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Factors Associated with Flu Vaccination Status Among Older Hispanics in the United States

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Abstract

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by

William E. Toledo Velazquez

MS, University of Bordeaux, 2004

BS, University of Havana, 2000

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Older Hispanics in the United States are less likely to be vaccinated with the flu vaccine compared to older White Americans, despite being at higher risk of influenza-associated deaths and hospitalizations. A quantitative cross-sectional study based on the social ecological model was carried out to evaluate the influence of several sociodemographic and health factors on flu vaccination status among elderly Hispanic individuals in the United States. Logistic regression analyses were conducted using secondary data collected from 95,414 elderly Hispanic and White American 2018 Behavioral Risk Factor Surveillance System participants. Multivariate logistic regressions controlling for other variables revealed health care coverage and having at least one chronic condition were not significant predictors of flu vaccination within this population. Having at least one personal doctor or healthcare provider, having a self-reported fair health, and having the last routine checkup within the previous 12 months were positively associated with flu vaccination ($p < 0.05$). Being separated and not seeing a doctor within the previous 12 months due to the cost were negatively associated with flu vaccination ($p < 0.05$). Consequently, this research's findings will impact positive social change by stimulating further studies leading to quality improvement in the flu vaccination among this population. Moreover, the results could encourage public health professionals to design and implement effective flu vaccination programs among older Hispanic adults at individual, interpersonal, and organizational levels.

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Dedication

I dedicate this dissertation to my grandma who has been my corner stone. I thank God she is alive and had the opportunity to see me become a Doctor of Philosophy. I hope you are proud of me.

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I want to thank Dr. Debo and Dr. Sato for making this dream come true. Without your collaboration this journey would have been very difficult. I also want to thank Dr. Davis for his fantastic contribution to the quality of my dissertation.

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Chapter 1: Introduction to the Study

Influenza (flu) is anacute respiratory infectious disease that leads tocough, headache, and acute fever, malaise, and myalgia. In many cases, the acute illness lasts about 3days but sometimes malaise and cough may last for weeks. Additionally, complications may occur like pneumonia, otitis media, and exacerbation of chronic obstructive pulmonary disease (COPD; Demicheli et al., 2018). In the United States, influenza kills thousands of people each year and results in the hospitalization of many others(Centers for Disease Control and Prevention [CDC], 2017a; Thompson et al., 2009). The elderly representthe most vulnerable group in terms of both death and hospitalization associated with the flu (CDC, 2017a). Older Latinos are especially affected, being at a higher risk of death and hospitalization associated with influenza compared to older White Americans. However, elderly Hispanics represent lower flu vaccination rates than their White American counterparts despite vaccination being the most effective method to prevent influenza (American Lung Association, 2010; Lu et al., 2019).

Although a few studies have been conducted, knowledge about factors influencing flu vaccination status in the elderly Hispanic population is limited (Moran et al., 2016). In this study, the influence of some previously studied social and ecological factors was assessed. These factors include level of education, income, marital status, sex, access to healthcare, having at least one chronic condition, self-reported health status, and the geographical region of residence. Additionally, flu vaccination status was compared between elderly Latinos and White Americans. Findings from this study will

enhance policymakers' knowledge about influenza vaccination coverage within the elderly Hispanic population. Additionally, these findings will contribute to the elaboration of appropriate interventions for increasing vaccination rates within this vulnerable population.

This chapter represents an introduction to the study. It includes a background on the topic of the study, followed by the problem statement. The purpose of the study is then addressed, followed by the research questions (RQs). Next, the theoretical framework is explored before a description of the nature of the study is made. Additionally, this chapter includes the definition of terms necessary to understand this study as well as the assumptions made. The chapter next describes the scopes and delimitations, followed by the study limitations. Finally, a description of the significance of the study is made before ending the chapter with a summary of its main points.

Background

Previous studies have evaluated factors influencing flu vaccination in the Hispanic population, but knowledge of these factors for the elderly Hispanic population is limited (Moran et al., 2016). For example, Cohen et al. (2012) evaluated the predictors of influenza vaccination status in a Hispanic urban population. They found that sex, level of education, and having at least one chronic respiratory condition were associated with flu vaccination status; however, these factors were assessed in the whole Hispanic population, and their specific influence among the elders was not estimated (Cohen et al., 2012). Moran et al. (2016) also found that healthcare coverage and education were associated with flu vaccination behavior in a Hispanic population. However, they did not

include male participants, and their study was restricted to a female subgroup living in Los Angeles, California (Moran et al., 2016). Further, Yoo, Hasebe, and Szilagyi (2015) identified education, income, geographical region of residence, and health care coverage as being associated with flu vaccination disparities among elders from different racial/ethnic origins. However, elders not insured by Medicare were not included in their study. Furthermore, they argued that, in terms of vaccination coverage status, the factors analyzed in their study could only explain 45% of the differences observed among racial/ethnic groups. They concluded that future studies should be conducted to identify other factors that could explain these differences (Yoo et al., 2015). Marital status, geographical region of residence, and self-reported health status have been previously identified as factors influencing vaccination status in other populations (Abbas et al., 2018; Nowak, Cacciatore, & Len-Ríos, 2018). Therefore, their influence on vaccination status among elderly Hispanics was assessed in this study along with some other social and ecological (level of education, income, sex, access to healthcare, and having at least one chronic condition). Differences in flu vaccination status between elderly Hispanics and White Americans were also estimated.

Problem Statement

In the United States, influenza causes the death of thousands of people each year (Thompson et al., 2009). The CDC (2017a) reported that between 2010 and 2014, the number of influenza-associated deaths ranged between 12,000 and 56,000 in the United States. Most of these deaths occurred among people 65 years and older, who showed

higher rates of influenza-associated hospitalizations compared to other age groups (CDC, 2017a).

The CDC has emphasized that getting the vaccine is the best way to prevent the flu (Trucchi et al., 2015). This argument is supported by some statistical data showing that vaccination significantly reduces the number of influenza-associated hospitalizations and illnesses (CDC, 2013). However, although they are at higher risk of influenza-associated complications compared to their White American counterparts (American Lung Association, 2010), older Hispanics are less likely to get vaccinated against the flu (Lu et al., 2019). Knowledge about the factors influencing flu vaccination status among Hispanic elders is limited (Moran et al., 2016).

In this study, I investigated the influence of some social and ecological factors on flu vaccination status among elderly Hispanics. Studies conducted in other population groups have revealed associations between influenza vaccination status and factors such as level of education, income, marital status, sex, the geographical region of residence, access to healthcare, having at least one chronic condition, and self-reported health status (Abbas et al., 2018; Moran et al., 2016). The influence of these factors on the flu vaccination status among elderly Hispanics was investigated in this study. Flu vaccination status was also compared between elderly Latinos and their White American counterparts.

Purpose of the Study

The purpose of this cross-sectional study was to evaluate the flu vaccine coverage in elderly Hispanics (≥ 65 years) living in the United States. Hence, the association

between flu vaccination status in elder Latinos and factors such as level of education, income, marital status, sex, the geographical region of residence, access to healthcare, having at least one chronic condition, and self-reported health status was studied. Additionally, differences in flu vaccination status between older Latinos and White Americans were estimated. This knowledge will assist in the planning and implementation of flu vaccination regime for this population.

Research Questions and Hypotheses

The following RQs were answered in this study:

RQ 1: Is flu vaccination status among elderly Hispanics living in the United States associated with the following sociodemographic factors (level of education, sex, marital status, and household income)?

$H_0$1: Flu vaccination status is not associated with level of education, sex, marital status, and household income among elderly Hispanics living in the United States.

$H_1$1: Flu vaccination status is associated with level of education, sex, marital status, and household income among elderly Hispanics living in the United States.

RQ 2: Is flu vaccination status among elderly Hispanics living in the United States associated with the following health factors (access to health care, self-reported health status and having at least one chronic condition)?

$H_0$2: Flu vaccination status is not associated with access to health care, self-reported health status and having at least one chronic condition among elderly Hispanics living in the United States.

$H_1$2: Flu vaccination status is associated with access to health care, self-reported health status and having at least one chronic condition among elderly Hispanics living in the United States.

RQ 3: Is flu vaccination status among elderly Hispanics living in the United States associated with region of residence?

$H_0$3: Flu vaccination status is not associated with region of residence among elderly Hispanics in the United States.

$H_1$3: Flu vaccination status is associated with region of residence among elderly Hispanics in the United States.

RQ 4: Are there differences in influenza vaccination status between elderly Hispanics and White American elders?

$H_0$4: Influenza vaccination status does not differ between elderly Hispanics and White American elders.

$H_1$4: Influenza vaccination status differs between elderly Hispanics and White American elders.

Theoretical Framework

This study used the socioecological model (SEM) as the theoretical framework. This model suggests that behavior is influenced at multiple levels: intrapersonal, interpersonal, organizational, community, and policy level (McLeroy, Bibeau, Steckler, & Glanz, 1988). Previous studies have used the SEM model to analyze the influence of several factors on flu vaccination status. For example, Abbas et al. (2018) used the SEM to demonstrate that behavior toward influenza vaccination is influenced by factors

operating at different levels: personal (e.g., personal perceptions about the vaccine), interpersonal (e.g., social influence), community (e.g., access to healthcare), and policy (e.g., insurance) levels. Kumar et al. (2011) also used the SEM to evaluate factors influencing the uptake of a 2009 H1N1 flu vaccine in the United States. They found that factors operating at intrapersonal (e.g., disease risk perception), interpersonal (e.g., social influence), institutional (e.g., regular healthcare provider), community (e.g., community risk), and policy levels (e.g., access to health insurance) explained 65% of the differences found among individuals from different racial/ethnic groups (White American, African Americans, and Hispanics). In this study, I evaluated factors influencing vaccination status at intrapersonal level (e.g., household income, sex, and level of education), interpersonal (e.g., marital status), organizational level (e.g., access to healthcare), and policy level (e.g., healthcare coverage).

Nature of the Study

The study was a cross-sectional study. A secondary analysis of the data collected by the Behavioral Risk Factor Surveillance System (BRFSS) was conducted. The analysis was used to evaluate the association between the influenza vaccination status among older Hispanics and sociodemographic and environmental factors. BRFSS is a nationwide survey system that gathers health-related information from U.S. residents living throughout the country (CDC, 2019a). Variables were accessed related to flu vaccination status, age, self-reported health status, sex, level of education, access to healthcare, marital status, household income, chronic conditions, and region of residence

based on the reported state of residence. I used BRFSS data collected in 2018 because it was the most recent BRFSS available data.

The dependent variable of the study was the influenza vaccination status. The independent variables were the level of education, household income, marital status, sex, access to healthcare, having at least one chronic condition, self-reported health status, geographical region of residence, and race/ethnicity. The associations between the dependent and the independent variables were evaluated using simple and multivariate logistic regressions. These statistical analyses have been previously used in similar studies (Abbas et al., 2018; Ang, Cutter, James, & Goh, 2016; Chang et al. 2016; Farmanara et al., 2018; Moran et al., 2016; Rikkin et al., 2017; Yoo et al., 2015).

Definitions

Chronic condition: The Illinois Department of Public Health (2019) defines chronic disease (condition) as any "disease that persists over a long period of time" (para. 1). The CDC specifies that chronic conditions are those lasting one year or more and "require ongoing medical attention, or limited activities of daily living, or both" (CDC, 2019e, para. 1). Chronic conditions include arthritis, Alzheimer, asthma, cancer, COPD, cystic fibrosis, diabetes, heart disease, obesity, and osteoporosis among others (New York Department of Health, 2019).

Self-reported health status: This term refers to the self-rated health status of participants when they are asked the following question: "Would you say that in general your health status is (a) excellent, (b) very good, (c) good, (d) fair, or (e) poor?"

Assumptions

One of the assumptions of this study was that the sample of elderly individuals used by the 2018 BRFSS survey was representative of the U.S. elderly population. To ensure representativeness of the U.S. elderly population, BRFSS uses a random sample design for the survey administered via cell phone and disproportionate stratified sample design for the survey administered via landline telephone (CDC, 2019a). Another assumption was that the selection of participants and data collection was conducted following the norms and ethics required for research involving humans. The CDC has emphasized that all research supported by them that include human participants must comply with the Department of Health and Human Services Policy for Protection of Human Research Subjects (CDC, 2017b). Finally, the reliability, validity, and accuracy of the data collected by the 2018 BRFSS survey are also assumed in this study.

Scope and Delimitations

This study focused on the analysis of sociodemographic and environmental factors associated with flu vaccination status in Hispanic elders living in the United States. The differences in flu vaccination status between elderly Latinos and White Americans were studied independently. The analysis was conducted on secondary data collected by BRFSS in 2018. The study population included elderly Hispanics aged 65 years and older living in the U.S. territory. Older White Americans were also included for comparative purposes.

Limitations

This study has several limitations. One of them is related to the nature of secondary data analysis in which the purpose is different from that one of the authors who originally collected the data (Johnston, 2014). The study is limited by the available information; therefore, it might be missing important explanatory variables in the analysis. Additionally, the database used for this study does not allow differentiating among elders born in Hispanic countries and those with Hispanic origins born in the United States.

In terms of validity, the nature of the study design implies other limitations. Because this study used a cross-sectional design, no conclusions can be made about causality. In other words, because the sequence of events cannot be demonstrated in a cross-sectional study, it does not allow establishing a cause-and-effect relationship between two variables that are significantly associated (Lu, 2009; Thiese, 2014). The study may also be subject to errors. One of these errors may be recall bias, which may occur when some participants recall past experiences better than others. For example, in BRFSS, participants must report whether they got the flu vaccine in the past 12 months. Participants suffering from a chronic respiratory disease may recall the flu vaccination event better than other participants, which may lead to misclassification in terms of vaccination status (Washington State Department of Health, 2019). Another possible source of error is self-report bias. Because BRFSS relies on self-reported data, people might tend to report a healthier lifestyle, so prevalence estimates might not reflect real values (Kentucky Department for Public Health and CDC, 2018).

Non-coverage bias, on the other hand, might be threatening external validity. This limitation is associated with the sampling method used by the BRFSS survey. BRFSS is a telephone-based survey, so individuals who do not possess a landline or cell phone are not included in the survey. Individuals who do not possess a telephone are often those with lower income, and their socioeconomic status might differ significantly compared to those included in the survey (CDC, 2019a).

Significance

This study contributed to filling the gap in the literature in terms of the social and ecological factors that are associated with influenza vaccination status in the elder Hispanic population living in the United States. The results of this study have an impact on social change. They can enhance policymakers' knowledge about influenza vaccination coverage within the elderly Hispanic population. Moreover, this knowledge may contribute to the elaboration of appropriate interventions for increasing vaccination rates within this vulnerable population. This would enhance the effectiveness of vaccination by reducing circulating disease and thereby lessening the socioeconomic impact of the infection with influenza virus (Smetana, Chlibek, Shaw, Splino, & Prymula, 2017). Older Latinos are at a higher risk of complications associated with influenza compared to older White individuals (American Lung Association, 2010); therefore, understanding the factors associated with flu vaccination status in the population, community, and healthcare systems levels contribute to positive social change. Furthermore, the targeted public health intervention of increasing vaccine uptake

among older Latinos will help to reduce the disparities existing among racial/ethnic groups in terms of health outcomes.

Summary

This chapter introduced the topic of the study. In summary, influenza is a public health concern in the United States because it causes thousands of deaths and hospitalizations every year (CDC, 2017; Thompson et al., 2009). People are encouraged to get the flu shot because it is the best way to prevent influenza (Trucchi et al., 2015), but special attention should be given to elders since they depict higher incidences of both influenza-associated hospitalization and death compared to the rest of the population (CDC, 2017). In terms of flu vaccination rates, racial/ethnic disparities exist among elders living in the United States (Yoo et al., 2015). This study focused on Hispanic elders, whose flu vaccination rates are lower compared to those of White American elders (Lu et al., 2019). A quantitative cross-sectional design was used to assess the association of sociodemographic and ecological factors with influenza vaccination status among elders Hispanics living in the United States. A secondary data analysis of the 2018 BRFSS survey was conducted. The next chapter will provide a literature review on the topic of this study and its theoretical foundation.

Chapter 2: Literature Review

Introduction

In the United States, influenza is the cause of thousands of deaths and hospitalization every year (Thompson et al., 2009). Elders represent the most affected group because most influenza-associated deaths and hospitalizations occur within this vulnerable population (CDC, 2017). The CDC has recommended vaccination as the most effective tool to prevent the flu (Trucchi, et al., 2015). But although elderly Latinos are at a higher risk of influenza-associated complications compared to White American elders, they are less likely to get the flu vaccine (American Lung Association, 2010; Lu et al., 2019). Previous studies have assessed factors associated with vaccine uptake among Hispanic populations, but knowledge about of these factors among elderly Hispanics is still limited (Moran et al., 2016). The purpose of this study was to investigate the factors associated with flu vaccination status among Hispanic elders living in the United States. Differences in flu vaccination status between elderly Hispanics and White Americans were also investigated. In this chapter, I discuss the literature search strategy used for this study as well as a description of the theoretical foundation on which the study is based. Additionally, a literature review related to the key variables of the study and a summary of the chapter are presented.

Literature Search Strategy

Articles related to factors associated with influenza vaccination status were selected using the Boolean approach to a literature search, the medical subject headings (MESH), and free text. The terms used in the search were *influenza vaccination*, *flu*

vaccination, elder Hispanics, elderly population, elder Latinos, vaccination coverage, vaccination status, determinants of influenza vaccination, and *factors influencing influenza vaccination status*. The databases searched in the Walden University library, and Pubmed Central library included MEDLINE with text, CINAHL plus with text, and PsycINFO. The search was limited to only papers with an available full text published in scholarly journals between 2013 and 2019 with free access through the Walden Library or Pubmed central library.

Theoretical foundations

This study used the SEM as the theoretical foundation. Uri Bronfenbrenner initially introduced this model in the 1970s with several revisions in later years. According to Bronfenbrenner's model, individuals' behavior is influenced by factors operating at multiple levels (McLeroy, Bibeau, Steckler, & Glanz, 1988). He organized environmental factors affecting human behavior in different levels of influence: the microsystem, mesosystem, exosystem, and macrosystem. The microsystem includes influential face-to-face factors such as interaction with immediate family members. The mesosystem includes influences involving interactions in various settings such as school and church. The exosystem includes influences affecting larger and more complex social systems such as employment, which has a significant impact on economic stability. Finally, the macrosystem includes factors such as cultural beliefs that also exert an influence on the microsystem (McLeroy, Bibeau, Steckler, & Glanz, 1988).

McLeroy et al. (1988) extrapolated Bronfenbrenner's model to health behavior, arguing that factors influencing health behavior might operate at five different levels:

intrapersonal level, interpersonal level, institutional level, community level, and policy level (Golden & Earp, 2012). For example, Kumar et al. (2011) used this model to evaluate how different social and ecological factors influenced the uptake of a 2011 H1N1 influenza vaccine in the United States. At the intrapersonal level, they assessed the influence of perceptions of susceptibility to the disease, the effectiveness of the vaccine, and the safety of the vaccine. At the interpersonal level, they evaluated the effect of social influence (i.e., the influence of family and friends) on vaccine uptake. At the institutional level, Kumar et al. evaluated the influence that recommendation of physicians operating at different institutions have on vaccine uptake. At the community level, the authors evaluated the influence of factors such as the presence of the disease in the community and perceived risk of infection. Finally, at the policy level, they evaluated access to health insurance as a factor influencing vaccine uptake (Kumar et al., 2011).

Similarly, Abbas et al. (2018) used the SEM to evaluate factors influencing flu vaccination status among adults living in the United States. At the intrapersonal level, they evaluated the influence of perceived susceptibility to influenza, perceived severity of influenza, and perceived benefits of getting the flu vaccine. At the interpersonal level, they evaluated the impact of social influence on vaccine uptake. At the community level, Abbas et al. assessed the influence of access to health care. Finally, at the policy level the authors evaluated the influence of health insurance on influenza vaccine uptake (Abbas et al., 2018). Similar to the studies conducted by Kumar et al. (2011) and Abbas et al. (2018), the influence of social and ecological factors on flu vaccination status among elderly Latinos was assessed in this study.

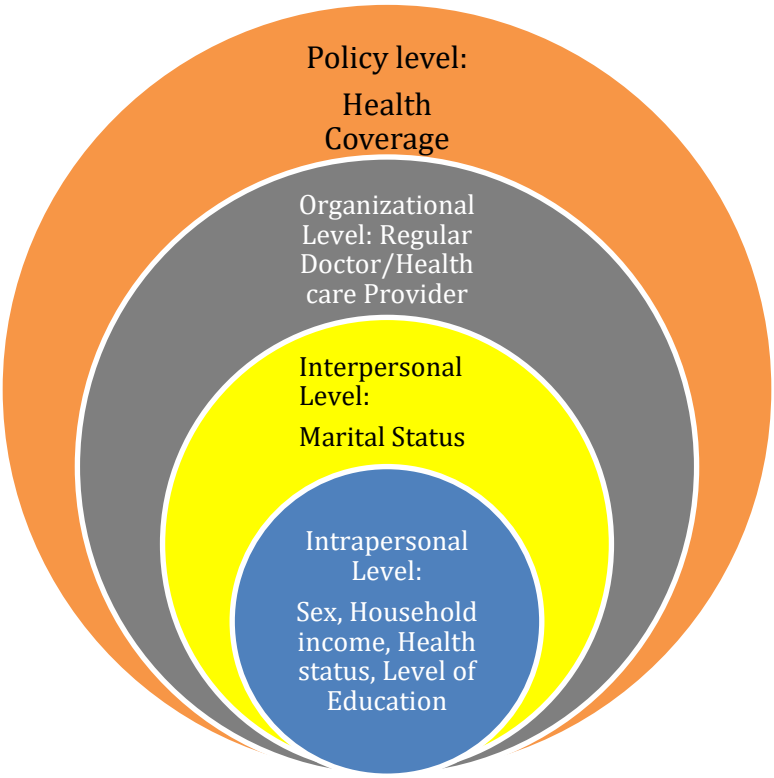

Figure 1. The social ecological model as a framework to analyze factors influencing flu vaccination status among Hispanic elders living in the United States.

Figure 1 represents the levels at which some of these factors might influence flu vaccination status among the Hispanic elders. For example, the influence of factors operating at the intrapersonal level such as sex, household income, level of education, and self-reported health status, was evaluated. At interpersonal level, the influence of marital status was evaluated. At the organizational level, the influence of having a regular doctor or healthcare provider (as measure of access to healthcare) was evaluated. Finally, at the policy level, the influence of health care coverage was assessed.

Literature Review Related to Key Variables

Influenza

Influenza (flu) is a contagious viral disease that mainly affects organs in the respiratory tract such as the nose and pharynx, and in some cases, the lungs. Most commonly, flu signs and symptoms include fever, sore throat, runny nose, cough, headache, body ache, and fatigue (CDC, 2018a). People with influenza infection usually recover within few days; however, influenza-associated complications and even death may occur, especially in vulnerable populations such as pregnant women, elders, and immunocompromised patients (Moghadami, 2017). Worldwide, influenza causes significant morbidity and mortality (Shrestha et al., 2015).

Influenza virus. Although three types of flu viruses can infect humans (types A, B, and C), influenza A and influenza B are most commonly associated with seasonal, epidemic, and pandemic diseases (Mosnier et al., 2015).Influenza viruses belong to the "*Orthomyxoviridae*" family, which groups RNA viruses with several antigenic variations (Moghadami, 2017). These viruses have on their surfaces the glycoproteins

hemagglutinin and neuraminidase, which play fundamental roles in the pathogenesis of influenza (Moghadami, 2017).At least 16 variants of hemagglutinin and nine variants of neuraminidase exist for influenza A. Classification of influenza A subtypes are based on existing combinations patterns of hemagglutinin and neuraminidase(e.g., H5N1 or H1N1). For influenza B, however, there is no significant variability in terms of antigenic patterns for hemagglutinin and neuraminidase. Therefore, there are no subtypes for influenza B (Moghadami, 2017).

Influenza in the United States. In the United States, influenza is the cause of significant mortality and morbidity. According to the CDC (2019b), between 9.3 and 49.0 million people developed the flu annually between 2011 and 2018. Additionally, during that period, the annual number of influenza-associated hospitalizations was between 140,000 and 960,000, and the annual number of deaths was between 12,000 and 79,000. In the 2017-2018 influenza season, 48.8 million people living in the United States got sick with influenza, 959,000 influenza-associated hospitalizations were registered, and approximately 79,400 people died from influenza-associated complications (CDC, 2019c). Of all flu- associated hospitalizations occurring during the 2017-2018 influenza season, more than 70% occurred among elderly adults (≥65 years). Moreover, elderly adults accounted for more than 90% of all influenza-associated deaths occurring during the season (CDC, 2019c).

Influenza Vaccination among the Elderly

The World Health Organization has emphasized that getting the flu vaccine is the best way to prevent influenza (Trucchi et al., 2015). In the United States, the Advisory

Committee on Immunization Practices has recommended annual flu vaccinations for all individuals who are 6 months of age or older and have no contraindications (CDC, 2019d). However, flu vaccination rates are far below the goals of Healthy People 2020. For example, among adults aged between 18 and 49 years old, the flu vaccination coverage was 26.9% in the 2017-2018 flu season. This coverage was significantly below the 90% goal of Healthy People 2020 (CDC, 2018b). Another goal of Healthy People 2020 is to increase the flu vaccination coverage in elderly adults up to 90%. But in the 2017-2018 flu season, the influenza vaccination coverage rate among elders living in the United States was as low as 59.6%; this is 5.7% lower than the vaccination rate during the previous flu season (65.3%; CDC, 2018b).

Racial/ethnic disparities in flu vaccination rates among the elderly in the United States. Although the overall influenza vaccination rates among the elders (≥65 years) ranged between 59.6% and 66.6% during the last eight flu seasons in the United States (CDC, 2018b), racial/ethnic disparities exist in the elderly population in terms of flu vaccination rates (American Lung Association, 2010; Yoo et al., 2015). For example, Lu et al. (2014) analyzed the trending in racial/ethnic disparities in flu vaccination in adults living in the United States for the 2011-2012 influenza season and found that among the elders aged ≥65 years, the flu vaccine coverage rates were 72.3%, 58.2%, and 60.4% for non-Hispanic Whites, non-Hispanic Blacks, and Hispanics, respectively. These results indicate that non-Hispanic Whites were 24% more likely to get vaccinated than non-Hispanic Blacks and were 20% more likely to get vaccinated than Hispanics. Other researchers such as Hebert, Frick, Kane, and McBean (2005) and Yoo et al. (2011) have

also documented racial/ethnic disparities in flu vaccination rates among the elders living in the United States.

Factors Influencing Flu Vaccination Rates Among the Elderly

Sex. Several factors affecting flu vaccination rates have been identified in several studies. For example, a cross-sectional telephone survey conducted in Hong Kong (China) showed that elderly females are more likely to get vaccinated than elderly males (*OR*: 1.93; 95% CI: 1.27–2.94; Mo& Lau, 2015). Similar results were found in a nationwide cross-sectional survey conducted in an elderly German population. The authors found that the odds of getting the flu vaccine was 1.43 times greater among elderly females compared to elderly males (*OR*: 1.43; 95% CI: 1.07- 2.11; Bödeker, Remschmidt, Schmich, & Wichmann, 2015).

Within the Hispanic population, one study conducted by Cohen et al. (2012) showed that adult Hispanic males were less likely to get vaccinated (*OR*: 0.54; 95% CI: 0.40- 0.73) than their females' counterparts. However, the analysis included all adults aged 18 years and older, and the study was restricted to a Hispanic immigrant community in northern Manhattan (New York; Cohen et al., 2012). Additionally, the specific influence of sex on vaccination status among older adults (≥ 65 years old) was not estimated by the authors (Cohen et al., 2012). Contrasting these results, a study conducted in Spanish elders who participated in the European Health Survey in Spain in 2009 and 2014 and in the National Health Survey in Spain in 2011 showed that male were more likely (*OR*: 1.13; CI: 1.05–1.22) to get the flu vaccine than females(Dios-Guerra et al., 2017).

Ganczak, Gil, Korzeń, and Bażydło (2017), on the other hand, found no association between gender and flu vaccine uptake among elders living in countries with insufficient flu vaccination implementation. Similarly, a study conducted in the U.S. population using 2009 BRFSS data showed no association between sex and influenza vaccination status among adults aged ≥ 65 years (Takayama, Wetmore, & Mokdad, 2012). Furthermore, a retrospective analysis of data collected by BRFSS between 2011 and 2014 showed no significant association (*OR*: 0.92; 95% CI: 0.59, 1.44) between sex and flu vaccination status among elderly participants (≥ 65 years old, La et al., 2017).

Health status. Health status has been identified as a determinant of flu vaccination status among elders in several research studies. Some studies have found that while poor self-perceived health status was a motivation for getting the flu vaccine among elderly adults, good self-perceived health status was the main reason for refusing to get the vaccine. For example, a research study based on data collected by a nationwide health survey conducted in an elderly Korean population (≥ 65 years) found that elders with better perceived health status were less likely to get the flu vaccine (*OR*: 0.79; 95% CI: 0.64 - 0.97) compared to those with worse perceived health status (Kwon, Kim, & Park, 2016).

Similarly, a study conducted in a nationally representative elderly German population showed that a low perceived health status was positively associated with influenza vaccine uptake (*OR*: 2.9; 95% CI: 1.1– 3.3; Klett-Tammen, Krause, Seefeld, & Ott, 2015). Additionally, a study conducted in Hong Kong (China) that analyzed data from an exploratory cross-sectional survey showed that elderly participants (≥ 65 years)

with poor to fair self-perceived health status were more likely (*OR*: 2.30; 95% CI: 1.47–3.60) to get vaccinated than those with very good self-perceived health status (Lau, Lau, & Lau, 2009). However, in a study conducted in the U.S. population, in which the influence of health status on influenza vaccination status among Hispanic elders was assessed, no significant association between these two variables was found (Rangel et al., 2005). These results were nonetheless obtained more than ten years ago; therefore, more recent results are needed.

Marital status. The influence of marital status on influenza vaccination status among the elders has been analyzed in several studies. For example, Ryu, Kim, Park, and Park (2011) found that being married was positively associated (*OR*: 1.26; 95% CI: 1.07–1.50) with flu vaccine uptake among elderly adults living in the Honam region of Korea. However, using data from a nationwide survey conducted in Korea between 2007 and 2009, some authors found that marital status was not significantly associated with flu vaccination status (*OR*: 0.90; 95% CI: 0.77 - 1.06; $p = 0.2$) among the elders (Kwon, Kim, & Park, 2016). These differences might be due to the fact that different target populations were assessed in each study. Also, a study conducted in an elderly Iranian population found no significant association (*OR*: 1.01; 95% CI: 0.68-1.5; $p = 0.90$) between flu vaccination status and marital status (Taheri Tanjani, Babanejad, & Najafi, 2015).

Alternatively, in a cross-sectional study conducted in an elderly population of Singapore, Ang et al. (2016) found that married elders were less likely (*OR*: 0.61; 95% CI: 0.44- 0.86) to get the flu vaccine compared to single elders. Similarly to these results,

a study conducted in the U.S. population showed that unmarried elderly Hispanics were more likely (*OR*: 1.26; 95% CI: 1.00 – 13.9) to get the flu vaccine than married Hispanic elders (Rangel et al., 2005). These differences might be attributed to differences among these populations in terms of other cultural and sociodemographic characteristics.

Level of education. Level of education has been reported to be strongly associated with flu vaccination status in several studies. For example, a study conducted in an elderly population in Belgrade (Serbia) showed that a higher level of education was positively associated (*OR*: 1.87; 95% CI: 1.13- 3.08) with getting the influenza vaccine (Gazibara et al., 2019). Similar results were obtained by a research study that analyzed data collected from the 2009 BRFSS survey (Takayama, Wetmore, & Mokdad, 2012). The authors found that, among the elders living in the United States, a lower level of education was negatively associated (*OR*: 0.96; 95% CI: 0.92- 0.99) with flu vaccine intake (Takayama, Wetmore, & Mokdad, 2012).

However, a study evaluating the influence of level of education on flu vaccination status in several European countries showed different results (Endrich, Blank, & Szucs, 2009). The authors of this study found that a higher level of education was positively associated with flu vaccine intake in Austria (*OR*: 1.67; $p = 0.001$) and Poland (*OR*: 2.74; $p < 0.001$). However, a higher level of education was negatively associated with flu vaccination intake in Germany (*OR*: 0.76; $p = 0.007$), Finland (*OR*: 0.67; $p = 0.001$) and other countries such as Ireland, Italy, and Spain (Endrich, Blank, & Szucs, 2009). According to these authors, no significant association was found between the level of education and flu vaccination status in the Czech Republic (Endrich, Blank, & Szucs,

2009). In a cross-sectional study conducted in Szczecin (Poland), Ganczak, Gil, Korzeń, and Bażydło (2017) also found no significant differences ($p = 0.55$) in terms of flu vaccine uptake among elders with different levels of education. However, this study was conducted in patients admitted to a municipal hospital. Therefore, the study sample may not be representative of the whole population for which conclusions were to be made.

Household income. Takayama, Wetmore, and Mokdad (2012) studied the influence of several sociodemographic factors on flu vaccine uptake in the U.S. population using data from the 2009 BRFSS survey. They found that, along with other factors, lower household income had a negative influence (*OR*: 0.94; 95% CI: 0.92- 0.96) on influenza vaccination uptake among the elders (≥ 65 years). Similarly, Gazibara et al. (2019) found a significantly positive association (*OR*: 1.57; 95% CI: 1.01- 2.46) between higher household income and flu vaccine uptake in a study conducted on a small sample of 480 elders (≥ 65 years) recruited at the Community Health Center of a municipality in municipality of Belgrade (Serbia).

In the United States, another study was conducted to estimate the influence of several factors on vaccination status for several vaccines using data collected by the BRFSS survey (La et al., 2017). The study showed that having an annual household income higher than $25,000 was positively associated with flu vaccine intake within the elderly population (≥ 65 years, La et al., 2017). Similar results were found in a study conducted in a community of older adults living in Singapore (Ang et al., 2016). The authors found that those with higher incomes were more likely (*OR*: 1.59; 95% CI: 1.17- 2.17) to get vaccinated against the flu than those with lower household incomes.

However, a study conducted in an elderly adult population living in the Honam region of Korea showed that those with lower monthly income were more likely to be vaccinated against influenza compared to those with higher monthly income (Ryu, Kim, Park, & Park, 2011). These results are probably due to the fact that the government administered free flu shots to the vulnerable (poor) population at public health centers (Ryu, Kim, Park, & Park, 2011).

Access to health care. Access to healthcare has been assessed in previous studies analyzing factors associated with flu vaccine uptake. Gilstad-Hayden et al. (2015) evaluated the influence of access to healthcare on flu vaccination status among adults from low-income neighborhoods in New Haven (Connecticut). Two of the variables used to measure access to health care were *health insurance status*, and *having a personal doctor or healthcare provider*. The authors found that having health insurance, and having a personal doctor or healthcare provider were significantly associated ($p < 0.001$) with higher vaccine uptake. Fortunately, these variables are included in the 2018 BRFSS survey questionnaire alone with two other variables and will be assessed in this study.

La et al. (2017) also evaluated the influence of access to healthcare on flu vaccination status among the elders in the United States. To measure access to care, they asked whether respondents needed to see a doctor in the past 12 months but could not because of cost, whether respondents had a designated primary care provider, and the length of time since the last doctor's visit for a routine checkup. The authors found that reduced access to care (measured by the above-mentioned variables) was negatively associated with flu vaccine intake within this population (La et al., 2017).

Having at least one chronic condition. Chronic conditions are defined by the CDC as those lasting one year or more and "requiring ongoing medical attention, or limited activities of daily living, or both" (CDC, 2019e). In a research study that included Hispanic children and adults, Cohen et al. (2012) showed that having at least one chronic respiratory condition was positively (*OR*: 2.03; 95% CI: 1.25- 3.31; $p = 0.01$) associated with getting the influenza vaccine. Similarly, Sato et al. (2015) found, in a population of elders Brazilians, that individuals having two or more chronic diseases (hypertension, cardiovascular disease, diabetes mellitus, COPD, arthritis, and osteoporosis) were more likely (*OR*: 1.14; 95% CI: 1.01- 1.27) to get vaccinated against the flu compared to those with a healthier status.

Additionally, using data collected by a nationally representative survey, Chiatti et al. (2011) found that having a severe chronic condition was one of the strongest (*OR* = 2.06; 95% CI: 1.90 - 2.24) predictors of flu vaccine uptake in an elderly Italian population. Furthermore, a research study, that used an anonymous cross-sectional telephone survey for data collection, found that having a chronic disease was positively associated (*OR*: 2.25; 95% CI: 1.49–3.41) with flu vaccine uptake among elderly Chinese living in Hong Kong (Mo& Lau, 2015)

Geographical region of residence. Abbas et al. (2018), investigated if the region of residence was a factor influencing flu vaccine uptake among adults living in the U.S. They categorized this variable into four possible outcomes (Northeast, South, East, and Midwest). They did not find significant differences among the four regions in terms of influenza vaccination rates. These authors did not specify the states included in each

region. However, they most probably used the regional distribution established by the US Census Bureau (United States Census Bureau, n.d.), which was the regional distribution used in this research study. Lu et al. (2019), on the other hand, conducted a study based on data collected by the National Health Interview Survey between 2010 and 2016. They found that the region of residence (Northeast, Midwest, South, and West) had no significant influence on flu vaccination status (Lu et al., 2019). Both, the study conducted by Abbas et al. (2018) and the study conducted by Lu et al. (2019), evaluated the influence of region of residence on flu vaccination status among individuals aged 18 years or older. The specific influence of region of residence on flu vaccination status among Hispanic elders was still to be determined.

Other studies have revealed the influence of the region of residence on flu vaccination status. For example, a study conducted by Andrew, McNeil, Merry, and Rockwood (2004) showed that elderly adults living in Ontario (Canada) were more likely to get vaccinated against the flu compared to elderly adults living in any other region of Canada. In this study, I evaluated the influence of the region of residence on flu vaccine uptake among elderly Latinos living in the United States.

Summary

This chapter starts with a brief description of the public health issue that was addressed in this study followed by an explanation of the strategy that was used to conduct the literature search. Then, the chapter describes how the SEM was used as the theoretical foundation to conduct this study. A brief description of influenza is then provided, which included the signs and symptoms of the disease, and possible

complications. The chapter also describes the general structure of the virus, the types of influenza viruses that exist, and the antigenic variability of influenza A.

The epidemiology of influenza in the United States is outlined in this chapter with emphasis in the elderly population. Also, the importance of getting the flu vaccine is mentioned as recommended by the Advisory Committee on Immunization Practices (CDC, 2019d) and World Health Organization (Trucchi et al., 2015). Additionally, this chapter mentions the existing racial/ethnic disparities within the U.S. elderly population in terms of flu vaccination status. More specifically, it shows how elderly Hispanics are less likely to get flu vaccine compared to their White American counterparts. These facts supported the need of identifying factors influencing flu vaccine uptake in the older Hispanic population.

The chapter also makes a description of several factors (level of education, income, marital status, sex, the geographical region of residence, access to healthcare, having at least one chronic condition, and self-reported health status) that were identified as influencing flu vaccine uptake in different populations of older adults. Based on the studies analyzed in this literature review, a higher level of education, higher household income, reporting poor perceived health status, and having at least one chronic condition were generally associated with an increased likelihood of being vaccinated against the flu.

For sex, more studies reported a positive association between flu vaccine uptake and being a female rather than being a male. However, several studies reported a lack of association between sex and flu vaccination status. Reduced access to healthcare was

found to be negatively associated with flu vaccine intake in most studies where this factor was assessed. Evidence for marital status was contrasting. While some studies reported a positive association between been married and flu vaccine intake, some others reported a negative or no association at all.

For the region of residence, most studies showed no association with flu vaccine intake in the United States. However, the region of residence has been found to be associated to flu vaccination status in other countries. Still, the influence of this factor on flu vaccination status among elder Latinos living in the United States was yet to be determined as well as the other above-mentioned factors. The influence of those factors on flu vaccine uptake among Hispanic elders was assessed in this study.

Chapter 3: Research Method

Introduction

Racial/ethnic disparities exist among the elderly living in the United States in terms of flu vaccination (American Lung Association, 2010; Yoo et al., 2015). Elderly Hispanics are less likely to get the flu vaccine compared to White American elders, even though they are more likely to develop influenza-associated complications (American Lung Association, 2010). But little is known about the factors influencing flu vaccination among older Latinos (Moran et al., 2016). The primary purpose of this quantitative, cross-sectional study was to evaluate the influence of several sociodemographic and ecological factors on flu vaccination status among Hispanic elders and whether differences exist in terms of vaccination status between Hispanic and White American elders.

This chapter discusses the rationale for using a quantitative analysis of secondary cross-sectional data in this study. The methodology is described as well as the study population, the employed sampling and sampling procedures, the procedures for recruitment and data collection, the procedures for accessing the dataset, and instrumentation and operationalization of the construct. Additionally, the threats to validity and ethical procedures are discussed, followed by a summary of the chapter.

Research Design and Rationale

As stated, the influence of several sociodemographic and ecological factors on flu vaccination status among elderly Latinos living in the United States was evaluated in this study. The independent variables of this study were level of education, household

income, marital status, sex, the geographical region of residence, access to healthcare, having at least one chronic condition, and self-reported health status. The dependent variable of the study was flu vaccination status. A secondary analysis of cross-sectional data from the BRFSS was conducted. The analysis was used to analyze how different factors operating at a given time may influence the flu vaccination status among the older Hispanics using data collected during the year 2018.

Methodology

Study Population

Elderly Hispanics (≥65 years) living in the United States represented the target population of this study. According to the U.S. States Census Bureau (2019), there were 4,418,086 Hispanic elders in the United States by July 1, 2018. This number (4,418,086) represents the size of the target population of this research study.

Data Sources

Data collected by the 2018 BRFSS were analyzed to answer the RQs. BRFSS is a nationwide system of telephone-based surveys that collects health-related data from U.S. residents. BRFSS gathers data not only from residents living in the 50 states of the United States but also from individuals living in three U.S. territories and the District of Columbia (CDC, 2019).

Sampling and Sample Size

This study included all Hispanic and White American U.S. residents65 years and older who participated in the 2018 BRFSS survey. The study excluded participants with missing data related to flu vaccination status. It also excluded participants missing data

for any factor evaluated in the study (level of education, income, marital status, sex, geographical region of residence, access to healthcare, having at least one chronic condition, or self-reported health status). G Power 3.1.9.2 was employed to calculate the minimum sample size required to reach a power of 0.80, with a significance level (α) of 0.05 and an effect size equivalent to an odds ratio of 1.57 for an independent variable with a binomial distribution. This program showed that the minimum sample size required to comply with these parameters was 688 participants.

The choice of this effect size (*OR* = 1.57) was based on the results obtained by Gazibara et al. (2019), who found that higher household income was positively (*OR*: 1.57; 95% CI: 1.01- 2.46) associated with flu vaccine uptake in an elderly population of Belgrade (Serbia). Similarly, Ang et al. (2016) found that higher income was positively (*OR*: 1.59; 95% CI: 1.17- 2.17) associated with flu vaccine intake in an elderly population of Singapore.

Procedure for Recruitment, Participation and Data Collection

In the BRFSS survey, each state collects its data, and most of them use the disproportionate stratified sample method (CDC, 2019). BRFSS uses telephone-based data collection. For the recruitment of participants, phone numbers are randomly selected throughout the state, while omitting business and nonworking numbers. BRFSS only recruits individuals 18 years and older (CDC, 2019).

Gaining Access to the Dataset

The 2018 BRFSS data are available to the public (CDC, 2019). Free access to the 2018 BRFSS data is granted at the CDC website (CDC, 2019). Therefore, no permission to get access was required.

Operationalization of the Variables

Flu vaccination status was the dependent variable in this study and was operationally defined as follows: got flu shot = 1, did not get the flu shot = 2. There were eight independent variables in this study: level of education, income, marital status, sex, geographical region of residence, access to healthcare, having at least one chronic condition, and self-reported health status. The following operational definitions were used:

- Level of education [never attended school or only attended kindergarten = 1, Grades 1 through 8 (elementary) = 2, Grades 9 through 11 (some high school) = 3, Grade 12 or GED (high school graduate) = 4, college 1 year to 3 years (some college or technical school) = 5,or college 4 years or more (college graduate) = 6]
- Household income (less than $10,000 = 1; $10,000 to less than $15,000 = 2; $15,000 or less than $20,000 = 3; $20,000 to less than $25,000 = 4; $25,000 to less than $35,000 = 5; $35,000 to less than $50,000 = 6; $50,000 to less than $75,000 = 7; $75,000 or more = 8)
- Marital status (married = 1, divorced = 2, widowed = 3, separated = 4, never married = 5, a member of an unmarried couple = 6)
- Sex (male =1, female = 2)

- Geographical region of residence. This variable was created by grouping states within different geographical regions using the values provided by the variable that provides individuals' information about their state of residence. Geographical region of residence was measured as follows: Midwest = 1, Northeast = 2, South = 3, and West = 4. The regional distribution of states made by the US Census Bureau was used (U.S. Census Bureau, n.d.). According to this agency, the Midwest region includes the following states: Indiana, Illinois, Michigan, Ohio, Wisconsin, Iowa, Nebraska, Kansas, North Dakota, Minnesota, South Dakota, and Missouri. The Northeast region includes the states Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, New Jersey, New York, and Pennsylvania. The South region includes the states Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia, Alabama, Kentucky, Mississippi, Tennessee, Arkansas, Louisiana, Oklahoma, and Texas. Finally, the West region includes the states Arizona Colorado, Idaho, New Mexico, Montana, Utah, Nevada, Wyoming, Alaska, California, Hawaii, Oregon, and Washington (United States Census Bureau, n.d.).
- Access to healthcare was measured through four different variables as follows: health care coverage (yes = 1, or no = 2), having a personal doctor/healthcare provider (yes, only one = 1, two or more = 2, or no = 3), could not see a doctor because of cost during the last 12 month (yes =1, no = 2), and length of time since last routine checkup (within the past year = 1, within the past 2 years = 2, within the past 5 years = 3, 5 or more years ago = 4, never = 8)

- Having at least one chronic condition (yes = 1, or no = 2). Value for this variable equaled 1 if a person reported suffering (or had suffered),for at least one year, one or more conditions that "require ongoing medical attention, or limited activities of daily living, or both" (CDC, 2019e). These conditions included coronary heart disease, stroke, asthma (any type), cancer (including individuals with remission over a year), COPD, arthritis, rheumatoid arthritis, gout, lupus, fibromyalgia, diabetes, depression, and kidney disease.
- Health status measured self-reported health status. Participants were asked to report how they would say their health was. They selected one of the following choices: (excellent =1, very good = 2, good = 3, fair = 4, or poor =5).

Data Analysis Plan

The purpose of this study was to answer the following RQs:

RQ 1: Is flu vaccination status among elderly Hispanics living in the United States associated with the following socio-demographic factors (level of education, sex, marital status, and household income)?

$H_0$1: Flu vaccination status is not associated with level of education, sex, marital status, and household income among elderly Hispanics living in the United States.

$H_1$1: Flu vaccination status is associated with level of education, sex, marital status, and household income among elderly Hispanics living in the United States.

RQ 2: Is flu vaccination status among elderly Hispanics living in the United States associated with the following health factors (access to health care, self-reported health status and having at least one chronic condition)?

$H_0$2: Flu vaccination status is not associated with access to health care, self-reported health status and having at least one chronic condition among elderly Hispanics living in the United States.

$H_1$2: Flu vaccination status is associated with access to health care, self-reported health status and having at least one chronic condition among elderly Hispanics living in the United States.

RQ 3: Is flu vaccination status among elderly Hispanics living in the United States associated with region of residence?

$H_0$3: Flu vaccination status is not associated with region of residence among elderly Hispanics in the United States.

$H_1$3: Flu vaccination status is associated with region of residence among elderly Hispanics in the United States.

RQ 4: Are there differences in influenza vaccination status between elderly Hispanics and White American elders?

$H_0$4: Influenza vaccination status does not differ between elderly Hispanics and White American elders.

$H_1$4: Influenza vaccination status differs between elderly Hispanics and White American elders.

SPSS software (version 25) was used to conduct all analyses in this study. Data cleansing involved the elimination of variables not relevant to this study. Additionally, cases with missing data for variables analyzed in this study were also eliminated.

Simple logistic regressions were conducted to analyze if level of education, income, marital status, sex, access to healthcare, having at least one chronic condition, self-reported health status, and geographical region of residence affect flu vaccination status in elderly Hispanics. Multivariate logistic regressions were then conducted to analyze the influence on flu vaccination status of each factor when controlling for other factors included in the models. Additionally, simple logistic regression was also used to evaluate the differences in vaccination status between elderly Hispanics and their White American counterparts. Interpretation of results was based on odd ratios values from logistic regressions along with the corresponding 95% confidence intervals (CI) and *p*-values.

Validity

Several studies have evaluated the validity of the BRFSS. Pierannunzi, Hu, and Balluz (2013) conducted a systematic review of research articles that assessed the validity and reliability of BRFSS between 2004 and 2011. In their report, these authors revealed the high levels of validity of BRFSS in terms of access to health care and general health according to published information. However, one of the articles included in the review showed BRFSS had higher proportions of persons reporting poorer health compared to the National Health Interview Survey (Pierannunzi, Hu, & Balluz, 2013). In terms of immunization, one of the studies included in the review evaluated the validity of self-reported vaccination data by comparing these data to medical records or Medicare claims. High validity of data was revealed by a specificity of 0.83 and a sensitivity of 0.75 (Pierannunzi, Hu, & Balluz, 2013). Although elevated levels of agreement in reliability

testing were found for chronic conditions, a few differences in prevalence rates were identified among different national surveys when compared to physical measures. However, validity was high for measures of chronic conditions among people aged ≥ 65 years (Pierannunzi, Hu, & Balluz, 2013).

The telephone-based nature of the BRFSS survey posed limitations. For instance, compared to face-to-face interviews, the level of no coverage for telephone surveys may be higher, due to the inability to reach some U.S. households by telephone (CDC, 2017c). Unfortunately, several studies have found differences concerning demographic, economic, and health characteristics between the telephone and non-telephone populations; therefore, some of the subpopulation estimates could be biased (CDC, 2017c). For example, for people with low incomes, people living in rural areas, people with a low level of education, people with poor health, and heads of households younger than 25 years of age, telephone coverage is smaller compared to the general population (CDC, 2017c).

There are also statistical issues associated with the complex sample design used in BRFSS. Most statistical software packages assume simple random sampling. BRFSS, however, collects data through a complex sample design. Therefore, misleading results may be obtained if standard statistical analysis methods for hypothesis testing and variance estimation are directly applied to these data (CDC, 2017c). Fortunately, SPSS account for complex sampling design, so it may be used to analyze BRFSS data (CDC, n.d.).

Ethical Procedure

The data that I analyzed in this study was collected by BRFSS. This data is available to the general public and does not contain any identifying information about research subjects. The BRFSS survey is conducted by the CDC and involves human participants. According to the CDC (2017b), all studies supported or conducted by the CDC involving human participants must follow the Health and Human Service Policy for Protection of Human Research Subjects. Additionally, before starting such studies, an Institutional Review Board (IRB) must approve them (CDC, 2017b). BRFSS complies with the principles of ethics and the guidelines established by the Belmont report for the protection of human subjects (CDC, 2017b; United States, 1978).

Furthermore, it was not required to contact the CDC to obtain permission for the use of this data. The data was analyzed ethically and responsibly in accordance with the guidelines of the American Psychological Association (American Psychological Association, 2017). Data cleansing, organization, and analysis was not conducted until approval was received from Walden University's Institutional Review Board (IRB).

Summary

This chapter discusses the cross-sectional quantitative nature of this study. The data source used for the analysis is described here, as well as the way the minimum sample size required was calculated. Independent and dependent variables are defined, followed by the data analysis plan, which includes the RQs and the statistical tests that will be used to answer those questions. Finally, the validity of the BRFSS data is discussed followed by the ethical procedure associated with the use of this database.

Chapter 4: Results

Introduction

This quantitative study aimed to analyze the factors associated to flu vaccination status among elderly Hispanics (≥ 65 years) living in the United States. The study evaluated the influence of several sociodemographic factors, health factor, and region of residence on flu vaccination status among Hispanic elders living in the United States. Additionally, this study evaluated the differences in terms of flu vaccination status between elderly Hispanics and their White American counterparts.

The study investigated four RQs. The purpose of the first question was to investigate whether sociodemographic factors such as level of education, sex, marital status, and household income had an influence on flu vaccination among elderly Hispanics living in the United States. The second question of the study analyzed if health factors such as access to health care, self-reported health status and having at least one chronic condition were associated to flu vaccination within the Hispanics elders. The third RQ of this study analyzed whether region of residency had an influence on flu vaccination among elderly Hispanics. Finally, the purpose of the fourth RQ was to analyze if there was significant difference in terms of flu vaccination status between Hispanic elders living in the United States and their White American counterparts. This chapter presents a brief description of how the data was collected followed by a descriptive statistic of the sample. Then, the chapter presents an evaluation of the assumptions of logistic regressions followed by the findings obtained from the statistical analyses associated to the RQs.

Data Collection

In this study, I conducted secondary analysis of data collected in 2018 by the BRFSS. BRFSS is a nationwide survey system that collects health-related data from U.S. adult residents (≥18 years) by phone. BRFSS gathers data from residents living in the 50 states of the United States and from individuals living in three U.S. territories and the District of Columbia (CDC, 2019).

Only elderly Hispanics and White American elders (≥ 65 years) living in continental United States and Hawaii were included in this study. This study excluded Hispanics from Puerto Rico because it is not included within one of the four region defined by U.S. Census Bureau. Participants with missing data (including those who refused to answer and those who did not know the answer) for any of the variables assessed in this study were excluded. A total of 95,414 participants were selected after applying the exclusion/inclusion criteria.

From selected participants, 92,593 (97.0%) were White American elders, and 2,821 (3.0%) were Hispanic elders (Table 1). Among White American elders, most (55.2 %, 51,120) were female, which was similar to Hispanic elders (53.8%, 1,517). Though in the United States the proportion of White American elders to Hispanic elders was 9.1 to 1 (40,097,798 White American elders to 4,394,798 Hispanic elders) in 2018, in the study sample the proportion was 32.8 to 1 (92,593 White American elders to 2,821 Hispanic elders). However, the sex distribution in the study sample was still similar to the sex distribution in the United States. For example, as of July 2018, 54.9 % (22,007,744) of

White American elders living in the United States were female, and 56.5% (2,483,192) of the Hispanic elders living in the United States were female.

Table 1

Comparisons of Sample Demographics and U.S. Demographics

	f (sample)	% (sample)	*f* (U.S.)	% (U.S.)
White elderly females	51,120	55.2	22,007,744	54.9
White elderly males	41,473	44.8	18,089,636	45.1
Total White elders	92,593	100.0	40,097,798	100.0
Elderly Hispanic females	1517	53.8	2,483,192	54.9
Elderly Hispanic males	1304	46.2	1,911,606	45.1
Total Hispanic elders	2821	100.0	4,394,798	100.0
Total White elders + Total Hispanic elders	95,414		44,492,178	
Total White elders : Total Hispanic elders	32.8 to 1		9.1 to 1	

Results

Descriptive Statistics

SPSS software (version 25) was used to conduct descriptive statistics for the variables race/ethnicity, vaccination status, level of education, sex, marital status, household income, self-reported health status, having at least one chronic condition, region of residence, and four other variables that were used to measure access to health care (health care coverage, having a personal doctor/healthcare provider, could not see a doctor because of cost during the last 12 months, and length of time since last routine checkup)

Among selected White American elders, 51,540 (55.7%) got the flu vaccine, while 41,053 (44.3%) did not. Among Hispanic elders, 1,428 (50.6%) got the flu vaccine in 2018 while 1,393 (49.4%) did not. Table 2 shows the frequency distribution of level of education among Hispanic elders. Most participants (684, 24.2%) graduated from high

school; only 45 participants (1.5%) never attended school. Among elderly Hispanics living in the United States, about half (1,414, 50.1%) were married, and 40 (1.4%) were part of an unmarried couple (Table 3).

Table 2

Frequency Distribution of Level of Education

	F	%	Valid %	Cumulative %
Never attended	45	1.6	1.6	1.6
Elementary School	546	19.4	19.4	21.0
Some High School	260	9.2	9.2	30.2
High School Graduate	684	24.2	24.2	54.4
Some college	653	23.1	23.1	77.6
College Graduate	633	22.4	22.4	100.0
Total	2821	100.0	100.0	

Table 3

Frequency Distribution of Marital Stauts

	F	%	Valid %	Cumulative %
Married	1,414	50.1	50.1	50.1
Divorced	480	17.0	17.0	67.1
Widowed	612	21.7	21.7	88.8
Separated	119	4.2	4.2	93.1
Never Married	156	5.5	5.5	98.6
Unmarried Couple	40	1.4	1.4	100.0
Total	2,821	100.0	100.0	

Tables 4-5 show the frequency distribution of household income and self-reported health status. Among elderly Hispanic participants, income was almost evenly distributed, with the most (430,15.2%) participants having a household income equal or greater than $75,000 (Table 4). Table 5 shows the frequency distribution of self-reported health status among elderly Hispanics. Most (919, 32.6%) participants reported a good

health, and 275 (9.7%) of them reported a poor health. Finally, 2,186 (77.5%) of the participants had at least one chronic condition, whereas 635 (22.5%) participants did not.

Table 4

Frequency Distribution of Household Income

	F	%	Valid %	Cumulative %
<10,000	325	11.5	11.5	11.5
≥ 10,000 &<15,000	365	12.9	12.9	24.5
≥15,000 &<20,000	389	13.8	13.8	38.2
≥20,000 &<25,000	351	12.4	12.4	50.7
≥25,000 &<35,000	321	11.4	11.4	62.1
≥35,000 &<50,000	325	11.5	11.5	73.6
≥50,000 &<75,000	315	11.2	11.2	84.8
≥75,000	430	15.2	15.2	100.0
Total	2821	100.0	100.0	

Table 5

Frequency Distribution of Self-Reproted Health Status

	F	%	Valid %	Cumulative %
Excellent	292	10.4	10.4	10.4
Very Good	607	21.5	21.5	31.9
Good	919	32.6	32.6	64.4
Fair	728	25.8	25.8	90.3
Poor	275	9.7	9.7	100.0
Total	2821	100.0	100.0	

The frequency distribution of health care coverage among elderly Hispanics participants is as follows: 2,691 (95.4%) participants had a type of health care coverage, whereas 130 (4.5%) participants did not. Additionally, 263 (9.3%) of these participants could not see a doctor because of the cost within a year from the day they were surveyed, but 2,558 (90.7%) participants did not have that issue. Further, 2,521(89.4%) elderly Hispanics included in this study had their last routine medical checkup less than 1 year

from the day they were surveyed, and only 20 (0.7%) participants never had a medical routine checkup before the day they were surveyed (Table 6).

Table 6

Frequency Distribution of Length of Time Since Last Routine Checkup

	f	%	Valid %	Cumulative %
<1 year	2,521	89.4	89.4	89.4
≥1year & <2 years	175	6.2	6.2	95.6
≥2 years & <5 years	41	1.5	1.5	97.0
≥5 years	64	2.3	2.3	99.3
Never	20	.7	.7	100.0
Total	2,821	100.0	100.0	

Table 7 shows the distribution of participants having one, more than one, or no primary doctor or healthcare professional. From participating Hispanic elders, 2,314 (82.0%) had one personal doctor/healthcare provider. Table 8 shows the frequency distribution of region of residency for Hispanic elders selected in this study, with most (1,372, 48.6%) living in the West.

Table 7

Frequency Distribution of Having a Doctor/Healthcare Provider

	f	%	Valid %	Cumulative %
Only 1	2314	82.0	82.0	82.0
More than 1	224	7.9	7.9	90.0
None	283	10.0	10.0	100.0
Total	2821	100.0	100.0	

Table 8

Frequency Distribution of Region of Residence

	f	%	Valid %	Cumulative %
Midwest	321	11.4	11.4	11.4
Northeast	387	13.7	13.7	25.1
South	742	26.3	26.3	51.4
West	1371	48.6	48.6	100.0
Total	2821	100.0	100.0	

Statistical Assumptions

Multivariate logistic regressions assume little or no multicollinearity among independent variables. This assumption is met because all independent variables in this study are categorical. Additionally, no detection of outliers is necessary due to the same reason. Other assumption such as: that the dependent variable should be dichotomous and that the observations should be independent from each other have also been met.

Inferential Statistics

Research Question 1. RQ1: Is flu vaccination status among elderly Hispanics living in the United States associated with the following sociodemographic factors (level of education, sex, marital status, and household income)?

$H_0$1: Flu vaccination status is not associated with level of education, sex, marital status, and household income among elderly Hispanics living in the United States.

$H_1$1: Flu vaccination status is associated with level of education, sex, marital status, and household income among elderly Hispanics living in the United States.

Simple logistic regressions were conducted to determine whether sociodemographic factors such as level of education, sex, marital status, and household

income independently influence flu vaccination status among elderly Latinos. The results indicate that level of education is associated with flu vaccination status among Hispanic elders (p =0.039). However, none of the levels of education were able to predict vaccination status among elderly Hispanics (p>0.05; see Table 9). These results are supported by the 95% confidence interval of odds ratios. All these intervals included the value 1 for all levels of education when compared to the baseline category (college graduate; see Table 9).

Table 9

Simple Logisitc Regression for Level of Education and Flu Vaccination Status

								95% CI	
	Vaccinated	b	SE	Wald	df	Sig.	*OR*	Lower	Upper
College graduate (*N* = 633)	322 (50.9%)			11.693	5	.039			
Never attended (*N* = 45)	25 (55.6%)	.188	.310	.368	1	.544	1.207	.657	2.218
Elementary school(*N* = 546)	304 (55.7%)	.193	.117	2.720	1	.099	1.213	.964	1.527
Some high school (*N* = 260)	135 (51.9%)	.042	.147	.082	1	.775	1.043	.781	1.393
High school graduate (*N* = 684)	341 (49.9%)	-.041	.110	.135	1	.713	.960	.774	1.192
Some college (*N* = 653)	301 (46.1%)	-.191	.112	2.931	1	.087	.826	.663	1.028
Constant	.	.035	.080	.191	1	.662	1.035		

Note. Variables entered on Step 1 related to level of education

The results from simple logistic regression indicate that sex is not associated with vaccination among Hispanics elders living in the U.S. (p= 0.229; 95% CI: 0.788-1.059, Table10). Sex is, therefore, not a predictor of flu vaccination among Hispanic elders. Additionally, results for the variable marital status indicate that being divorced predicts flu vaccination status among elderly Hispanics. According to the results, the odds of getting the flu vaccine among divorced participants were 0.78 the odds of those who were married (*OR* = 0.784; 95% CI: 0.637 – 0.965, p = 0.022; see Table 11). However, no

significant differences in terms of flu vaccination status were found between married Hispanic elders and those who never married, were separated, widowed or were part of an unmarried couple (p >0.05; see Table 11).

Table 10

Simple Logisitc Regression for Sex and Flu Vaccination Status

								95% CI	
	Vaccinated	b	SE	Wald	df	Sig.	*OR*	Lower	Upper
Male (*N* = 1,304)	676 (51.8%)								
Female (*N* = 1,517)	752 (49.6%)	-.091	.076	1.444	1	.229	.913	.788	1.059
Constant		.074	.055	1.766	1	.184	1.076		

Table 11

Simple Logistic Regression for Marital Status and Flu Vaccination Status

								95% CI	
	Vaccinated	b	SE	Wald	df	Sig.	*OR*	Lower	Upper
Married (*N* = 1,414)	731 (51.7%)			14.780	5	.011			
Divorced (*N* = 480)	219 (45.6%)	-.243	.106	5.274	1	.022	.784	.637	.965
Widowed (*N* = 612)	335 (54.7%)	.122	.097	1.584	1	.208	1.130	.934	1.367
Separated (*N* = 119)	51 (42.9%)	-.356	.193	3.404	1	.065	.701	.480	1.022
Never married (*N* = 156)	70 (44.9%)	-.274	.170	2.607	1	.106	.761	.545	1.060
Unmarried couple (*N* = 40)	22 (55.0%)	.133	.322	.170	1	.680	1.142	.607	2.148
Constant		.068	.053	1.629	1	.202	1.070		

Note. Variables entered on Step 1 related to marital status

Furthermore, the simple logistic regression conducted for the variable household income indicates that there is not a significant association between household income and flu vaccination status among elderly Hispanics in the United States (p = 0.702; Table 12). These claims are supported by the 95% confidence intervals of odds ratios, which include the value 1 (Table 12), demonstrating that none of the household income categories predict vaccination status within the studied population.

Table 12

Simple Logistic Regression for Household Income and Flu Vaccination Status

								95% CI	
	Vaccinated	b	SE	Wald	df	Sig.	*OR*	Lower	Upper
≥75,000 (*N* = 430)	219 (50.9%)			4.656	7	.702			
<10,000 (*N* = 325)	172 (52.9%)	.080	.147	.294	1	.587	1.083	.812	1.445
≥ 10,000 &<15,000 (*N* = 365)	188 (51.5%)	.023	.142	.026	1	.871	1.023	.774	1.353
≥15,000 &<20,000 (*N* = 389)	207 (53.2%)	.091	.140	.426	1	.514	1.096	.833	1.442
≥20,000 &<25,000 (*N* = 351)	178 (50.7%)	-.009	.144	.004	1	.952	.991	.748	1.314
≥25,000 &<35,000 (*N* = 321)	149 (46.4%)	-.181	.148	1.497	1	.221	.835	.625	1.115
≥35,000 &<50,000 (*N* = 325)	159 (48.9%)	-.080	.147	.298	1	.585	.923	.692	1.231
≥50,000 &<75,000 (*N* = 315)	156 (49.5%)	-.056	.148	.144	1	.704	.945	.707	1.264
Constant		.037	.096	.149	1	.700	1.038		

A multiple logistic regression was conducted to evaluate whether the sociodemographic factors included in this study (level of education, sex, marital status, and household income) were together able to predict flu vaccination status among elderly Hispanics. The results indicate that level of education, sex, and household income do not predict flu vaccination status among elderly Hispanics living in the United States when controlling for the other sociodemographic factors including in the model (p >0.05, Table 13). Only the influence of marital status was significant; the odds of getting the flu vaccine among separated Hispanic elders were 0.65 the odds of those that were married (*OR* = 0.649; CI: 0.441 – 0.954, p = 0.028; Table 13). However, being divorced, widowed, or never married did not predict flu vaccination status among elderly Hispanics (p >0.05) when level of education, sex, and household income were included in the model (Table 13).

Table 13

Mutliple Logistic Regression of Level of Education, Sex, Marital Status, Household Income, and Flu Vaccination Status

							95% CI	
Variables	b	SE	Wald	df	Sig.	*OR*	Lower	Upper
Education								
College graduate			7.251	5	.203			
Never attended	.149	.321	.216	1	.642	1.161	.618	2.180
Elementary school	.146	.140	1.083	1	.298	1.157	.879	1.523
Some high school	.029	.161	.033	1	.856	1.030	.752	1.410
High school graduate	-.039	.120	.107	1	.743	.961	.760	1.216
Some college	-.186	.116	2.571	1	.109	.831	.662	1.042
Sex								
Females	-.114	.080	2.044	1	.153	.892	.764	1.043
Marital status								
Married			15.683	5	.008			
Divorced	-.201	.111	3.295	1	.070	.818	.658	1.016
Widowed	.155	.103	2.271	1	.132	1.168	.955	1.428
Separated	-.433	.197	4.844	1	.028	.649	.441	.954
Never married	-.276	.173	2.558	1	.110	.759	.541	1.064
Unmarried couple	.112	.324	.118	1	.731	1.118	.592	2.112
Household income								
< 10,000	-.048	.172	.079	1	.779	.953	.680	1.335
≥ 10,000 &<15,000	.018	.162	.013	1	.909	1.019	.741	1.400
≥15,000 &<20,000	-.065	.157	.170	1	.680	.937	.689	1.275
≥20,000 &<25,000	-.003	.156	.000	1	.985	.997	.735	1.353
≥ 25,000 &< 35,000	.168	.155	1.167	1	.280	1.183	.872	1.604
≥35,000 &<50,000	.048	.153	.098	1	.754	1.049	.777	1.416
≥50,000 &<75,000	.041	.150	.074	1	.785	1.042	.777	1.397
≥ 75,000			2.753	7	.907			
Constant	-.041	.120	.117	1	.733	.960		

*Note.*Variables entered on Step 1were level of education, sex, marital status, household income

Research Question 2. RQ2: Is flu vaccination status among elderly Hispanics living in the United States associated with the following health factors (access to health care, self-reported health status and having at least one chronic condition)?

$H_0$2: Flu vaccination status is not associated with access to health care, self-reported health status and having at least one chronic condition among elderly Hispanics living in the United States.

$H_1$2: Flu vaccination status is associated with access to health care, self-reported health status and having at least one chronic condition among elderly Hispanics living in the United States.

Simple logistic regressions were conducted to determine whether health factors such as access to health care, self-reported health status, and having at least one chronic condition independently influence flu vaccination status among elderly Latinos. Access to health care was measured using the variables: *health care coverage*, *having a personal doctor/health care provider*, *could not see a doctor because of cost during the last 12 months*, and *length of time since last routine checkup*.

Health care coverage had a significant influence on flu vaccination status among elderly Hispanics. The odds of getting the flu vaccine among those with health care coverage was 1.62 the odds of those with no health care coverage (*OR*=1.623; 95% CI: 1.132 – 2.327, p = 0.008; Table 14). Having a personal doctor/healthcare provider also had a significant influence on flu vaccination status among elderly Hispanics. The odds of getting the flu vaccine among elderly Hispanics with one personal doctor or healthcare provider were 2.13 times the odds of Hispanic elders with no personal doctor or

healthcare provider (*OR* = 2.128; CI: 1.642 – 2.757; $p<0.01$; Table 15). Additionally, the odds of getting the flu vaccine were 2.42 times greater among Hispanic elders with more than one personal doctor or healthcare provider compared to those with no personal doctor or healthcare provider (*OR* = 2.415; CI: 1.684 – 3.464; $p<0.01$; Table 15).

Table 14

Simple Logistic Regression for Health Care Coverage and Flu Vaccination Status

								95% CI	
	Vaccinated	b	SE	Wald	df	Sig.	*OR*	Lower	Upper
No health coverage (*N* = 130)	51 (39.2%)								
Health coverage (*N* = 2,691)	1,377 (51.2%)	.484	.184	6.953	1	.008	1.623	1.132	2.327
Constant		-.438	.180	5.935	1	.015	.646		

Note. Variables entered on Step 1 related to health care coverage

Table 15

Simple Logistic Regression for Having a Personal Doctor/Healthcare Provider and Flu Vaccination Status

								95% CI	
	Vaccinated	b	SE	Wald	df	Sig.	*OR*	Lower	Upper
No doctor (*N* = 283)	96 (33.6%)			34.649	2	.000			
One doctor (*N* = 2,314)	1,208 (52.2%)	.755	.132	32.578	1	.000	2.128	1.642	2.757
≥One doctor (*N* = 224)	124 (55.4%)	.882	.184	22.989	1	.000	2.415	1.684	3.464
Constant		-.667	.126	28.201	1	.000	.513		

Note. Variables entered on Step 1 related to having a personal doctor/healthcare provider

The variable *could not see a doctor because of cost during the last 12 months* also predicted flu vaccination status among Hispanic elders living in the U.S. ($p<0.05$); Table 16). The odds of getting the flu vaccine among those who could not see a doctor during the previous year because of cost were 0.762 of the odds of elderly Hispanics who could (*OR* = 0.762; CI: 0.591 – 0.984; $p = 0.037$; Table 16). Furthermore, the time elapsed since the last routine checkup had a significant influence on flu vaccination status among

elderly Hispanics. Results from a simple logistic regression revealed that the odds of getting the flu vaccine among elderly Hispanics who had their last checkup within the past 2 years but more than one year were 0.53 the odds of those who had their last routine checkup within the past 12 months (*OR* = 0.533; CI: 0.389 – 0.730; p <0.01). Also, the odds of getting the flu vaccine among elderly Hispanics who had their last routine checkup within the past five years but more than two years were 0.15 the odds of those who had had their last routine checkup within the past 12 months (*OR* = 0.151; CI: 0.063 – 0.360; $p < 0.01$). Furthermore, the odds of getting the flu vaccine among elderly Hispanics who had their last routine more than 5 years ago were 0.11 the odds of those who had had their last routine checkup within the past 12 months (*OR* = 0.108; CI: 0.049 – 0.238; $p < 0.01$; Table 17). However, no significant difference were observe in term of flu vaccination status between Hispanic elders who had their last checkup within the past 12 months and those who never had a routine checkup ($p = 0.244$; Table 17).

Table 16

Simple Logistic Regression for Could Not See a Doctor Because of Cost and Flu Vaccination Status

								95% CI	
	Vaccinated	b	SE	Wald	df	Sig.	*OR*	Lower	Upper
Could see a doctor (*N* = 2,558)	1,311 (51.3%)								
Could not see a doctor (*N* = 263)	117 (44.5%)	-.271	.130	4.345	1	.037	.762	.591	.984
Constant		.050	.040	1.601	1	.206	1.051		

Table 17

Simple Logistic Regression for Length of Time Since Last Routine Checkup and Flu Vaccination Status

								95% CI	
	Vaccinated	b	SE	Wald	df	Sig.	*OR*	Lower	Upper
< 1 year (*N* = 2,521)	1,341 (53.2%)			62.903	4	.000			
≥ 1 year &< 2 years (*N* = 175)	66 (37.7%)	-.630	.161	15.293	1	.000	.533	.389	.730
≥ 2 years &<5 years (*N* = 41)	6 (14.6%)	-1.891	.444	18.177	1	.000	.151	.063	.360
≥ 5 years (*N* = 64)	7 (10.9%)	-2.225	.402	30.562	1	.000	.108	.049	.238
Never (*N* = 20)	8 (40.0%)	-.533	.458	1.355	1	.244	.587	.239	1.440
Constant		.128	.040	10.268	1	.001	1.136		

Self-reported health status had a significant influence on flu vaccination status among Hispanic elders. Results from simply logistic regression showed that the odds of getting the flu vaccine among elderly Hispanics who considered to have a poor health were 1.631 times the odds of those who considered to have an excellent health (*OR* = 1.631; CI: 1.170 – 2.272; $p = 0.004$). Also, the odds of getting the flu vaccine among those reporting to have a fair health were 1.59 times the odds of those who considered to have an excellent health (*OR* = 1.589; CI: 1.209 – 2.088; $p = 0.019$; Table 18). However, those who considered to have an excellent health did not show significant differences in terms of flu vaccination compared to those who considered their health as very good ($p = 0.309$) or good ($p = 0.091$; Table 18). Additionally, having at least one chronic condition was also associated with flu vaccination status among elderly Hispanics. The odds of getting the flu shot among elderly Hispanics who had at least one chronic condition were 1.5 times the odds of those who did not (*OR* = 1.498; CI: 1.253- 1.790; $p < 0.01$; Table 19).

Table 18

Simple Logistic Regression for Health Status and Flu Vaccination Status

								95% CI	
	Vaccinated	b	SE	Wald	df	Sig.	*OR*	Lower	Upper
Excellent (*N* = 292)	128 (43.8%)			17.927	4	.001			
Very good (*N* = 607)	288 (47.4%)	.146	.143	1.033	1	.309	1.157	.874	1.532
Good (*N* = 919)	455 (49.5%)	.228	.135	2.853	1	.091	1.256	.964	1.637
Fair (*N* = 728)	403 (55.4%)	.463	.140	11.009	1	.001	1.589	1.209	2.088
Poor (*N* = 275)	154 (56.0%)	.489	.169	8.341	1	.004	1.631	1.170	2.272
Constant		-.248	.118	4.416	1	.036	.780		

Note. Variables entered on Step 1 related to health status.

Table 19

Simple Logisitc Regression for Having at Least One Chronic Condition and Flu Vaccination Status

								95% CI	
	Vaccinated	b	SE	Wald	df	Sig.	*OR*	Lower	Upper
No chronic condition (*N* = 635)	272 (42.8%)								
≥ 1 chronic condition (*N* = 2,186)	1,156 (52.9%)	.404	.091	19.743	1	.000	1.498	1.253	1.790
Constant		-.289	.080	12.951	1	.000	.749		

A multiple logistic regression was conducted to evaluate whether health factors such as access to health care (measured through *health care coverage*, *having a personal doctor/healthcare provider*, *could not see a doctor because of cost during the last 12 months*, and *length of time since last routine checkup*), self-reported health status, and having at least one chronic condition were together able to predict flu vaccination status among elderly Hispanics.

Although simple logistic regression showed that health care coverage was significantly associated with flu vaccination status among elderly Hispanics (Table 14), health care coverage did not predict flu vaccination status when other health factors were included in the model (CI: 0.839 -1.826; p = 0.282; Table 20). Having at least one

personal doctor/healthcare provider was able to predict flu vaccination status even after controlling for other health factors included in the logistic regression model. The odds of getting the flu vaccine among elderly Hispanics with one personal doctor or healthcare provider were 1.46 the odds of Hispanic elders with no doctor or healthcare provider (*OR* = 1.456; CI: 1.095 – 1.935; *p* = 0.010; Table 20). Also, the odds of getting the flu vaccine among Hispanic elders with more than one personal doctor or healthcare provider were 1.61 times the odds of those with no personal doctor or healthcare provider (*OR* = 1.613; CI: 1.099 - 2.367; *p* = 0.015; Table 20). These odds ratios differed significantly from those obtained by simple logistic regression. For example, compared to the odds ratios obtained by simple logistic regression, those obtained in a multiple logistic regression were 67.2% lower when elderly Hispanics having one personal doctor/healthcare provider were compared with those with no personal doctor/healthcare provider, and 80.2% lower when elderly Hispanics having more than one personal doctor/healthcare provider were compared with those with no personal doctor/healthcare provider. These results suggest that one or more variables included in the model modified or confounded the effect of having a personal doctor/healthcare provider on flu vaccination status among elderly Hispanics living in the U.S.

The variable *could not see a doctor because of cost during the last 12 months* also predicted flu vaccination status among Hispanic elders living in the United States even after controlling for the others health factors included in the model. Those who could not see a doctor during the previous year because of cost were less likely to get the flu vaccine compared to those who could (*OR* = 0.759; CI: 0.580 – 0.994; *p* = 0.045; Table

20). Additionally, the time elapsed since the last routine checkup was the factor with the most significant influence on flu vaccination status among elderly Hispanics even when controlling for other health factors. The results revealed that the odds of getting the flu vaccine among elderly Hispanics who had their last checkup within the last 2 years (but more than 1 year) were 0.6 the odds of those who had their last checkup within the past 12 months (*OR* = 0.603; CI: 0.437 – 0.831; $p = 0.002$). Also, the odds of getting the flu vaccine among elderly Hispanics who had their last checkup within the last 5 years (but more than 2 year) were 0.19 the odds of those who had their last routine checkup within the past 12 months (*OR* = 0.186; CI: 0.077 – 0.451; $p < 0.01$). Moreover, the odds of getting the flu vaccine among elderly Hispanics who had their last checkup more than 5 years ago were 0.16 times the odds of those who had their last routine checkup within the past 12 months (*OR* = 0.156; CI: 0.070 – 0.351; $p < 0.001$; Table 20). However, no significant difference was observed in term of flu vaccination status between Hispanic elders who had their last checkup within the past 12 months and those who never had a routine checkup ($p = 0.414$). This lack of significance is probably due to the small sample size among those who never had a routine checkup (see Table 17).

Health status was able to predict flu vaccination status among Hispanic elders even after controlling for other health factors included in the regression model. However, only those who reported having a fair health showed a significant difference in terms of flu vaccination status compared to those who reported an excellent health. Actually, the odds of getting the flu vaccine among those with fair health were 1.43 the odds of those who reported an excellent health (*OR* =1.428; 95% CI: 1.068- 1.910; $p = 0.034$; Table

20). The results showed a difference of 16.1% between the odds ratio obtained in simple logistic regression (*OR* = 1.589; see Table 18) and the odds ratio obtained by multiple logistic regression (*OR* =1.428; see Table 20); suggesting that one or more variable in the model modified or confounded the effect of self-reported health status on vaccination status. No significant differences in terms of flu vaccination were observed between elderly Hispanics with excellent health and those with very good (p = 0.950), good (p = 0.467), or poor health (p =0.065; Table 20). Finally, although simple logistic regression showed that having at least one chronic condition was associated with flu vaccination in elderly Hispanics (*OR* = 1.498; CI: 1.253- 1.790; $p< 0.01$; Table 19), no significant association was found between these two variables when other health factors were added to the model (*OR* = 1.189, 95% CI: 0.980-1.443; p = 0.079; Table 20). These results showed that the odds ratio obtained in simple logistic regression differed by 30.9% with the odds ratio obtained in a multiple logistic regression model, which suggests that one or more variables in the model modified or confounded the effect of having at least one chronic condition on flu vaccination status among elderly Hispanics living in the United States.

Table 20

Multiple Logistic Regression for Acces to Healthcare, Self-Reported Health Status, Having at Least One Chronic Condition, and Flu Vaccination Status

							95% CI	
	b	SE	Wald	df	Sig.	*OR*	Lower	Upper
Health care coverage	.213	.198	1.159	1	.282	1.238	.839	1.826
Having a personal doctor								
No personal doctor			7.538	2	.023			
One personal doctor	.375	.145	6.679	1	.010	1.456	1.095	1.935
> one personal doctor	.478	.196	5.973	1	.015	1.613	1.099	2.367
Could not see a doctor because of costs	-.276	.138	4.019	1	.045	.759	.580	.994
Last checkup								
< 1 year			41.191	4	.000			
≥ 1 year &< 2 years	-.506	.164	9.534	1	.002	.603	.437	.831
≥ 2 years &< 5 years	-1.681	.451	13.897	1	.000	.186	.077	.451
≥ 5 years	-1.856	.413	20.243	1	.000	.156	.070	.351
Never	-.382	.468	.668	1	.414	.682	.273	1.706
Health status								
Excellent			13.145	4	.011			
Very good	.009	.148	.004	1	.950	1.009	.755	1.349
Good	.103	.141	.529	1	.467	1.108	.840	1.462
Fair	.356	.148	5.775	1	.016	1.428	1.068	1.910
Poor	.331	.179	3.411	1	.065	1.393	.980	1.980
Chronic condition								
At least one	.173	.099	3.095	1	.079	1.189	.980	1.443
Constant	-.711	.255	7.764	1	.005	.491		

Note. Variables entered on Step 1 were health care coverage, having at least one personal doctor/health care provider, could not see a doctor because of cost, length of time since last routine checkup, having at least one chronic condition

Research Question 3. RQ3: Is flu vaccination status among elderly Hispanics living in the United States associated with region of residence?

$H_0$3: Flu vaccination status is not associated with region of residence among elderly Hispanics in the United States.

$H_1$3: Flu vaccination status is associated with region of residence among elderly Hispanics in the United States.

A simple logistic regression was conducted to evaluate whether region of residence has an influence on flu vaccination status among elderly Latinos living in the United States. The results show that there is no a significant association between region

of residence and flu vaccination status among elderly Hispanics living in the United States ($p > 0.05$; Table 21). These results were supported by the 95% confidence intervals of odds ratios that included the value 1 (Table 21), demonstrating that none of the U.S. regions predicted vaccination status within the study population.

Table 21

Simple Logistic Regression for Region of Residence and Flu Vaccination Status

								95% CI	
	Vaccinated	B	SE	Wald	df	Sig.	OR	Lower	Upper
West (*N* = 1,371)	696 (50.8%)			4.704	3	.195			
Midwest (*N* = 321)	172 (53.6%)	-.113	.124	.826	1	.364	.893	.700	1.140
Northeast (*N* = 387)	206 (53.2%)	-.099	.115	.733	1	.392	.906	.723	1.136
South (*N* = 742)	354 (47.7%)	.122	.091	1.799	1	.180	1.130	.945	1.351
Constant	696 (50.8%)	-.031	.054	.322	1	.571	.970		

Note. Variables entered on Step 1 related to region of residence.

Research Question 4. RQ4: Are there differences in influenza vaccination status between elderly Hispanics and White American elders?

$H_0$4: Influenza vaccination status does not differ between elderly Hispanics and White American elders.

$H_1$4: Influenza vaccination status differs between elderly Hispanics and White American elders.

A simple logistic regression was conducted to determine if there were differences in terms of flu vaccination status between the elderly Hispanic population living in the United States and their White Americans counterparts. The results indicated that there were significant differences between these two populations in terms of flu vaccine status ($p < 0.01$; Table 22). Actually, the odds of getting the flu vaccine among White American

elders were 1.225 times the odds of elderly Hispanics living in the United States (*OR* = 1.225; CI: 1.136 – 1.320; $p < 0.01$; Table 22).

Table 22

Simple Logistic Regression for Race/Ethnicity and Flu Vaccination Status

								95% CI	
	Vaccinated	B	SE	Wald	df	Sig.	OR	Lower	Upper
Hispanic elders (*N* = 2,821)	1,428 (50.6%)								
White elders (*N* = 92,593)	51,540 (55.7%)	.203	.038	28.099	1	.000	1.225	1.136	1.320
Constant		-.227	.007	1182.638	1	.000	.797		

Note. Variables entered on Step 1 related to race/ethnicity.

Summary

This chapter describes the results that were obtained in this research study. First, I assessed the influence of socio-demographic factors such as level of education, sex, marital status, and household income on flu vaccination status among Hispanic elders living in the United States. The results indicated that, among these factors, only marital status was able to predict flu vaccination within this population, showing that married elderly Hispanics were more likely to get vaccinated than those that were separated. Then, I analyzed the influence on flu vaccination of several health factors such as access to health care (evaluated through the variables health care coverage, having a personal doctor/healthcare provider, could not see a doctor because of cost during the last 12 months, and length of time since last routine checkup), self-reported health status, and having at least one chronic condition. The results showed that all these variables independently predicted flu vaccination among elderly Hispanics in the Unites States. However, when all variables were analyzed together in a multiple logistic regression model, *having one personal doctor/healthcare provider, could not see a doctor because*

of cost during the last 12 months, and *length of time since last routine checkup* were still able to predict flu vaccination status among Hispanic elders while *health care coverage*, *self-reported health status*, and *having at least one chronic condition* were not.

The influence of region of residence on flu vaccination status among Hispanic elders living in the United States was also evaluated. The results showed that the region of residence was not a predictor of flu vaccination within this population. Finally, whether flu vaccination status differed between Hispanic elders and their White American counterparts was investigated. The results showed that there was a significant difference in terms of flu vaccination status between elderly Hispanics and their White American counterparts.

In the next chapter I will provide an interpretation of the findings of this study. I will also discuss about the limitations of the study and recommendations for future research. Additionally, the implications for social change will be mentioned followed by the conclusions of the study.

Chapter 5: Discussion, Conclusions, and Recommendations.

Introduction

Influenza is the cause of thousands of hospitalizations and deaths in the United States every year. Most of these deaths and hospitalizations occur within the elderly population, which is the most vulnerable group in terms of this disease. The CDC has advised that vaccination is the best way to prevent influenza. However, flu vaccination coverage among elderly Americans is far below the goal of Healthy People 2020 (90%, CDC, 2018). Additionally, racial/ethnic disparities exist among elderly living in the United States in terms of flu vaccination. Hispanic elders and African Americans are less likely to get the flu vaccine compared to their White American counterparts. The purpose of this quantitative, cross-sectional study was to investigate the factors associated with flu vaccination status among elderly Hispanics living in the United States. The influence of sociodemographic factors such as level of education, sex, marital status, and household income was investigated. I also analyzed the influence of region of residence and several health factors such as access to healthcare (evaluated through the variables health care coverage, having a personal doctor/healthcare provider, could not see a doctor because of cost during the last 12 months, and length of time since last routine checkup), self-reported health status, and having at least one chronic condition. Another purpose of this study was to analyze whether disparities in terms of flu vaccination status still exist between elderly Hispanics and elderly White Americans.

The analyses conducted in this study revealed that among the sociodemographic factors included, only marital status was able to predict flu vaccination status in the

elderly Hispanic population. All health factors independently predicted flu vaccination status among Hispanic older adults; however, when the influence of all health factors together was analyzed—self-reported health status and three of variables measuring access to healthcare (having a personal doctor/healthcare provider, could not see a doctor because of cost during the last 12 months, and length of time since last routine checkup)—were still able to predict flu vaccination status among Hispanic older adults. Health care coverage and having at least one chronic condition were no longer able to predict flu vaccination status among the population when controlling for other health factors included in the analysis. Region of residence, on the other hand, was not associated with flu vaccination status in the elderly Hispanic population. Finally, the analysis showed that elderly White Americans are more likely to get the flu vaccination than elderly Hispanics.

Interpretation of the Findings

Research Question1

One purpose of the study was to investigate whether level of education, sex marital status, and household income influenced flu vaccination status among elderly Hispanics living in the United States. This study revealed that none of the levels of education was able to predict flu vaccination within this population ($p > 0.05$). Similar results have been found among older adults living in other countries such as the Czech Republic and Poland (Endrich, Blank, & Szucs, 2009; Ganczak, Gil, Korzeń, & Bażydło, 2017). However, the results of this study differ from those researchers like Takayama, Wetmore, and Mokdad (2012), who found that lower level of education was negatively

associated with flu vaccine intake in the elderly population living in the United States (*OR*: 0.96; 95% CI: 0.92- 0.99). But it is important to emphasize that the study conducted by Takayama et al. targeted the whole elderly population living in the United States, whereas this study specifically targeted the elderly Hispanic population.

This study also revealed that sex was not associated with flu vaccination among Hispanic older adults living in the United States. Although these results are different from those obtained in other elderly populations (Bödeker, Remschmidt, Schmich, & Wichmann, 2015; Mo & Lau, 2015), they support the results obtained in a study analyzing data collected by the BRFSS in 2009 (Takayama et al., 2012), and those obtained in a study analyzing data collected by the BRFSS between 2011 and 2014 (La et al., 2017).

Marital status was associated with flu vaccine uptake among elderly Hispanics in the United States. A simple logistic regression showed that divorced Hispanic older adults were less likely to get the flu vaccine than those who were married (*OR* = 0.784; 95% CI: 0.637 – 0.965, *p* = 0.022). However, although close to significance, being divorced was no longer able to predict flu vaccination status among elderly Hispanics when other sociodemographic factors were included in a multiple logistic regression model (*OR*= 0.818; 95% CI: 0.658 -1.016; *p* = 0.07). No significant differences in terms of flu vaccination were observed between married Hispanic older adults and those who never married, were part of an unmarried couple, or widowed (*p*> 0.05). These results differ from Rangel et al. (2005), who found that that unmarried elderly Hispanics were more likely to get the flu vaccine than married elderly Hispanics (*OR*: 1.26; 95% CI: 1.00

– 13.9). However, their study was conducted more than 10 years ago, and during that time several sociodemographic changes might have occurred within the elderly Hispanic population living in the United States. Additionally, the sample size for elderly Hispanics used in the study conducted by Rangel el al. (*N*= 535) was significantly smaller compared to the sample I used in this study (*N*= 2,821).

Further, although simple logistic regression showed no statistically significant differences in terms of flu vaccination between married Hispanic older adults and those who were separated, these differences were near to be significant (*OR* = 0.701; 95% CI: 0.480 -1.022; *p* = 0.65). However, when marital status was included in a multiple logistic regression model, being separated was able to predict flu vaccination among elderly Hispanics. The results showed that separated elderly Hispanics were less likely to be vaccinated compared to those who were married (*OR* = 0.649; CI: 0.441 – 0.954, *p* = 0.028).

Finally, a simple logistic regression analysis showed that household income was not associated with flu vaccination among Hispanic elderly living in the United States (*p*> 0.05). Household income was not significant in predicting flu vaccination among elderly Hispanics even after controlling for other sociodemographic factors included in a multiple logistic regression model (see Table 20). These findings differ from those obtained by previous studies, which claimed that higher incomes were positively associated with flu vaccination among elderly in the United States (La et al., 2017; Takayama et al., 2012). One possible explanation for these differences is that the previous studies targeted the whole elderly population living in the United States,

whereas this study only targeted the elderly Hispanic population. Differences may exist in terms of flu vaccination when comparing these two different populations.

Research Question 2

A second purpose of this study was to investigate whether there is an association between flu vaccination and some health factors such as access to healthcare (measured through the variables health care coverage, having a personal doctor/healthcare provider, could not see a doctor because of cost during the last 12 months, and length of time since last routine checkup), self-reported health status, and having at least one chronic condition. Simple logistic regressions showed that health care coverage, having a personal doctor/healthcare provider, could not see a doctor because of cost during the last 12 months, and length of time since last routine checkup were associated with flu vaccine uptake among elderly Hispanics living in the United States.

Those with health care coverage were more likely to get the flu vaccine that those without a health care coverage (*OR*=1.623; 95% CI: 1.132 – 2.327, p = 0.008). Additionally, those with one personal doctor/healthcare provider (*OR* = 2.128; CI: 1.642 – 2.757; p<0.01) and those having two or more personal doctors/healthcare providers (*OR* = 2.415; CI: 1.684 – 3.464; p<0.01) were more likely to get the flu vaccine compared to those with no personal doctor/healthcare provider. However, after controlling for other health factors, health care coverage was no longer able to predict flu vaccination status among the Hispanic older adults (CI: 0.839 -1.826, p = 0.282). These results differed from Gilstad-Hayden et al.'s (2015) study, which showed that having health insurance was significantly associated (p < 0.001) with higher vaccine uptake

among adults from low-income neighborhoods in New Haven (Connecticut). But this study's results were similar to their study in that having one (*OR*= 1.456, 95% CI: 1.095 - 1.935, *p* = 0.01) or more than one (*OR*= 1.613, 95% CI: 1.099 -2.367, *p* = 0.015) personal doctor/healthcare provider was still significant after controlling for other health factors included in a multiple logistic regression model. However, compared to the odds ratios obtained by simple logistic regression, those obtained in a multiple logistic regression were 67.2% lower for having one personal doctor/healthcare provider and 80.2% lower for having more than one personal doctor/healthcare provider. This suggests a possible modifying or confounding effect of one or more variables included in the model on the association of having a personal doctor/healthcare provider with flu vaccination status among elderly Hispanics.

The results of a simple logistic regression also showed that elderly Hispanics who could not see a doctor during the last 12 months because of the cost were less likely to get the flu vaccine compared to those who could (*OR* = 0.762; CI: 0.591 – 0.984; *p* = 0.037). This difference was still significant after controlling for other health factors in a multiple logistic regression model (*OR* = 0.759; CI: 0.580 – 0.994; *p* = 0.045). These results support those obtained by La et al. (2017), who found that U.S. adults who could not see a doctor during the last 12 months were less likely to get the flu vaccine compared to those who could.

Further, a simple logistic regression analysis revealed that elderly Hispanics who had their last routine checkup within the past 2 years but more than 1 year (*OR* = 0.533; CI: 0.389 – 0.730; *p* <0.01), those who had their last routine checkup within the past 5

years but more than 2 years (*OR* = 0.151; CI: 0.063 – 0.360; $p < 0.01$), and those who had their last routine more than 5years ago (*OR* = 0.108; CI: 0.049 – 0.238; $p < 0.01$) were less likely to get the flu vaccine compared to those who had their last routine checkup within the past 12 month (Table 17). The results of a multiple logistic regression showed that the time elapsed since the last routine checkup was the factor that most influenced flu vaccination status even after controlling for other factors included in the model. This suggests that emphasis in guaranteeing access to healthcare should be a priority of intervention aiming to increase flu vaccination status among elderly Hispanics. Interestingly, neither simple logistic regression ($p = 0.244$) nor multiple logistic regression (p = O.414) models found significant differences in term of flu vaccination status between Hispanic elders who had their last checkup within the past 12 months and those who never had a routine checkup, this unexpected result might be due a very small sample size corresponding to the group of those who never had a routine checkup (n = 20). These results support those obtained by La et al. (2017), who found that the likelihood of getting the flu vaccine was lower among elder with a longer time since last routine checkup.

Simple logistic regression showed that elderly Hispanic who reported having apoor health (*OR* = 1.631; CI: 1.170 – 2.272; $p = 0.004$) or a fair health (*OR* = 1.589; CI: 1.209 – 2.088; $p = 0.019$) were more likely to get the flu vaccine than those who reported an excellent health. However, no significant differences were observed among those reporting excellent, very good, or good health ($p > 0.05$). However, when health status was included in a multiple logistic model, flu vaccination status among Hispanic elders

who reported an excellent health was still different from those reporting a fair health, but not from those reporting a poor health. Still, the difference between those with excellent health and those with poor health was close to significance (*OR* = 1.393; 95% CI: 0.980 – 1.980; *p* = 0.065).These findings confirm those obtained in several studies conducted in elderly populations reporting that poorer health status was positively associated with flu vaccination status (*p* <0.01, Kwon, Kim, & Park, 2016; Klett-Tammen, Krause, Seefeld, & Ott, 2015; Lau, Lau, & Lau, 2009). One possible explanation is that those reporting poorer health believe that due to their health status they have an elevated risk of contracting the flu, while those reporting excellent health think that they are less likely to catch the flu.

Simple logistic regression analysis showed that elderly Hispanics having at least one chronic condition were more likely to get the flu vaccine that those with no chronic conditions (*OR* = 0.1498; CI: 1.253- 1.790; *p* < 0.01).However, the association between flu vaccination status and having at least one chronic condition was no longer significant after controlling for other health factors included in a multiple logistic regression model (CI: 0.980- 1.443; *p* = 0.079). These findings are not consistent with those obtained in several studies conducted in elderly populations. For example, Sato et al. (2015) found that elders Brazilians with two or more chronic diseases were more likely (*OR*: 1.14; 95% CI: 1.01- 1.27) to get vaccinated against the flu compared to those with a healthier status. Chiatti et al. (2011), on the other hand, found that having a severe chronic condition was one of the strongest (*OR* = 2.06; 95% CI: 1.90 - 2.24) predictors of flu vaccine uptake in an elderly Italian population. Furthermore, Mo and Lau (2015) found that having a

chronic disease was positively associated (*OR*: 2.25; 95% CI: 1.49–3.41) with flu vaccine uptake among elderly Chinese living in Hong Kong. It should be noted that although having at least one chronic condition was not a significant predictor of flu vaccination among elderly Hispanics, its influence was closed to significance (p =0.079).

Research Question 3

Another purpose of this study was to analyze whether region of residence was associated with flu vaccination status among elderly Hispanics. A simple logistic regression analysis showed that region of residence does not predict flu vaccination within the Hispanic elderly population living in the United States ($p > 0.05$). This finding is consistent with the results of Abbas et al. (2018) who found no significant difference between flu vaccination status and region of residence in a study conducted on the adult population living in the United Sates. Similarly, Lu et al. (2019) found that the region of residence (Northeast, Midwest, South, and West) had no significant influence on flu vaccination status when they analyzed data collected between 2010 and 2016 by the National Health Interview Survey.

Research Question 4

The last purpose of this study was to evaluate if there was a significant difference in terms of flu vaccination status between Hispanic elders living in the United States and their White American counterparts. The results from a simple logistic regression revealed that White American elders are more likely to get vaccinated than elderly Hispanics (*OR* = 1.225; CI: 1.136 – 1.320; $p < 0.01$, table 28). Disparities in terms of flu vaccination between White American elders and Hispanic elders have been systematically reported.

For example, Lu et al. (2014) reported that non-Hispanic Whites were 24% more likely to get vaccinated than non-Hispanic Blacks and 20% more likely to get vaccinated than Hispanics. Additionally, Hebert, Frick, Kane, and McBean (2005) found that among Medicare beneficiaries, White American elders (66.6 %) were more likely to receive the flu vaccine than elderly African Americans (43.3%) or elderly Hispanics (52.5%) in the United States. Similar results were found in a study analyzing data collected from American elders who participated in the 2011 Medicare Current Beneficiary Survey (Yoo et al., 2011).

Interpreting the Results on the Context of the Socioecological Model

This study used the SEM as theoretical framework. This model suggests that health behavior is influenced by factors that operate at different levels: intrapersonal, interpersonal, organizational, organizational, community, and policy levels. In this study I analyzed the influence on flu vaccination status of factors that may have an effect at one or more of the above-mentioned levels of influence. For example, at the intrapersonal level I assessed the influence of factors such as level of education, health status, sex, and household income. At the interpersonal level the influence of marital status was assessed. At the organizational level, I assessed the influence of some factors used in this study to measure access to healthcare, these factors include having one personal doctor/healthcare provider, could not see a doctor because of cost during the last 12 month, and length of time since last routine checkup. Finally, at the policy level, I analyzed the influence of health care coverage on flu vaccination status.

Findings of this study suggest that self-reported health status was the only factor operating at the intrapersonal level that had an influence on flu vaccination status among elderly Hispanics living in the United States. Sex, level of education, and household income did not predict flu vaccination within this population. At the interpersonal level, marital status had an influence on flu vaccination status; the results suggest that being separated is negatively associated with flu vaccination among Hispanic elders.

All variables operating at the organizational level (having one personal doctor/healthcare provider, could not see a doctor because of cost during the last 12 month, and length of time since last routine checkup) had an influence on flu vaccination status among elderly Hispanics even after controlling for other factors included a multivariate logistic regression model. These findings suggest that doctors and/or healthcare providers play a crucial role in promoting positive health behavior in terms of flu vaccination among Hispanic elders living in the United States. Finally, health care coverage, which operated at the policy level showed an independent influence on flu vaccination among Hispanic elders. Those with health insurance were more likely to get the flu vaccine compared to those with no health insurance. However, this influence was no longer significant when other factors were controlled using a multivariate logistic regression model.

Limitations of the Study

This study has several limitations. First, I used secondary data analysis, therefore the analysis was limited by the available data from the BRFSS; other important explanatory variables might have been excluded from the analysis. Second, this was a

cross-sectional study, which implies that no cause-effect relationship can be established between variables. At most, an association between the alleged independent and dependent variable can be suggested. Third, the study may have been subject to recall bias due to the self-reported nature of the data. Some participant might not have recalled adequately some of the information collected by The BFRSS, which may have led to misclassification, posing a threat to the internal validity of the study. Fourth, only Hispanic elders living within the four U.S. geographical regions (Northeast, South, East, and Midwest) defined by the United States Census Bureau were included in this study. Places, such as Puerto Rico, that have a significant elderly Hispanic population were not included in the analysis. Therefore, careful attention must be paid when trying to generalize these results to the entire U.S. elderly Hispanic population.

Recommendations

In this study, I evaluated the influence that region of residence and several socio-demographic and health factors have on flu vaccination status among elderly Hispanics living in the United States. The analysis excluded areas that do not belong to one of the four regions of the U.S. defined by the United States Census Bureau. For example, Puerto Rico, which has a significant Hispanic elder population, was excluded from this study. Future studies should include these areas in their analysis in order to improve the external validity and generalizability of the results. Additionally, future studies should include other variables that might have an influence on flu vaccination among Hispanic elders. For example, some studies showed that variables such as perceived vaccine efficacy, perceived vaccine safety, and perceived susceptibility were associated with flu

vaccination status in other populations (Abbas et al., 2018; Kumar et al., 2011; Moran et al., 2016).

Implications

This study has implications for social change. The results showed that elderly Hispanics are less likely to get the flu vaccine compare to their White American counterparts. This suggests that more interventions targeting the Hispanic elders should be elaborated with the aim of reducing racial/ethnic disparities in term of flu vaccination status. These interventions should be implemented to have an impact for positive social change at different levels. At the intrapersonal level, intervention should emphasize on those reporting excellent or very good health since they are less likely to get the flu vaccine. At the intrapersonal level, the future interventions should target separated elderly Hispanics as they are less likely to get vaccinated compared to those who are married. Finally, at the institutional level, interventions must focus on Hispanic elders with no personal doctor or healthcare provider, taking more than one year to have a routine medical checkup, or couldn't see a doctor because of the cost during the 12 previous months, because these individuals were less likely to get vaccinated compared to other elderly Hispanics. Based on these results, doctors and other healthcare providers seem to play a crucial role on health behavior towards flu vaccination among the elderly. Therefore, interventions should also target these professionals who may represent a significant instrument for the promotion of flu vaccination among elderly Hispanics living in the United States.

Conclusions

In this study, I investigated the influence that several socio-demographic and health factors have on flu vaccination status in the elderly Hispanic population living in the United States. I also investigated the differences in terms of flu vaccination that exist between elderly Hispanics and their White American counterparts. Findings of this study show that racial/ethnic disparities persist in terms of flu vaccination within the elderly U.S. population. Actually, Hispanic elders are less likely to get vaccinated against the flu than White American elders. Therefore, public health interventions are required to eliminate or, at least, reduce these existing disparities. The results suggest that being separated, having a self-reported excellent or very good health, taking more than one year to have a routine medical checkup, and not seeing a doctor because of the cost during the 12 previous months, were negatively associated with flu vaccination among Hispanic elders. However, having a personal doctor or healthcare provider was positively associated with flu vaccination in this population. After controlling for other variables, level of education, sex, household income, health care coverage, having at least one chronic condition, and region of residence, did not predict flu vaccination status among elderly Hispanics. These results should be taken in consideration by public health professional when implementing interventions aimed to increase flu vaccination rates within the elderly Hispanic population living in the United States.

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