).

Table 2

*Frequencies and Percentages for Non-Fully-Vaccinated Participants (*N = *60)*

		Frequency	Percent
Age	16-24	8	13.3
	25-34	19	31.7
	35-44	8	13.3
	45-54	11	18.3
	55+	10	16.7
	Total	56	93.3
Missing	System	4	6.7
Total		60	100.0
Gender	Male	17	28.3
	Female	37	61.7
	Nonbinary	5	8.3
	Transgender – Female	1	1.7
	Total	60	100.0
Race	Prefer not to say	2	3.3
	White/Not Hispanic	33	55.0
	Pacific Islander	2	3.3
	Asian	4	6.7
	Native American	5	8.3
	African American	7	11.7
	Latinx/Hispanic	7	11.7
	Total	60	100.0
Marital Status	Prefer not to say	1	1.7
	Married	25	41.7
	Cohabitating with a partner	5	8.3
	Divorced	10	16.7
	Separated	2	3.3
	Single	17	28.3
	Total	60	100.0
Household Size	prefer not to say	1	1.7
	one person	8	13.3
	two people	22	36.7
	three people	12	20.0
	four people	9	15.0
	more than 4 people	8	13.3
	Total	60	100.0
Healthcare Worker Job Title	health receptionist	12	20.0
	Dietician	2	3.3
	Technician	5	8.3
	social worker	8	13.3
	counseling professional	7	11.7
	medical doctor/nurse practitioner	2	3.3
	Pharmacist	1	1.7
	health assistant	5	8.3
	Nurse	8	13.3
	healthcare administration	10	16.7
	Total	60	100.0

Table 3 presents the demographic characteristics of participants who are fully vaccinated with 2 doses of COVID-19 vaccine. Among the 540 fully-vaccinated participants, 103 were 55 years old and above (18.4%), 133 were 45 to 54 years old (23.7%), 136 were 25 to 34 years old (24.2%), 99 were 35 to 44 years old (17.6%), and 69 were 16 to 24 years old (12.3%). In terms of gender, there were more females (n = 344, 61.3%) than males (n = 211, 37.6%). For the race of participants, the majority were non-Hispanic Whites (n = 331, 59%). For marital status, 325 participants were married (57.9%) and 120 participants were single (21.4%). In terms of the household size, 172 participants have two people in the household (30.7%), 128 participants have three people in the household (22.89%), 125 participants have four people in the household (22.3%), and 44 participants have more than four people in the household (7.8%). For the healthcare worker job title, 106 were health receptionists (18.9%), 84 were technicians (15%), 75 participants were healthcare administrators (13.4%), and 70 were nurses (12.5%).

Table 3

Frequencies and Percentages for Fully-Vaccinated Participants (N = 561)

		Frequency	Percent
Age	16-24	69	12.3
	25-34	136	24.2
	35-44	99	17.6
	45-54	133	23.7
	55+	103	18.4
	Total	540	96.3
Missing	System	21	3.7
Total		561	100.0
Gender	Male	211	37.6
	Female	344	61.3
	Nonbinary	2	.4
	Transgender – Male	1	.2
	Transgender – Female	2	.4
	Prefer not to say	1	.2
	Total	561	100.0
Race	White/Not Hispanic	331	59.0
	Pacific Islander	5	.9
	Asian	76	13.5
	Native American	9	1.6
	African American	53	9.4
	Latinx/Hispanic	76	13.5
	Prefer not to say	11	2.0
	Total	561	100.0
Marital Status	Married	325	57.9
	Cohabitating with a partner	50	8.9
	Divorced	40	7.1
	Separated	17	3.0
	Single	120	21.4
	Prefer not to say	9	1.6
	Total	561	100.0
Household Size	one person	84	15.0
	two people	172	30.7
	three people	128	22.8
	four people	125	22.3
	more than 4 people	44	7.8
	prefer not to say	8	1.4
	Total	561	100.0
Healthcare Worker Job Title	health receptionist	106	18.9
	Dietician	26	4.6
	Technician	84	15.0
	social worker	56	10.0
	counseling professional	39	7.0
	dentist/hygiene professional	14	2.5
	medical doctor/nurse practitioner	32	5.7
	Pharmacist	27	4.8
	health assistant	32	5.7

(table continues)

		Frequency	Percent
	Nurse	70	12.5
	healthcare administration	75	13.4
	Total	561	100.0

Other demographic characteristics were measured using a continuous scale such as the number of school age children in the house and years in practice. The study variables in the study such as community connections, interpersonal motivation, vaccine efficacy, vaccine safety, and potential side effects are also measured on a continuous scale. The descriptive statistics are presented in Table 4. The number of school age children in the household ranged from 0 to 6 with a mean of .93 (*SD* = 1.18). The years in practice ranged from 0 to 60 with a mean of 11.89 (*SD* = 11.38). The news source score ranged from 4 to 20 with a mean of 11.91 (*SD* = 3.79). The community connection score ranged from 11 to 35 with a mean of 24.75 (*SD* = 5.27). The interpersonal motivation score ranged from 4 to 20 with a mean of 15.30 (*SD* = 4.63). The vaccine efficacy responses ranged from 1 to 5 with a mean of 3.59 (*SD* = 1.32). Similarly, the vaccine safety responses ranged from 1 to 5 with a mean of 3.68 (*SD* = 1.31). The potential side effects ranged from 0 to 1 with a mean of .60 (*SD* = .49).

Table 4

Descriptive Statistics of Study Variables

	N	Min	Max	*M*	*SD*
Number of School Age Children	590	0.00	6.00	.93	1.18
Years in Practice	592	0.00	60.00	11.89	11.38
News Source	621	4.00	20.00	11.91	3.79
Community Connections	619	11.00	35.00	24.75	5.27
Interpersonal Motivation	621	4.00	20.00	15.30	4.63
Vaccine Efficacy	621	1.00	5.00	3.59	1.32
Vaccine Safety	621	1.00	5.00	3.68	1.31
Potential Side Effects	621	0.00	1.00	.60	.49

The descriptive statistics were also presented for nonfully-vaccinated participants. The mean number of school age children is .89 (*SD* = 1.26). The mean number of years in practice is 9.69 (*SD* = 10.16). The mean news source score is 8.98 (*SD* = 3.85). The mean community connections score is 20.10 (*SD* = 5.30). The mean interpersonal motivation score is 9.80 (*SD* = 5.45). The mean vaccine efficacy is 2.22 (*SD* = 1.34). The mean vaccine safety is 2.12 (*SD* = 1.26). The mean potential side effects is .80 (*SD* = .40).

Table 5

Descriptive Statistics of Study Variables for Non-Fully Vaccinated Participants

	N	Min	Max	*M*	*SD*
Number of School Age Children	55	0.00	6.00	.89	1.26
Years in Practice	57	0.00	40.00	9.69	10.16
News Source	60	4.00	18.00	8.98	3.85
Community Connections	59	11.00	32.00	20.10	5.30
Interpersonal Motivation	60	4.00	20.00	9.80	5.45
Vaccine Efficacy	60	1.00	5.00	2.22	1.34
Vaccine Safety	60	1.00	5.00	2.12	1.26
Potential Side Effects	60	0.00	1.00	.80	.40

The descriptive statistics were also presented for fully vaccinated participants. The mean number of school age children is .8594 (*SD* = 1.17). The mean number of years in practice is 12.13 (*SD* = 11.48). The mean news source score is 12.22 (*SD* = 3.64). The mean community connections score is 25.24 (*SD* = 5.02). The mean interpersonal motivation score is 15.89 (*SD* = 4.12). The mean vaccine efficacy is 3.74 (*SD* = 1.23). The mean vaccine safety is 3.85 (*SD* = 1.20). The mean potential side effects is .58 (*SD* = .49).

Table 6

Descriptive Statistics of Study Variables for Fully Vaccinated Participants

	N	Min	Max	*M*	*SD*
Number of School Age Children	535	0.00	6.00	.94	1.17
Years in Practice	535	0.00	60.00	12.13	11.48
News Source	561	4.00	20.00	12.22	3.64
Community Connections	560	11.00	35.00	25.24	5.02
Interpersonal Motivation	561	4.00	20.00	15.89	4.12
Vaccine Efficacy	561	1.00	5.00	3.74	1.23
Vaccine Safety	561	1.00	5.00	3.85	1.20
Potential Side Effects	561	0.00	1.00	.58	.49

Assumptions for Logistic Regression

Prior to conducting the inferential analyses, assumptions of the binary logistics regression were tested. The assumptions considered were multicollinearity and outliers. The collinearity statistics presented in Table 7 show the variance inflation factors of the predictor variables. The VIFs ranged from 1.046 to 2.994, which is below the value of 10. Therefore, the assumption on multicollinearity is met.

Table 7

Collinearity Statistics

	Tolerance	VIF
Race	.956	1.046
Vaccine Efficacy	.334	2.994
Vaccine Safety	.341	2.929
Potential Side Effects	.823	1.215
News Source	.549	1.822
Community Connections	.539	1.856
Interpersonal Motivation	.433	2.311
Household Size	.932	1.073
Healthcare Worker Job Title	.918	1.089

To test the assumption on outliers, boxplots were generated for continuous study variables. The boxplots showed that there are outlier points for the community

connections variable. As observed in Figure 1, there are no outliers in the dataset. Thus, all data points were included in the binary logistic regression analyses.

Figure 1

Boxplots of Continuous Study Variables: Part 1

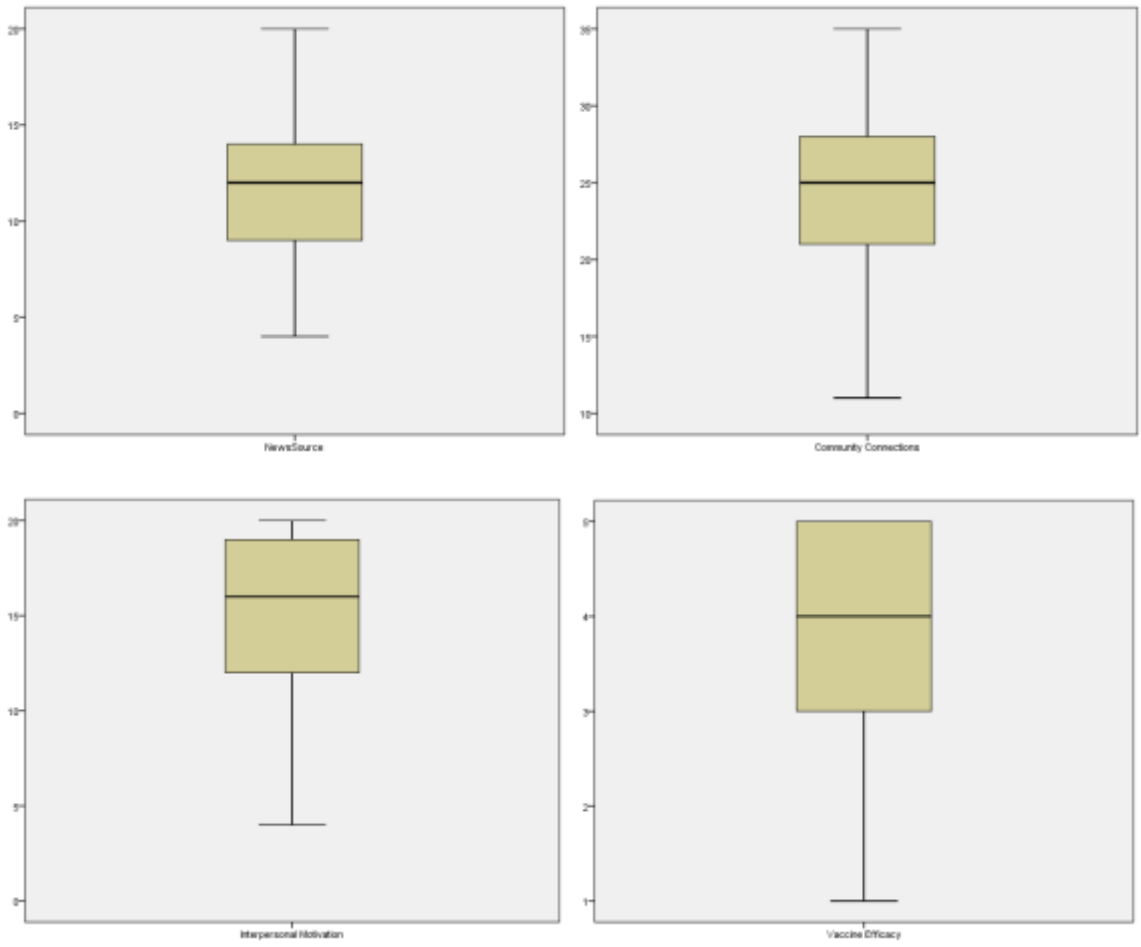
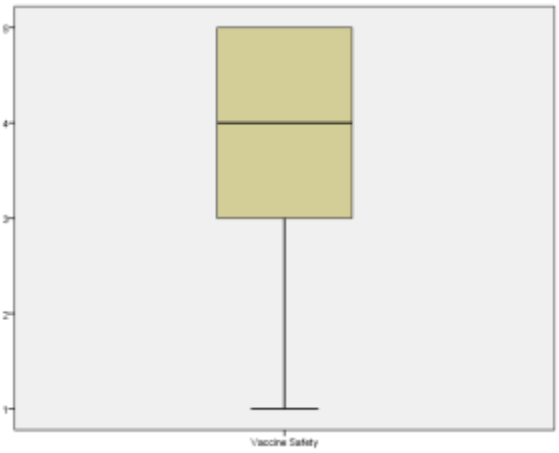


Figure 2

Boxplots of Continuous Study Variables: Part 2



Inferential Statistical Analysis

RQ1 – What is the association between healthcare worker's individual influences and COVID-19 full vaccination when controlling for age and gender?

$H_0$1: There is no association between healthcare worker's individual influences and COVID-19 full vaccination when controlling for age and gender.

H_a1: There is an association between healthcare worker's individual influences and COVID-19 full vaccination when controlling for age and gender.

To test the first set of hypotheses, a binary logistic regression was conducted. Healthcare worker's individual influences was measured using variables of race, attitudinal factors, and risk aversion. Therefore, the predictor variables were race and perspectives on vaccine efficacy, vaccine safety, and potential side effects. The dependent variable was the COVID-19 full vaccination of participants while covariates were age and gender. The result of the binary logistic regression is presented in Table 8. The result showed that category 5 of race which is African American (Wald = 4.825, p =

.028) and vaccine safety (Wald = 16.122, $p < .001$) responses are significant predictors of the COVID-19 full vaccination of participants. The results showed that African Americans are 2.046 times less likely than other races to have COVID-19 full vaccination. Moreover, participants who have more positive perceptions on vaccine safety are .794 more likely to have COVID-19 vaccine than participants who have negative perceptions on vaccine safety. The Hosmer and Lemeshow test determined that the model is not significant in predicting the COVID-19 full vaccination of participants (Chi-square = 14.554, $p = .069$). The predictors also explain 38.8% of the variance in the dependent variable based on the Nagelkerke R square value. Moreover, the classification table presented in Table 9 shows that the model is able to classify 92.8% of the cases correctly.

Table 8

Binary Logistic Regression for Research Question 1

		B	S.E.	Wald	*df*	*p*	Exp(B)
Step 1[a]	Race			9.286	6	.158	
	Race(1)	-1.218	1.003	1.472	1	.225	.296
	Race(2)	-.372	.542	.470	1	.493	.689
	Race(3)	-1.482	1.377	1.158	1	.282	.227
	Race(4)	.573	.751	.583	1	.445	1.774
	Race(5)	-2.046	.932	4.825	1	.028	.129
	Race(6)	-.321	.704	.208	1	.648	.725
	VaccineEfficacy	.337	.186	3.274	1	.070	1.401
	VaccineSafety	.794	.198	16.122	1	.000	2.212
	PotentialSideEffects	-.765	.447	2.935	1	.087	.465
	AgeCat			1.644	4	.801	
	AgeCat(1)	-.581	.618	.883	1	.347	.559
	AgeCat(2)	-.206	.519	.157	1	.692	.814
	AgeCat(3)	.117	.599	.038	1	.846	1.124
	AgeCat(4)	.064	.542	.014	1	.906	1.066
	Gender			12.514	5	.028	
	Gender(1)	20.618	40192.970	.000	1	1.000	899838251.233
	Gender(2)	1.952	1.349	2.095	1	.148	7.043
	Gender(3)	2.281	1.336	2.916	1	.088	9.790
	Gender(4)	-1.874	1.827	1.052	1	.305	.153
	Gender(5)	20.200	40192.970	.000	1	1.000	592623911.524
	Constant	-2.141	1.481	2.090	1	.148	.118

Table 9

Classification Table for Research Question 1

			Predicted		
			Full Immunization with COVID 19 Vaccine		Percentage Correct
Observed			No	Yes	
Step 1	Full Immunization with COVID 19 Vaccine	No	15	41	26.8
		Yes	2	538	99.6
	Overall Percentage				92.8

a. The cut value is .500

RQ2 – What is the association between healthcare worker's interpersonal influences (Interpersonal motivations and household size and COVID-19 full vaccination when controlling for age and gender?

$H_0$2: There is no association between healthcare worker's interpersonal influences (Interpersonal motivations and household size) and COVID-19 full vaccination when controlling for age and gender.

H_a2: There is an association between healthcare worker's interpersonal influences (Interpersonal motivations and household size) and COVID-19 full vaccination when controlling for age and gender.

To test the second set of hypotheses, a binary logistic regression was conducted. The predictor variables are interpersonal motivations and household size. The dependent variable is the COVID-19 full vaccination of participants while covariates are age and gender. The result of the binary logistic regression is presented in Table 10. The result showed that interpersonal motivation (Wald = 67.00, $p < .001$) was significant while household size categories ($p > .05$) were not significant predictors of the COVID-19 full vaccination of participants. The results showed that participants with higher scores in interpersonal motivation are .286 times more likely to have the COVID-19 full vaccination. The Hosmer and Lemeshow test determined that the model is not significant in predicting the COVID-19 full vaccination of participants (Chi-square = 10.612, $p = .225$). The predictors also explain 36.6% of the variance in the dependent variable based on the Nagelkerke R square value. Moreover, the classification table presented in Table 11 shows that the model is able to classify 91.9% of the cases correctly.

Table 10

Binary Logistic Regression for Research Question 2

		B	S.E.	Wald	*df*	*p*	Exp(B)
Step 1[a]	InterpersonalMotivation	.286	.035	66.99	1	.000	1.331
	HouseholdSize			3.012	5	.698	
	HouseholdSize(1)	-.203	1.201	.029	1	.866	.816
	HouseholdSize(2)	.896	.693	1.673	1	.196	2.451
	HouseholdSize(3)	.117	.562	.044	1	.835	1.125
	HouseholdSize(4)	.506	.603	.704	1	.401	1.659
	HouseholdSize(5)	.113	.629	.032	1	.858	1.119
	AgeCat			1.879	4	.758	
	AgeCat(1)	-.256	.594	.186	1	.666	.774
	AgeCat(2)	-.302	.512	.347	1	.556	.740
	AgeCat(3)	.234	.591	.157	1	.692	1.264
	AgeCat(4)	.222	.555	.159	1	.690	1.248
	Gender			18.598	5	.002	
	Gender(1)	22.702	40192.970	.000	1	1.000	7231461766.752
	Gender(2)	2.611	1.326	3.874	1	.049	13.611
	Gender(3)	2.803	1.309	4.583	1	.032	16.494
	Gender(4)	-1.873	1.739	1.160	1	.281	.154
	Gender(5)	20.208	40192.970	.000	1	1.000	597549786.566
	Constant	-4.217	1.471	8.220	1	.004	.015

Table 11

Classification Table for Research Question 2

			Predicted		
			Full Immunization with COVID 19 Vaccine		Percentage Correct
Observed			No	Yes	
Step 1	Full Immunization with COVID 19 Vaccine	No	16	40	28.6
		Yes	8	532	98.5
	Overall Percentage				91.9

a. The cut value is .500

RQ3 – What is the association between healthcare worker's organizations influences (Healthcare worker job title) and COVID-19 full vaccination when controlling for age and gender?

$H_0$3: There is no association between healthcare worker's organizations influences (Healthcare worker job title) and COVID-19 full vaccination when controlling for age and gender.

H_a3: There is an association between healthcare worker's organizations influences (Healthcare worker job title) and COVID-19 full vaccination when controlling for age and gender.

To test the third set of hypotheses, a binary logistic regression was conducted. The predictor variables were the categories of healthcare worker job title. The dependent variable was the COVID-19 full vaccination of participants while covariates were age and gender. The result of the binary logistic regression is presented in Table 12. The result showed that the categories of healthcare worker job titles were not significant predictors of the COVID-19 full vaccination ($p > .05$). The Hosmer and Lemeshow test determined that the model was not significant in predicting the COVID-19 full vaccination of participants (Chi-square = 4.166, $p = .842$). The predictors also explains 11.4% of the variance in the dependent variable based on the Nagelkerke R square value. Moreover, the classification table presented in Table 13 shows that the model is able to classify 91.1% of the cases correctly.

Table 12

Binary Logistic Regression for Research Question 3

		B	S.E.	Wald	*df*	*p*	Exp(B)
Step 1[a]	JobTitle			7.997	10	.629	
	JobTitle(1)	.200	.465	.184	1	.668	1.221
	JobTitle(2)	1.092	.960	1.295	1	.255	2.981
	JobTitle(3)	1.049	.616	2.902	1	.088	2.856
	JobTitle(4)	.278	.567	.241	1	.624	1.321
	JobTitle(5)	-.048	.563	.007	1	.933	.953
	JobTitle(6)	19.255	11534.525	.000	1	.999	230400215.554
	JobTitle(7)	2.308	1.331	3.008	1	.083	10.053
	JobTitle(8)	1.437	1.106	1.688	1	.194	4.207
	JobTitle(9)	.136	.636	.046	1	.830	1.146
	JobTitle(10)	.276	.509	.295	1	.587	1.318
	AgeCat			2.350	4	.672	
	AgeCat(1)	-.370	.524	.499	1	.480	.691
	AgeCat(2)	-.279	.440	.402	1	.526	.757
	AgeCat(3)	.276	.520	.281	1	.596	1.318
	AgeCat(4)	.120	.469	.065	1	.798	1.127
	Gender			13.433	5	.020	
	Gender(1)	21.161	40192.970	.000	1	1.000	1548623566.589
	Gender(2)	2.114	1.343	2.479	1	.115	8.285
	Gender(3)	1.751	1.326	1.742	1	.187	5.758
	Gender(4)	-2.343	1.867	1.574	1	.210	.096
	Gender(5)	21.439	40192.970	.000	1	1.000	2045834525.478
	Constant	.134	1.363	.010	1	.922	1.143

Table 13

Classification Table for Research Question 3

			Predicted		
			Full Immunization with COVID 19 Vaccine		Percentage Correct
Observed			No	Yes	
Step 1	Full Immunization with COVID 19 Vaccine	No	4	52	7.1
		Yes	1	539	99.8
	Overall Percentage				91.1

a. The cut value is .500

RQ4 – What is the association between healthcare worker's community and environment influences (Community connections) and COVID-19 full vaccination when controlling for age and gender?

$H_0$4: There is no association between healthcare worker's community and environment influences (Community connections) and COVID-19 full vaccination when controlling for age and gender.

H_a4: There is an association between healthcare worker's community and environment influences (Community connections) and COVID-19 full vaccination when controlling for age and gender.

To test the fourth set of hypotheses, a binary logistic regression was conducted. The predictor variable was the community connections score. The dependent variable was the COVID-19 full vaccination of participants while covariates are age and gender. The result of the binary logistic regression is presented in Table 14. The result showed that the community connections score (Wald = 90.54, $p < .001$) was a significant predictor of the COVID-19 full vaccination. The results showed that participants with higher community connections score were .257 times more likely to have the COVID-19 full vaccination. The Hosmer and Lemeshow test determined that the model was not significant in predicting the COVID-19 full vaccination of participants (Chi-square = 7.16, $p = .520$). The predictors also explained 28.7% of the variance in the dependent variable based on the Nagelkerke R square value. Moreover, the classification table presented in Table 15 shows that the model was able to classify 88.8% of the cases correctly.

Table 14

Binary Logistic Regression for Research Question 4

		B	S.E.	Wald	*df*	Sig.	Exp(B)
Step 1[a]	Community Connections	.257	.027	90.539	1	.000	1.293
	AgeCat			2.128	4	.712	
	AgeCat(1)	-.046	.415	.012	1	.912	.955
	AgeCat(2)	-.424	.345	1.512	1	.219	.654
	AgeCat(3)	-.386	.389	.986	1	.321	.680
	AgeCat(4)	-.256	.362	.499	1	.480	.774
	Gender			11.328	5	.045	
	Gender(1)	.781	1.851	.178	1	.673	2.185
	Gender(2)	1.416	1.285	1.214	1	.271	4.120
	Gender(3)	1.719	1.280	1.803	1	.179	5.582
	Gender(4)	-1.250	1.620	.595	1	.440	.287
	Gender(5)	20.803	40192.97	.000	1	1.000	1083244092.573
	Constant	-4.949	1.398	12.525	1	.000	.007

a. Variable(s) entered on step 1: Community Connections, AgeCat, Gender.

Table 15

Classification Table for Research Question 4

			Predicted		
			Full Immunization with COVID 19 Vaccine		
Observed			No	Yes	Percentage Correct
Step 1	Full Immunization with COVID 19 Vaccine	No	21	81	20.6
		Yes	12	713	98.3
	Overall Percentage				88.8

a. The cut value is .500

RQ5 – What is the association between healthcare worker's society and public policy (News source) and COVID-19 full vaccination when controlling for age and gender?

$H_0$5: There is no association between healthcare worker's society and public policy (News source) and COVID-19 full vaccination when controlling for age and gender.

H_a5: There is an association between healthcare worker's society and public policy (News source) and COVID-19 full vaccination when controlling for age and gender.

To test the fifth set of hypotheses, a binary logistic regression was conducted. The predictor variable was the news source score. The dependent variable was the COVID-19 full vaccination of participants while covariates were age and gender. The result of the binary logistic regression is presented in Table 15. The result showed that the news source score (Wald = 76.958, $p < .001$) was a significant predictor of COVID-19 full vaccination. The results showed that participants who have a higher news source score were .318 times more likely to have the COVID-19 full vaccination. However, the healthcare worker's job title categories were not significant predictors of the COVID-19 full vaccination ($p > .05$). The Hosmer and Lemeshow test determined that the model was not significant in predicting the COVID-19 full vaccination of participants (Chi-square = 12.283, $p = .139$). The predictors also explained 23.7% of the variance in the dependent variable based on the Nagelkerke R square value. Moreover, the classification table presented in Table 17 showed that the model was able to classify 88.4% of the cases correctly.

Table 16

Binary Logistic Regression for Research Question 5

		B	S.E.	Wald	*df*	Sig.	Exp(B)
Step 1[a]	NewsSource	.318	.036	76.958	1	.000	1.375
	AgeCat			3.166	4	.531	
	AgeCat(1)	-.465	.402	1.338	1	.247	.628
	AgeCat(2)	-.537	.333	2.593	1	.107	.585
	AgeCat(3)	-.481	.377	1.632	1	.201	.618
	AgeCat(4)	-.261	.345	.574	1	.449	.770
	Gender			18.615	5	.002	
	Gender(1)	2.154	1.778	1.468	1	.226	8.618
	Gender(2)	2.469	1.277	3.739	1	.053	11.815
	Gender(3)	2.851	1.275	5.003	1	.025	17.312
	Gender(4)	-.726	1.589	.209	1	.648	.484
	Gender(5)	21.432	40192.970	.000	1	1.000	2032392519.048
	Constant	-3.583	1.340	7.150	1	.007	.028

a. Variable(s) entered on step 1: NewsSource, AgeCat, Gender.

Table 17

Classification Table for Research Question 5

			Predicted		
			Full Immunization with COVID 19 Vaccine		
Observed			No	Yes	Percentage Correct
Step 1	Full Immunization with COVID 19 Vaccine	No	12	92	11.5
		Yes	4	723	99.4
	Overall Percentage				88.4

a. The cut value is .500

RQ6 – What is the association between healthcare worker's individual, interpersonal, organizations, community and environment, society/public policy influences and COVID-19 full vaccination when controlling for age and gender?

$H_0$6: There is no association between healthcare worker's individual, interpersonal, organizations, community and environment, society/public policy influences and COVID-19 full vaccination when controlling for age and gender.

H_a6: There is an association between healthcare worker's individual, interpersonal, organizations, community and environment, society/public policy influences and COVID-19 full vaccination when controlling for age and gender.

To test the sixth set of hypotheses, a binary logistic regression was conducted. The predictor variables were the categories of race, healthcare worker's job title, household size, community connections, news source, interpersonal motivation, vaccine efficacy, vaccine safety, and potential side effect responses. The dependent variable was the COVID-19 full vaccination of participants while covariates were age and gender. The result of the binary logistic regression is presented in Table 18. The result showed that category 5 of race or African Americans (Wald = 4.318, $p = .038$), interpersonal motivation score (Wald = 9.368, $p < .001$) and vaccine safety (Wald = 8.314, $p < .001$) are significant predictors of COVID-19 full vaccination. However, the other predictor variables were not significant predictors of the COVID-19 full vaccination ($p > .05$). The Hosmer and Lemeshow test determined that the model was not significant in predicting the COVID-19 full vaccination of participants (Chi-square = 7.880, $p = .445$). The predictors also explained 48.2% of the variance in the dependent variable based on the Nagelkerke R square value. Moreover, the classification table presented in Table 19 showed that the model was able to classify 93.9% of the cases correctly.

Table 18

Binary Logistic Regression for Research Question 6

		B	S.E.	Wald	*df*	*p*	Exp(B)
Step 1[a]	Race			7.099	6	.312	
	Race(1)	-.848	1.135	.558	1	.455	.428
	Race(2)	-.124	.606	.042	1	.838	.884
	Race(3)	-.635	1.671	.145	1	.704	.530
	Race(4)	.606	.796	.579	1	.447	1.833
	Race(5)	-2.002	.964	4.318	1	.038	.135
	Race(6)	-.155	.801	.037	1	.847	.857
	HouseholdSize			3.716	5	.591	
	HouseholdSize(1)	.497	1.440	.119	1	.730	1.644
	HouseholdSize(2)	1.086	.820	1.755	1	.185	2.961
	HouseholdSize(3)	.122	.667	.034	1	.854	1.130
	HouseholdSize(4)	.832	.718	1.344	1	.246	2.298
	HouseholdSize(5)	.362	.741	.239	1	.625	1.437
	JobTitle			8.734	10	.557	
	JobTitle(1)	-.525	.685	.587	1	.444	.592
	JobTitle(2)	.473	1.151	.169	1	.681	1.605
	JobTitle(3)	.754	.779	.937	1	.333	2.125
	JobTitle(4)	-.632	.752	.707	1	.401	.532
	JobTitle(5)	-1.020	.791	1.662	1	.197	.361
	JobTitle(6)	18.312	10218.615	.000	1	.999	89657276.668
	JobTitle(7)	2.231	2.020	1.219	1	.270	9.308
	JobTitle(8)	.630	1.300	.235	1	.628	1.878
	JobTitle(9)	-.446	.878	.258	1	.612	.640
	JobTitle(10)	-.058	.696	.007	1	.934	.944
	NewsSource	.053	.071	.547	1	.459	1.054
	CommunityConnections	.035	.047	.567	1	.452	1.036
	InterpersonalMotivation	.164	.054	9.368	1	.002	1.178
	VaccineEfficacy	-.063	.236	.071	1	.790	.939
	VaccineSafety	.665	.231	8.314	1	.004	1.945
	PotentialSideEffects	-.416	.482	.744	1	.388	.660
	AgeCat			1.758	4	.780	
	AgeCat(1)	-.688	.704	.955	1	.329	.503
	AgeCat(2)	-.314	.604	.270	1	.604	.731
	AgeCat(3)	.031	.672	.002	1	.963	1.032
	AgeCat(4)	.108	.621	.030	1	.861	1.114
	Gender			14.030	5	.015	
	Gender(1)	23.203	40192.970	.000	1	1.000	11943134963.212
	Gender(2)	2.380	1.461	2.654	1	.103	10.802
	Gender(3)	2.735	1.448	3.567	1	.059	15.402
	Gender(4)	-1.855	1.956	.899	1	.343	.156
	Gender(5)	20.133	40192.970	.000	1	1.000	554024645.087
	Constant	-5.133	2.015	6.491	1	.011	.006

Table 19

Classification Table for Research Question 6

Observed			Predicted		
			Full Immunization with COVID 19 Vaccine		Percentage Correct
			No	Yes	
Step 1	Full Immunization with COVID 19 Vaccine	No	26	29	47.3
		Yes	7	532	98.7
	Overall Percentage				93.9

a. The cut value is .500

Summary

The purpose of this quantitative correlational, cross-sectional study was to examine the associations between healthcare worker job title, race, years in practice, perceptions of vaccine safety, perceptions of vaccine efficacy, perceptions of vaccine potential side effects, household size, marital status, number of school age children, interpersonal motivations, community connections, news source, and full COVID-19 immunization while controlling for age and gender. After excluding data with missing values and nonhealthcare professionals, a total of 621 participants were included in the analyses. About 24.2% of participants were 25 to 34 years old, 23.7% of participants were 45 to 54 years old, and 18.4% of participants were above 55 years old. For the race variable, a majority (59%) of the participants were Whites or not Hispanic. A total of 561 participants were fully vaccinated while 60 participants were not fully vaccinated with 2 doses of COVID 19 vaccine.

Binary logistic regression analyses were conducted to test the hypotheses posed in the study. The results showed that there is a significant association between perception of

vaccine safety and potential side effect and COVID-19 full vaccination. Thus, there is sufficient evidence to reject the null hypothesis which stated that there is no association between healthcare worker's individual influences and COVID-19 full vaccination when controlling for age and gender. The result of the analysis also showed that there is a significant association between interpersonal motivation and COVID-19 full vaccination. Therefore, there is sufficient evidence to partially reject the null hypothesis which stated that there is no association between healthcare worker's interpersonal influences (Interpersonal motivations and household size) and COVID-19 full vaccination when controlling for age and gender. Household size was not a significant predictor of COVID-19 full vaccination. The result of the third binary logistic regression showed that categories of healthcare worker job titles were not significant predictors of the COVID-19 full vaccination. Thus, there is insufficient evidence to reject the null hypothesis which stated that there is no association between healthcare worker's organizations influences (Healthcare worker job title) and COVID-19 full vaccination when controlling for age and gender. The fourth analysis showed that community connections score was a significant predictor of the COVID-19 full vaccination. There is sufficient evidence to partially reject the null hypothesis, which stated that there is no association between healthcare worker's community and environment influences (Community connections) and COVID-19 full vaccination when controlling for age and gender. The fifth binary logistic regression revealed that news source score is a significant predictor of COVID-19 full vaccination. The result showed that there is sufficient evidence to partially reject the null hypothesis which stated that there is no association between healthcare worker's

society and public policy (News source) and COVID-19 full vaccination when controlling for age and gender. Finally, the sixth analysis which included all predictor variables in the model determined that race, interpersonal motivation score, and vaccine safety were significant predictors of COVID-19 full vaccination. Thus, there is sufficient evidence to partially reject the null hypothesis which stated that there is no association between healthcare worker's individual, interpersonal, organizations, community and environment, society/public policy influences and COVID-19 full vaccination when controlling for age and gender. Chapter 5 will provide the discussions, conclusions, and recommendations for the study.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

COVID-19 vaccine attitudes and behaviors of essential workers, such as healthcare workers, are of utmost importance because of their proximity to individuals who have contracted COVID-19 and their ability to have a positive influence on the people in their care (Li et al., 2021). Although studies have investigated factors associated with healthcare workers perceived hesitant attitude toward the intention of receiving a future COVID-19 full vaccination, Li et al. (2021) suggested the need for further research that explores COVID-19 vaccine behaviors and factors associated with those behaviors. The purpose of this quantitative correlation study was to further examine the associations between healthcare worker job title, race, years in practice, perceptions of vaccine safety, perceptions of vaccine efficacy, vaccine potential side effects, household size, marital status, number of school age children, interpersonal motivations, community connections, news source, and full COVID-19 immunization while controlling for age and gender. Binary logistics regression analyses were conducted to test the hypotheses posed in the study.

This quantitative correlation study was conducted among a sample of 621 healthcare workers. Participants were asked whether they have full immunization with the COVID-19 vaccine. A total of 561 participants were fully vaccinated (90.3%) while 60 participants were not fully vaccinated with two doses of the COVID 19 vaccine (9.7%).

The following research questions and hypotheses guided this study:

RQ1 – What is the association between healthcare worker's individual influences and COVID-19 full vaccination when controlling for age and gender?

$H_0$1: There is no association between healthcare worker's individual influences and COVID-19 full vaccination when controlling for age and gender.

H_a1: There is an association between healthcare worker's individual influences and COVID-19 full vaccination when controlling for age and gender.

RQ2 – What is the association between healthcare worker's interpersonal influences (Interpersonal motivations and household size and COVID-19 full vaccination when controlling for age and gender?

$H_0$2: There is no association between healthcare worker's interpersonal influences (Interpersonal motivations and household size) and COVID-19 full vaccination when controlling for age and gender.

H_a2: There is an association between healthcare worker's interpersonal influences (Interpersonal motivations and household size) and COVID-19 full vaccination when controlling for age and gender.

RQ3 – What is the association between healthcare worker's organizations influences (Healthcare worker job title) and COVID-19 full vaccination when controlling for age and gender?

$H_0$3: There is no association between healthcare worker's organizations influences (Healthcare worker job title) and COVID-19 full vaccination when controlling for age and gender.

H_a3: There is an association between healthcare worker's organizations influences (Healthcare worker job title) and COVID-19 full vaccination when controlling for age and gender.

RQ4 – What is the association between healthcare worker's community and environment influences (Community connections) and COVID-19 full vaccination when controlling for age and gender?

$H_0 4$: There is no association between healthcare worker's community and environment influences (Community connections) and COVID-19 full vaccination when controlling for age and gender.

$H_a 4$: There is an association between healthcare worker's community and environment influences (Community connections) and COVID-19 full vaccination when controlling for age and gender.

RQ5 – What is the association between healthcare worker's society and public policy (News source) and COVID-19 full vaccination when controlling for age and gender?

$H_0 5$: There is no association between healthcare worker's society and public policy (News source) and COVID-19 full vaccination when controlling for age and gender.

$H_a 5$: There is an association between healthcare worker's society and public policy (News source) and COVID-19 full vaccination when controlling for age and gender.

RQ6 – What is the association between healthcare worker's individual, interpersonal, organizations, community and environment, society/public policy influences and COVID-19 full vaccination when controlling for age and gender?

$H_0$6: There is no association between healthcare worker's individual, interpersonal, organizations, community and environment, society/public policy influences and COVID-19 full vaccination when controlling for age and gender.

H_a6: There is an association between healthcare worker's individual, interpersonal, organizations, community and environment, society/public policy influences and COVID-19 full vaccination when controlling for age and gender.

Key findings from this study revealed for RQ1 that there was a significant association between the individual influences of perceived vaccine safety and potential side effects and the COVID-19 full vaccination ($p < .001$). For RQ2, there was a significant association between interpersonal motivation and the COVID-19 full vaccination ($p < .001$). For RQ3, there was no significant association between categories of healthcare worker job titles and receiving the COVID-19 full vaccination ($p > .05$). For RQ4, there was a significant association between community and environmental influence and the COVID-19 full vaccination ($p < .001$). For RQ5, there was a significant association between news sources/public policy in society and the COVID-19 full vaccination ($p < .001$). For RQ6, the most significant associations that were found to receiving the COVID-19 full vaccination were vaccine safety ($p < .001$), interpersonal motivation ($p < .001$), and race ($p = .038$).

Interpretation of the Findings

In this section, an interpretation of the findings of this study will be given that will discuss in further depth how these key findings answered the research questions. In the process, these key findings as previously noted will be discussed within the context that they confirm, disconfirm, or extend the related extant literature. These key findings will then be analyzed within the context of the theoretical framework.

Research Question 1

The key finding from this study that answered RQ1 indicated that there was a significant association between the individual influences of race ($p = .038$), perceived vaccine safety and potential side effects ($p < .001$), and the COVID-19 full vaccination among these healthcare worker study participants. Specifically, African Americans were 2.05 times more likely than other races to have full COVID-19 vaccination, and those with positive perceptions of vaccine safety were .79 times more likely to have full COVID-19 vaccination. This significant association between perceived vaccine safety and side effects and the COVID-19 vaccine may be explained by all these study participants working in the healthcare profession that focuses on caring for and protecting others. The most common factor relating to vaccine hesitancy found in the literature within the broader population was a concern for the safety of the vaccine (Biswas et al., 2021; Chu & Liu, 2021; Troiano & Nardi, 2021). This concern was generally attributed to the speed at which the vaccine was developed (Biswas et al., 2021). Bogart et al. (2021) also found that participants who reported hesitancy to receive a COVID-19 full vaccination were uncertain about the origins of the virus and lacked confidence in the

treatments for the disease and the government responses to the pandemic. Other factors that were recognized in the literature included potential side effects and doubts about the efficacy of the vaccine (Biswas et al., 2021). Specifically pertaining to healthcare workers, in a longitudinal study, Halbrook et al. (2022) found that attitudes toward vaccine uptake increased over time among frontline healthcare workers in California. Prior to vaccine rollouts, only 46.4% of participants expressed confidence in the vaccine's efficacy in protecting against the COVID-19 disease, and only one-third of participants intend to receive the vaccine at their earliest opportunity. Within 3 months following authorization for emergency use of COVID-19 vaccines, confidence in vaccine protection against COVID-19 rose to 90%, and 96% of participants had been vaccinated. Halbrook et al. attributed the changes in attitude toward COVID-19 vaccine uptake to vaccine accessibility through employer-sponsored vaccine distribution, as well as growing evidence of vaccine efficacy and increased confidence. Therefore, the first key finding of this study generally confirmed consensus in the existing literature that there were concerns about vaccine safety, potential side effects, and vaccine efficacy within the broader population and among healthcare workers.

The theoretical framework of this study is the social ecological model (SEM) that explores individuals' health behaviors (Bronfenbrenner, 1979; Ohri-Vachaspati et al., 2015). In SEM, levels that describe personal health behaviors are individual, interpersonal, organizational, community/environment, and society/public. The community/environment level may include personal thoughts, attitudes, and perceptions of vaccine safety, efficacy, and side effects (Bronfenbrenner, 1979; Ohri-Vachaspati et

al., 2015). Therefore, this first key finding that indicated there was a significant association between the individual influences of perceived vaccine safety and potential side effects and the COVID-19 full vaccination aligns with this theoretical framework of the significance of individual perceptions on their health behaviors as it pertains to healthcare workers and the COVID-19 full vaccination.

Research Question 2

The key finding from this study that answered RQ2 indicated that there was a significant association between interpersonal motivation ($p < .001$) and the COVID-19 full vaccination among healthcare worker study participants, with individuals having higher interpersonal motivation scores being .29 times more likely to have full COVID-19 vaccination. This significant association between interpersonal motivation and the COVID-19 vaccine may also be explained by all these study participants working in the healthcare profession that focuses on the interpersonal motivation of caring for and protecting others. No studies were found in the literature that specifically focused research on exploring interpersonal motivations and the COVID-19 full vaccination such as household size and personal relationships among healthcare workers or the general population. Therefore, this study's finding makes a valuable contribution to extending the literature and invites further research.

Regarding the theoretical framework for this study, the interpersonal level consists of an individual's immediate setting of their home and innermost circle of family and friends that includes household size, marital status, and number of school-age children, as well as perceptions of protecting others (Bronfenbrenner, 1979; Ohri-

Vachaspati et al., 2015). Interpersonal motivations were significantly associated with the COVID-19 full vaccination in this study. Therefore, the second key finding also aligns with this theoretical framework of the significance of interpersonal motivations as it pertains to healthcare workers and the COVID-19 full vaccination.

Research Question 3

The key finding from this study that answered RQ3 indicated that there was no significant association between categories of healthcare worker job titles ($p > .05$) and receiving the COVID-19 full vaccination among these healthcare worker study participants. This lack of a significant association between healthcare worker job titles and the COVID-19 vaccine may be reflective of the more significant interpersonal motivation within the study sample as previously noted that was greater than their job titles. Research in the literature that was conducted by Dooling et al. (2021) determined that the first group the ACIP recommended being vaccinated included all healthcare workers. The Department of Health and Human Services in the United States also issued a vaccine mandate that required certified providers and suppliers of Medicare and Medicaid to be fully vaccinated to include all healthcare workers in hospitals and long-term care facilities (Adashi & Cohen, 2022). However, despite this broad recommendation and mandate to include all healthcare workers, regardless of job title, other studies in the literature found that there was still a significant association between healthcare worker job title and the COVID-19 full vaccination.

Li et al. (2021) found that nurses were the least willing to receive the COVID-19 full vaccination when it became available compared to other healthcare workers. Reasons

for vaccine hesitancy among healthcare workers were similar to those in other studies and included concerns for safety, efficacy, and effectiveness of the vaccine, in addition to distrust of the government (Li et al., 2021). By contrast, physicians had a higher receptivity toward the intention to take the COVID-19 vaccine (Li et al., 2021). These findings of Lie et al. added support to the findings of Halbrook et al. (2022) about the concerns about the efficacy of the vaccine among frontline healthcare workers. An additional study in the literature that was conducted on the topic of healthcare workers and the COVID-19 full vaccination further concurred with Lie et al. that physicians were the most likely to receive a vaccination (Afzal et al., 2022). However, nurses had a higher rate of vaccination among healthcare workers than those who had the job titles of community outreach tracers or hospital police (Afzal et al., 2022). Niznik et al. (2022) also found that only 45% of healthcare assistants working in nursing homes, hospitals, assisted living centers, or in-home reported that they intended to get the vaccine when it became available.

Consensus was found in the literature that there was a significant association between healthcare worker job title and the COVID-19 full vaccination (Afzal et al., 2022; Lie et al., 2021; Niznik et al., 2022). This consensus was found despite the broad recommendation and mandate that all healthcare workers be vaccinated, regardless of their job title (Adashi, & Cohen, 2022; Dooling et al., 2021). Therefore, the third key finding of this study disconfirms the consensus found in the literature, inviting further research on this topic.

The theoretical framework for this study further describes other influences affecting the individual that exist at the organizational level such as job title and years in a profession (Bronfenbrenner, 1979; Ohri-Vachaspati et al., 2015). The third key finding indicated there was no significant association between categories of healthcare worker job titles and receiving the COVID-19 full vaccination. Therefore, this finding does not align with this theoretical framework as it pertains to job title. This lack of alignment may have occurred due to the greater significance these study participants gave to the interpersonal level of influence on their health behaviors rather than the organizational level of influence.

Research Question 4

The key finding from this study that answered RQ4 indicated that there was a significant association between community and environmental influences ($p < .001$) and the COVID-19 full vaccination among these healthcare worker study participants, with individuals having higher community connection scores being .26 times more likely to have full COVID-19 vaccination. This significant association between community and environmental influences and the COVID-19 vaccine emphasizes the interaction of healthcare workers with their communities and surrounding environment and helps to explain the significance of these influences, while these healthcare workers also have a significant influence in return on their communities. Studies in the literature that focused specifically on the association between community and environmental influences and the COVID-19 full vaccination were quite limited, and no studies were found that specifically focused on healthcare workers. However, Kricorian et al. (2021) found that

participants who believed the COVID-19 myths within their communities were more likely to believe COVID-19 vaccines were unsafe and were less willing to receive the vaccine. Those who believed in COVID-19 myths were generally less educated, of lower socioeconomic status, and geographically located in rural areas (Kricorian et al., 2021). Therefore, the fourth key finding of this study both confirmed and extended the literature with a specific focus on healthcare workers. Further research is clearly indicated though on this topic of the association between community and environmental influences and the COVID-19 full vaccination among the broader population and among healthcare workers.

The theoretical framework for this study also describes broader influences affecting the individual that exist at the community/environment level that may also include shared beliefs of reasons for being infected with COVID-19 among family, friends, church members, and other significant members of a community (Bronfenbrenner, 1979; Ohri-Vachaspati et al., 2015). The fourth key finding of this study indicated that there was a significant association between community and environmental influences and the COVID-19 full vaccination. Therefore, this finding aligns with this theoretical framework of the significance of community and environmental influences as it pertains to healthcare workers and the COVID-19 full vaccination.

Research Question 5

The key finding from this study that answered RQ5 indicated that there was a significant association between news sources/public policy in society ($p < .001$) and the

COVID-19 full vaccination among these healthcare worker study participants. Specifically, participants having a higher news source score were .32 times more likely to have full COVID-19 vaccination. This significant association between news sources/public policy in society and the COVID-19 vaccine further emphasizes the interaction of these healthcare workers with their environment that includes these broader societal influences as well. Multiple studies were found in the literature that explored the interaction of news sources/public policy in society and the COVID-19 full vaccination. Most experts agreed in new sources and supported public policy that this vaccination was vital to protecting the public against COVID-19 (Batteaux et al., 2022).

Yet, there was some disagreement as to what percentage of the population should be vaccinated to achieve herd immunity. Percentages range from as low as 60% (Randolph & Barreiro, 2020) to as high as 90% (Dong et al., 2020). However, critics in new sources of public policy vaccine mandates argued that there was not enough scientific evidence to support their usefulness and may negatively impact future vaccine uptake including routine immunizations (Bardosh et al., 2022). Participants were also more likely to believe information pertaining to COVID-19 and vaccines if the information was relayed by healthcare providers rather than by elected officials (Bogart et al., 2021). Murti et al. (2019) reported though that education, positive messages, and easily accessible vaccines yielded improved compliance with vaccine mandates, and healthcare workers who were mandated to receive influenza vaccines reported fewer sick days than those who abstained. Therefore, the fifth key finding of this study confirmed

general consensus in the literature that there was a significant association between news sources/public policy in society and the COVID-19 full vaccination.

According to the theoretical framework of this study, the society/public level includes elements of media news sources and public policy (Bronfenbrenner, 1979; Jalali et al., 2020; Ohri-Vachaspati et al., 2015). The fifth key finding of this study indicated that there was a significant association between news sources/public policy in society and the COVID-19 full vaccination. Therefore, this finding aligns with this theoretical framework of the significance of news sources/public policy in society as it pertains to healthcare workers and the COVID-19 full vaccination.

Research Question 6

The key finding from this study that answered RQ6 indicated that the most significant associations to receiving the COVID-19 full vaccination were perceptions of vaccine safety ($p < .001$), interpersonal motivation ($p < .001$), and race ($p = .038$) among these healthcare worker study participants, with being African American, having more positive perceptions of vaccine safety, and reporting more interpersonal motivations were associated with greater likelihood of having full COVID-19 vaccination. The most significant associations to receiving the COVID-19 full vaccination among these healthcare workers of perceptions of vaccine safety and interpersonal motivation are interrelated and may be explained by the nature of their profession that focuses on protecting and caring for others. Race may have emerged as an additional significant association to receiving the COVID-19 full vaccination among these healthcare workers due to the demographic mix of the study sample. As previously noted, there were

concerns about vaccine safety, potential side effects, and vaccine efficacy within the broader population and among healthcare workers from other studies that were found in the existing literature (Biswas et al., 2021; Bogart et al., 2021; Chu & Liu, 2021; Halbrook et al., 2022; Troiano & Nardi, 2021). However, as also previously noted, no studies were found in the literature that specially focused research on interpersonal motivation and its interaction with receiving the COVID-19 full vaccination among healthcare workers or the general population.

A few additional studies were found in the literature though relating to vaccine hesitancy and race during the COVID-19 pandemic. Vaccine hesitancy in the general population differed by race/ethnicity, age, income, and education (Rane et al., 2022). Results from this study further indicated that those who identified as vaccine-hesitant or vaccine refusers were generally younger, female, or Black in comparison to other age groups, genders, or ethnicities (Rane et al., 2022). However, Rane et al. (2022) also found that vaccine refusal by Black Americans decreased over time. Coe et al. (2022) concurred that Black Americans were less likely to receive this vaccine than Whites. Among healthcare workers, Afzal (2022) found as well that age, gender, and race were significantly associated with COVID-19 vaccine acceptance, and older adults, men, and Asians were most likely to accept this vaccine. Therefore, the sixth key finding of this study confirmed general consensus in the literature that there was a significant association between race and the COVID-19 full vaccination.

As previously noted within the context of the theoretical framework of this study, the community/environment level may include personal thoughts, attitudes, and

perceptions of vaccine safety, efficacy, and side effects (Bronfenbrenner, 1979; Ohri-Vachaspati et al., 2015). Therefore, the key finding of a significant association between individual perceptions of vaccine safety and the COVID-19 full vaccination among healthcare workers aligns with this theoretical framework. Also as previously noted, the interpersonal level consists of an individual's immediate setting of their home and innermost circle of family and friends that includes household size, marital status, and number of school-age children, as well as perceptions of protecting others (Bronfenbrenner, 1979; Ohri-Vachaspati et al., 2015).

Therefore, the key finding of a significant association between interpersonal motivation and the COVID-19 full vaccination among healthcare workers also aligns with this theoretical framework, Regarding the key finding of a significant association between race and the COVID-19 full vaccination among healthcare workers, according to the theoretical framework of this study, the individual level refers to demographic characteristics such as age, race, or gender that can influence personal health behaviors (Bronfenbrenner, 1979; Latkin et al., 2021; Ohri-Vachaspati et al., 2015). Therefore, this key finding aligns with this theoretical framework as well as it pertains to healthcare workers and the COVID-19 full vaccination.

Limitations of the Study

Limitations to generalizability and/or trustworthiness, validity, and reliability that arose from the execution of this study will now be discussed. Overall, there was strong generalizability for this study because of the relatively large sample size of 561 healthcare worker participants that also included a generalizable demographic mix, and

there were no recognized limitations. Regarding trustworthiness, there were no recognized limitations. Regarding validity, the external validity of this study was diminished by using a convenience sampling method instead of a random sampling method. The convenience sampling method consisted of accepting anyone who met the inclusion criteria. Therefore, external validity is limited, and findings should be interpreted with caution. A potential threat to both external and internal validity of the study was also associated with the specificity of the variables. Each variable in this study was represented by a single survey item that I developed, and no validated instruments were used. Furthermore, the variable names and what they represent may have been perceived differently by the study participants. Although such construct validity was a consideration, this consideration was mitigated by conducting a panel review of survey items for consensus validity and a pilot study for the data collection process. Regarding reliability, a limitation of this study was the use of a correlation design. According to Creswell and Creswell (2018), correlational designs cannot be used to infer causation. Self-report data was also utilized which is associated with response bias (Creswell & Creswell, 2018). However, I mitigated the potential influence of response bias by explaining in the informed consent document that all responses would be anonymous.

Recommendations

Recommendations for further research within the context of the strengths and limitations of the current study and the literature reviewed will now be discussed. This current study offered many strengths of a specific focus on healthcare workers and the COVID-19 full vaccination, more in-depth research on significant variables that interact

within the decision-making process of the choice of healthcare workers to receive or not receive this vaccination, and a relatively large sample size with a good demographic mix. However, several limitations to this study were noted that invite further research. Therefore, it is recommended that further studies on this topic utilize different types of research designs and methodologies to enhance validity and reliability such as studies with a random sampling method, validated instruments, that are noncorrelational, and that are qualitative or utilize a mixed method approach that does not completely rely on self-report data.

Several areas for further research were also recognized from the existing literature reviewed. No studies were found in the literature that specifically focused research on exploring interpersonal motivations and the COVID-19 full vaccination among healthcare workers or the general population. Therefore, further research is recommended on this topic among healthcare workers and the general population. The key finding from this study that answered RQ3 that there was no significant association between categories of healthcare worker job title and the COVID-19 full vaccination disconfirmed the consensus found in the literature that there was a significant association. Therefore, further research is also recommended on this topic among healthcare workers and their job titles and the COVID-19 full vaccination to better understand the deeper nuances of this discrepancy. Further research is recommended as well on the topic of the association between community and environmental influences and the COVID-19 full vaccination among the broader population and among healthcare workers due to the literature being very limited in this area.

Implications

On the individual level, providing deeper insight into the factors that influence healthcare workers' decisions to receive the COVID-19 vaccine offers the potential impact for positive social change by increasing the likelihood that healthcare workers will receive the COVID-19 vaccine and enhance their protection against this virus. In turn, their increased willingness to receive the COVID-19 full vaccination could potentially become a positive influence on their families to also receive this vaccination and for the people who are professionally in their care. Increased awareness of factors in the decision to receive the vaccine could potentially create the opportunity as well to invest in areas that may establish effective community-wide interventions with improved uptake of the COVID-19 full vaccination. Furthermore, examining the factors associated with COVID-19 vaccine acceptance among healthcare workers may lead to designing future successful communications and educational pathways that facilitate the potential impact for positive social change on the societal/policy level that could become necessary again, despite this pandemic currently waning, due to a possible resurgence of this virus with new variants.

Regarding methodological implications, there is a need for future studies as previously noted that will explore the research topic of this study with different types of research designs and methodologies to further enhance validity and reliability. Regarding the theoretical implications, this study makes a valuable contribution to the social ecological model (SEM) from its specific application to healthcare workers and the COVID-19 full vaccination, with findings from this study that consistently aligned with the tenets of this theoretical model overall that was useful in the interpretation of the

study findings and could also be applicable to future research on this topic. The only exception to this consistency was the finding pertaining to job title that invites further research to better understand the deeper nuances of these implications.

Recommendations for practice within the healthcare industry from the findings of this study to encourage even greater COVID-19 vaccine acceptance point to the imperative to send clear, consistent, and positive messaging that is factually based of the need to receive the COVID-19 full vaccination that will significantly reduce or eliminate any remaining concerns about the safety, side effects, or efficacy of this vaccine. This messaging must also be consistent though with public policy to be the most effective, and both the healthcare industry and public policy entities must be considered to be reliable news sources by healthcare workers. Intrapersonal factors such as race must also be considered among healthcare workers as well that will emphasize cultural inclusion and facilitate a greater understanding of how interpersonal and community factors influence their individual health behaviors.

Conclusion

The purpose of this quantitative correlation study was to further examine the associations between healthcare worker job title, race, years in practice, perceptions of vaccine safety, perceptions of vaccine efficacy, vaccine potential side effects, household size, marital status, number of school age children, interpersonal motivations, community connections, news source, and full COVID-19 immunization while controlling for age and gender. Key findings from this study emphasized the significance of perceptions of vaccine safety, interpersonal motivations, and race among these healthcare worker study

participants that were the most influential factors in their decision-making process of receiving full COVID-19 immunization. The COVID-19 vaccine attitudes and behaviors of healthcare workers can have a great impact on the broader population, particularly on those who have contracted COVID-19 and their ability to have a positive influence on the people in their care. Therefore, it is imperative that effective efforts continue to be made to reduce vaccine hesitancy among healthcare workers that are based on a deeper understanding of their attitudes and individual health behaviors that this study has helped to provide.

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Appendix A: Recruitment Post

Healthcare workers needed to partake in a survey for a COVID-19 dissertation study.

The link to the below is for a survey that is part of the doctoral study for Carrie VanZant, a Ph.D. student at Walden University.

There is a new study called *"Examining Factors Associated with COVID-19 Vaccination Rates Among Healthcare Workers"* that could provide information on the factors that influence healthcare workers' decision to receive the COVID-19 vaccine.
More information regarding the survey and how to participate is provided in the link.
About the study:

- One 10-minute online survey
- To protect your privacy, no names or personal identifiers will be collected
- You may change your mind and request to no longer be part of the survey

Volunteers must meet these requirements:

- Reside in the US
- 18 years old or older
- Healthcare workers who provide direct or indirect care
- Received 2 or more COVID=19 vaccines

To confidentially volunteer, click the following:
https://www.surveymonkey.com/r/GZVM9LR
or

Appendix B: Screening Questions

1. Are you above 18 years old?
   - ❑ Yes
   - ❑ No

2. Are you a healthcare worker residing in the United States?
   - ❑ Yes
   - ❑ No

3. Have you received two or more COVID-19 vaccinations?
   - ❑ Yes
   - ❑ No

Appendix C: Survey Question

You are invited to complete an anonymous survey by a Walden University student working toward a doctoral degree.

Study title: Examining Factors Associated with COVID-19 Vaccination Rates Among Healthcare Workers.
The purpose of this quantitative study is to examine the associations between healthcare worker, individual, interpersonal, organizational, community, environment society and public policy influences, and their full COVID-19 immunization while controlling for age and gender. The data collected from the survey questions will be analyzed using a numeric data procedure allowing the student to make inferences.

For this study, healthcare workers are individuals employed in the healthcare setting and who provide care to patients, including but not limited to the physicians, therapists, social workers and nurses.
There are a total of 20 questions and at any time you may stop participating. If all responses are not completed it will be assumed, you have decided to stop participation. You have the option to create a personalized alphanumeric code at the end of the survey. If at any time you wish to stop participation post your completion of the survey, you may send this personalized code to the research student who in turn will remove your survey responses from the research study.

Doctoral student name: Carrie VanZant
Doctoral student contact information: carrie.vanzant@waldenu.edu
Number of volunteers needed: 500
Avg time needed to complete the survey: 10 minutes

Volunteers must be:
Full COVID-19 vaccinated
18 or older
Living in United States
Healthcare Worker

Your role:
can end any time you wish
involves no more risk than daily life
involves no payment

Privacy:
To protect your privacy, the doctoral student will not collect, track, or store your identity or contact info.

In place of a consent signature, your completion of the survey would indicate that you consent to your responses being analyzed in the study.

Data will be kept secure by using password-protected devices and platforms. Data will be kept for a period of at least 5 years, as required by the university.

Use of your responses:
Your survey responses will be used for academic research purposes only. Once the doctoral student graduates, the study's results will be posted online in Scholarworks (a searchable publication of Walden University research). Anticipated benefit of this study is that it will provide insight into the factors that influence healthcare workers' decisions to receive the COVID-19 vaccine. This information has potential to be used for future intervention campaigns and may advance vaccine acceptance in the general population through a lens of diversity, equity and inclusion.

Protecting You:
This survey has minimal risks similar to those encountered in daily life. If you want to talk privately about your rights as a participant or any negative parts of the study, you can call Walden University's Research Participant Advocate at 612-312-1210 or email IRB@mail.waldenu.edu. Walden University's approval number for this study is IRB will enter approval number here and it expires on IRB will enter expiration date.

You might wish to retain this consent form for your records. You may ask the doctoral student or Walden University for a copy at any time using the contact info above.

1. Do you consent to participate?

- ◯ Yes
- ◯ No

Demographic Questions

* 2. I have received 2 or more COVID-19 vaccines?

- ◯ Yes
- ◯ No

* 3. How old were you on your last birthday?

* 4. Select one of the below options that most accurately matches how you identify.

- ◯ Male
- ◯ Female
- ◯ Nonbinary
- ◯ Transgender-male
- ◯ Transgender-female
- ◯ Prefer not to say

* 5. What is your present religion, if any?

- ◯ Protestant
- ◯ Roman Catholic
- ◯ Mormon
- ◯ Greek Orthodox
- ◯ Russian Orthodox
- ◯ Jewish
- ◯ Muslim
- ◯ Buddhist
- ◯ Hindu
- ◯ atheist
- ◯ agnostic
- ◯ something else
- ◯ nothing in particular

* 6. Select one of the below options that most accurately matches your race:

- ◯ African American
- ◯ Asian
- ◯ Latinx/Hispanic
- ◯ Native American
- ◯ Pacific Islander
- ◯ White/Not Hispanic
- ◯ Prefer not to say

* 7. Select one of the below options that most accurately matches your current relationship situation:

- ◯ Married
- ◯ Cohabitating with a partner
- ◯ Divorced
- ◯ Separated
- ◯ Single
- ◯ Prefer not to say

* 8. Including you, select one of the below options that most accurately matches how many people currently reside in your home:

- ◯ one person
- ◯ two people
- ◯ three people
- ◯ four people
- ◯ more than four people
- ◯ Prefer not to say

* 9. How many school age children live in your home?

* 10. Select one of the below options that most accurately matches your current work occupation?

- ◯ I am a healthcare receptionist
- ◯ I am a dietician
- ◯ I am a healthcare technician
- ◯ I am a social worker
- ◯ I am a counseling professional
- ◯ I am a dentist/hygiene professional
- ◯ I am a medical doctor/nurse practitioner
- ◯ I am a pharmacist
- ◯ I am a medical assistant
- ◯ I am a nurse
- ◯ I am a healthcare administrator
- ◯ I am not a healthcare professional

* 11. How many years have you worked in your profession?

COVID-19 Vaccine Questions

* 12. I most trust COVID-19 news and information coming from liberal media and news sources, such as, MSNBC, CNN, etc.

Not True	Somewhat Not True	Neutral	Somewhat True	Very True
◯	◯	◯	◯	◯

* 13. I most trust COVID-19 news and information coming from conservative media and news sources, such as FOX News, One America Network, etc.

Not True	Somewhat Not True	Neutral	Somewhat True	Very True
◯	◯	◯	◯	◯

* 14. I most trust COVID-19 news and information coming from government sources, such as CDC, WHO, etc

Not True	Somewhat Not True	Neutral	Somewhat True	Very True
◯	◯	◯	◯	◯

* 15. I most trust COVID-19 news and information coming from social media sources, such as Twitter, TikToc, FaceBook, etc

Not True	Somewhat Not True	Neutral	Somewhat True	Very True
◯	◯	◯	◯	◯

* 16. Select one of the below options that most accurately matches your response to the following statement: I believe the COVID-19 vaccine to be an effective preventative measure for contracting COVID-19.

Not True	Somewhat Not True	Neutral	Somewhat True	Very True
○	○	○	○	○

* 17. Select one of the below options that most accurately matches your response to the following statement: I believe the COVID-19 vaccine is safe to receive.

Not True	Somewhat Not True	Neutral	Somewhat True	Very True
○	○	○	○	○

* 18. Select one of the below options that most accurately matches your response to the following statement: I am concerned about experiencing side effects from the COVID-19 vaccination.

Not True	True
○	○

* 19. Select if you agree or disagree with the following statements:

	Strongly Agree	Mostly Agree	Neutral	Mostly Disagree	Strongly Disagree
I received monetary incentive for my COVID-19 vaccine	○	○	○	○	○
Members in my church are pro COVID-19 vaccination	○	○	○	○	○
My family members are pro COVID-19 vaccination	○	○	○	○	○
My closest friends are pro COVID-19 vaccination	○	○	○	○	○
My personal primary care provider is pro COVID-19 vaccination	○	○	○	○	○
My employment requires COVID-19 vaccination	○	○	○	○	○
COVID-19 vaccine status allows for easier access (travel, venues concerts, etc.)	○	○	○	○	○

* 20. Select if you agree or disagree with the following statements regarding the reason you received the COVID-19 vaccine:

	Strongly agree	Somewhat agree	Neutral	Somewhat disagree	Strongly disagree
I received a COVID-19 vaccine to protect my family	○	○	○	○	○
I received a COVID-19 vaccine to protect my neighbors	○	○	○	○	○
I received a COVID-19 vaccine to protect my co-workers	○	○	○	○	○
I received a COVID-19 vaccine to protect my patients	○	○	○	○	○

21. Optional: Create a unique alphanumeric code. (This will only be used if you contact the author post summiting your survey answers).

Thank you for your valuable time! Your confidential answers are greatly appreciated! If you would like to view the results of this study, they will be posted here: linkedin.com/in/carrievanzant/.

Appendix D: Codebook

1. Consent to participate: 1= yes, 2 = disqualify
2. I have received 2 or more COVID-19 vaccinations? 1=yes, 0=no (disqualify)
3. Age: 1= 16-24, 2= 25-34, 3= 35-44, 4=55 over, 0=prefer not to say
4. Gender: 1 = male, 2 = female, 3 = nonbinary, 4 = transgender-male, 5 = transgender-female, and 0 = prefer not to say
5. Religion Status 1 = Protestant, 2 = Roman Catholic, 3 = Mormon, 4 =Orthodox, 5 = Jewish Muslim = 6, Buddhist = 7, Hindu =8, atheist =9, agonistic =10, something else = 1, and 0 = nothing in particular
6. Race: 1 = White/Not Hispanic, 2 = Pacific Islander, 3 = Asian, 4 = Native American = 4, 5 = African American, 6= Latinx/Hispanic, and 0 = prefer not to say
7. Marital Status: 1 = married, 2 = cohabitating with a partner, 3 = divorced, 4 = separated, 5 = single, and 0 = prefer not to say
8. Household size: 1 = one person, 2 = two people, 3 = three people, 4 = four people, 5 = more than four people, and 0 = prefer not to say.
9. Number of school age children: 0 = 0, 1 = 1, 2 = 2, 3 = 3, 4= 4, 5= 5 or more
10. Work occupation title: 0 = non-healthcare professionals, 1 = healthcare receptionist, 2 = dietician, 3 = technician, 4 = social worker, 5 = counseling professional, 6 = dentist/hygiene professional, 7 = medical doctor/nurse practitioner, 8 = pharmacist, 9 = health assistant, 10 = nurse, 11=healthcare administration
11. Years in practice: 1 = < 1 years, 2 = 2-5 years, 3 = 6-8 years, 4 = 9-12 years, 5 = 13-17 years, and 6 = >18 years
12. News source liberal: 0 = Not True, 1 = Somewhat Not True, 2 = Neutral 3 = Somewhat True, 4= Very True
13. News source conservative: 0 = Not True, 1 = Somewhat Not True, 2 = Neutral 3 = Somewhat True, 4= Very True
14. News source government: 0 = Not True, 1 = Somewhat Not True, 2 = Neutral 3 = Somewhat True, 4= Very True
15. News source social media: 0 = Not True, 1 = Somewhat Not True, 2 = Neutral 3 = Somewhat True, 4= Very True
16. COVID-19 vaccine efficacy belief: 1= not true, 2=somewhat not true, 3=neutral, 4=somewhat true, 5=very true
17. Belief in self safety statement: 0=not true, 1=somewhat not true, 3= neutral, 4=somewhat true, 5=very true
18. Side effect concerns: 0 = Not true, 1 =somewhat true, 2 = concerned, 3= neutral, 4=somewhat true, 4 very true
19. Community Connections:
    a. monetary incentive 1= strongly agree, 2=somewhat agree, 3=neutral, 4=somewhat disagree, 5=strongly disagree

b. church 1= strongly agree, 2=somewhat agree, 3=neutral, 4=somewhat disagree, 5=strongly disagree
c. family 1= strongly agree, 2=somewhat agree, 3=neutral, 4=somewhat disagree, 5=strongly disagree
d. friends1= strongly agree, 2=somewhat agree, 3=neutral, 4=somewhat disagree, 5=strongly disagree
e. pcp1= strongly agree, 2=somewhat agree, 3=neutral, 4=somewhat disagree, 5=strongly disagree
f. employment1= strongly agree, 2=somewhat agree, 3=neutral, 4=somewhat disagree, 5=strongly disagree
g. ease of access in community 1= strongly agree, 2=somewhat agree, 3=neutral, 4=somewhat disagree, 5=strongly disagree

20. Interpersonal motivations:
    a. Protect family 1= strongly agree, 2=somewhat agree, 3=neutral, 4=somewhat disagree, 5=strongly disagree
    b. Protect neighbors 1= strongly agree, 2=somewhat agree, 3=neutral, 4=somewhat disagree, 5=strongly disagree
    c. Protect co-workers l1= not true, 2=somewhat not true, 3=neutral, 4=somewhat true, 5=very true
    d. Protect my patients = 1= strongly agree, 2=somewhat agree, 3=neutral, 4=somewhat disagree, 5=strongly disagree
21. Alphanumeric code