

2022

Sociodemographic Factors as Predictors of Low Influenza Vaccination in Chicago, Illinois

Ingrid L. Jeske
Walden University

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Walden University

College of Health Sciences and Public Policy

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Ingrid Lorena Jeske

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Walden University
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Abstract

Sociodemographic Factors as Predictors of Low Influenza Vaccination in Chicago,
Illinois

by

Ingrid Lorena Jeske

MS, Walden University, 2015

MD, Universidad Militar Nueva Granada, 2007

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

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Abstract

Outbursts of seasonal influenza contribute to morbidity and mortality in the United States. Influenza is a contagious disease caused by influenza viruses. The main subtypes of the influenza virus are Type A and Type B. Influenza vaccines are among the most effective methods in preventing the spread of the influenza virus because they offer the best immune defense. However, health care providers face significant challenges due to low patient compliance with current vaccine recommendations and misinformation. Scholars have yet to expand and further explore the reasons for the gap in influenza vaccination between White individuals and minorities, such as the non-Hispanic Black and Hispanic populations. Following the social cognitive theory as a theoretical framework, the research questions for this study tested the potential association between sociodemographic factors that might predict the lack of flu vaccination in racial minorities living in Chicago, Illinois. A logistical regression and chi-square test were used to answer the research questions. The data analysis showed that, in Chicago, there is a statistically significant association between annual household income, age group, and flu vaccine refusal among racial minorities. This study contributed to filling the gap in the literature regarding the social and environmental factors associated with flu vaccination uptake in Hispanic and Non-Hispanic Black adults living in the United States. The potential positive social change implications include the insight into how household income and age could relate to health behaviors and flu vaccination hesitancy among Hispanic and Non-Hispanic Black adults living in the United States and apply this knowledge to future vaccination practice promotion activities.

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Dedication

I want to dedicate this dissertation to my Heavenly Father, who made this dream come true. To my beloved husband, soul mate, and best friend, William Jeske, for his abundant encouragement, unconditional support, and patience during this journey. I also dedicate this dissertation to my parents, who believed in me and supported me with priceless educational opportunities. I dedicate this work and give my deepest thanks to my brothers in Christ, Ivan M. Torovich and Felix Bernate, for their spiritual guidance during my entire Ph.D. journey. I dedicate this dissertation to my son Julio Arthur, who was the source of my strength and inspiration at the end of this path.

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Chapter 1: Introduction to the Study

Seasonal influenza can cause illness in the American population, commonly during the fall, winter, and spring. Seasonal influenza impacts the health and lives of many people due to the severity of the acute respiratory effects of this virus (Hart, 2015). Seasonal influenza causes an acute infection that most commonly affects the upper and lower airways. The most common symptoms are fever, malaise, general body aches, and extreme fatigue (Hunter et al., 2020), which can last from 3 days to weeks. In addition, these symptoms can cause complications such as pneumonia, ear infections, exacerbations of chronic lower respiratory diseases such as asthma, and chronic obstructive pulmonary disease (Cheng et al., 2020).

Regardless of the significant advancements in the medical and public health fields, seasonal influenza continues to take the lives of thousands of people each year and increases school/work absenteeism in the United States (Sah et al., 2019). Published literature indicates that racial minorities represent a vulnerable population of work/school absenteeism and mortality due to the seasonal influenza (Yoshida et al., 2016). Given the persistently low influenza vaccination rates among the racial minority (Hispanic and non-Hispanic Black) adults in the United States, determining the association between sociodemographic factors and lack of influenza vaccination is a crucial step for a better interpretation of the extent and seriousness of the problem (Quinn et al., 2017).

This dissertation study focused on the potential association between sociodemographic factors that might predict the lack of influenza vaccination in racial minorities living in the South Lawndale community in Chicago, Illinois. Studies on

influenza immunization disparities in racial minorities are focused on national representative surveys and behavioral factors affecting immunization rates. However, this observational study focused on two racial minorities living in an ethnically diverse neighborhood and analyzes the sociodemographic factors that might predict low influenza vaccine intake to provide an idea about this important public health issue at a regional level. This study aimed to fill the gap in the literature in terms of the social and environmental factors that are associated with influenza vaccination uptake in Hispanic and non-Hispanic Black adults living in the United States. The potential positive social changes include the insight into how sociodemographic factors could relate to health behaviors and influenza vaccination hesitancy among Hispanic and non-Hispanic Black adults living in the United States.

This chapter describes the background of the study, the problem statement, and the purpose of the study. Additionally, this chapter describes the research questions and hypotheses, nature of the study, theoretical model, assumptions and limitations, and significance. This chapter ends with a summary and a transition to the literature review.

Background

Given the increasing incidence of the influenza among this study's target population, it is crucial to be aware of the problem's seriousness and implications. Determining the extent to which an association exists between sociodemographic factors, such as annual income, gender, and age group, that might predict the lack of influenza vaccination in racial minorities is crucial for developing effective health promotion interventions.

The literature reflects that seasonal influenza immunization coverage has been low among adult populations in the United States, particularly among African Americans and Hispanics (Bazargan et al., 2020; Freimuth et al., 2017; Jamison et al., 2019; Quinn, 2018; Quinn et al., 2019). Although the overall influenza immunization rate increased from 2010 to 2016 among ≥ 18 years old, this rate was still considered sub-optimal (Lu et al., 2019). Much of the published literature studying the low influenza vaccination intake among minority populations living in the United States recommends further research to understand the factors influencing influenza immunization behaviors among the U.S. adult non-Hispanic Black and Hispanic populations (Burger et al., 2018).

Quinn et al. (2017) provided a comprehensive review of the current evidence that supports the risk factors that play a role in the lack of influenza vaccination among high-risk Black and White adults and make a comparison between these two ethnic groups. Hughes et al. (2018) presented the results of a community-based study conducted in Chicago, Illinois, to evaluate the local-level adult and pneumococcal vaccination disparities. This publication provides a list of risk factors for immunization disparities in the population studied in this study research.

Vupputuri et al. (2019) took an approach called the Oaxaca-Blinder (O.B.) decomposition method that calculates the contribution of covariates to the difference or disparity in immunization between Hispanic, Non-Hispanic Black and Non-Hispanic White adults. The O.B. method helped the researchers identify factors that demonstrate a strong contribution to racial disparities in Influenza vaccinations. The study conducted for this dissertation had a similar objective as I sought to identify the risk factors and their

relationship to immunization disparities using a quantitative methodology. Conversely, Yue et al. (2018) aimed to evaluate the racial differential impacts of health care access in non-elderly adults. One of the health outcomes of Yue et al.'s study was receiving an influenza vaccine, which was the same health outcome studied by Vupputuri et al. (2019). Both sets of authors defined the influenza vaccination from diagnosis codes from electronic medical records or immunization cards. Yue et al. analyzed data from the Behavioral Risk Factor Surveillance System (BRFSS) for their study as well, whereas Vupputuri et al. analyzed a local database from Kaiser Permanente to address racial disparities in Influenza vaccination.

Publications by Vupputuri et al. (2019) and Yue et al. (2018) provide descriptive epidemiology for this study population and one of the independent variables that I considered, because both authors collected the data from similar data sets as this study and on the same target population. Moreover, some of the references used by Yue et al. and Vupputuri et al. to gather statistical data on national influenza outbreaks and vaccination uptake were considered for this study as well.

Scholars have yet to expand and further explore reasons for the gap in influenza vaccination between the White and other racial minority groups, such as the non-Hispanic Black and Hispanic populations. According to various authors, the cause for these racial/ethnic immunization disparities is difficult to explain because there are no clear social and health care system factors that might explain this immunization gap (Bleser et al., 2016; Hughes et al., 2018; Quinn, 2018). It is necessary to further study the data at a local level that involves minority sub-groups (viz., Hispanic and non-Hispanic

Black population) to develop further interventions to close that immunization gap in a community.

Problem Statement

Outbreaks of seasonal influenza contribute to morbidity and mortality in the United States. Influenza is a contagious disease caused by influenza viruses; the main subtypes of the influenza virus are Type A and Type B. These viruses cause the seasonal Influenza epidemics (Centers for Disease Control and Prevention [CDC], 2019). In 2018, there were between 250,000 to 500,000 deaths associated with influenza worldwide. On average, the death toll in the United States is approximately 41,000 per year (World Health Organization [WHO], 2018).

Some individuals are at a higher risk of serious influenza complications, including infants, the elderly, and people with chronic diseases (Crouse Quinn et al., 2017). Seasonal influenza vaccines have been available since 1942 for influenza A and soon after influenza B (Hunter et al., 2020). These vaccines have shown to be one of the most effective methods in preventing the spread of the influenza virus by offering the best immune defense. Moreover, seasonal influenza immunizations can reduce medical visits and missed school or workdays, as well as prevent influenza-related hospitalizations and deaths (Mammas et al., 2019).

Health care providers face significant challenges concerning seasonal influenza vaccination due to the patient's low compliance with current recommendations, misinformation, and complacency (Hunter et al., 2020). In the United States, influenza vaccination coverage during the 2015-2016 influenza season for 18 years and older was

42%, compared with the Healthy People 2020 target of 70% (Hunter et al., 2020).

Furthermore, Vupputuri et al. (2019) found that the influenza immunization rate in the United States was 47.1% in 2014 overall, and lower among non-Hispanic Blacks and Hispanics (43.8%) compared to White (48.5%). These rates suggest a gap in influenza immunization between Whites and minority populations (Hispanic and Non-Hispanic Black) and should be considered a public health issue in the United States.

During the review of the literature for this study, it was found that in the existing literature, there is a gap in the influenza vaccination rate between White Americans and racial minorities such as Hispanics and non-Hispanic Blacks (Lu et al., 2017). Many factors influence influenza vaccine uptake in adults living in the United States. The most stated factors in the literature were trust in the safety of the vaccine (Freimuth et al., 2017), confidence in their health care providers (Quinn et al., 2019), insurance coverage (Quinn, 2018), education level (Cordoba & Aiello, 2016), and racial consciousness (Quinn et al., 2017).

Purpose of the Study

The purpose of this cross-sectional study was to assess the influenza vaccine access and coverage among racial minorities (Hispanic and Non-Hispanic Black) living in Chicago, Illinois. Thus, this study aimed to evaluate the association between sociodemographic factors, such as gender, health insurance coverage, and annual household income, that might predict the lack of seasonal Influenza vaccination in racial minorities living in Chicago. Additionally, the differences in influenza vaccination status between minorities (Hispanic and Non-Hispanic Black) and non-Hispanic Whites in

Chicago was examined. I also evaluated the association between influenza immunization status and gender, regardless of ethnicity.

According to Crouse Quinn et al. (2017) multiple socioeconomic and demographic factors, including age, race, ethnicity, annual household income, and health insurance status, can influence vaccine choice. For this study, the dependent variable for influenza immunization was influenza vaccine status. The independent variables were sociodemographic factors (age group, gender, health insurance status, and annual household income level), ethnicity. This study was quantitative in approach. It involved retrospective data from public datasets that had been collected on the public health area of interest and target population in conjunction with existing data from other studies.

Research Questions and Hypotheses

RQ1: What is the association between mean annual household income, ethnicity, and seasonal Influenza immunization refusal in adults ages 18–69 living in Chicago, Illinois, in 2019?

H₁: There is no statistically significant association between mean annual household income and refusal to receive seasonal influenza vaccination in adults from ages 18–69 living in Chicago, Illinois.

H_{1A}: There is a statistically significant association between mean annual household income and refusal to accept seasonal influenza vaccination in adults from ages 18–69 living in Chicago, Illinois.

RQ2: What is the association between sociodemographic factors (annual household income, gender, age group, and health care access), and seasonal Influenza refusal in adults from ages 18–69 living in Chicago, Illinois, in 2019?

H2₀: There is no statistically significant association between sociodemographic factors (annual household income, age group, and health care access), and seasonal influenza refusal in adults from ages 18–69 living in Chicago, Illinois, in 2019.

H2_A: There is a statistically significant association between sociodemographic factors (annual household income, age group, and health care access), and seasonal influenza refusal in adults from ages 18–69 living in Chicago, Illinois, in 2019.

RQ3: Are there statistically significant differences in influenza vaccination status between Hispanic and Non-Hispanic Black and White between 18 years and older living in Chicago, Illinois, in 2019?

H3₀: There are not statistically significant differences in influenza vaccination status between Hispanic and Non-Hispanic Black and White adults from ages 18 years and older living in Chicago, Illinois, in 2019

H3_A: There are statistically significant differences in influenza vaccination status between Hispanic and Non-Hispanic Black and White adults from ages 18 years and older living in Chicago, Illinois, in 2019

Theoretical Framework for the Study

The theoretical framework for this study was the social cognitive theory (SCT) developed by Bandura (1989). This is a suitable theory for explaining the association between sociodemographic predictors of influenza vaccination uptake and immunization gaps among this population. Bandura stated that SCT is a multifactorial system that operates linked with goals, challenges, outcomes, and environmental, social behavior. This framework highlights the reciprocal determinism in the interactions of personal, behavioral, and ecological factors that influence how a person acts (Muncan, 2018).

The SCT offered further guidance in designing and implementing interventions or preventative programs by evaluating behavior changes influenced by the environment, personal and behavioral factors (Priest et al., 2015). This study aimed to expand the theoretical basis for the association between sociodemographic predictors and Influenza immunization gaps among the targeted population, comprised of Hispanic and Non-Hispanic Black from the South Lawndale community in Chicago, Illinois. For this study, the SCT was selected because it may help identify the predictors of lack of influenza immunization in the target population. Moreover, SCT is a theoretical framework with a predictor component of behavioral effects, motivations, and intentions that can explain the gap in influenza vaccination among the population living in the Southdale community in Chicago, IL.

Nature of the Study

This study aimed to determine if there are sociodemographic associations of Influenza immunization status among the targeted population in 2019, using a

quantitative retrospective cross-sectional study design using secondary surveillance data obtained from the CDC's BRFSS data collected from the state of Illinois. The BRFSS is the nation's first system of health-related telephone surveys that collect state data about U.S. residents regarding their health-related risk behaviors, chronic health conditions, and use of preventive services. For this study, the data were collected specifically from residents of the state of Illinois. The nature of this study was focused on socioeconomic status and demographic characteristics regarding how they translate to vaccine choice among the target population living in the South Lawndale community in Chicago, Illinois, in 2019. I used secondary BRFSS data to evaluate vaccine uptake or influenza vaccine status among the targeted population over the influenza season of 2019.

The population for this study included adults 18–69 years of age during 2019. I conducted a binary logistic regression to explore the relationship between influenza vaccination status, age group, gender, ethnicity, Hispanic/Latino, health insurance status, and annual household income. The dependent variable was influenza vaccine status: “During the past 12 months, have you had either a flu shot or an Influenza vaccine that was sprayed in your nose?” (yes or no), and it was considered a dichotomous variable. For independent variables, age was considered a categorical variable, divided into different age groups: 18 to 30 years of age, 31 to 45 years of age, 46 to 60 years of age, and 60 and over; gender was considered a categorical variable and divided into two groups: male and female; household income rates were determined using the variable annual household income, which was considered a continuous variable.

Definitions

The following terms gave the basis for the project constructs:

Disparity: An inequality in seasonal influenza prevention that happens when there is a low vaccine supply or delay in vaccination for vulnerable populations, causing a barrier to access (Lin et al., 2016).

Seasonal influenza: A vaccine-preventable disease caused by circulating Type A or B influenza virus by causing the person's immune system to (Hunter et al., 2020).

Seasonal influenza vaccine: A vaccine that is considered one of the best ways to help protect against influenza (CDC, 2019).

Sociodemographic factors: For this study, the following were considered as sociodemographic factors: age, gender, ethnicity, health insurance status, and annual household income (Patel et al., 2017).

Vaccine uptake: The acceptance and administration of a vaccine that belongs to an immunization program (Quinn et al., 2019)

Racial Minorities: "Anyone other than a non-Hispanic Whites, including Asian Americans, Black or African Americans, Hispanics or Latino, Native Hawaiians and Other Pacific Islanders, American Indians and Alaska Natives" (Hong et al., 2018, p. 1278).

For this study, non-Hispanic Whites, non-Hispanic African Americans and Hispanics were considered. The dependent variable was the influenza vaccine uptake. The independent variables included age group, gender, ethnicity, Hispanic/Latino, health insurance status, and annual household income level.

Assumptions

One assumption of this study was that the sample of racial minorities participants of the 2018 BRFSS survey represent the population that lives in the South Chicago metro area. The BRFSS survey participants were selected randomly and contacted via phone to complete the survey questionnaire, to ensure population representativeness of the target population (Health et al., 2018). Furthermore, an additional assumption is that the participants' selection and the data collection process were made according to the CDC's human research protection policies (CDC, 2019). Lastly, another assumption is that the data collected in the BRFSS of 2018 is reliable, valid, and accurate.

For the statistical analysis, the following assumptions were considered: (a) linearity between the continuous independent variables and the logit transformation of the dependent variable (Pezzullo, 2013), an assumption I tested through the Box-Tidwell approach; (b) multicollinearity, which was tested by assessing the correlation coefficients and tolerance/VIF values; and (c) significant outliers, which were tested using case-wise diagnostics (Pezzullo, 2013).

Scope and Delimitations

The present study evaluated sociodemographic factors that might predict influenza vaccination in racial minorities living in the South Lawndale community in Chicago, Illinois. The analyses were conducted on secondary data originating from the 2019 BRFSS survey. The study population included Hispanic and non-Hispanic Black population 18–69 years old living in the South Lawndale community in Chicago, Illinois; ZIP Code 60623. Non-Hispanic White Americans were considered for comparison

purposes. This focus was chosen due to the limited number of primary studies conducted on predictors of low influenza vaccination in racial minorities at a community level (Crouse Quinn et al., 2017) using a national survey such as the BRFSS. This study was delimited to the population living in the South Lawndale community in Chicago, Illinois. Therefore, the results are expected to be valid and generalizable to the specific ethnicities in which the original data from the BRFSS were conducted. The results might not be generalized to other populations such as racial minorities living outside of the United States or living in rural areas of the United States as the selected population reside in a suburban area of the state of Illinois.

Limitations

There are several study limitations to consider with this study. First, this study used secondary data, which is associated with its own limitations. The survey itself might have some limitations due to the way the information was collected. For example, the measurement of vaccination coverage was gathered from self-report, which may be subject to recall bias (Hughes et al., 2018). Researchers have no control over the way data are collected when using secondary data. Issues of reliability may arise with secondary data, which may be subject to political agendas of the organizations that gathered the original data, and thus, these biases may transfer into analyses. Another potential barrier in using secondary data is that the data accessed may include a partner-site agreement and possible fees for accessibility.

Additionally, this study might be subject to errors such as recall bias. Recall bias occurs when participants do not recall past experiences as well as others; hence, the

reliability of their answer can be impacted (Bednarz et al., 2020). One way to improve the validity of the data obtained is to corroborate the results of this study with findings in the literature review. Another strategy to address the limitation in this study includes a comprehensive literature search strategy to avoid bias in study identification and selection. Another strategy to avoid bias includes not looking at the data in the 2019 BRFSS before it is time for data analysis.

Significance

The lack of influenza vaccine is a significant problem to investigate because there is not much research published on vaccination disparities on racial minorities (Hispanic and non-Hispanic Black population) in the United States. In the middle of the SARS-CoV-2 (COVID-19) pandemic, developing a vaccine became a priority. However, there is a possibility that the same factors that contribute to the decreased influenza immunization in the Hispanic and non-Hispanic Black population might also contribute to the low vaccination rate for COVID-19. This study was significant because it identified a gap in the current knowledge base about the decreased influenza immunization among Hispanic and non-Hispanic Black populations. Furthermore, researchers have yet to expand the relationship between influenza vaccination and low vaccination among Hispanic and non-Hispanic Black people.

The-social change implications of this study include the recognition of social and environmental factors that increase influenza immunization disparities among Hispanic and non-Hispanic Black populations living in the South Lawndale community in Chicago, Illinois. The analysis of these factors associated with immunization gaps in

adults can improve vaccine recommendations, decrease immunization differences, and improve immunization policies. The findings of this research may lead to increased awareness of the influenza virus immunization gaps in racial minorities in the United States. This study added to the current literature about the associations between sociodemographic factors that might influence flu vaccination disparities among the Hispanic and non-Hispanic Black population living in Chicago.

Summary

The prevalence of low influenza immunization among racial minorities living in the United States keeps being a public health issue regardless of the increased access to the Influenza vaccine to different country areas. Various published studies have been done to understand the association of Influenza vaccine intake and sociodemographic factors in racial minorities living in the United States. However, studies focused on the specific predictors of lack of immunization at community levels in racial minorities living in the United States lack. This study aimed to understand the predictors of lacking and low influenza vaccine intake on the target population by running a multiple regression model. Determining these predictors and understanding the magnitude and severity of association between the identified predictors of lack of influenza vaccine uptake is a necessary step before developing appropriate interventions to deal with the persistent issue of vaccine hesitancy and low vaccine uptake by racial minorities in this country, not only influenza vaccine but also COVID-19 vaccine uptake.

This chapter presented the study's background and purpose, problem statement, and research questions with the related hypothesis. A summary of the assumptions,

scope, and limitations were discussed as well. The summary ended with a brief description of the significance of the study and the study implications for social change. In Chapter 2, I present the literature review that supported the planned research and the relevant peer-reviewed published studies evaluating the low vaccination intake among minorities living in the United States.

Chapter 2: Literature Review

In Chapter 1, I introduced the subject of influenza and the influenza vaccine. This chapter will cover the literature review strategy, theoretical model of the study, description of the seasonal, and its complications. This will be followed by a description of the outcomes of low vaccination uptake, risk factors, and consequences of low vaccination coverage. The final section includes a review of the methodologies of research and a rationale for using a multiple regression analysis for this study, followed by a summary and conclusions of this chapter.

Influenza infection is a critical concern in public health because of the virus's virulence and high infectivity responsible for seasonal influenza. The influenza virus can cause serious complications that can be life-threatening. According to Petrova and Russell (2018), seasonal influenza viruses infect 5%–15% of the population each year, resulting in ~500,000 deaths globally. The yearly occurrence of the seasonal influenza is the result of the constant transformation of the influenza virus (Petrova & Russell, 2018).

This virus can escape the immunity obtained by previous seasonal influenza vaccines because of the viruses' continuous evolution and its ability to infect humans efficiently (Petrova & Russell, 2018). That is why it is necessary to develop seasonal influenza vaccines every year to prevent the spread and further complications of the virus (CDC, 2019). The peak of seasonal influenza infections occurs mostly from October through March in the United States. During influenza season, an influenza virus spreads at a fast pace, causing increased morbidity and mortality in the United States. (Hart, 2015). Influenza can be deadly for vulnerable individuals.

Influenza infection is also considered a vaccine-preventable disease (Álvarez et al., 2019). However, there is a need to administer the influenza vaccine annually to keep up with the different mutations from the virus and the documented decline of the immunity that comes from the vaccination (Álvarez et al., 2019). The influenza vaccine's inconsistency in annual uptake leads to an increase in school and work absenteeism and increased hospital admissions during peak influenza season.

The literature has documented that influenza immunization coverage has been low among adult populations in the United States, particularly among non-Hispanic Black and Hispanic populations. Although the overall influenza immunization increased from 2010-2016 among ≥ 18 years old, it was still considered sub-optimal (Lu et al., 2019). Most of the published literature studying the low vaccination intake among minorities living in the United States recommends further research to understand the factors influencing influenza immunization behaviors among the United States adult non-Hispanic Black and Hispanic populations.

This study's objective was to evaluate the association between sociodemographic factors that might predict the lack of Influenza vaccination in racial minorities living in the South Lawndale community in Chicago, Illinois. Additionally, the association between being a minority (Hispanic and Non-Hispanic Black) and higher incidence and mortality by influenza in the South Lawndale community in Chicago was evaluated. Given the increasing incidence of influenza among this study's target population, it is crucial to be aware of the problem's seriousness and implications. Determining the extent of association between sociodemographic factors, such as annual household income, age

group, health insurance status, and ethnicity, might help predict the lack of influenza vaccination in racial minorities, which is a crucial starting point for developing effective health promotion interventions.

Literature Review Strategy

Publications utilized in this literature review were retrieved electronically from different databases, journal websites, dissertations, and references from relevant articles. I used the following databases for the published literature review: MEDLINE, Proquest, EMBASE, PsycINFO, and publishers' databases, such as Elsevier and Springer. Google Scholar and the National Center of Biotechnology (NCBI) were also consulted to retrieve relevant literature for this review. Boolean operators in addition to the literature search helped minimize the irrelevant literature and improve the obtaining more relevant relative. Another filter added was that only peer-reviewed articles be part of the search results.

The databases were searched for publications from January 2016 to January 2021, except for theoretical and conceptual information publications. The following keywords and terms were used to explore the databases: *influenza vaccine, seasonal flu/influenza, vaccination, health disparities, Hispanic and Non-Hispanic Blacks, Behavioral Risk Factor, Surveillance System, BRFSS, refusal of the Influenza vaccine, Illinois, United States, sociodemographic factors, annual household income, health insurance status, race, and Social Cognitive Theory or SCT*. The results led to studies about adult flu vaccination, rejection of the vaccine, perceptions of influenza vaccination, immunization gaps among minorities, and health behaviors related to influenza vaccine intake. The

publications that addressed one or more of those subjects were considered in this literature review.

The literature search was limited to articles published in the English language. Items in different languages were excluded. Internet sites such as the CDC and WHO were also consulted for relevant information on the main topic, epidemiology data, and relevant research. Lastly, a comprehensive literature review was done to define the appropriate conceptual model for this study described in the next section.

Theoretical Foundation

A suitable framework for explaining the association between sociodemographic predictors and influenza immunization gaps among the targeted population was the SCT developed by (Bandura, 2004). Bandura (1989) stated that SCT is a multifactorial system that operates linked with goals, challenges, outcomes, and environmental, social behavior. SCT focuses on a core set of determinants such as knowledge of health risks, perceived self-efficacy, outcome expectations, health goals, and perceived facilitators and impediments to the changes an individual is seeking (Bandura, 2004).

The SCT originated from the social learning theory (SLT) by Bandura in the 1960s. It started with a series of trials involving an inflatable clown or Bobo doll to discover how children learn aggressive behaviors (Nabavi, 2012). These experiments showed the value of modeling for developing new behaviors. Bandura published the results of these initial studies in 1977 and extended knowledge on the concept of how new behavior is acquired, therefore expanding on the SLT (Bandura, 1989). The SLT evidenced that a direct correlation exists between an individual's perceived self-efficacy

and change in behavior. The four sources that contribute to self-efficacy, according to Bandura (1989), are performance accomplishments, verbal persuasion, vicarious experience, and physiological states.

From the SLT, Bandura expanded more in the social component of learning because the early theories stated that behavior was an outcome of a person's environment or the interaction between an individual and their environment (Nabavi, 2012). Later, Bandura renamed and expanded the SLT to SCT because it highlights the important role cognition plays in determining and executing behaviors (Bandura, 1989, 2004). Furthermore, SCT is a theory based on a person's knowledge from observing other people's behavior in certain environments, with a specific action or both. According to (Bandura, 2004), the behavior itself influences an individual and the individual's environment. These complex and reciprocal interactions between a person, a setting, and an action are defined as reciprocal determinism.

The SCT focuses on the factors that affect a person's health behaviors. These factors are the person's experiences, other people's actions, and their environment (Myrick, 2017). When applying the SCT to social research, SCT delivers the opportunity to achieve a behavior change using self-efficacy, expectations, and observational learning. According to (Bandura, 2004), the following components of the SCT are essential to achieve a health behavior change in an individual:

- self-efficacy: when a person believes they have control over behavior, and hence is capable of executing it

- expectations: deciding the result or consequences of behavior and the belief that behavior will direct to a specific outcome
- behavioral capacity: comprehending and being able to execute a behavior
- expectancies: value the ending results of changing behavior
- self-control: controlling personal behavior
- observational learning: observing the results of someone else executing the preferred behavior
- reinforcements: creating ways to motivate and reward behavior change

During the literature review related to the SCT application as a theoretical framework, different authors reported studies where the SCT was successfully applied towards exploring the predictors of receiving a vaccine such as the human papilloma virus (HPV). However, only two studies were done specifically on flu or influenza vaccination, showing a gap in the literature for the prediction of Influenza vaccination according to the theoretical framework of SCT. Su et al. (2019) adopted the SCT in their study to understand the motivators and behavioral expectations for individuals to get the influenza vaccine. More specifically, the authors adopted the SCT to study a person's behavior towards getting the Influenza vaccine. Su et al. found that influenza vaccine adoption is encouraged by individual and environmental factors such as health beliefs regarding vaccine administration and perceived benefits from the vaccine. The component that was found to explain why people would have higher vaccine intake was behavioral expectations (Su et al., 2019).

Yang (2015) implemented the SCT framework in their research to evaluate the social cognitive factors that influence the H1N1 influenza vaccination intentions of college students nationwide in the United States. The author also explored other theories, such as planned behavior theory and the health belief model. The key variable of the SCT that explained the motivation to get the influenza vaccine was self-efficacy because it influenced an individual's adoption of the influenza vaccine (Yang, 2015). The author concluded that most of the study participants had more willingness to get vaccinated had a more positive mindset towards the vaccine.

Based on the published literature about studies adopting the SCT to help predict influenza vaccination and the review of the components of the SCT key factors, those factors can be applied to indicate refusal of influenza vaccination in racial minorities as follows:

- Self-efficacy: An individual believes that a person can get the influenza vaccine voluntarily (Yang, 2015). However, Kamimura et al. (2017) stated that self-efficacy is driven by a person's beliefs related to the health outcomes of being vaccinated.
- Observational learning: An individual will get the influenza vaccine if he or she observes that someone else got the vaccine and did not get sick with the Influenza (Kamimura et al., 2017)
- Behavioral expectation: The person decides to get the Influenza vaccine because of external motivators such as access to healthcare (Su et al., 2019).

Table 1 displays how the variables of this study relate to the theoretical construct of the SCT.

Table 1

Theoretical Construct and Study Variable Relationship

Theoretical construct	Study variable(s)
Personal	Age group, gender, race
Behavioral	Influenza vaccine uptake/Immunization status
Environmental	Health insurance status and annual household income

For this study, I selected the SCT because it may help identify the predictors of lack of influenza immunization in the target population. Other authors have used the SCT to predict vaccination intentions among different people. According to Priest et al. (2015), SCT is an important theory for developing immunization-related interventions because the SCT framework aims to predict the role of an individual's environment influence on behaviors. Moreover, SCT is a theoretical framework with a predictor component of behavioral effects, motivations, and intentions that can explain the gap in influenza vaccination among Hispanic and non-Hispanic Black populations living in the Southdale community in Chicago, Illinois. The following section of this chapter discusses the target population, influenza and the influenza vaccine, the burden of lack of influenza vaccination in the target population, and the possible health outcomes.

Literature Review Related to Key Variables and Concepts

This objective of this literature review was to provide a comprehensive insight into the currently published information regarding this study topic. This study aimed to

evaluate the association between sociodemographic factors that might predict lack of influenza vaccination in racial minorities living in the South Lawndale community in Chicago, Illinois. For this study, the dependent variable is influenza vaccination status; the independent variables are the possible factors that predicted a lack of influenza vaccination, such as ethnicity, health insurance status, and annual household income level.

Influenza

Influenza, most known as the flu, is a viral infectious disease that affects all age groups, particularly during the cold temperature season (Hunter et al., 2020). Influenza causes complications that can be deadly in vulnerable individuals like pregnant women, the elderly, and persons with a compromised immune system (Moghadami, 2017). Even though most of the cases recover within a week from the onset of symptoms, influenza is responsible for high rates of work and school absenteeism and a burden to the health care system due to the increase of hospitalizations because of influenza complications during influenza season (Álvarez et al., 2019). According to Sah et al. (2019), over the last 11 years, there has been an average of 28.41 million cases, 461,111 hospitalizations, and 40,500 influenza-related deaths each year in the United States. It is estimated that influenza's financial burden is about \$5.8 billion dollars yearly, which accounts for 65% of the healthcare cost burden.

Influenza Transmission and Symptoms

The virus responsible for the seasonal flu enters its human host through upper and lower respiratory airways via the epithelial cells of the trachea, bronchioles, and bronchi

using a glycoprotein that attaches to the epithelial cells of the host (Hart, 2015). Once the virus binds to the epithelial cells using its glycoprotein, known as the globular head of hemagglutinin (HA), it starts replicating in the airways causing the infection and symptoms. The influenza viral infection causes swelling of the respiratory tract and overproduction of mucus. Once the virus colonizes different tissues of the host, the person starts having symptoms of influenza that might include fever, headache, generalized body aches, and respiratory symptoms (cough, runny nose, and sore throat) (Hart, 2015). Symptoms usually last 5–10 days.

Influenza Prevalence and Complications

It has been described in published literature that seasonal influenza has caused millions of illnesses, about an average of 475,00 hospitalizations and approximately 40,500 deaths in the United States in the last 5 years (Chu et al., 2020). The calculation of the seasonal flu can be challenging as not everyone infected seeks medical care, particularly the racial minorities group due to the associated lower access to health care (Bleser et al., 2016). Uyeki (2020) stated that non-Hispanic Blacks and Hispanics are considered a high-risk group for influenza complications. From 2009 to 2019, non-Hispanic Black people had the highest influenza hospitalization rates, followed by non-Hispanic American Indian or Alaska Native people, then Hispanic, and in last place non-Hispanic White individuals (Uyeki, 2020).

According to Almario et al. (2016), there is a significant racial disparity in access and coverage for the influenza vaccine among adults living in the United States, meaning that non-Hispanic Blacks and Hispanics are less likely than non-Hispanic Whites to receive

the annual influenza vaccine. The gaps identified by Almario et al. include lack of access to healthcare, racism, lack of trust in healthcare providers and their recommendations, and education level.

Influenza Vaccine

The Influenza is a vaccine-preventable disease Citation here. Since 2010, the CDC and the CDC's Advisory Committee on Immunization Practices (ACIP) recommend that routine Influenza vaccine be administered annually to all individuals \geq six months of age who do not have any contraindications to obtain the vaccination (Grohskopf et al., 2020). Contraindications include previous severe allergic reaction to any ingredient of the Influenza vaccine, allergic reaction to aspirin or current treatment with aspirin, immunocompromised patients, and having received influenza antiviral medication 48 hours before the vaccine (Grohskopf et al., 2020).

Various factors affect the Influenza vaccine's effectiveness, such as age, health, type of vaccine, and viral mutations. Even though there is variability in the vaccine's effectiveness, Influenza immunization protects from severe Influenza disease and its complications. The Influenza vaccine works by targeting the HA. According to (Sah et al., 2019), the efficacy of the vaccine depends on a good match between the antigens present in the vaccine and those that are part of the influenza strains.

The Influenza vaccine prevented an estimated 1.6-6.7 million influenza virus illnesses during Influenza seasons from 2011 through 2016, 790,000–3.1 million doctor's office visits, 39,000–87,000 hospital admissions, and 3,000–10,000 respiratory and cardiovascular deaths each Influenza season in the United States (Grohskopf et al., 2020).

However, during the 2017 to 2018 Influenza season, there were higher numbers of infections, medical office visits, and hospital admissions than the previous years. Still, Influenza vaccines prevented about 7.1 million Influenza-related illnesses, 3.7 million outpatient medical office visits, 109,000 hospital admissions, and 8,000 deaths (Grohskopf et al., 2020), with an overall vaccine efficacy of only 38%.

The efficacy of the seasonal Influenza vaccine ranges from 19-60% during the same period, according to Sah et al. (2019). Therefore, the National Institute of Allergy and Infectious Disease (NIAID) identified the need to develop a more universal and efficacious Influenza vaccine. A “universal” vaccine can be a solution to some of the seasonal vaccine shortcomings due to the high antigen variability of the Influenza virus. Sah et al. proposed that a universal vaccine will have the capability to provide longer protection against seasonal influenza and its strain variants by decreasing the need for a new vaccine development each year. Currently, the seasonal Influenza vaccine antigens are re-manufactured every year to keep up with the Influenza virus’s antigen variability. The goal of a universal vaccine is to provide lifelong protection against not just the seasons but the possible future strains of the Influenza that could cause a pandemic. However, the development of a universal vaccine is still in pre-clinical phase trials and clinical studies are under development (Ben-Yedidia et al., 2017).

Influenza Vaccination Challenges

Throughout the literature review on the research topic, there were different challenges related to the influenza vaccine, such as financial burden, effectiveness challenges, and low rate vaccination. Ozawa et al. (2016) aimed to identify the extent of

the financial burden associated with the lack of Influenza vaccination by reviewing all the costs related to vaccine-preventable diseases in U.S. adults. The authors suggested that the low vaccination among adult U.S. residents leads to a financial burden due to increased morbidity and mortality. Ozawa et al. (2016) found that the annual economic burden is approximately \$9 billion dollars per year related to vaccine-preventable diseases, such as the Influenza. Ozawa et al. suggested that the result only called for policies that aim to increase vaccine intake by adults, decreasing the financial burden of lack of immunization in adults.

Data reviewed from published literature stated that the influenza vaccination rates among all U.S. residents were below the goals of Healthy People 2020. Due to the reported low rates of influenza vaccinations that keep below the US Federal Government of 70%, Nowak et al. (2018) evaluated the health beliefs and experiences associated with Influenza vaccination among US adults (19 and older). The authors used a survey of 1,005 US adults from the National Opinion Research Center's AmeriSpeak Panel (Nowak et al., 2018). The authors found that the Influenza immunization rate from the 2016-2017 Influenza season was only 42.3%, with rates even lower for Hispanic survey respondents and higher within non-Hispanic White because they were the ones with the least awareness of the immunization recommendations. Nowak et al. also found the low rates of Influenza immunization result from inadequate knowledge of the benefits of the Influenza vaccine and not much convinced of the vaccine safety. The authors recommended increasing Influenza immunization awareness about recommendations and

benefits among high-risk patients for severe influenza illness of all ethnic groups residing in the US.

Influenza Vaccine in U.S. Hispanic and Non-Hispanic Black Populations

It was found during the review of the existing literature that racial inequalities in Influenza vaccination persist amongst minorities living in the United States. Bazargan et al. (2020) conducted a community-based cross-sectional study that included 620 African American adult participants to evaluate the factors associated with the low Influenza immunization rates in underserved African American adults living in Los Angeles County. The authors analyzed the collected data using multiple regression and found that only 49% of the study participants received the Influenza vaccine during the past 12 months. Moreover, the authors found that adults older than 65 years living in South Los Angeles have never been immunized against the Influenza within their study population.

Bleser et al. (2016) reported that low Influenza vaccination in the United States could result from racial disparities regardless of the adult immunization recommendations. Bleser et al. hypothesized that the perceived discrimination in healthcare is a factor that could explain Influenza immunization disparities among racial minorities. The authors collected data from a nationally representative survey on healthcare, with a sample size of 8,127. Logistic regression was used to evaluate the relationship between ethnicity and Influenza immunization and binary mediation to assess the significance of the relationship between perceived discrimination in healthcare and influenza vaccination. The results showed that perceived discrimination in healthcare reduced Influenza vaccine intake by 50% compared to those who did not perceive

healthcare discrimination. Bleser et al. recommended doing further research with a multifactorial approach as the causes of persistent racial disparities are multifaceted and not attributed to just one factor.

Another study highlighted the racial disparities in influenza vaccination in the United States and used nationally representative data collected specifically to evaluate the H1N1 Influenza vaccine intake. Burger et al. (2018) evaluated how race and gender influence the beliefs and health behaviors about the H1N1 vaccination among non-Hispanic Blacks and non-Hispanic Whites. The authors assessed the differences in beliefs about the effectiveness and safety of the H1N1 vaccine in their study target population. The data was analyzed using logistic regression to evaluate if race and gender are statistically significantly influenced by health beliefs, socioeconomic status, pre-existing conditions, and healthcare access. Similar to Bleser et al. (2016), the results reflected that non-Hispanic Blacks of both genders expressed more hesitancy about the safety and effectiveness of the H1N1 Influenza vaccine (Burger et al., 2021). Additionally, the authors found that Black women had the lowest odds of vaccination when compared to Black men, White women, and White men who participated in the survey. Burger et al. and Bleser et al. suggested that the lessons learned from their studies should be applied to promote the COVID-19 vaccine on racial minorities proactively.

Methodologies Used in Evaluating Influenza Vaccination Determinants Among Hispanics and non-Hispanic Blacks in the United States

The review of published literature also included assessing the determinants of Influenza vaccinations among Hispanics and non-Hispanic Blacks in the United States.

During the exhaustive literature review, studies were mostly focused on evaluating the level of acceptance of the influenza vaccine, mostly in non-Hispanic White people. These studies are quantitative and primarily observational community based. The study designs include descriptive cross-sectional and some ecological/correlational. During the last 5 years, only eight publications evaluated the factors that influence the lack of influenza vaccination among African Americans or non-Hispanic Blacks living in the United States. Therefore, there is an important need to expand peer-reviewed research on the social determinants of Influenza vaccine uptake in racial minorities such as Hispanics or non-Hispanics Blacks living in the United States because a gap in the literature was evident.

Regardless of the literature gap, some authors decided to evaluate the Influenza vaccine's predictors and the intention to receive the immunization among racial minorities living in the United States. Padilla et al. (2020) aimed to evaluate the theoretically driven predictors, including health beliefs, the Influenza, and the intentions to get the vaccine among the Hispanic population. The method of data collection was a survey, and data were analyzed using multiple regression. Padilla et al. were motivated to do their research based on the lack of published studies evaluating the social causes that influence Influenza vaccine uptake in the Hispanic population. The results of their research revealed that the perceived effectiveness and safety of the Influenza vaccine were the main predictors of the intentions to receive the Influenza vaccine ($p < .001$). One of the study's limitations was that the questionnaires were self-report evaluations that might not have reliable data.

Quinn et al. (2017) did not find that much evaluation of the racial factors that might predict the Influenza vaccine's attitudes and behaviors. Therefore, these authors designed a cross-sectional study to examine differences in the level of vaccine knowledge and attitudes towards the Influenza vaccine between non-Hispanic Black and Whites. Also, the authors wanted to evaluate if racial factors influenced vaccine uptake and perception among African Americans compared to White participants. It was found that the vaccine attitudes, perception, and trust were significantly different among both racial groups. Among African Americans, there was stronger racial consciousness in health care and influenced the decision to get the Influenza vaccine and the vaccine's trust.

Using the same data collected from a nationally representative survey with a similar objective, Crouse et al. (2017) developed a cross-sectional study to evaluate Influenza vaccine attitudes and behaviors. The study focused on non-Hispanic Black and White adults in the United States with medical conditions that put them at higher risk for Influenza-related complications. A secondary objective was to evaluate the main factors that affect health behavior towards getting the Influenza vaccine. Data were analyzed using ANOVA, and it showed marked differences in action towards the influenza vaccine for demographic predictors such as gender, annual income, and ethnicity. It was found again that high-risk African Americans tend to have lower Influenza vaccination rates than Whites because of the factors such as knowledge of vaccine recommendations. Knowledge about vaccine effectiveness, safety, and advice was more insufficient among African Americans respondents (Crouse et al., 2017).

One study evaluated the influenza vaccination disparities at the local level among individuals living in South Chicago, IL. Hughes et al. (2018) conducted a cross-sectional descriptive study to assess the gaps in immunization at a community-level in south Chicago, Illinois, known for its ethnic diverse background. The authors also evaluated the association between demographic and socioeconomic factors and health care-provider behavior with vaccine acceptance and administration (Hughes et al., 2018). The data was collected from a community survey, Sinai Community Health Survey, representing the target study population. The data was analyzed using bivariate analysis and multiple regression. The authors found that the Influenza vaccine coverage was markedly different by gender, ethnicity, insurance, and physician trust (Hughes et al., 2018). The results also showed that marked disparities existed among ethnically diverse neighborhoods in adult Influenza vaccine coverage. Factors identified to affect the Influenza vaccine intake included the annual household income, ethnicity, and trust in healthcare providers (Hughes et al., 2018). For non-Hispanic Blacks, those who trusted their primary care physician had increased Influenza “vaccination coverage compared with those who had low or medium trust (45% vs. 20%; $P < .01$)” (Hughes et al., 2018).

Summary and Conclusions

In this chapter, I presented the literature review for the influenza virus and the Influenza vaccine. It also described the Influenza immunization challenges, Influenza vaccine uptake studied on this study target population, and the methodologies used to evaluate the determinants of Influenza vaccine uptake among racial minorities (Hispanics and non-Hispanic Blacks) in the United States. It was found that there is a gap in the

Influenza vaccination rate between White Americans and racial minorities such as Hispanics and non-Hispanic Blacks (Lu et al., 2017). Many factors influence Influenza vaccine uptake in adults living in the United States. The most mentioned factors in the literature were trust in the safety of the vaccine (Freimuth et al., 2017), confidence in their health care providers (Quinn et al., 2019), insurance coverage (Quinn, 2018), an education level (Cordoba & Aiello, 2016), and racial consciousness (Quinn et al., 2017). The most predominant data collection methods in the studies identified were national or locally representative surveys. The data analysis mostly used were multiple regression and ANOVA because most of the studies conducted on racial minorities, such as Hispanics and non-Hispanic Blacks, aimed to evaluate associations and predictors of Influenza vaccination disparities among the target population (Lutz et al., 2020).

What is unknown is the specific predictors of lack of immunization at community levels in racial minorities living in the United States. Only one study was identified at a community level (Hughes et al., 2018) that addressed the Influenza and pneumococcal immunization disparities among racial minorities living in an ethnically diverse neighborhood in Chicago, IL. The authors were motivated to conduct this study by the marked difference in annual Influenza vaccine intake between Whites and non-Whites living in Chicago, IL. On the other hand, Bednarz et al. (2020) were motivated to evaluate Influenza vaccination obstacles among people living in a small town in the State of Tennessee called Sneedville. The authors also wanted to understand the attitudes the residents of Sneedville have towards the Influenza vaccine and if those attitudes contribute to the low proportion of annual Influenza vaccination in adults. This study's

focus was not to compare Influenza vaccine intake among ethnic groups but to understand why rural communities tend to have low vaccination rates than other urban communities in the United States (Bednarz et al., 2020).

Most of the published studies reviewed did not focus on evaluating the sociodemographic predictors of Influenza vaccination among Hispanic and Black communities based on the region or community of residence (except Hughes et al., 2018). Yet, the influence of this and other demographic factors on the lack of Influenza vaccination among Hispanic and Non-Hispanic Black populations living in the United States needs to be expanded. This study aimed to determine the association between sociodemographic factors that might predict lack of Influenza vaccination in racial minorities living in the South Lawndale community in Chicago, IL. Measuring the association of different sociodemographic factors with lack of Influenza vaccine uptake could help to provide a better idea of the magnitude and severity of the problem in Chicago, Illinois, and the United States. Given the persistently low Influenza vaccination rates in adults and the associated burden due to influenza's morbidity, it is important to be mindful of this problem's seriousness.

Determining the magnitude of the association between sociodemographic factors that might predict lack of Influenza vaccination among racial minorities could help to fill the gap in the existing literature regarding this important topic related to Hispanic and Non-Hispanic Black populations health living in the United States. The following chapter contains details about the study methodology, including the research design and rationale.

Chapter 3 will also describe the study population, variables, sampling procedures, data collection strategy, and data analysis.

Chapter 3: Research Method

The first segment of this chapter defines the research design and restates the study questions. Furthermore, this chapter describes the research methodology, population used for the study, study variables, and data analysis techniques. Lastly, the data collection methods, threats to validity, and ethical procedures are considered, followed by a summary of the design and methodology of the research analysis method.

Given the persistent low influenza vaccination rates among Hispanic and non-Hispanic Black adults in the United States, determining the association between sociodemographic factors and lack of Influenza vaccination is an important step for a better depiction of the extent and seriousness of the problem. The purpose of this study was to evaluate the association between sociodemographic factors that might predict the lack of influenza vaccination in racial minorities living in the South Lawndale community in Chicago, Illinois. Studies on influenza immunization disparities in racial minorities are focused on national representative surveys and behavioral factors affecting immunization rates. However, this observational study focuses on two racial minorities living in an ethnically diverse neighborhood. It analyzes the sociodemographic factors that might predict low influenza vaccine intake to explain this important public health issue at a regional level.

Research Design and Rationale

Study Variables

As mentioned previously, this quantitative study aims to evaluate the association between sociodemographic factors that might predict the lack of influenza vaccination in

racial minorities living in Chicago, Illinois. The dependent variable is seasonal influenza vaccine status; the independent variables are age group, gender, ethnicity, health insurance status, and annual household income level.

Research Design

This observational, cross-sectional study analyzed secondary data obtained from the BRFSS. The BRFSS is a federally financed database managed by the CDC's Population Health Surveillance branch. The research focused on assessing factors that might predict the seasonal influenza vaccine status among Hispanics and Non-Hispanic Black living in Chicago, Illinois, during the influenza season of 2018–2019. The BRFSS differs from the standard data collection methods used in healthcare settings, such as in-person interviews. A disadvantage of the in-person data collection is the low participation in health care surveys as some racial minorities might not have access to health care or did not seek medical attention the day the data was collected (Peng-jun et al., 2018). However, the BRFSS survey holds a large sample size, with reduced exclusions; therefore, the data represent the target population.

Furthermore, collecting data using surveys is consistent with published studies on the main topic of this study (Burger et al., 2018; Crouse et al., 2019; Hughes et al., 2018; Quinn, 2018; Quinn et al., 2017). The BRFSS provides a cost-effective, reliable, and convenient way to evaluate the sociodemographic factors that might predict the lack of Influenza vaccination in this study's target population. A quantitative approach was selected because this research design allows the analysis of the relationship between a predictor variable and an outcome, such as the influenza vaccine intake (Larson et al.,

2018). I used logistic regression to analyze the data to determine whether sociodemographic factors (independent variables) can predict the lack of influenza vaccination in Hispanic and Non-Hispanic Black populations living in the South Lawndale community in Chicago, Illinois. The tests that I used to analyze the data are binomial logistic regression.

Time and Resources Constraints

There were certain anticipated time and resource constraints in conducting this study, such as the data cleaning process of the BRFSS and extracting all the relevant data and filtering the correct variables within the available timelines. Another challenge was getting access to certain publications that were not available through the Walden Library.

Methodology

Population

The study population, which is comprised of adults 18–69 years old living in Chicago, Illinois, represents this study's target population. In addition, non-Hispanic Whites were included for comparison. According to the CDC (2019), the BRFSS for 2019 collected 418,268 records nationwide.

Sampling and Sampling Procedures

The sampling strategy for this study was purposive convenience sampling because the secondary data was used to answer the research questions of this study. The participants of this study were selected based on specific characteristics chosen by the researcher, rather than the convenience sample in which the participants are determined based on the type of access to the data (Etikan & Bala, 2017). By doing purposive

sampling, a researcher can reach a study target population fast and inexpensively.

However, one limitation of the purposive sampling is the increased risk for research bias, thus affecting the reliability and validity of the study (Etikan & Bala, 2017).

The BRFSS is a national registry that collects health-related data annually from U.S. residents through a phone survey (Rolle-Lake & Robbins, 2020). The BRFSS is a survey conducted over the telephone to collect health outcomes, health behaviors, chronic health conditions, and the use of preventive services from an adult living in each state of the United States (CDC, 2019). The CDC obtains a list of randomly selected landline and cellphone numbers and then shares this list with each state. According to Schauer et al. (2020), the samples utilized in the BRFSS are probability samples. Therefore, information from the sample can be further used to generalize results to the total population in a state or nationwide.

Each state uses a disproportionate stratified sample (DSS) design. The DSS method is a stratified sampling where the sample size from each stratum or level is not in proportion to the size of that level in the total population. In the BRFSS survey, this sampling was used to obtain a population-based probability sample (Luo et al., 2020). One of the limitations of the DSS is that it can be more complex than a simple random sampling during data analysis. Therefore, the CDC recommended that the BRFSS data be stratified appropriately and sample weight analysis (CDC, 2019).

For this study, I did not conduct additional stratification, as the state of Illinois already did that by stratifying the whole state as the only geographical stratum (Mazurek et al., 2020). Cases or participants that meet eligibility criteria were considered for

extraction, and the data were cleaned to ensure that all relevant variables such as Influenza vaccine status, age groups, ethnicity, and annual household income are captured on all the eligible participants. Survey responses with missing data or with “refused” or “Don’t know” answers were excluded. Excluding these cases assured data integrity and reliability to answer this study’s research questions (Schauer et al., 2020).

Sample Size Calculation

Three factors determine the sample size: effect size, statistical power, and alpha (Etikan & Bala, 2017). I used G*Power 3.1.9.7 software to calculate the sample size required to reach a power of 0.8 or higher, with a significance level of 0.05. Similar published studies were evaluated during the literature to determine the appropriate effect size for the sample size calculation. However, no specific effect size was reported after conducting the literature review and evaluating similar studies with similar target populations. Therefore, the suggested effect size by Faul et al. (2009) is 0.15 medium effect size for multiple regression.

All the research questions were analyzed using binomial and multiple linear regression. The first research question is: What is the association between mean annual household income and seasonal influenza immunization status (yes vs. no) in adults from ages 18–69 living in Chicago, Illinois, in 2019? The parameters used in the G*Power for this question were as follows: Test family = F test, Statistical test = Linear multiple regression: Fixed model, R^2 deviation from zero, Type of power analysis = A priori: compute required sample size given alpha, power, and effect size, Effect size = 0.15,

Alpha = 0.05, power = 0.80, and Number of predictors = 3. Based on the sampling criteria, the minimum total sample size needed was 77 participants for this question.

The second question was, What is the association between sociodemographic factors (annual household income, age group, and health care access) and seasonal Influenza immunization status in adults from ages 18–69 living in Chicago, Illinois, in 2019? For this question, the number of predictors increased to five. Therefore, the minimum total sample size needed is 92 participants. The third question was, Are there differences in influenza vaccination status between Hispanic and Non-Hispanic Black and White adults from ages 18–69 living in Chicago, Illinois, in 2019? The number of predictors for this question was two. Therefore, the minimum total sample size needed is 68 participants.

Procedure for Recruitment, Participation, and Data Collection

For this study, I used secondary data from the BRFSS survey, publicly available from the CDC after Walden University Institutional Review Board (IRB) granted approval. The study participants had already signed an informed consent for the original study so there was no need to provide additional consent for this dissertation study.

Further, there were no follow-up procedures or study exit interviews. There was no direct or indirect interaction or communication with the survey participants.

For the BRFSS survey, the data are collected in each of the 50 states of the United States using a telephone survey as a data collection (Health et al., 2018). The participants in the BRFSS are 18 years and older and are randomly selected by their phone numbers in each state. The data are collected in collaboration with the state health department. The

CDC uses the Random Digit Dialing (RDD) system to select the phone numbers of the survey participants (Lennon et al., 2021). The target population for the 2019 BRFSS was adults living in private housing or college residences among all the states of the United States.

The BRFSS collects health risk behaviors, chronic health conditions prevalence, and the utilization of preventive health services from adults U.S. residents of the 50 states each year (Khalil & Crawford, 2015). The data are secondary data from the BRFSS collected in 2019 using a Computer Assisted Telephone Interview (CATI) system to collect the data from the participants (Health et al., 2018). However, software consultants assisted with data collection and quality control of the interviews. The BRFSS database data are collected randomly to avoid subject selection bias. It is vital for this study because of the diversity of the participants and the data collection method.

Gaining Access to the Dataset

The data from the 2019 BRFSS survey are publicly available through the CDC website, and free access is granted (CDC, 2019). Thus, access to the database did not require any additional data access approval. Additionally, the data from the 2019 BRFSS are de-identified that does not include any personal information from the participants (Kennet & Gfroerer, 2005). However, the data includes demographic information of interest for this study, such as gender, ethnicity, and age group. Furthermore, the 2019 BRFSS dataset contains all the predictor and outcome (influenza vaccination status) variables of interest to answer the research questions of this study.

Instrumentation and Operationalization of Constructs

Instrumentation

I retrieved the data electronically using the online portal of the CDC. Once I had downloaded the 2019 BRFSS into Microsoft Excel format, I transferred the data into the IBM Statistical Package for Social Sciences (SPSS) for further evaluation and analysis. Since the data utilized are secondary, no direct survey administration or additional tools were required.

The BRFSS data are collected in all 50 states by state-level health departments on health behaviors that might predict health outcomes (Health et al., 2018). The information that was utilized for this study was collected in Illinois during 2019 among adult participants. The creation of this survey took place in the 1980s to record health-related information on an annual basis and specific to each state to track the achievement of national and state health goals (Khalil & Crawford, 2015). The BRFSS is a dataset publicly available at no cost for any individual to use for their research (Rolle-Lake & Robbins, 2020) and is considered a public domain that might be reproduced without permission. However, the CDC requires that any published study that used data derived from the BRFSS references the survey and acknowledges the CDC as the source of the data (CDC, 2019).

Data from the BRFSS survey has been widely utilized in several published studies that addressed the reliability and validity of this survey and its ability to provide nationally representative data from all the states (Luo et al., 2020). According to Health et al. (2018), the BRFSS survey is reliable and valid for health behavior surveillance

information. Most of the BRFSS questions come from other national surveys such as the National Center for Health Statistics, National Health and Nutrition Interview Survey, National Survey of Family Growth), Current Population Survey, and National Survey on Drug Use and Health (Rolle-Lake & Robbins, 2020). Therefore, the validity and accuracy of the BRFSS are comparable to other national surveys that use self-reported data.

According to Rolle-Lake and Robbins (2020), the validity and reliability of the BRFSS survey has been confirmed in a comprehensive literature review of scholarly studies.

Operationalization of Constructs

The dependent or outcome variable for this study was influenza vaccination. Table 2 displays the variables from the 2019 BRFSS survey utilized in this study to answer the research questions. The variables used from the BRFSS include influenza vaccination status, age group, gender, ethnicity, Hispanic/Latino, health insurance status, and annual household income level. Table 3 describes the operational definitions of the independent and dependent variables extracted from the BRFSS.

Table 2*Independent and Dependent Variables*

Name	Definitions
Influenza vaccine status	Received the influenza vaccine (vaccine uptake)
Age group	Grouping of the length of time the participants have been alive
Gender	Male or female
Ethnicity	Participant's race
Health insurance status	Health insurance coverage or lack of health insurance coverage
Annual household income level	The combined gross amount of money that was earned by each person part of a household on an annual basis

Table 3*Operational Definitions of Independent and Dependent Variables*

Variable name	Variable type	Questions from the 2019 BRFSS	Response choices	Measurement
Influenza vaccine status	Dichotomous	During the past 12 months, have you had either a Influenza vaccine that was sprayed in your nose or a Influenza vaccine injected into your arm?	1= Yes 2= No 7 = Don't know/ Not sure 9= Refused to answer	Dependent variable
Age group	Categorical	Reported age in five-year age categories calculated variable	1 = 18-24 2 = 25-29 3 = 30-34 4 = 35-39 5 = 40-44 6 = 45-49 7 =50-54 8 =55-59 9 =60-64 10 =65-69 11 =70-74 12 =75-79 13 = Age 80 or older 14 = Don't know/refused/missing	Covariate
Gender	Nominal	What was your sex at birth? Was it male or female?	1 = Male 2 = Female 3 = Refused	Covariate
Ethnicity	Nominal	Race/ethnicity categories	1 = White-Non-hispanic 2 = Black Non-hispanic 3 = Asian Non-hispanic 4 = American-Indian 5 = Hispanic 6 = Other Non-hispanic	Independent variable
Health insurance status	Nominal	Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare or Indian Health Service?	1 = Yes 2 = No 7 = Don't know/Not sure 9 = Refused to answer	Covariate
Annual household income level	Ordinal	Is your annual household income from all sources?	1 = < \$10,000 2 = < \$15,000 3 = < \$20,000 4 = < \$25,000 5 = < \$35,000 6 = < \$50,000 7 = < \$75,000 8 = \$75,000 or more 77 = Don't Know/Not sure 99 = Refused	Independent variable

Data Analysis Plan

The IBM SPSS software (Version 27) was used to perform the data analysis plan and clean up the data by eliminating the data variables that are not relevant to this study before its analysis. Furthermore, the IBM SPSS software was used to clean any missing data to facilitate data analysis. However, an evaluation and review of the missing data was conducted to maintain this study's results (Fleming, 2011). The 2019 BRFSS data plan from the CDC was used to access the codebooks and the database.

Once the data has been imported into the SPSS software, a descriptive analysis was performed to display the frequencies and rate distributions to evaluate the demographic characteristics of the study sample. Moreover, covariates are important in this study because they might impact the outcome (Influenza vaccination status). The covariates extracted from the BRFSS database for this study include gender, Hispanic/Latino, age group, and health insurance status. These covariates were selected because they can change the outcome of this study.

The statistical analysis selected for this study is simple logistic regression. This statistical test was used to evaluate if sociodemographic factors (age group, gender, and health insurance status) affect the Influenza vaccine uptake in racial minorities (Hispanic and Non-Hispanic Black) living in the South Lawndale community in Chicago, Illinois. Furthermore, binomial logistic regression was conducted to analyze the influence on the Influenza vaccination status of each sociodemographic factor selected for this study when controlling for other factors included in the analysis, such as age group and gender. In addition, the data set was narrowed down to only have survey participants located in the

South Lawndale community in Chicago; ZIP Code 60623. Lastly, simple logistic regression was utilized to evaluate the differences in Influenza vaccination uptake between adult racial minorities (Hispanic and Non-Hispanic Black) and their White counterparts.

Research Questions and Hypotheses

RQ1- What is the association between mean annual household income, ethnicity, and seasonal Influenza immunization status in adults from ages 18–69 living in Chicago, Illinois in 2019?

H1₀: There is not a statistically significant association between mean annual household income, ethnicity, and refusal to accept seasonal Influenza vaccination in racial minorities (Hispanic and Non-Hispanic Black) living in Chicago, Illinois

H1_A: There is a statistically significant association between mean annual household income, ethnicity and refusal to accept seasonal Influenza vaccination in racial minorities (Hispanic and Non-Hispanic Black) living in Chicago, Illinois

RQ2- What is the association between sociodemographic factors (annual household income, gender, age group, and health care access) and seasonal Influenza immunization status among adults from ages 18–69 living in Chicago, Illinois in 2019

H2₀: There is not a statistically significant association between sociodemographic factors (annual household income, age group, and health care access) and seasonal Influenza immunization status among adults from ages 18–69 living in Chicago, IL 2019.

H2_A: There is a statistically significant association between sociodemographic factors (annual household income, age group, and health care access) and seasonal Influenza immunization status among adults from ages 18–69 living in Chicago, IL 2019.

RQ3- Are there differences in influenza vaccination status between Hispanic and Non-Hispanic Black and White adults 18 years and older living in Chicago, Illinois in 2019?

H3₀: Influenza vaccination status does not differ between Hispanic and Non-Hispanic Black and White adults 18 years and older living in Chicago, Illinois in 2019

H3_A: Influenza vaccination status does differ between Hispanic and Non-Hispanic Black and White adults 18 years and older living in Chicago, Illinois in 2019.

Table 4 displays the hypothesis and statistical analysis that took place in this study.

Table 4*Research Questions, Hypothesis, and Statistical*

Research question	Hypothesis (H _A)	Variables	Statistical test
RQ1- What is the association between mean annual household income, ethnicity, and seasonal Influenza immunization status in adults from ages 18–69 living in Chicago, Illinois in 2019?	H1 _A : There is a statistically significant association between mean annual household income, ethnicity and refusal to accept seasonal Influenza vaccination in adults from ages 18–69 living in Chicago, Illinois	<ul style="list-style-type: none"> • Independent: Annual household income, and Ethnicity • Dependent: Influenza vaccine status 	Binomial logistic regression
RQ2- What is the association between sociodemographic factors (annual household income, gender, age group, and health care access) and seasonal Influenza immunization status among the adults from ages 18–69 living in Chicago, Illinois in 2019?	H2 _A : There is a statistically significant association between sociodemographic factors (annual household income, gender, age group, and health care access) and seasonal Influenza immunization status among the in adults from ages 18–69 living in Chicago, Illinois 2019.	<ul style="list-style-type: none"> • Independent: Annual household income, gender, age group, Ethnicity, and health care access • Dependent: Influenza vaccine status 	Binomial logistic regression
RQ3- Are there differences in influenza vaccination status between Hispanic and Non-Hispanic Black and White adults 18 years and older living in Chicago, Illinois in 2019?	H3 _A : Influenza vaccination status does differ between Hispanic and Non-Hispanic Black and White adults 18 years and older living in Chicago, Illinois in 2019	<ul style="list-style-type: none"> • Independent: Ethnicity, Hispanic/Latino • Dependent: Influenza vaccine status 	<ul style="list-style-type: none"> • Binomial logistic regression • Chi-square test of homogeneity

Threats to Validity

Some published studies have studied the validity of this national survey. Evenson et al. (2017) stated that some potential threats to data validity of the BRFSS are that the data are self-reported; thus, the higher the odds of recall and social desirability biases. Pierannunzi et al. (2013) did a systematic review of published articles that evaluated the validity and reliability of the BRFSS from 2004-2011. It concluded that the BRFSS is comparable to other surveys collecting data at a national and state level in the United States that assess health behavior topics. Furthermore, it was found that the BRFSS is reliable and higher validity compared to the other surveys considered in that report. However, Pierannunzi et al. warned that some of the participants lacked a full understanding of the questions asked in the BRFSS survey. Therefore, the answers might not be accurate regarding health topics.

Ethical Procedure

This study is a cross-sectional study that analyzed secondary data obtained from the BRFSS database. The data collected for this study comes from a de-identified, public use database that does not contain any personal information from the participants. According to CDC (2019), the BRFSS data collection follows strict human protection policies such as the Health and Human Service Policy for Protection of Human Research Subjects. It requires Walden University IRB approval. The IRB approval number is 02-25-22-0487484.

Issues of confidentiality and anonymity have been addressed the CDC. Further, there are no conflicts of interest identified. The BRFSS dataset was downloaded from the

CDC website, and data was stored in a password-protected computer after the Walden University IRB granted approval. No data access, analysis, or reporting was done until IRB approval was obtained.

Summary

This chapter explained the research study design, research questions, and hypotheses, relevant variables pertinent for this study. This study is a cross-sectional quantitative study that evaluates the Influenza vaccine coverage among racial minorities (Hispanic and Non-Hispanic Black) living in Chicago, Illinois, in 2019. The data to answer the three research questions and prove the hypothesis was collected from the CDC's national survey BRFSS conducted in 2019. Regression analysis was conducted to determine how Influenza vaccine uptake is predicted based on sociodemographic factors such as gender, age group, health coverage, and annual household status. Additionally, regression provided information on the strength of the relationship between the relevant variables. Finally, threats to validity and ethical procedures were discussed. Chapter 4 will discuss the data analysis of the data collected and the results of this study.

Chapter 4: Results

The purpose of this study was to evaluate the association between sociodemographic factors that might predict the lack of Influenza vaccination in racial minorities living in the South Lawndale community in Chicago, Illinois. Given the persistent incidence of influenza cases and influenza-related health complications among American citizens, particularly racial minorities, it is important to understand the challenges to public health that this issue brings. Determining and understanding the significance of the association between sociodemographic factors and seasonal influenza vaccine uptake is a crucial starting point for developing health promotion interventions.

By having efficient health interventions that aim to increase vaccination against influenza and other preventable infectious diseases, immunization will result in less mortality and morbidity due to viral infectious diseases such as influenza. Certain parameters were specified, and research questions were constructed around them to determine the magnitude of the association between sociodemographic factors and influenza vaccination among racial minorities living in South Lawndale, Illinois. There were three research questions for this study. The first question was related to the association between mean annual household income and seasonal influenza immunization status in racial minorities living in Chicago, Illinois, in 2019. The second question was related to the association sociodemographic factors (annual household income, gender, age group, and health care access) and seasonal influenza immunization status among the racial minorities (Hispanic and Non-Hispanic Black) living in Chicago in 2019. The third question was related to the differences in influenza vaccination status

between Hispanic and Non-Hispanic Black and White 18–69 years of age living in Chicago in 2019.

This chapter presents the main findings on the seasonal influenza vaccination of 489 residents of Chicago, Illinois. Findings include data for 411 non-Hispanic Whites, 65 non-Hispanic Blacks, and 13 Hispanics. All study participants were adult men and women, ages 18–69 years old, who participated in the 2019 BRFSS. This chapter describes the procedure for data collection, reviews the statistical methods used to analyze the data, and discusses the results obtained from these statistical methods, such as binomial logistic regression and chi-square test.

Data Collection

For this study, I conducted a secondary data analysis from the CDC BRFSS survey collected in 2019. The BRFSS is a federally financed database managed by the CDC's Population Health Surveillance branch. According to the CDC (2019), the BRFSS for 2019 collected 418,268 records nationwide. For this dissertation study, only adult (18–69 years old) respondents living in Chicago, Illinois, non-Hispanic Whites, non-Hispanic Black, and Hispanics were included in the sample. The 2019 BRFSS survey did not allow to separate participants by zip code, but only the main cities in Illinois. Since South Lawndale is a community of Chicago, the population was filtered for those respondents who reported living in Chicago.

The BRFSS 2019 data collected allowed the cases to meet the inclusion criteria of this study population. The variables selected for this study excluded survey participants with missing data who did not answer or did not know the answer. From the initial 489

respondents living in Chicago, the final number of participants reached 447 after applying the exclusion criteria and cleaning the data in SPSS. Table 5 displays the baseline characteristics of the study participants selected for this study.

Table 5*Baseline Characteristics*

Characteristic	<i>n</i>	%
Gender		
Male	171	38.3
Female	276	61.7
Total	447	100
Age group		
Age 18 to 24	9	2.0
Age 25 to 29	5	1.1
Age 30 to 34	6	1.3
Age 35 to 39	16	3.6
Age 40 to 44	21	4.7
Age 45 to 49	33	7.4
Age 50 to 54	60	13.4
Age 55 to 59	62	13.9
Age 60 to 64	113	25.3
Age 65 to 69	122	27.3
Total	447	100
Race/Ethnicity		
White, Non-Hispanic	375	83.9
Black, Non-Hispanic	61	13.6
Hispanic	11	2.5
Total	447	100
Income Level		
Less than \$10,000	17	3.8
Less than \$15,000 (\$10,000 to less than \$15,000)	10	2.2
Less than \$20,000 (\$15,000 to less than \$20,000)	19	4.3
Less than \$25,000 (\$20,000 to less than \$25,000)	18	4.0
Less than \$35,000 (\$25,000 to less than \$35,000)	37	8.3
Less than \$50,000 (\$35,000 to less than \$50,000)	51	11.4
Less than \$75,000 (\$50,000 to less than \$75,000)	76	17.0
\$75,000 or more	219	49
Total	447	100
Health Care Coverage		
Yes	428	95.7
No	19	4.3
Total	447	100

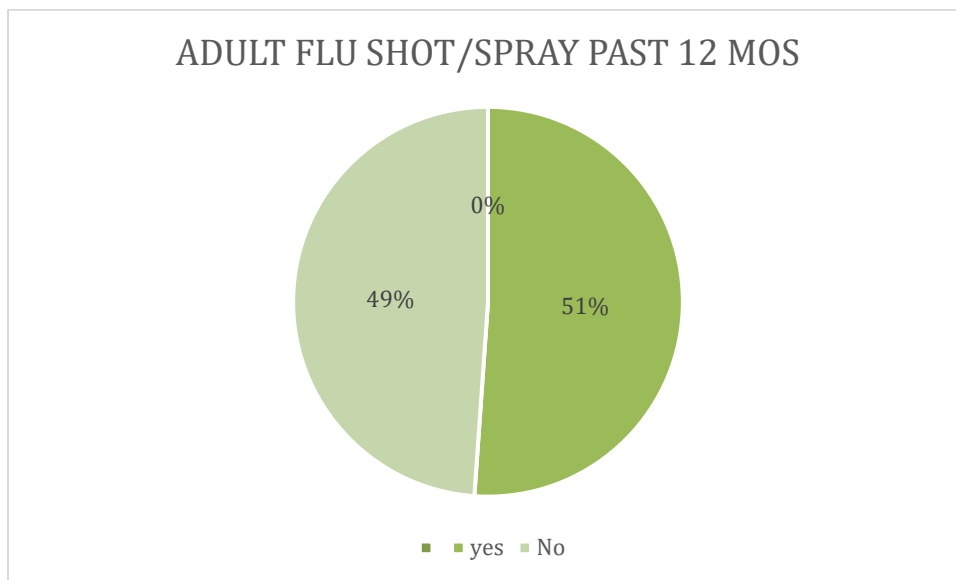
According to Schauer et al. (2020), the samples utilized in the BRFSS are probability samples. Therefore, information from the sample can be further used to generalize results to the total population in a state or nationwide. In the selected study population, 62% were female and 38% were male. According to the 2019 U.S. Census Bureau, the Illinois population was 49.1% male and 50.9%. The sex distribution in the study population was similar to that reported in the United States in 2019.

Moreover, 83.7% of survey participants were non-Hispanic Whites, 13.8% non-Hispanic Blacks, and 2.5% were Hispanics. The 2019 U.S. Census Bureau reported 71.5% non-Hispanic Whites, 14.2 % non-Hispanic Blacks, and 17.1% Hispanics. The ethnicity distribution was similar to that reported in the 2019 U.S. census for Whites and Blacks but not for Hispanics. The language barrier might explain this discrepancy. According to (Edward et al., 2018) language barrier contributes to low health literacy and health insurance literacy among non-English speaking populations, particularly Hispanics. The BRFSS survey is conducted in English; therefore, there is a possibility that some potential participants didn't understand English and were unable to participate.

From the selected study population, 229 participants (51.2%) reported that they received the seasonal influenza vaccine in 2019 and 218 (48.8%) reported that they did not receive the vaccine. Figure 1 displays the distribution of the 2019 BRFSS participants who answered the question about receiving the influenza vaccine.

Figure 1

Distribution of the 2019 BRFSS Participants Questioned for Influenza Vaccine Uptake in Chicago, Illinois

**Results****Descriptive Statistics**

I used SPSS software (Version 27) for data entry, data cleaning, and to perform descriptive statistics for the dependent (influenza vaccine intake) and the independent variables (gender, age group, annual income, health care coverage and ethnicity). Among the selected study population, 37.6% males and 62.4% females received the annual influenza vaccine in 2019, whereas 39% males and 61% females did not receive the annual influenza vaccine in 2019 (see Table 6).

Table 6*Gender vs. Influenza Vaccine Frequency Distribution*

Variable		Adult influenza vaccine/spray past 12 mos		
		Yes	No	Total
Gender				
Male	Count	86	85	171
	% within influenza vaccine	37.6%	39.0%	38.3%
Female	Count	143	133	276
	% within influenza vaccine	62.4%	61.0%	61.7%
Total	Count	229	218	447
	% within influenza vaccine	100.0%	100.0%	100.0%

Table 7 and Table 8 display the frequent distribution of the influenza vaccine uptake within the different ethnicities, age groups, household income, and access to health care reported by the study population. It is evident in the frequency distribution tables that some groups tend to have less influenza vaccine uptake. Thirty-six out of 61 (59%) non-Hispanic Black participants from the study population did not get the influenza vaccine, compared to 47.5% of non-Hispanic Whites and 36% of Hispanics. Thirty-three percent of participants in the age group 65-69 did not receive the influenza vaccine, compared to 48% of participants in the age groups 40-44 and 60 -64 years and 60% of the rest of the age groups of the study population. Sixty percent of participants with less than \$50,000 annual income from the study population did not receive the influenza vaccine compared 43% of participants with more than \$50,000 annual income. Lastly, 42% of the participants without healthcare coverage from the study population did not receive the influenza vaccine, compared to 49% of participants with healthcare coverage.

Table 7*Frequency Distribution of Influenza Vaccine Status vs Ethnicities and Age Groups*

Variable		Adult influenza vaccine/spray past 12 mos		
		Yes	No	Total
Race/ethnicity				
White, Non-Hispanic	Count	197 (52.5%)	178 (47.5%)	375
	% within adult influenza	86.0%	81.7%	83.9%
Black, Non-Hispanic	Count	25(41%)	36 (59%)	61
	% within adult influenza	10.9%	16.5%	13.6%
Hispanic	Count	7 (64%)	4 (36%)	11
	% within adult influenza	3.1%	1.8%	2.5%
Total	Count	229	218	447
	% within adult influenza	100.0%	100.0%	100.0%
Age group				
Age 18 to 24	Count	4 (44%)	5 (56%)	9
	% within adult influenza	1.7%	2.3%	2.0%
Age 25 to 29	Count	1 (20%)	4 (80%)	5
	% within adult influenza	0.4%	1.8%	1.1%
Age 30 to 34	Count	2 (33%)	4 (67%)	6
	% within adult influenza	0.9%	1.8%	1.3%
Age 35 to 39	Count	7 (44%)	9 (56%)	16
	% within adult influenza	3.1%	4.1%	3.6%
Age 40 to 44	Count	11 (52%)	10 (48%)	21
	% within adult influenza	4.8%	4.6%	4.7%
Age 45 to 49	Count	13 (39%)	20 (61%)	33
	% within adult influenza	5.7%	9.2%	7.4%
Age 50 to 54	Count	26 (43%)	34 (57%)	60
	% within adult influenza	11.4%	15.6%	13.4%
Age 55 to 59	Count	24 (39%)	38 (61%)	62
	% within adult influenza	10.5%	17.4%	13.9%
Age 60 to 64	Count	59 (52%)	54 (48%)	113
	% within adult influenza	25.8%	24.8%	25.3%
Age 65 to 69	Count	82 (67%)	40 (33%)	122
	% within adult influenza	35.8%	18.3%	27.3%
Total	Count	229	218	447
	% within adult influenza	100.0%	100.0%	100.0%

Table 8

Frequency Distribution of Influenza Vaccine Status vs Household Income, and Access to Health Care

Variable		Adult influenza vaccine/spray past 12 Mos		
		Yes	No	Total
Household income				
Less than \$10,000	Count	5	12	17
	% Within adult influenza	2.2%	5.5%	3.8%
Less than \$15,000 (\$10,000 to less than \$15,000)	Count	4	6	10
	% Within adult influenza	1.7%	2.8%	2.2%
Less than \$20,000 (\$15,000 to less than \$20,000)	Count	9	10	19
	% Within adult influenza	3.9%	4.6%	4.3%
Less than \$25,000 (\$20,000 to less than \$25,000)	Count	8	10	18
	% Within adult influenza	3.5%	4.6%	4.0%
Less than \$35,000 (\$25,000 to less than \$35,000)	Count	11	26	37
	% Within adult influenza	4.8%	11.9%	8.3%
Less than \$50,000 (\$35,000 to less than \$50,000)	Count	23	28	51
	% Within adult influenza	10.0%	12.8%	11.4%
Less than \$75,000 (\$50,000 to less than \$75,000)	Count	40	36	76
	% Within adult influenza	17.5%	16.5%	17.0%
\$75,000 or more	Count	129	90	219
	% Within adult influenza	56.3%	41.3%	49.0%
Total	Count	229	218	447
	% Within adult influenza	100.0%	100.0%	100.0%
Health care coverage				
Yes	Count	218	210	428
	% Within adult influenza	95.2%	96.3%	95.7%
No	Count	11	8	19
	% Within adult influenza	4.8%	3.7%	4.3%
Total	Count	229	218	447
	% Within adult influenza	100.0%	100.0%	100.0%

Statistical Assumptions

The statistical methods that were conducted to answer the research questions of this study were binomial logistic regression and chi-square test. Binomial logistic regression has seven assumptions that were tested during the data analysis to answer each of the three questions of this study. The first assumption is related to having a dichotomous variable (Aggarwal & Ranganathan, 2019). In this case, I used the Influenza intake variable as dependent, and the only categories are “yes” or “no”. Additionally, I used one or more independent variables to answer the research questions: household income, age group, gender, ethnicity, and health care coverage. Another assumption met for the logistic regression was that a minimum of 15 cases are needed per independent variable (Cohen et al., 2014). The testing of the remaining assumptions for binomial logistic regression and chi-square test will be addressed in the following sections under each research question individually.

Research Question 1

What is the association between mean annual household income, ethnicity, and seasonal Influenza immunization status in adults from ages 18–69 living in Chicago, Illinois in 2019?

Assumptions

Binomial logistic regression was performed to answer RQ1 using the Influenza vaccine status as dichotomous dependent variable and ethnicity and income level as the independent variables. As seen in Table 9, linearity of the independent continuous variable with respect of the logit of the of the dependent variable was assessed via the

Box-Tidwell (1962) procedure, by creating a natural log for the continuous independent variable, household income. The continuous independent variable is linearly related to the logit of the dependent variable, Influenza vaccine status, because the p values (per Bonferroni correction) are greater than 0.0083 (Cohen et al., 2014). Additionally, there were no outliers identified and there was no multicollinearity among the independent variables.

Table 9

Variables in the Equation

Variable	B	SE	Wald	df	Sig.	Exp(B)	95% CI for EXP(B)	
							Lower	Upper
Income level	.399	.546	.535	1	.464	1.491	.511	4.346
White, non-Hispanic			2.160	2	.340			
Black, non-Hispanic	.256	.293	.761	1	.383	1.291	.727	2.293
Hispanic	-.714	.651	1.205	1	.272	.490	.137	1.753
Income level by Ln_income	-.221	.211	1.100	1	.294	.801	.530	1.212
Constant	.129	.963	.018	1	.893	1.138		

Note. CI = confidence interval.

Hypothesis Test Results

H10: There is not a statistically significant association between mean annual household income and refusal to accept seasonal Influenza vaccination in racial minorities (Hispanic and Non-Hispanic Black) living in Chicago, Illinois

H1A: There is a statistically significant association between mean annual household income and refusal to accept seasonal Influenza vaccination in racial minorities (Hispanic and Non-Hispanic Black) living in Chicago, Illinois

After conducting a binomial logistic regression, it was found that the statistical test was statistically significant, $X^2(4) = 14.266$, $p < .005$ (See Table 10). The model

explained 4.2% (Nagelkerke R²) of the variance in Influenza vaccine uptake and correctly classified 58.6% of cases. Sensitivity was 43.1%, specificity was 73.4%, positive predictive value was 57.5% and negative predictive value was 60.6% (see Table 11). Of the three predictor variables only one was statistically significant: Annual Household Income (as shown in Table 12). Black, Non-Hispanic had 1.27 times higher odds of refusing the seasonal Influenza vaccine than non-Hispanic White. However, this association was not statistically significant ($p = .411$). Decreasing annual household income was associated with a reduction in the likelihood of receiving the Influenza vaccine ($p = .001$).

Table 10

Omnibus Tests of Model Coefficients

		Chi-square	<i>df</i>	Sig.
Step 1	Step	14.266	3	.003
	Block	14.266	3	.003
	Model	14.266	3	.003

Table 11

Binomial Logistic Regression for Income Level, Ethnicity and Influenza Vaccine Status: Classification Table

Observed		Predicted		
		Influenza vaccine status		% correct
		yes	No	
Influenza vaccine status	yes	168	61	73.4
	No	124	94	43.1
Overall %				58.6

Table 12

Binomial Logistic Regression for Income Level, Ethnicity and Influenza Vaccine Status: Variables in the Equation

Variable	B	SE	Wald	df	p	Odds	95% CI for EXP(B)	
						Ratio	Lower	Upper
Income level	-.172	.054	10.267	1	.001	.842	.758	.935
White, Non-Hispanic			2.147	2	.342			
Black, Non-Hispanic	.241	.293	.675	1	.411	1.272	.717	2.258
Hispanic	-.744	.656	1.288	1	.256	.475	.131	1.718
Constant	1.069	.381	7.864	1	.005	2.913		

Note. Variable(s) entered on Step 1: Income level, Race/Ethnicity. CI = confidence

interval.

The result of the binomial logistic regression showed that there was a statistically significant association ($p = .001$) between mean annual household income and refusal to accept seasonal Influenza vaccination in racial minorities (Hispanic and Non-Hispanic Black) living in Chicago, Illinois. The results show that decreasing the income level, increases the odds (0.842) of Influenza vaccine refusal in the study population (OR= 0.842; 95% CI [0.758, 0.935], $p = .001$; see Table 12). Therefore, the null hypothesis can be rejected, and the alternate hypothesis can be accepted for the variable mean annual household income

Research Question 2

What is the association between sociodemographic factors (annual household income, gender, age group, and health care access) and seasonal Influenza immunization status among adults from ages 18–69 living in Chicago, Illinois in 2019?

Assumptions

Binomial logistic regression was performed to answer RQ2 using the Influenza vaccine status as dichotomous dependent variable and annual household income, gender, age group, and health care access as the independent variables. As seen on Table 14, linearity of the independent continuous variable with respect of the logit of the dependent variable was assessed via the Box-Tidwell (1962) procedure, by creating a natural log for the continuous independent variables, household income and age. The continuous independent variables are linearly related to the logit of the dependent variable, Influenza vaccine status, because the p values (per Bonferroni correction) are greater than .007 (Cohen et al., 2014). Additionally, there was no outliers identified, and there was no multicollinearity among the independent variables.

Table 13

Variables in the Equation

Variable	B	SE	Wald	df	p	Odd ratio	95% CI for EXP(B)	
							Lower	Upper
Step 1 ^a Income level	-2.220	1.205	3.392	1	.066	.109	.010	1.153
Gender: Female	.470	.610	.595	1	.441	1.600	.484	5.285
Reported age in five-year age categories	-1.746	1.284	1.849	1	.174	.175	.014	2.161
Health care coverage: no coverage	-21.053	40192.970	.000	1	1.000	.000	.000	.
Income level by ln_income	.862	.484	3.179	1	.075	2.369	.918	6.112
Reported age in five-year age categories by ln_age	.609	.456	1.785	1	.182	1.839	.752	4.497
Constant	7.090	3.393	4.366	1	.037	1199.634		

Note. CI = confidence interval.

Hypothesis Test Results

H2₀: There is not a statistically significant association between sociodemographic factors (annual household income, age group, and health care access) and seasonal

Influenza immunization status among adults from ages 18–69 living in Chicago, Illinois 2019.

H2_A: There is a statistically significant association between sociodemographic factors (annual household income, age group, and health care access) and seasonal Influenza immunization status among adults from ages 18–69 living in Chicago, Illinois 2019.

After conducting a binomial logistic regression, it was found that the model was statistically significant, $X^2(4) = 26.814, p < .005$ (See Table 14). The model explained 7.8% (Nagelkerke R²) of the variance in Influenza vaccine uptake and correctly classified 58.2% of cases. Sensitivity was 68.1%, specificity was 47.7%, positive predictive value was 52% and negative predictive value was 58.7% (See Table 15).

Of the four predictor variables, two were statistically significant: Annual Household Income and age group (as shown in Table 16). Females had 0.936 times higher odds to receive the Influenza vaccine compared to males. However, this association was not statistically significant ($p = .742$). Young age was associated with a reduction in the likelihood of receiving the Influenza vaccine and this association is statistically significant ($p = .000$). Participants with no health care coverage have 0.792 higher odds to receive the vaccine compared to those with health care coverage. However, this association was not statistically significant ($p = .637$). Decreasing annual household income was associated with a reduction in the likelihood of receiving the Influenza vaccine and this association is statistically significant ($p = .000$).

Table 14*Omnibus Tests of Model Coefficients*

		Chi-square	df	Sig.
Step 1	Step	26.814	4	.000
	Block	26.814	4	.000
	Model	26.814	4	.000

Table 15*Binomial Logistic Regression for Income Level, Ethnicity, Gender, Age, Healthcare Coverage and Influenza Vaccine Status: Classification Table*

Observed		Predicted		
		Influenza vaccine status		Percentage Correct
		yes	No	
Influenza vaccine status	Yes	156	73	68.1
	No	114	104	47.7
Overall percentage				58.2

Table 16*Binomial Logistic Regression for Income Level, Ethnicity Income Level, Ethnicity, Gender, Age, Healthcare Coverage and Influenza Vaccine Status: Variables in the Equation*

	B	SE	Wald	df	p	Odds ratio	95% CI for EXP(B)	
							Lower	Upper
Income level	-.195	.053	13.548	1	.000	.823	.742	.913
Gender: Female	-.066	.201	.108	1	.742	.936	.631	1.388
Reported age in five-year age categories	-.180	.049	13.608	1	.000	.835	.759	.919
Health care coverage: No	-.233	.494	.223	1	.637	.792	.301	2.084
Constant	2.719	.581	21.878	1	.000	15.163		

Note. Variable(s) entered on step 1: Income Level, Gender, Reported Age In Five-Year

Age Categories, Health Care Coverage. CI = confidence interval.

The result of the binomial logistic regression shows that there is not a statistically significant association between the sociodemographic factors, gender, health care access and seasonal Influenza immunization status in adults aged 18–69 living in Chicago, Illinois. Therefore, the null hypothesis cannot be rejected for these variables. However, there is a statistically significant association ($p = .001$) between mean annual household income, age and refusal to accept seasonal Influenza vaccination in aged 18–69 living in Chicago. The results show that decreasing the income level, increases the odds (0.823) of Influenza vaccine refusal in the study population (OR= 0.823; 95% CI [0.742, 0.913], $p = .000$; see Table 16). Additionally, the younger the population, the odds of Influenza vaccine refusal are 0.835 greater than the older population (OR= 0.835; 95% CI [0.759, 0.919], $p = .000$; see Table 16). Therefore, the null hypothesis can be rejected, and alternate hypothesis can be accepted for the variables annual household income and age group.

Research Question 3

Are there differences in influenza vaccination status between Hispanic and Non-Hispanic Black and White adults 18 years and older living in Chicago, Illinois in 2019?

Assumptions: Chi-Square test

To answer this research question, chi-square test was done to determine if there is a difference between the Influenza vaccine status between non-Hispanic, Whites, non-Hispanic black and Hispanic adults 18 years and older living in Chicago. The sample size assumption was met. All expected cell counts were greater than five (See Table 17).

Therefore, there is enough large sample size to report the statistical significance results of the chi square test.

Table 17

Expected Count Crosstabulation

		Influenza Vaccine past 12 months		
		yes	No	Total
Imputed Race/Ethnicity	White, Non-Hispanic	192.1	182.9	375.0
Value	Black, Non-Hispanic	31.3	29.7	61.0
	Hispanic	5.6	5.4	11.0
Total		229.0	218.0	447.0

Hypothesis Test Results

H30: Influenza vaccination status does not differ between Hispanic and Non-Hispanic Black and White adults 18 years and older living in Chicago, Illinois in 2019

H3A: Influenza vaccination status does differ between Hispanic and Non-Hispanic Black and White adults 18 years and older living in Chicago, Illinois in 2019.

After conducting a chi-square test using crosstabs and Pearson's chi-square for the independent variable, ethnicity, against the dependent variable Influenza vaccine status, 447 patients were asked if they received the Influenza vaccine during the past 12 months. At the conclusion of the survey, 36 (59%) Black, non-Hispanic adults did not receive the Influenza vaccine compared to 47% White, non-Hispanic and 36% Hispanic participants from the study population (Table 18).

Table 18*Observed Count Crosstabulation*

		Adult Influenza vaccine/spray past 12 mos		Total
		Yes	No	
Race/ethnicity	White, non-Hispanic	197	178 (47%)	375
	Black, non-Hispanic	25	36 (59%)	61
	Hispanic	7	4 (36%)	11
Total		229	218	447

The difference in the proportions displayed on Table 14 was not statistically significant ($p > .005$). According to Table 19, there was not a statistically significant difference between the three independent variables proportions. Thus, the null hypothesis cannot be rejected.

Table 19*Chi-Square Test*

	Value	df	Asymptotic	p	Exact Sig. (1-sided)	Point Probability
			Significance (2-sided)			
Pearson Chi-Square	3.496 ^a	2	.174	.170		
Likelihood Ratio	3.515	2	.172	.175		
Fisher-Freeman-Halton Exact Test	3.463			.170		
Linear-by-Linear Association	.012 ^b	1	.914	.946	.484	.054
N of valid cases	447					

^a 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.36.

^b The standardized statistic is .109.

Post-hoc analysis involved pairwise comparison (Table 20) using z-test of two proportions with a Bonferroni correction (Cohen et al., 2014). The proportion of participants that reported refusing to get the Influenza vaccine among the independent

variable non-Hispanic Black was not statistically significantly different than those that received the Influenza vaccine, $p > .05$. The proportion of participants that reported getting the Influenza vaccine among the independent variable non-Hispanic Whites was not statistically significantly different than those that did not received the Influenza vaccine, $p > .05$. Lastly, the proportion that reported getting the Influenza vaccine among the independent variable Hispanic was not statistically significantly different than those that didn't received the Influenza vaccine, $p > .05$.

Table 20

Crosstabulation pairwise comparisons

			Adult Influenza vaccine/spray past 12 mos		
			Yes	No	Total
Race/ethnicity	White, non- Hispanic	Count	197 _a	178 _a	375
		% within adult Influenza vaccine/spray past 12 mos	86.0%	81.7%	83.9%
	Black, non- Hispanic	Count	25 _a	36 _a	61
		% within adult Influenza vaccine/spray past 12 mos	10.9%	16.5%	13.6%
	Hispanic	Count	7 _a	4 _a	11
		% within adult Influenza vaccine/spray past 12 mos	3.1%	1.8%	2.5%
Total	Count		229	218	447
	% within adult Influenza vaccine/spray past 12 mos		100.0%	100.0%	100.0%

Each subscript letter denotes a subset of adult Influenza vaccine/spray past 12 mos categories whose column proportions do not differ significantly from each other at the .05 level.

Assumptions: Binomial Regression

Binomial logistic regression was performed to answer RQ3 using the Influenza vaccine status as dichotomous dependent variable and ethnicity as the independent variables. Because the independent variable is not a continuous variable, linearity assumption was not tested at this time. However, there was no outliers identified, and there was no multicollinearity among the independent variables.

Hypothesis Test Results

H30: Influenza vaccination status does not differ between Hispanic and Non-Hispanic Black and White adults 18 years and older living in Chicago, Illinois in 2019

H3A: Influenza vaccination status does differ between Hispanic and Non-Hispanic Black and White adults 18 years and older living in Chicago, Illinois in 2019.

After conducting a binomial logistic regression, it was found that the model was not statistically significant, $X^2(4) = 3.515, p > 0.005$ (See Table 21). The model explained 10% (Nagelkerke R²) of the variance in Influenza vaccine uptake and correctly classified 53.7% of cases. Sensitivity was 89.1%, specificity was 16.5%, positive predictive value was 52.8% and negative predictive value was 40.9%. All the cases must have fell into one of two categories, YES for received the Influenza vaccine or NO for refusal to getting the Influenza vaccine (See Table 22).

In the predicted category there are 204 cases that fell in the YES category for receiving the Influenza vaccine and 25 refused to get the Influenza vaccine. This means in the logistic regression model that out of the 447 survey participants who received the Influenza vaccine, the prediction was correct 204 times with a percentage correct of

89.1%. Nevertheless, in the opposite direction, in the predicted category there were 36 cases that fell into the NO category and 182 fell into the YES category meaning that the logistic regression model predicted out of the 447 survey participants who refused to take the Influenza vaccine, the prediction was correct 36 times with a percentage correct of 16.5%. The overall percentage correct reveals a 53.7% (See Table 22).

Of the three ethnic groups of the predictor variable ethnicity, none were statistically significant, as shown in Table 23. Black, non-Hispanic have 1.594 times higher odds to refuse the Influenza vaccine compared to White, non-Hispanic, but this association was not statistically significant ($p = .096$). Black, non-Hispanic have 0.632 times higher odds to get the Influenza vaccine compared to White, non-Hispanic. However, this association was not statistically significant ($p = .471$).

Table 21

Omnibus Tests of Model Coefficients

		Chi-square	<i>df</i>	Sig.
Step 1	Step	3.515	2	.172
	Block	3.515	2	.172
	Model	3.515	2	.172

Table 22

Binomial Logistic Regression for Income Level, Ethnicity, Gender, Age, Healthcare Coverage and Influenza Vaccine Status: Classification Table

Observed		Predicted		
		Influenza vaccine status		Percentage correct
		Yes	No	
Influenza vaccine status	Yes	204	25	89.1
	No	182	36	16.5
Overall percentage				53.7

Table 23

Binomial Logistic Regression for Income Level, Ethnicity Income Level, Ethnicity, Gender, Age, Healthcare Coverage and Influenza Vaccine Status: Variables in the Equation

	B	SE	Wald	df	p	Exp(b)	95% CI for exp(b)	
							Lower	Upper
White, Non-Hispanic			3.445	2	.179			
Black, Non-Hispanic	.466	.280	2.768	1	.096	1.594	.920	2.760
Hispanic	-.458	.635	.520	1	.471	.632	.182	2.197
Constant	-.101	.103	.962	1	.327	.904		

Note. CI = confidence interval.

The result of the binomial logistic regression shows that there was not a statistically significant association ($p > .005$) between White-Non-Hispanic, Black, non-Hispanic ethnicities and seasonal Influenza immunization status in adults 18 years or older living in Chicago, Illinois. Additionally, there was not a statistically significant association ($p = .471$) between Hispanics and seasonal Influenza immunization status seasonal Influenza vaccination in adults 18 years or older living in Chicago. Based on these results, the null hypothesis cannot be rejected.

Summary

This chapter described the results of the four-statistical analysis that were conducted to answer three research questions and test their hypothesis. The statistical analyses included frequencies, descriptive statistics, assumption testing and two statistical tests (binomial regression and chi-square). The frequencies distribution showed that the sample population does not have a similar distribution for ethnicities but are similar regarding gender and household income. It was evident that most of the survey participants were White, Non-Hispanic and the percentage of racial minorities was significantly less (83.9% Whites vs. 16.1% other ethnicities).

The statistical test selected to answer these three research questions were a good fit for the data that was used, and the variables used to answer the research questions while controlling for the covariates. Furthermore, the results showed that sociodemographic factors such as annual household income, black ethnicity, and age are associated to refusal of getting the Influenza vaccine. The null hypothesis was partially accepted and rejected as not all sociodemographic variables that were tested in this study showed a statistically significant association with the Influenza vaccine uptake. The null hypothesis for the third question was rejected as there was a statistically significant difference between Influenza vaccine uptake and ethnicity. The next chapter will have a deeper interpretation of these results, will describe the limitations of this study data analysis, recommendations for further research, and implications for positive social change.

Chapter 5: Discussion, Conclusions, and Recommendations

A cross-sectional retrospective study was conducted from secondary data to determine the association between sociodemographic factors such as age, gender, household income, ethnicity, and Influenza immunization status among adults living in Chicago, Illinois, in 2019. The influenza vaccine status was the outcome variable selected to determine whether the sociodemographic factors influence the refusal to get the seasonal influenza vaccine in the study population. Three research questions and hypotheses were tested using binomial logistic regression and a chi-square test. It is worth noting that the level of participation in the BRFSS survey was not equal among all ethnic groups: White, non-Hispanic 375 (83.9%), Black, non-Hispanic 61 (13.6%), and Hispanic 11 (2.5%).

The null hypothesis was rejected for the first two research questions, confirming a statistically significant association between mean annual household income and the refusal to accept the seasonal Influenza vaccine among adults aged 18–69 living in Chicago, Illinois, in 2019. Additionally, it was confirmed that there is a statistically significant association between annual household income and age group and seasonal Influenza immunization status among adults ages 18–69 living in Chicago in 2019. However, age, gender, and ethnicity did not have statistical significance, and therefore the null hypothesis was not rejected for the third question.

The descriptive statistics of the study population indicated that the odds of refusing the intake of the influenza vaccine were greater in the Black, non-Hispanic population compared to White, non-Hispanic and Hispanic participants. The odds of

refusing the uptake of the influenza vaccine were greater in participants with annual household income less than \$50,000 compared to those with annual income higher than \$50,000. Lastly, the odds of refusing the intake of the influenza vaccine were greater in participants younger than 40 years old than in participants 41 years old and older.

Interpretation of the Findings

The findings of this dissertation study are aligned with the findings of some of the studies reviewed in the peer-reviewed literature. However, the results are specific to a geographic area (Chicago, Illinois) and a more targeted population. The interpretation of the findings of this study and the comparison with the published literature are described according to the following research questions.

Research Question 1

What is the association between mean annual household income, ethnicity, and seasonal influenza immunization refusal in adults ages 18–69 living in Chicago, Illinois, in 2019?

This study found that lower mean annual household income is associated with Influenza vaccine refusal within this study population ($p < .05$). However, there was no statistically significant association between ethnicity and influenza vaccine refusal ($p > .05$) within this study population. These results align with other study outcomes, such as those reported by Lu et al. (2017) and Bleser et al. (2016). Sociodemographic factors such as having a college of higher education and having an annual household income $>$ \$50,000 were statistically significantly associated with a higher level of knowledge about the influenza vaccine recommendations than lower levels of education and annual

revenue (Lu et al., 2017). In a different study, Bleser et al. reported that influenza vaccine uptake was significantly lower among study participants who did not have health coverage and had an annual income at or below the poverty line. Additionally, these participants reported less trust in the influenza vaccine information received by their healthcare providers. This lack of trust in health care professionals generates an increase in influenza immunization refusal, hence increasing the risk of influenza-related health complications.

Although this study did not show that ethnicity was statistically significantly associated with influenza vaccine uptake refusal, Almario et al. (2016) reported ethnic gaps and disparities in influenza vaccine immunization in California. The study found that in a sample size of 42,935, non-Hispanic Blacks were 33% more likely to refuse the influenza vaccine intake than non-Hispanic Whites ($p < .001$). Some of the sociodemographic factors identified as predictors of influenza vaccine uptake were education level, access to health coverage, and annual household income (Almario et al., 2016). The latter findings align with the results from Su et al. (2019) about the relationship between motivation and behavior in the influenza vaccine uptake based on the SCT. Annual income, college education, and access to healthcare can be motivators for someone to receive the yearly influenza vaccine. This relationship also was mediated by behavioral expectation because the individual chooses to get the Influenza vaccine motivated by external factors such as access to health care and annual income (Su et al., 2019).

Research Question 2

What is the association between sociodemographic factors (annual household income, gender, age group, and health care access) and seasonal influenza refusal in adults ages 18–69 living in Chicago, Illinois, in 2019?

The results showed that decreasing the income level, increases the odds of Influenza vaccine refusal in the study population living in the state of Illinois. Additionally, in the younger the population, the odds of Influenza vaccine refusal are greater than the older population ($p = .000$). The results of this dissertation study are similar to those reported by Burger et al. (2021) and Crouse Quinn et al. (2017). Black and younger males (26.4%) showed lower odds of the H1N1 vaccine uptake in Burger et al.'s observational cross-sectional study. Moreover, the authors found that Black females expressed sociodemographic disadvantages contributing to immunization disparities, such as living below the poverty line and lack of health care access (Burger et al., 2021). Crouse Quinn et al. aimed to explore the sociodemographic and racial predictors of the Influenza vaccine uptake for 5 years. The authors reported that the refusal to get the Influenza vaccine was higher among Black than White participants.

Low income was statistically significantly associated with less influenza vaccine uptake in this dissertation study and confirmed by ANOVA in high-risk participants for Influenza complications in a study conducted by Crouse Quinn et al. (2017). This dissertation study showed a statistically significant association between the sociodemographic factors, annual household income and age group, and seasonal

influenza refusal among the study population ($p = .001$). However, the association between gender and healthcare access was not statistically significant ($p = .742$).

Research Question 3

Are there differences in influenza vaccination status between Hispanic and non-Hispanic Black and White adults 18 years and older living in Chicago, Illinois, in 2019?

The descriptive statistics showed lower influenza vaccine uptake among male Black, non-Hispanics compared to the rest of the study population. Despite this, the association between ethnicity and influenza vaccine vaccination status was not statistically significant after conducting a logistic regression and a chi-square test in this dissertation study ($p = .170$). The result of the binomial logistic regression shows that there was not a statistically significant association ($p > .005$) between White non-Hispanic, Black, non-Hispanic ethnicities and seasonal influenza immunization status in adults 18 years or older living in Chicago, Illinois. Additionally, there was not a statistically significant association ($p = .471$) between Hispanics and seasonal influenza immunization status seasonal influenza vaccination in adults 18 years or older living in Chicago, Illinois. One possible explanation for these results is the disproportionate participation level among all the ethnic groups: White, non-Hispanic, 375 (83.9%); Black, Non-Hispanic, 61 (13.6%); and Hispanic, 11 (2.5%).

In contrast to the mentioned results, other authors have found a statistically significant difference in influenza vaccine uptake between Whites and non-Whites (Crouse Quinn et al., 2017, Danziger et al., 2020; Hughes et al., 2018). Danziger et al. (2020) aimed to evaluate the proportion of immunized patients at different dialysis

facilities according to the ethnic group. It was found that healthcare facilities with a higher proportion of Black and Hispanic ethnic group patients reported considerably lower vaccination rates than less diverse facilities. Furthermore, Hughes et al. (2018) found statistically significant differences in influenza vaccination status among diverse age groups, health care coverage, and ethnic groups. These authors aimed to study influenza and pneumococcal immunization disparities at a local level using a community survey (Hughes et al., 2018).

There were marked disparities in influenza vaccine uptake between ethnic groups influenced by the lack of trust in health care providers. Hughes et al. (2018) conducted a cross-sectional descriptive study to assess the gaps in immunization at a community-level in south Chicago, Illinois, known for its ethnically diverse background. The authors also evaluated the association between demographic and socioeconomic factors and health care-provider behavior with vaccine acceptance and administration. Black participants showed 25% more refusal of the influenza vaccine than other ethnic groups, and it was reported that the lack of trust in their health provider impacted their rejection of the vaccine (Hughes et al., 2018).

Interpreting the Results in the Context of the SCT

This dissertation study used the SCT as the theoretical framework. This framework predicts social influence on health behaviors (Priest et al., 2015). The findings of this dissertation study are explained by two SCT constructs such as self-control and behavioral expectation that can contribute to influenza vaccine refusal. Self-control refers to the individual control of the execution of health behavior (Priest et al., 2015). This

dissertation study found that younger populations had higher refusal rates for the Influenza vaccine than those aged 50 and above. Priest et al. (2015) conducted a survey using the SCT to predict HPV vaccination intentions in a college population. The authors reported that male and younger participants had the lowest knowledge about HPV vaccination, thus lower vaccine uptake (Priest et al., 2015). It was also found that the self-control construct of the SCT for HPV vaccine uptake was a statically significant predictor for vaccine refusal.

Even though self-control and behavioral expectation were not directly assessed for this dissertation study, it is believed that the self-control construct might explain why influenza vaccine refusal was higher in younger populations. Behavioral expectation denotes specific motivations and abilities to set a goal to execute a behavior. According to Priest et al. (2015), younger participants tend to be less motivated to complete a health behavior such as receiving a vaccine. The results of this dissertation study are aligned with the findings reported in the published literature.

Although it was evident in the literature and the findings from this dissertation study that sociodemographic factors such as low annual household income and young age are associated with influenza vaccination refusal, the behavioral expectation might partially explain why some age groups or people with lower income do not get the seasonal Influenza vaccine (Su et al., 2019). However, additional research needs to be conducted to evaluate how behavioral expectation is linked to Influenza vaccine uptake, specifically in Black non-Hispanics and Hispanics. Lastly, the results of this dissertation study add to the discussion as to the potential of the SCT theory to be incorporated into

immunization promotion interventions targeted at low-income and younger populations among racial minorities.

Limitations of the Study

This dissertation study has several limitations. The first limitation is related to the inherent nature of using secondary data in general (Sherif, 2018). The data analysis was limited to the study population determined by the BRFSS collected in 2019. Furthermore, the BRFSS is a large population-based survey that excluded specific influenza immunization questions, making it challenging to explore the SCT constructs further. Another limitation was related to generalizability because the sample size was not well proportionate among the different racial and ethnic groups; therefore, it was challenging to determine if the results of this study are also applicable to a broader group of individuals. The sample size for only Hispanics was unexpectedly small compared to Whites, non-Hispanics. That disproportion could hinder the statistical significance of the statistical test conducted to answer the three research questions. The additional limitations described in Chapter 1 were observed after finalizing this study, such as recall bias from the study participants as it was a self-conducted survey. This recall bias might lead to participants' misclassification, hence compromising the study's internal validity.

Recommendations

This study investigated the association between the sociodemographic factors of age group, gender, annual household income, healthcare coverage, and influenza vaccination refusal. The analysis was completed in an ethnically disproportionate sample; therefore, further studies need to be conducted where all ethnic groups are equally

represented. According to Marks et al. (2020), this discrepancy can be the result of the lack of access to health care, surveillance, and even phone service among racial minorities. Age group and annual household income were associated with influenza vaccine refusal in the study population of this dissertation. Thus, it is recommended to expand further the research studying these variables and interventions in the people (low income and younger adults) to increase the uptake of the Influenza and other preventable diseases immunization. While evaluating interventions, it is also recommended to assess further the SCT theory constructs that impact the acceptance of these interventions that aim to improve vaccination uptake (Priest et al., 2015).

Implications

Positive Social Change

During the current events of this COVID-19 pandemic that started on December 2019 and are still going on in 2022, filling the gap in the literature regarding vaccination uptake among different ethnic groups has a positive social change. Understanding why there are immunization disparities and vaccine refusal among racial minorities is an important feature of this dissertation study. This study provided a different perspective on factors associated with vaccination refusal in other ethnic groups in the United States. When combining the results of the published studies conducted in a similar population as the populations used for this study and a few sociodemographic predictors of immunization disparities, this dissertation study has partially filled the literature gap by providing statistically significant association evaluations. It was found in this study that annual income and age groups are associated with influenza vaccine uptake refusal,

which is a good starting point for further research efforts aiming at studying the epidemiology of infectious diseases that can be prevented through vaccination.

Disseminating the results of this dissertation study may result in the creation of interventions by the health care providers and policymakers to increase public participation in vaccination uptake. The study also aligned with findings reported by Gupta (2021), who noted a discrepancy and lack of involvement of racial minorities in public health surveillance studies or surveys such as the BRFSS. Therefore, at a societal level, interventions should focus on giving proportionate access to all ethnic groups living in the United States. Furthermore, interventions should be tailored to reach younger adults and individuals living under the poverty line based on their health literacy. Finally, an implication for social change resulting from this dissertation study includes making policymakers and health care practitioners aware of the magnitude of issues related to vaccination refusal in general. Bringing awareness of the factors that are associated with vaccination uptake refusal can increase the ability of public health and health care professionals to identify and target populations that have higher rates of lack of vaccinations.

Conclusion

Seasonal influenza tends to cause illness in the American population, commonly during the fall, winter, and spring. It impacts the health and lives of many people due to the severity of the acute respiratory effects of this virus (Hart, 2015). Regardless of the significant advancements in the medical and public health fields, influenza takes the lives of thousands of people each year and increases school/work absenteeism in the United

States (Sah et al., 2019). Given the persistently low influenza vaccination rates among Hispanic and non-Hispanic Black adults in the United States (Quinn et al., 2017), this study aimed to determine the association between sociodemographic factors and lack of Influenza vaccination because it is an important step for a better illustration of the extent and seriousness of the problem. This study showed a statistically significant association between age groups, annual household income, and influenza vaccine refusal in adults aged 18–69 years living in Chicago, Illinois, in 2019. Determining these predictors and understanding the magnitude and severity of association between the identified predictors of lack of influenza vaccine uptake is a necessary step before developing appropriate interventions to deal with the persistent issue of vaccine hesitancy and low vaccine uptake by racial minorities in this country, not only influenza vaccine but also COVID-19 vaccine uptake. Therefore, it is advised that healthcare professionals and policymakers tailor interventions regarding vaccinations among all ethnic groups in the United States, by focusing on addressing risk factors and predictors for vaccination

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