2023

Sun Exposure and Protective Behaviors Among U.S. Hispanic Farmworkers

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
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Walden University
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Abstract

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MPH Environmental Health, Ponce Health Sciences University, 2014

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Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

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Abstract

Sun exposure increases the risk of sun-related illnesses and skin cancer among U.S. Hispanic farmworkers. Reinforced by the health belief model, the purpose of this study was to determine the association between socio-demographic factors (i.e., age, educational attainment, gender, income, and marital status) and skin cancer with the level of sun exposure (sun's effect on skin, sunburn reported) and protective behaviors (use of cap/visor, use of sunscreen) among adult Hispanic farmworkers in the United States. The study included Hispanic farmworkers aged 21 or older (N = 112) who responded to the 2015 National Health Interview Survey. Ordinal logistic regression showed that older male Hispanic farmworkers are positively associated with the use of cap/visor, and females are associated with the use of sunscreen. Binary logistic regression showed that increasing age was associated with a decreased likelihood of sunburn reported, $\chi 2(1) = 3.764$, $p = 0.052$, (95% CI, 0.921 to 1.000). Increasing knowledge of beneficial behaviors that decrease sun exposure in Hispanic farmworkers represents a positive social change for public health. This research can inform current interventions and policies aimed at reducing sun-related illnesses and skin cancer among Hispanic farmworkers in the United States.

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Dedication

This doctoral study is dedicated firstly to my grandparents, Juan and Aida, who are the people in heaven I loved the most and for whom I promised I would finish my doctoral studies, and I DID IT! Second, to my children, Sebastian, and Fernando, because of them, I wouldn't have the strength and courage to finish my Doctor in Public Health and show them that anything in life is possible when you believe it. Third, to my parents Frances and Giovanni, my sister Ginnette, and aunt Giannina (Titi Gi) who always believed in me and helped me no matter what with my doctoral process. Fourth, to my husband, Hector, who has had patience and loved me during the doctoral process, never left my side in difficult times, and mostly, encouraged me to achieve my academic dream goal which is becoming a Doctor in Public Health no matter the circumstances. Fifth, to my best friends: Neyssa, Giselle (Gigi), Marisol, Zedia, Carlitos Diou, Isabel, and Milka, for being there, hearing me, and motivating me when I needed it most. Love you all.

Additionally, I am dedicating this research to my work supervisor, Daniel, who has given me the motivation, opportunities, and encouragement to finish this doctorate degree, and since day 1 of my working journey as an EHS specialist and safety manager with him, has believed in me. I am very grateful for it, and so is my family.

Finally, I dedicate this research to God because if I don't have faith in him, I wouldn't be able to finish it. This means that when you believe in something, you can achieve it.

Dreams do come true, just believe!

I am finally a Doctor in Public Health!

Acknowledgments

Being a doctoral student has been a great threat, but a beautiful one. Daily living, a son with autism and a baby, married life, working mom, and other situations affected my doctoral process throughout these past nine years. But, with the help of my Walden professors and staff, and my family and friends, I am able to finish this exciting and long journey in life, especially, my last step on the academic ladder: being a Doctor in Public Health.

Dr. Shanna Barnett, my mentor, and a great professor. She has had the patience to understand my point of view and what I wanted for this research and to meet with me every time I had a doubt. She has been a great resource for me during my research journey. I thank you for all the teaching and mentoring you did with me throughout this process. Without you, I don't know how I would finish this. So, in little words: thank you! To Dr. Adebowale, thank you for all the mentoring you did with me and the guidance throughout the process.

Thanks to all my family, coworkers, and friends for believing in me. This is to all of you! THANK YOU!

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Section 1: Foundation of the Study and Literature Review

Sun exposure is a leading cause of skin cancer in the United States (CDC, 2022c). One of the most sun-exposed individuals are Hispanic farmworkers (Castillo et al., 2021). In 2020, 14.4% of U.S. Hispanics had sunburns due to prolonged sun exposure (National Cancer Institute, 2022). To prevent sunburns and skin cancer, it is important to adopt sun protection behaviors like wearing a cap/visor and sunscreen (Niu et al., 2022). To protect Hispanics farmworkers from sun exposure and cancer, and promote protective behaviors, it is important to address social change. Hispanics farmworkers maintain a negative attitude toward sun exposure due to misbehaviors and misinformation (Niu et al., 2022). But Hispanic farmworkers are less studied and cited regarding sun exposure and protection behaviors (Bloss et al., 2021). Further research is necessary to understand how Hispanic farmworkers in the United States adopt sun-protective behaviors to reduce sun exposure and skin cancer. The present study expands knowledge of sun exposure and protective behaviors among Hispanic farmworkers in the United States to inform public health initiatives.

Section 1 of this study provides information on the background, problem statement, purpose of the study, research questions, and null and alternative hypotheses. Next, the theoretical foundation for the study is discussed, nature of the study, literature review, scope, assumptions, and limitations are described. Finally, this section finishes with the significance of the study.

Background

Sun exposure and protective behaviors among Hispanic farmworkers in the United States have been less studied than in other farm working populations. Sun exposure among all Hispanic farmworkers has been little researched to better understand the risks of sun exposure, prevention measures, and behaviors, sun effect on skin, skin cancer, and sociodemographic (Kuehn, 2021; Luque et al., 2020; Mutic et al., 2018; Niu et al., 2022). Not wearing a hat, not drinking enough water, not resting in the shade, and not using sunscreen, are related to sunburns in male Hispanic outdoor laborers (i.e., farmworkers; Niu et al., 2022). Hispanic farmworkers in the United States need to be studied to identify sun exposure and protective behaviors.

Further research is needed to identify and increase knowledge of protective behaviors to avoid sun exposure and skin cancer among U.S. Hispanic farmworkers minorities. Although few researchers have identified the necessity of studying Hispanic populations regarding sun exposure, sun protective behaviors, and skin cancer (Niu et al., 2022; Smith et al., 2020), there has not been adequate research to understand the association between sociodemographic (age, gender, marital status, educational attainment, and income) of Hispanic farmworkers and sunburns, sun effect on skin, protective behaviors (use of cap/visor, use of sunscreen), and skin cancer. This study is needed to address the current gap in literature and expand knowledge of how sun exposure in Hispanic farmworkers in the United States is associated with sun protective behaviors, sunburns, sun effect on the skin, and skin cancer. Determining the association

helped gain more public health information in this farm worker population and provides guidance for addressing sun exposure among Hispanic farmworkers in the United States.

Problem Statement

Farmworkers represent the frontline of bringing food to U.S. tables, but they are exposed to several dangerous environmental threats, one being sun exposure, which causes heat-related illnesses and skin cancer (Castillo et al., 2021). Eighty-three percent of the farming industry is labored by foreign workers, in which most of them are Mexicans (69%), followed by Puerto Ricans (9%) (Employment and Training Administration, 2022). Most studies related to farmworkers and sun exposure protective behaviors are related to Hispanic populations of Mexican descent or origin (Culp & Tonelli, 2019; Kearney & Garzon, 2020; Luque et al., 2019; Niu et al., 2022; Smith et al., 2020). Studying Hispanic populations by identifying health threats to this population may help us understand exposure behaviors and attitudes toward this specific public health issue.

Sun exposure represents one of the biggest public health threats for farmworkers' health due to the absence of protective behaviors like the use of cap/visor or sunscreen, long work hours, low educational attainment, age, extreme heat, and inadequate breaks (Goldman et al., 2021). Sun exposure can cause mild symptoms like sunburn, excessive sweating, skin rashes, dehydration, and severe heat exhaustion (Buller, 2011); other severe symptoms are acute kidney injury and skin cancer (Mitchell, 2018). Exposure to the sun can also cause skin cancer like melanoma (Niu et al., 2022). In many Hispanic regions (like Peru, Guatemala, Mexico, Uruguay, Dominican Republic, Haiti, Puerto

Rico Island, and Cuba), melanoma skin cancer represents between the 13th to the 30th types of cancer that affect their population (Global Cancer Observatory, 2022) . In the United States, 32,000 new melanoma cases arise in Hispanic farmworkers, for which 6,700 may lead to death (Mitchell, 2018).

Little is known about sun protective behaviors to avoid skin cancer (Ragan et al., 2019), specifically in Hispanic farmworkers. Sun exposure, sunburns, sun protective behaviors, and skin cancer has a necessity to be studied in Hispanic farm working population expanding the knowledge and to help protect this population's health. Hispanic farmworkers in the United States need to be studied since little research has been conducted regarding sun exposure, sun protective behaviors, and skin cancer. Studying Hispanic farmworkers will contribute to gain more knowledge of how sun exposure and protective behaviors could lead to skin cancer in this population. This will also help identify what is the level of sun exposure and sun protective behaviors in this population, what factors determines this level, and how this may affect the negative health outcomes of Hispanic farmworkers.

Purpose of the Study

The purpose of this quantitative study was to determine the association between sociodemographic factors (i.e., age, gender, marital status, educational attainment, and income) and skin cancer with the level of sun exposure (sun's effect on skin, sunburns reported) and protective behaviors (use of cap/visor, use of sunscreen) among adult Hispanic farmworkers in the United States. I analyzed if there was an association between skin cancer and sunburns reported, the sun's effect on the skin, wearing a

cap/visor, and sunscreen use among Hispanic farmworkers, controlling for age, marital status, gender, educational attainment, and income. The independent variables (IVs) are age, gender, marital status, educational attainment, income, and skin cancer; the dependent variables (DVs) are sun protective behaviors (i.e., sunburns reported, the sun's effect on the skin, wearing a cap/visor, and sunscreen use) .

Research Questions and Hypothesis

This study is guided by the following research questions.

RQ 1: What is the association between sociodemographic factors (age, gender, marital status, educational attainment, and income), and sunburns reported, the sun effect on skin, wearing a cap/visor, and sunscreen use among U.S. Hispanic farmworkers?

$H_0$1: There is no association between age, gender, marital status, educational attainment, income, and sunburns reported, the sun effect on skin, wearing a cap/visor, and sunscreen use among U.S. Hispanic farmworkers.

H_a1: There is a relationship between age, gender, marital status, educational attainment, income, and sunburns reported, the sun effect on skin, wearing a cap/visor, and sunscreen use among U.S. Hispanic farmworkers.

RQ 2: What is the association between skin cancer and sunburns reported, the sun effect on skin, wearing a cap/visor, and sunscreen use among U.S. Hispanic farmworkers, controlling for age, marital status, gender, educational attainment, and income?

$H_0$2: There is no association between skin cancer and sunburns reported, the sun effect on skin, wearing a cap/visor, and sunscreen use among U.S. Hispanic farmworkers, controlling for age, marital status, gender, educational attainment, and income.

H_a2: There is a relationship between skin cancer and sunburns reported, the sun effect on skin, wearing a cap/visor, and sunscreen use among U.S. Hispanic farmworkers, controlling for age, marital status, gender, educational attainment, and income.

Theoretical Foundation for the Study

This research used the health belief model (HBM). The HBM was developed by Irwin Rosenstock, Godfrey Hochbaum, and Stephen Kegels in the early 1950s as a model to understand the failure of individuals to adopt illness prevention methods and/or strategies for the early detection of a disease (LaMorte, 2019). The constructs on which the HBM are based have provided a useful context for an individual's own perception and beliefs about an illness and disease, which are being used widely in public health and social science research (Corner and Norman, 2022). The HBM has six constructs: perceived severity, perceived susceptibility, perceived benefits, perceived barriers, cue to action, and self-efficacy (Boskey, 2022). For this research, cue to action, perceived severity, perceived susceptibility, and self-efficacy were the four HBM constructs that were relevant for this study.

The National Health Interview Survey (Integrated Public Use Microdata Series [IPUMS] Health Surveys) has four sun exposure and protective behaviors variables that were aligned and applicable to the four HBM constructs to this research: use of cap/visor worn if outside (perceived susceptibility), how often sunscreen is used if outside on a sunny day over 1 hour (self-efficacy), in sun 1 hour and the effect on the skin (perceived severity), and sunburns reported in the last 12 months (cue to action). Use of cap/visor worn if outside on a sunny day is related to perceived susceptibility since it refers to a

subjective evaluation about the risk of developing a health problem. HBM predicts that people who perceive they are susceptible to a health problem will involve behaviors to reduce the risk of developing the health problem. In this case, if the person wore a cap, it is a behavior to reduce sun exposure health problems. How often sunscreen is used if outside on a sunny day for over 1 hour is related to self-efficacy since it is the individual's perception to act with success in certain behavior—in this case, use sunscreen to avoid sunburn. In sun 1 hour and the effect on the skin is related to perceived severity since it is the subjective evaluation of the severity of a certain health problem and its consequences. In this case, if the farmworker was exposed to the sun for an hour, what health effects could bring that exposure. Sunburn reported in the last 12 months is related to the cue to action since it is the illness that could promote health behavior participation in protecting from the sun to avoid sunburns and skin cancer diagnosis.

Nature of the Study

The nature of this study was quantitative research with a cross-sectional design. The design was chosen to understand the association between sociodemographic factors (i.e., age, gender, marital status, educational attainment, and income) and skin cancer with the level of sun exposure (sun effect on skin, sunburns) and protective behaviors (use of cap/visor, use of sunscreen) among adult Hispanic farmworkers in the United States. Ordinal and binomial logistic regression were used to analyze if age, gender, income, educational attainment, marital status, and skin cancer are associated with sunburn reported, the sun effect on skin, wearing a cap/visor, and sunscreen use among

Hispanic farmworkers in the United States. Data from the National Health Interview Survey (IPUMS Health Surveys) was used for this study.

Literature Search Strategy

This research study on sociodemographic factors, sun exposure, and skin cancer within U.S. Hispanic farmworkers and their potential association with sun protective behaviors was based on recent scholarly literature. I performed an extensive literature search to understand what gaps exist about the presented topic and what research has been performed about it. The literature review was focused on articles related to Hispanic farmworkers, focusing on sun exposure, sun protective behaviors, and skin cancer.

The literature review was performed utilizing Walden University's Thoreau multi-database, which consists of PubMed, CINAHL Plus with Full Text, Academic Search Complete, and Complementary Index. External searches were performed using Google Scholar to supplement the primary data search engine, Thoreau. Finally, the U.S. Bureau of Labor Statistics, National Center for Farmworker Health, National Cancer Institute, International Agency for Research on Cancer, and Centers for Disease Control and Prevention were used to identify and obtain sunburn, skin cancer, and farmworkers related data and statistics. Phrases and key terms used throughout the research included the following phrases and terms: *farmworkers* OR *agricultural workers* OR *Hispanic farmworkers* OR *United States* OR *United States of America* OR *sociodemographic factors* OR *educational attainment* OR *farm* OR *farming* OR *migrant farmworkers* OR *heat-related* OR *heat-related illnesses* OR *heat illness* OR *occupational sunburn* OR *sun protective behaviors* OR *sun protection* OR *use of cap/visor* OR *environmental sun*

exposure OR *sunburn* OR *sunburns* OR *skin cancer* OR *melanoma* OR *skin cancer diagnosis* OR *skin cancer prevention* OR *skin cancer risk factors* OR *effect on skin* OR *linear regression* OR *health belief model* OR *sunlight effects* OR *UV exposure* OR *minority health*. This literature review was limited to including searches from the past 5 years (2017–2022).

Theoretical Foundation

Sun exposure and skin cancer was addressed by analyzing why healthy people do not take advantage of preventive measures like the use of sunscreen or cap/visor. This study was guided by the theoretical framework known as HBM, considered as one of the first theories of health behavior developed in the 1950s by Hochbaum, Kegals, and Rosenstock (LaMorte, 2019). The HBM constructs help predict why people engage in prevention, control, and/or screen several health conditions (Glanz et al. 2008). The HBM proposes that an individual's health related behaviors depend on its perceptions throughout the known HBM constructs (Glanz et al., 2008). HBM constructs are

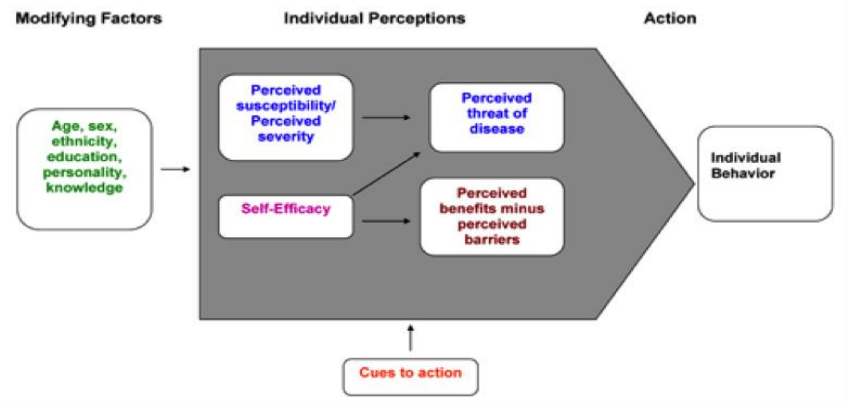
- Perceived susceptibility is the individual's belief to susceptibility to a certain disease.
- Perceived severity is the individual's belief of the severity or seriousness of the condition or illness or disease.
- Perceived barriers are the individual's evaluation of obstacles that prevent the individual to adopt new health behaviors.
- Perceived benefits are the individual's value placed to reduce the risk of illness by adopting new health behaviors.

- Self-efficacy is the individual's perception to successfully achieve a healthy behavior.
- Cues to action is what is necessary for the individual to engage to in the healthy behavior.

HBM also includes modifying factors that could affect the health-related behaviors indirectly, which includes variables pertaining personality, sociodemographic factors (age, gender, education, ethnicity), knowledge, and satisfaction (LaMorte, 2019; see Figure 1).

Figure 1

Health Belief Model



Note. From *Health Behavior and Health Education Theory, Research, and Practice*, by Glanz, Romer, and Viswanath, 2008. John Wiley & Sons.

HBM has been used in past recent research to identify risk and protection beliefs towards sun exposure in farmworkers. Mott (2020) adopted HBM to increase South Carolina farmworker's awareness of skin cancer susceptibility and severity while showing them ways to avoid barriers that disable farmworkers from using sunscreen

protection when working in fields. Nahar et al. (2019) also used HBM constructs to identify factors that are associated with sun protection behaviors among outdoor workers in southeastern United States, such as state park workers and farmers. Mott and Nahar et al. used the HBM constructs to identify perceived susceptibility, perceived severity, perceived barriers, and perceived benefits among outdoor workers like farmworkers. The HBM is useful to identify how a safety and health culture among farmworkers can affect farmworkers behaviors toward being negative or positive to prevent sun exposure (Soto et al., 2018). The HBM model identifies and explains how individuals perceive risks and protection behaviors towards sun exposure (Binti et al., 2020), which is why it is so important for public health practitioners.

The HBM was chosen for this study to provide a better understanding of U.S. Hispanic farmworkers' sun protective behaviors toward sun exposure and skin cancer. This model has been used successfully in previous farm working environments for which HBM constructs were utilized for explaining their behaviors towards a specific illness (sun exposure and skin cancer). This research included variables of U.S. Hispanic farmworkers, sociodemographic factors (age, gender, income, educational attainment, and marital status), sunburns, sun protective behaviors (use of cap/visor and sunscreen), and skin cancer. A farmworker is an outdoor worker, who has an increased risk of sun exposure and skin cancer (Niu et al., 2022). To prevent sun exposure effects and skin cancer, federal agencies like the Occupational Health and Safety Administration (OSHA) recommends following sun protective behaviors like the use of cap/visor and sunscreen (Ragan, 2019). The inadequate use of cap/visor and/or sunscreen, and increased sun

exposure are one of the primary risks for sunburns and skin cancer in farmworkers (Ragan, 2019). Therefore, it is important to describe the relationship between the described DVs and the four HBM applicable constructs (perceived susceptibility, perceived severity, self-efficacy, and cue to action).

HBM Constructs

Perceived Susceptibility

Perceived susceptibility refers to an individual's belief about getting a condition, illness, or disease (LaMorte, 2019). The DV, the use of cap/visor worn if outside on a sunny day, is related to perceived susceptibility since it refers to a subjective evaluation about the risk of developing a health problem. This HBM construct predicts that people who perceive they are susceptible to a health problem, will involve behaviors to reduce the risk of developing the health problem. In this case, if the person wore a cap, it is a behavior to reduce sun exposure health problems.

Perceived Severity

Perceived severity refers to an individual's belief about how serious the condition or illness is or has the willingness to leave unattended the condition and its consequences (LaMorte, 2019). The DV, sun's effect on the skin, is related to perceived severity since it is the subjective evaluation of the severity of a certain health problem and its consequences. In this case, if the farmworker was exposed to the sun for more than an hour, they would evaluate what health effects come from that exposure.

Self-Efficacy

Self-efficacy relates to an individual's belief that they can achieve the behavior needed to gain the outcome (LaMorte, 2019). The variable how often sunscreen is used if outside on a sunny day for over 1 hour is related to self-efficacy since it's the individual's perception to act with success in certain behavior, for example, using sunscreen to avoid sunburns.

Cues to Action

Cues to action are factors which stop or trigger to get to action (LaMorte, 2019). The DV sunburns reported in the last 12 months is related to cue to action since it is the illness that could promote health behavior participation to avoid any illness or condition in the future like skin cancer. These HBM constructs help guide this research of sun protective behaviors as a primary skin cancer and sunburn prevention measures.

Literature Review Related to Key Variables and Concepts

Rationale for Study Variables

Hispanic farmworkers, sun exposure, and skin cancer have been studied, including sun protecting behaviors. However, most of the Hispanic populations studied are Mexicans (Bloss et al., 2021). Based on current research, I tested whether sociodemographic factors like age, gender, income, educational attainment, marital status are related to sunburns reported, the sun effect on skin, wearing a cap/visor, and sunscreen use among U.S. Hispanic farmworkers. I also tested whether skin cancer is related to the sunburns reported, the sun's effect on skin, wearing a cap/visor, and sunscreen use among U.S. Hispanic farmworkers. Sociodemographic factors and skin

cancer were selected as the independent variables to understand if there was a statistically significant difference in sunburns reported, the sun's effect on skin, wearing a cap/visor, and sunscreen use based on the U.S. Hispanic farmworkers response, and if age, gender, and educational attainment (covariates) contribute to any difference. The DVs were chosen as indicators that represent sun exposure and protective behaviors among the U.S. Hispanic farm working population. Additionally, these variables were selected due to lack of research presented when it comes to U.S. Hispanic farmworkers. The covariates used in this research were selected and used in previous research on sun protective behaviors and sunburns and represents the variables that could contribute to differences among sun exposure and skin cancer within the U.S. Hispanic farm working population (Niu et al., 2022).

Current Research Related to Variables

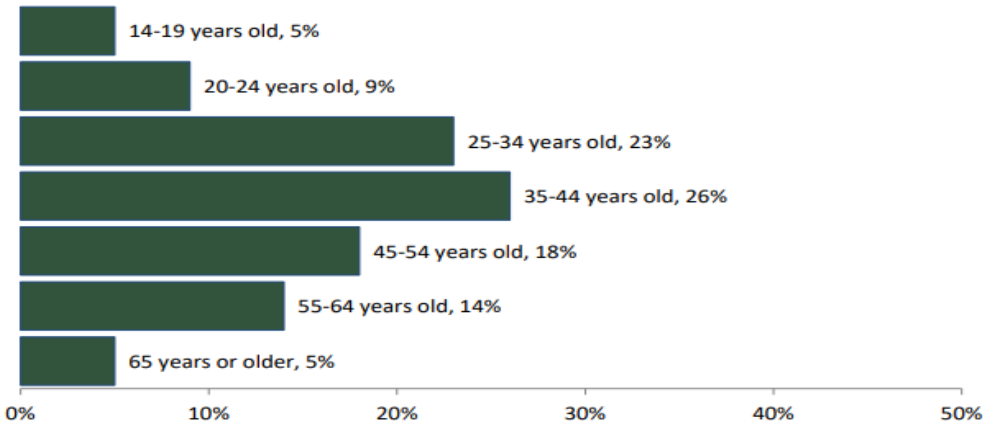
Sun Protective Behaviors and Age

According to Employment and Training Administration (2022) under the National Agricultural Workers Survey 2019-2020, the average age of farmworkers was 41 years old, with a median of 39 years old. Thirty-five percent of the farming population was less than 35 years, and 19% were aged 55 or older (see Figure 2). Similar research has indicated that the average Hispanic worker is 39 years old or between 30 and 39 (Castillo et al., 2021; Niu et al., 2022). Research has shown that Hispanic farmworkers between 35 and 41 years are more likely to work in agricultural fields, get exposed to at least one sunburn, assume fewer protective behaviors, and be more exposed to skin cancer (Castillo et al., 2021; Mott, 2020; Ragan et al., 2019). Hispanic outdoor day laborers, like

farmworkers, are more likely to have been diagnosed with skin cancer at 49 years old, than non-Hispanics whites (58 years; Niu et al., 2022). This research is limited to U.S. Hispanic farmworkers aged 21 or older and did not consider younger farmworkers. Therefore, age will be considered as one of the independent variables within this project.

Figure 2

Farmworkers Age Distribution, 2019-2020



Note. From the "Findings from the National Agricultural Workers Survey (NAWS) 2019-2020: A Demographic and Employment Profile of United States Farmworkers (Research Report No. 16)," by the Employment and Training Administration, 2022.

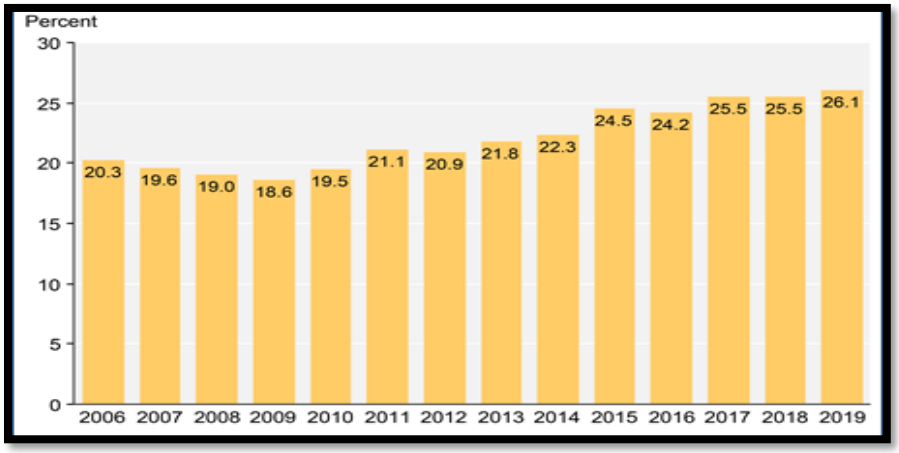
Sun Protective Behaviors and Gender

Hispanic farmworkers are more likely to be males than females. Seventy-three percent of all agriculture occupations are performed by males (Economic Research Service, 2022). In previous studies, more than 75% of their Hispanic farmworker populations were males (Culp & Tonelli, 2019; Kearney & Garzon, 2020; Luque et al., 2019; Niu et al., 2022). Although from 2009 to 2019, there has been an increased percentage of females (26.1%) participating in the farming industry (see Figure 3;

Economic Research Service, 2022), sunburn incidence is higher among Hispanic men, and sun protective behaviors are more like to be practiced by females (Kuehn, 2021; Luque et al., 2020; Mutic et al., 2018; Niu et al., 2022). Women tend to be more protective about their skin when exposed to sun, and men less protective due to poor engagement to protect their skin from sun exposure. Thus, sociodemographic factors, like gender, are related to engagement in sun protective behaviors, but income is another sociodemographic factor that can be related to these behaviors.

Figure 3

U.S. Farm Laborers Who Are Women, 2006-2019



Note. From the USDA, Economic Research Service using data from the U.S. Department of Commerce, annual American Community Survey, and the U.S. Census Bureau revised on March 15th, 2022.

Sun Protective Behaviors and Income

Poverty income lines are defined as the guidelines that indicate the minimum amount of annual income that a family or an individual needs have for essential needs (food, water and other utilities, transportation, housing, and clothing; Assistant Secretary

for Planning and Evaluation [ASPE], 2021). Determining the poverty income of an individual or a family will depend on the size of the family and the state for which they live in (see Table 1). According to the 2020 Poverty Guidelines, 20% of farmworkers and their families were considered as individuals below-poverty income (see Figure 4; Economic Research Service, 2022). Many farmworkers have big families in which only the male figure is the income provider of the family. This study relates to Hispanic farmworkers who in their majority, are considered as low-income workers. The annual income for a single Hispanic farmworker is between $20,000 to $24,999 (National Center for Farmworker Health, 2018). Forty-four percent of Hispanic farmworkers households has a family size of six or more, representing that farmworkers with larger families are more common to be below poverty income families (see Figure 5). Hispanic farmworkers who work at an average of $10.95 per hour ($20,000 to $24,000 annual income) are more likely to drink water only when they are asked to and not because they need to maintain hydrated, use light-colored long-sleeved shirt, use a cap, and uses trees to take a break (Luque et al., 2020; Smith et al., 2020). Hispanic farmworkers like to work without drinking water since is an easy way to loosen time of work but do uses caps and light-colored long sleeves to work. Although this study looks at the farmworker's income, it does also emphasize the education farmworkers received before starting to work in the farming industry.

Table 1

2020 Poverty Guidelines for the 48 Contiguous States and the District of Columbia

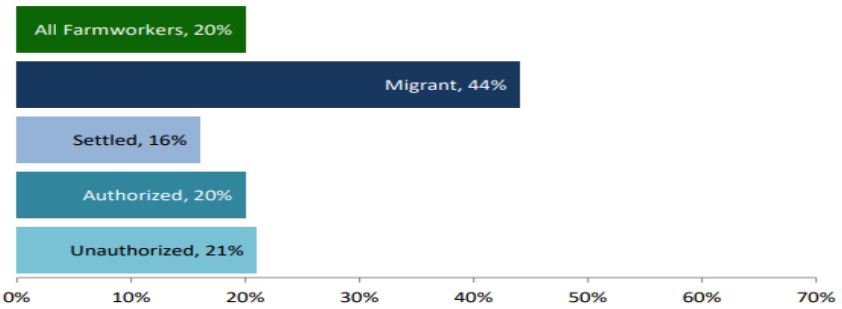
Persons in family / household	Poverty guideline
1	$12,760
2	$17,240
3	$21,720
4	$26,200
5	$30,680
6	$35,160
7	$39,640
8*	$44,120

Note. From the Office of the Assistant Secretary for Planning and Evaluation (ASPE) revised on January 17th, 2020.

* For families/households with more than eight people, add $4,480 for each additional person.

Figure 4

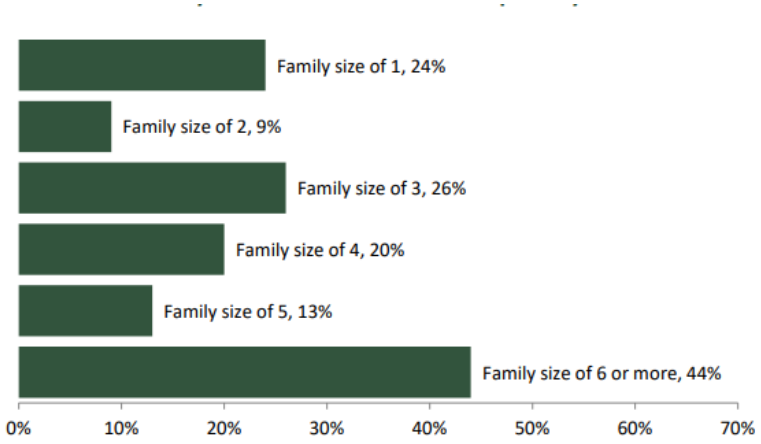
U.S. Farmworkers that Have Family Incomes Below the Federal Poverty Level, 2019-2020



Note. From Findings from the National Agricultural Workers Survey (NAWS) 2019–2020: A Demographic and Employment Profile of United States Farmworker from JBS International to U.S. Department of Labor revised and published in January 2022.

Figure 5

Percent of U.S. Farmworkers with Family Income Below Poverty Level by Family Size, 2019-2020



Note. From Findings from the National Agricultural Workers Survey (NAWS) 2019–2020: A Demographic and Employment Profile of United States Farmworker from JBS International to U.S. Department of Labor revised and published in January 2022.

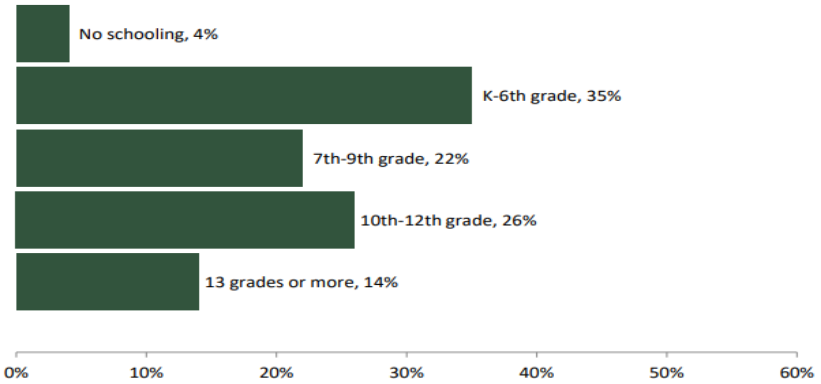
Sun Protection Behaviors and Educational Attainment

Educational attainment is very difficult for Hispanic farmworkers since working in farms is a priority to maintain their families (Kuehn, 2021). Hispanic farmworkers have an average of six (6) to nine (9) years of education (Employment and Training Administration, 2022; Mutic et al., 2018; Smith et al., 2020). An average of 35% of all Hispanics farmworkers have at least completed six years of primary school, and an average of 26% completed high school (see Figure 6; Culp and Tonelli, 2019; Luque et al., 2019; Mutic et al., 2018). Basically, Hispanic farmworkers leave their education because they need to support financially their house at an early stage of life. By this, we see that educational attainment is important in order to engage sun protective behaviors.

Farmworkers with higher educational level had reported less sunburns and more sun protective behaviors (Culp and Tonelli, 2019; Mutic et al., 2019; Niu et al., 2022). Sun protective behaviors like the use of sunscreen, use of cap/visor, use of long-sleeve shirt, and use shade for taking rest are limited when farmworkers do not have any educational attainment (Luque et al., 2019; Niu et al., 2022). Additionally, having less educational attainment makes the farmworker more exposed to acquiring skin cancer due to less sun protective behaviors (Mutic et al., 2018). By this, it becomes important to notice that meanwhile a farmworker has gained more education, more knowledge and behaviors will acquire to protect himself from sun exposure and skin cancer.

Figure 6

U.S. Farmworkers' Average Educational Attainment



Note. From the "Findings from the National Agricultural Workers Survey (NAWS) 2019-2020: A Demographic and Employment Profile of United States Farmworkers (Research Report No. 16)" of the Employment and Training Administration (ETA) published on June 3rd, 2022.

Sun Protection Behaviors and Marital Status

More than half of reported farmworkers in the United States are married (Employment and Training Administration, 2022). Around 51% of Hispanic farmworkers

are considered as having a married marital status (Economic Research Service, 2022). Married Hispanic farmworkers has been related to less engaging in sun protective behaviors like the use of long-sleeve shirt, use of cap/visor, and use of sunscreen (Boyas et al., 2021). Boyas et al stated that Latino day laborers who work outside in sun peak hours, who are married, has less education, and having supervisors who doesn't engage in sun protective behaviors, are less likely to engage in sun protective behaviors than other Latino day laborers. Married farmworkers have a priority to bring economic support to their families, as per this, it is more important for them to work than to protect their health. Certainly, we see that farmworkers are more susceptible to engaging less in sun protective behaviors because of socio-demographic factors, bringing the possibility to be more exposed to sunburns and skin cancer.

Sun Protection Behaviors, Sunburns, and Skin Cancer

Farmworkers are at risk of environmental threats to their health, specifically skin threats (Castillo et al., 2021). One of the environmental threats is excessive sun exposure (Castillo et al., 2021; Tortolero et al., 2022). Excessive sun exposure due to lack of sun protective behaviors (use of cap/visor, use of sunscreen, use of long pants, use of long-sleeve shirt, use of shade, and others) can cause skin cancer (Niu et al., 2022; Culp and Tonelli, 2019; Ragan et al., 2019; Tortolero et al., 2022). Skin cancer incidences are rising among US Hispanic adults (Viola et al., 2019). Individuals considered as farmworkers are more at risk of skin cancer, like melanoma, due to excessive sun exposure and lack of sun protective behaviors while working (Niu et al., 2022). Farmworkers are laborers who are exposed to sun all day, and by this, if they are not

engaging in sun protective behaviors, they are definitely exposed to sunburns. Having sun exposure and sunburn can definitely bring to farmworkers skin cancer, like melanoma, in the long term.

Melanoma skin cancer has an incidence rate of 21.5 per 100,000 men and women every year (National Cancer Institute, 2022). Lack of sun protective behaviors like the use of sunscreen, use of cap/visor, and the use of long-sleeve shirts can cause melanoma skin cancer (Mutic et al., 2018). Higher levels of sun protective behaviors are found in farmworkers who have more knowledge of skin cancer prevention (Mutic et al., 2018; Niu et al., 2022; Ragan et al., 2019; Smith et al., 2020). Skin cancer is definitely associated to less sun protective behaviors, but in farmworkers, skin cancer prevention can be found in the use of sun protective behaviors which is a common finding in these workers. Per this, farmworkers need to engage in sun protective behaviors (use of sunscreen, use of cap/visor, and the use of long-sleeve shirts) to reduce the exposure of possible sin cancer diagnosis and sunburns.

Review and Analysis of Research Related to Research Questions

Minimal research has been performed on how sun protective behaviors are associated with socio-demographic factors (age, gender, marital status, educational attainment, and income) and skin cancer among U.S. Hispanic farmworkers. Most research focuses on non-Hispanic farmworkers, but other ethnicities, like Hispanics, are less studied (Bloss et al., 2021; Boyas et al., 2021; Niu et al., 2022; Ragan et al., 2019; Smith et al., 2020). Hispanics, like Mexicans and Puerto Ricans, works in the farming

industry, and by this, researchers need to study them to know their behaviors in terms of sun protection.

The initial researchers who explored this research topic focused on understanding the current socio-demographic factors and skin cancer associated to sun protective behaviors like the use of sunscreen, the use of cap/visor, sunburns, and effect of sunburns in the skin in Hispanic farmworkers, especially Mexicans. Research by Bloss et al. emphasized the necessity of studying Mexicans and other Hispanic populations, in sun exposure due to lack of research in this specific topic. Additionally, Boyas et al. explained that Hispanic farmworkers are less likely to engage in sun protection behaviors than any other farm working population. Both investigations analyzed the necessity of studying sun exposure and protection behaviors associated to skin cancer in Hispanic farm working populations. By this, Hispanic populations are needed to be studied to determine if there is any relationship between the IVs and DVs expressed in this study.

Minimal research has been performed in determining the relationship between the IV skin cancer and the DV of sunburns reported, sun's effect on skin, wearing a cap/visor, and use of sunscreen. Niu et al. exposed that Hispanic individuals who work outside do not engage in sun protective behaviors (like the use of cap/visor, use of sunscreen) and are more at risk to develop sunburns and skin cancer. This study indicates the necessity of continuing studying Hispanics, and outdoor working occupations, like farmworkers.

In sum, there has been minimal research regarding U.S. Hispanic farmworkers, socio-demographic factors, sun protective behaviors, and sunburns. Little studies have

demonstrated the impact of sun exposure and protective behaviors in the Hispanic farm working population in the US, and how it can affect its skin cancer knowledge. By this, Boyas et al., Niu et al., Ragan et al., Smith et al., and Tortolero et al. has exposed the necessity of studying Hispanic farmworkers in terms of sun exposure and protective behaviors. Therefore, after evaluating outcomes and necessity of study, this research can help public health practitioners to organize campaigns that prioritize U.S. Hispanic farm workers and sun exposure and protective behaviors.

Definitions

Sunburn reported: Sunburns are caused by exposure to the sun's ultraviolet rays (UV) and may lead to inflamed, painful, and red skin (Guerra and Crane, 2022). This DV refers to the number of sunburns a respondent has had in a period of 12 months in a row during 2015.

Sun effect on skin: When individuals are exposed to UV for a long period, it can cause major damage to the skin (Hoss, 2022). This DV refers to the severity of the sun effect of 1 hour on the respondent's skin.

Wear of cap/visor: The best way to prevent sunburns and UV rays from affecting the skin is the utilization of a cap/visor (Division of Cancer Prevention and Control, 2022). This DV refers to how often the respondent wears a cap if is outside on a sunny day.

Sunscreen Use: Sunscreen is a Food and Drug Administration (FDA) approved drug to be used to decrease the risk of skin cancer, prevent early skin aging caused by the sun, or prevent sunburns when individuals are exposed to the sun while working or

recreational activities (U.S. Food and Drug Administration, 2022). This DV refers to how often the respondent uses sunscreen if it's outside on a sunny day.

Skin cancer: Most skin cancers are caused by an individual's exposure to the sun's ultraviolet rays for a long period (American Cancer Society, 2019). One of the most common skin cancers related to sun exposure is melanoma (American Cancer Society, 2019). Previous sunburns and sun protection behaviors may lead to skin cancer (i.e., melanoma) (American Cancer Society, 2019). This IV refers to the respondent's diagnosis of skin cancer by the time of the data collection.

Assumptions

The following assumptions are taken into consideration for this study: First, the dataset utilized for this study was the 2015 IPUMS National Health Interview Survey (NHIS) and since this survey is a self-administered instrument, it is assumed that the anonymity of respondents helped reduce social desirability bias, which do not systematically affect the means of variables that are independent of social influence (Gaia, 2020), and increased willingness of survey participation. Secondly, the sample to be utilized from this survey focused on adult Hispanic farmworkers in the United States and provide the variables needed to explore possible associations. Therefore, the chosen dataset is assumed to be suitable to explore the possible association between the IVs of age, educational attainment, earnings, gender, and marital status, and DVs of sun protective exposure and behaviors and skin cancer among U.S. Hispanic farmworkers. All these assumptions are truthful and necessary to accept the secondary dataset and use it to answer the research questions.

Scope and Delimitations

The scope of this research was limited to the analysis of sun exposure, sun protective behaviors, socio-demographics, and skin cancer of Hispanic farmworkers in the US. However, there is little or no data regarding socio-demographic factors, sun exposure, skin cancer, and sun protective behaviors in U.S. Hispanic farmworkers. For this study, I focused on farmworkers who has a Hispanic heritage, lives in the United States, and were 21 years or older. Respondents less than 21 years old, non-Spanish speakers, and not working in the farming industry are excluded from the study. Additionally, since the collection of the data comes from a secondary data set, no contact with primary investigators or respondents where accessible. Additionally, the timeline of the dataset to be collected is from 2015 since variables were not available for any other year. Finally, this research was limited by the use and variables available in the secondary dataset.

Limitations

There were several limitations present in this study. First, this study was based on a secondary dataset, and it comes with several limitations regarding data collection. Additionally, it may present lack of accuracy due to data collection methods. Secondly, it can exist other undocumented or unresearched confounding variables that can contribute to sun exposure and protective behaviors in Hispanic farmworkers that could not be accounted for when performing statistical analysis. Thirdly, since the data for this study is from a secondary dataset, reporting bias may be present. Fourth, since is a cross-sectional study, causation cannot be addressed. Fifth, sun protection behavior questions

that were studied in this research, were not necessarily asked to the respondent as if they were practiced or performed during farm working labor. Lastly, the secondary dataset chosen for this study does not show a full representation of the Hispanic farmworkers who work in the US which could affect the generalizability of the study by not guaranteeing that the results of this research will occur in every Hispanic farmworker in the US and will only be applied to the IPUMS respondents. Although this dataset may affect generalizability, it was still chosen due to the variables selected for the study.

Significance

This study is essential and could build more knowledge on the currently limited information about sun exposure and protective behaviors among U.S. Hispanic farmworkers. This topic has not been extensively researched, so this study will enhance and possibly bring new prevention strategies for sun protection behaviors to avoid sun exposure and skin cancer among U.S. Hispanic farmworkers. Additionally, the results of this study may identify effective ways to increase sun protective behaviors (i.e., use of sunscreen, use of cap/visor) among U.S. Hispanic farmworkers to reduce sun exposure and possible skin cancer, which could enhance the development of targeted public health campaigns or workplace policies. Thus, this research has the potential to create positive social change by increasing knowledge of sun exposure, skin cancer, and sun protection behaviors among U.S. Hispanic farmworkers, and could inform interventions and policies aimed at reducing sun-related illnesses and skin cancer among U.S. Hispanic farmworkers in the United States.

Summary and Conclusions

Previous research has established that U.S. Hispanic farmworkers and sun exposure are one of the less studied topics in the US (Bloss et al., 2021). Sun exposure represents a public health problem for Hispanic farmworkers, and it needs to be addressed so that more initiatives are performed to address this public health issue (Castillo et al., 2021). Throughout this research, I will be expanding actual knowledge about sun exposure and protecting behaviors in U.S. Hispanic farmworkers and will help contribute to public health practitioners to create initiatives for this specific population.

The second section of this research will discuss research design and data collection for this present study to answer research questions and add new and actual knowledge about sun exposure and protecting behaviors in U.S. Hispanic farmworkers. Additionally, it will discuss rationale of the research design, methodology, instrumentation and operationalization of constructs, and threats to validity.

Section 2: Research Design and Data Collection

Sun exposure represents a concern for public health practitioners in the agricultural industry. In this research project, I determined the association between sociodemographic factors (i.e., age, gender, marital status, educational attainment, and income) and skin cancer with the level of sun exposure (sun effect on skin, sunburns) and protective behaviors (use of cap/visor, use of sunscreen) among adult Hispanic farmworkers in the United States. I analyzed if there was an association between skin cancer and sunburns reported, the sun effect on skin, wearing a cap/visor, and sunscreen use among U.S. Hispanic farmworkers, controlling for age, marital status, gender, educational attainment, and income. Section 2 of this research project includes research design and rationale for this research (including methodology and threats of validity) and ethical procedures within this study.

Research Design and Rationale

To address the research questions of this study, I used secondary data from the NHIS with a cross-sectional design to understand the association between sociodemographic variables, sun exposure, skin cancer, and protective behaviors of U.S. Hispanic farmworkers. Descriptive statistics, binomial and ordinal logistic regressions were used to determine any association between the variables while controlling for the included covariates. The selected research design provided the appropriate method to examined current data sets for the understanding of sun exposure and sun protection behaviors within U.S. Hispanic farmworkers.

The use of the NHIS data set and the research design is common of sun exposure related research within farmworkers. The NHIS data sets have been used in several research studies due to variable health topics within the survey (NIH, 2022). For example, Holman et al. (2019) used NHIS data on sun exposure and protective behaviors. The NHIS from the IPUMS Health Surveys is a public access data set on the health, health behaviors, and health care access of U.S. population since 1963 to present (NHIS, 2022). The 2015 dataset is the most recent to include all the required variables. The use of this secondary dataset helped reduce the time to create and collect primary data across Hispanic farmworkers in the United States. The use of secondary data helped me gain all the necessary information needed to scope U.S. Hispanic farmworkers, sun exposure, and sun protective behaviors.

Methodology

Population

The population of this study was U.S. Hispanic farmworkers who answered the 2015 NHIS. The sample for this study were female and male respondents 21 or older at the time of the 2015 NHIS survey. All participants also had an occupation in the farming industry and are considered as Spanish speakers (Hispanics). Exclusion criteria were respondents aged 20 or less, those who are not considered as Hispanic (non-Spanish speakers), and those who do not work in the farming industry. The inclusion criteria of all qualifying NHIS respondents showed a good sampling size that helps have the necessary statistical power for this study.

Sampling Procedures Used by IPUMS

Sampling Strategy

The sample design and strategy used for the 2006-2015 NHIS data sets involved a stratified multistage sampling design of the U.S. population (CDC, 2014). As per the stratification and sample design parameters, the 2006-2015 NHIS survey included 66% of self-representing individuals, non-self-representing primary sampling unit for this period is 400,000 units, 227 full-interview sample non-self-representing primary sampling units, and in total 42,000 households interviewed (CDC, 2014). This survey also included all 50 mainland states and D.C. Furthermore, the minority sampling techniques for housing unit selection and within household used an oversample and screen for Black, Asian, and Hispanic individuals (CDC, 2014). NHIS data sampling helps provide estimates of health care access and utilization, health-related indicators, and behaviors for the U.S. population.

Data Generation

NHIS survey data are collected annually from 2006 to 2015 (CDC, 2014). The annual sample was later divided into four calendar quarters for which it represents the probability sample of the targeted population (CDC, 2014). NHIS data collection is conducted by Census Bureau employees who work as NHIS interviewers performing face-to-face interviews to each family in the survey sample; geographical clustering is needed to lower operational and field costs (CDC, 2014). For this survey, one adult and one child from each family is interviewed at random selection. For selected adults, the Sample Adult Core Survey is administered, and the Sample Child Core questionnaire is

administered to the selected child (CDC, 2014). Some interviews may not be completed during the first visit, and if the second interview cannot be finished during a face-to-face interview, then the interview will be performed via telephone to finish what was not completed during the face-to-face interview. All data collected are analyzed using variance estimation method according to the type of design utilized (if is for in-house design or public-use design; CDC, 2014). Once all data are analyzed, annually the data is released for public use and research.

Inclusion and Exclusion Criteria

The population targeted by the NHIS are the noninstitutionalized civilian population who resides in the District of Columbia and within the 50 states at the time of the NHIS interview. Residents of noninstitutional group quarters (rooming houses, homeless shelters, and group homes), residents of households, individuals residing with Armed-Forces personnel in non-military housing, and individuals residing temporarily in temporary housing or student dormitories are included in the NHIS Survey (National Center for Health Statistics, 2022). Exclusion criteria would be individuals with no fixed household address, civilians living in military bases, Armed-Forces active individual, individuals living in long-term care facilities (e.g., hospitals or nursing homes), individuals in correctional facilities (e.g., jails, prisons halfway houses, or juvenile detention centers), and Americans living in foreign countries (National Center for Health Statistics, 2022).

Data Access

NHIS data sets are used to track health care access, health status, and achieving the national health objectives (CDC, 2023). The NHIS contains core questions divided into three components: family, sample child, and sample adult. These data sets are public. To access these files, researchers need to access the NHIS website and register to IPUMS. The registration process allows the researcher to access all NHIS data and agreeing that data will not be redistributed without permission, data will only be used for statistical analysis and reporting only, data will not be used to identify individuals, and that data will be cited appropriately (NHIS, 2022). The registration process also includes creating an account with IPUMS, which requires personal information like email, first name, last name, name of institution or employer, occupational category and title, field of research, and general research statement. Once registration is completed, access is granted immediately. The user shall select the year sample for which the research will be based and later select all applicable variables for the study. Once all is selected, data can be extracted to the researcher's email.

NHIS Data Reputability and Quality Relative to This Study

IPUMS NHIS data is one of the major health surveys sponsored by the National Center for Health Statistics of the CDC (CDC, 2014). Through NHIS, data related to health of noninstitutionalized U.S. population are collected through face-to-face interviews throughout all the United States and District of Columbia (CDC, 2014). Per this, NHIS is the U.S. primary source of general health information. Holman et al. (2019) and other researchers have used the NHIS data set to approach sun exposure and

behaviors in the US population. The NHIS has been widely used to research on health topics including epilepsy, Internet access and obesity, sun exposure, asthma, cancer, and others (CDC, 2014). This data set represents the most appropriate data for this study since the variables for this study are present in the NHIS and it provides the opportunity to understand the association that could exist between sociodemographic and sun exposure and behaviors, and skin cancer and sun exposure and behaviors in U.S. Hispanic farmworkers.

Power Analysis

Power is defined as the probability of detecting an effect, meaning the probability of rejecting the null hypothesis (UCLA, 2021). Doing a power analysis gives information about the sample size needed for the current study to ensure that the study has an adequate number of participants. For this study, I used lineal multiple regression with a fixed model, an alpha of 0.05, 0.15 medium effect size, and 80% for power as criteria since they are scientific standards for research (Ceran et al, 2021; UCLA, 2021). The power analysis, using G*Power 3.1 application, determined that the minimum sample size to be used for this research is 89. The results showed that the ideal sample size for this study would be 89; however, the actual sample size needed is substantially greater. Thus, all available data were utilized.

Instrumentation and Operationalization

The NHIS was developed in July 1957 when the National Health Survey and the National Vital Statistics Division were combined (CDC, 2022a). The objective of the NHIS is to gather information about the health of the United States population throughout

the data gathering of a series of health topics categorizing them in demographic and socioeconomic characteristics. Every fifteen to twenty years, the survey is updated to incorporate survey methodology advances to achieve national health objectives (CDC, 2022b). The most current version of the NHIS is the 2019 redesigned content and structure, which differs from the 1997 to 2018 survey.

The NHIS survey instrument was appropriate for this study because it provided the needed variables to perform this research. The survey instrument collected information relevant to sociodemographic variables like age, gender, marital status, educational attainment, and income; skin cancer, sunburns reported, sun effect on skin, wearing a cap/visor, and sunscreen use. The previous study relating sun exposure and protective behaviors, skin cancer, and sociodemographic used NHIS survey due to data engagement and necessity of information (Ragan, et al, 2019).

The NHIS has been widely used for several health research in the United States. In the case of sun exposure and behaviors in farmworkers, NHIS data has not been used frequently since data pertaining to sun exposure / heat-related illnesses has been only gathered in 2015. Although, NHIS has not been used frequently for this topic, for other health topics like psychological, diabetes, vaccination, heart diseases, cancers, and socioeconomic disparities have been extensively used. The frequent use of the NHIS data for several health topics sets speaks to the validity and reliability of the data, and for this, the appropriateness for this study.

Operationalization

The variables for this research included sociodemographic factors like age (scale independent variable), gender (nominal independent variable), income (ordinal independent variable), educational attainment (ordinal independent variable), marital status (nominal independent variable), and skin cancer (nominal independent variable) can predict the sunburns reported (continuous scale dependent variable), the sun effect on skin (ordinal dependent variable), wearing a cap/visor (ordinal dependent variable), and sunscreen use (ordinal dependent variable) among U.S. Hispanic farmworkers.

The independent variables are age for which represents the participant's age in years, gender represents if the participant is a male or female, income represent the participant's income, educational attainment represents the scholarity of the participant, and skin cancer represents if the participant mentioned to have skin cancer (any type including melanoma). The dependent variables are sunburns reported which represents the amount of times that the participant has had any type of sunburn in the past 12 months, the sun's effect on skin represents the type of severity of sunburns as an effect on skin for being exposed in the sun for 1 hour, wearing a cap/visor represents how often a cap/visor is worn if outside on a sunny day over 1 hour, and sunscreen use which represents how often the participant use sunscreen if outside on a sunny day for over 1 hour. The covariates included in the study are age (scale), marital status (nominal), gender (nominal), educational attainment (ordinal), and income (ordinal).

Table 2

Operationalization of Variables

Variable name	Type	Categorization and operationalization	Level of Measurement
Age	Independent	Respondent's age in years from 01 to 120.	Continuous scale
Gender	Independent / Covariate	Respondent's sex: 1 Male 2 Female	Nominal
Income	Independent / Covariate	Person's total earnings, previous calendar year $01 to $75,000 and over 1 $01 to $9,999 2 $10,000 to $24,000 3 $25,000 or more	Ordinal
Educational attainment	Independent / Covariate	Respondent's highest level of schooling an individual has completed 1 Kinder to 6th grade 2 7th to 12th grade (no diploma) 3 Completed High School/AA/BS	Ordinal
Marital Status	Independent / Covariate	Respondent's current marital status 1 Not-married 10 Married	Nominal
Sunburns reported	Dependent	Sunburns reported in last 12 months 0 No sunburn 1 Yes, had sunburn	Continuous Scale
Sun effect on skin	Dependent	In sun a long time, effect on skin 1 = say nothing would happen 2 = turn darker or mildly burn 3 = severe sunburn with peeling or blister	Ordinal
Use of a cap/visor	Dependent	How often cap/visor worn if outside on sunny day over 1 hour 1 never 2 sometimes 3 always	Ordinal
Sunscreen use	Dependent	How often sunscreen used if outside on sunny day over 1 hour 1 = never 2 = sometimes 3 = always	Ordinal

Data Analysis Plan

Data analysis was completed using IBM SPSS version 28. Once the data was downloaded, it was screened and cleaned for accuracy, consistency, and completeness in alignment with all elements related to the research question and inclusion criteria. To address invalid or missing data, I used imputation in which missing data is replaced with an estimated value to maintain the sample size and distribution of data.

Research Questions

Research Question 1: What is the association between sociodemographic factors (age, gender, marital status, educational attainment, and income), and the sunburns reported, the sun's effect on skin, wearing a cap/visor, and sunscreen use among U.S. Hispanic farmworkers?

$H_0$1: There is no association between age, gender, marital status, educational attainment, income, and sunburns reported, the sun effect on skin, wearing a cap/visor, and sunscreen use among U.S. Hispanic farmworkers.

H_a1: There is a relationship between age, gender, marital status, educational attainment, income, and sunburns reported, the sun's effect on skin, wearing a cap/visor, and sunscreen use among U.S. Hispanic farmworkers.

Research Question 2: What is the association between skin cancer and sunburns reported, the sun's effect on skin, wearing a cap/visor, and sunscreen use among U.S. Hispanic farmworkers, controlling for age, marital status, gender, educational attainment, and income?

$H_0$2: There is no association between skin cancer and sunburns reported, the sun's effect on skin, wearing a cap/visor, and sunscreen use among U.S. Hispanic farmworkers, controlling for age, marital status, gender, educational attainment, and income.

H_a2: There is a relationship between skin cancer and sunburns reported, the sun's effect on skin, wearing a cap/visor, and sunscreen use among U.S. Hispanic farmworkers, controlling for age, marital status, gender, educational attainment, and income.

Statistical Analysis

For this research study, quantitative data analysis was used to answer both of the research questions. To answer the first research question, descriptive statistics, ordinal logistic regression (OLR), and binomial logistic regression (BLR) were performed. Regression is a method for predicting values of one variable (the outcome or dependent variable) on the basis of the values of one or more independent or predictor variables to represent the relationship (Quick Study Academics, 2020). OLR was used to answer the first research question to describe a possible relationship between the IVs and DVs. To answer the second question, BLR was used, for which analysis will account for the included covariates (age, gender, and educational attainment).

Ordinal logistic regression is used to predict an ordinal dependent variable given one or more independent variables. OLR assumptions include having one (1) ordinal dependent variable, have one (1) or more continuous, ordinal, or categorical independent variables, no multicollinearity, and there should be proportional odds. OLR was performed separately for the three (3) dependent variables associated with this inferential analysis. To ensure that OLR assumptions were met for this study, I confirmed that the

study has one (1) ordinal dependent variable (use of cap/visor, sun's effect on skin, use of sunscreen) and five (5) continuous, ordinal, or categorical IVs (age, gender, educational attainment, income, and marital status).

Binomial logistic regression (BLR) attempts to predict the probability that an observation falls into one or two categories of a dichotomous dependent variable based on one or more independent variables than can be either categorical or continuous (Laerd Statistics, 2023). BLR assumptions include have one (1) dichotomous dependent variable, one or more independent variables that are continuous or nominal, there should be independence of observations, bare minimum of 15 cases per categories of each independent variable, have linear relationship, no multicollinearity, and no significant outliers. To ensure that BLR assumptions were met for this study, I confirm that the study has one (1) dichotomous dependent variable (sunburn reported) and six (6) continuous or nominal IVs (age, gender, educational attainment, income, skin cancer, and marital status).

Sun exposure and protective behaviors in farmworkers represents a public health crisis that has several contributing factors. For this study, I chose the age, gender, and educational attainment covariates to ensure that there were any potential relationships between the independent and dependent variables when looking into these covariates. Current research demonstrates that some socio-demographic factors have a relationship with sun exposure. One such example was that older farmworkers are more likely to report sun-related illness than younger farmworkers (Chavez, et al, 2022).

The probability of observing sample results as extreme or more extreme than those actually observed, under the assumption the null hypothesis is true is what is called the level of significance. Evaluation of inferential statistics was performed by using p-value of 0.05 which indicates a 5% risk of concluding that a difference may exists where there is no actual difference (Frost, 2023). When p-value is interpreted, if it's above 0.05 then the null hypothesis is true, but if the p-value is below 0.05 then the alternative hypothesis is true. Since my level of significance is 0.05, it meant that there was 5% probability of rejecting the null hypothesis, the corresponding confidence level was 0.95 or 95% for this study.

Threats to Validity

External Validity

External validity involves the extent to which the results of research can be generalized beyond the sample (Siegel, n.d.). For this research, the threats to external validity were evaluated. The first is generalize from the study sample to a target population, second was the Hawthorne effect, and lastly, the interaction of history and treatment effect. This study focuses only on farmworkers that are U.S. Hispanics. Additionally, since this is a pre-determined survey, participants know they are being asked questions about their health, and this can jeopardize the results of the survey and might not represent the real sun exposure and protective behaviors among farmworkers. Lastly, external validity was addressed when conclusion of the data analysis was performed for this study was specific to the U.S. Hispanic farm working individuals and not for all the US farmworkers.

Internal Validity

Internal validity is the extent in which a researcher is confident that the cause-and-effect relationship established in its research cannot be explained by other factors (Bhandari, 2020). As per this study, internal validity was improved by minimizing the selection of subjects by using the entire sample population. Lastly, internal validity was tested to ensure that all assumptions are tested and evaluated.

Statistical Conclusion Validity

Statistical conclusion validity is defined as the degree to which the conclusions drawn from statistical analyses of data are accurate and appropriate (APA, 2023). For this study, measures taken into consideration as a threat to statistical conclusion validity was the reliability of the data and the relationship for covariates and the IVs and DVs. Limitations of this study will be addressed in the limitations section of this study.

Ethical Procedures

This study was conducted with the highest ethical values. The NHIS is approved by the Research Ethics Review Board of the National Center for Health Statistics and the U.S. Office of Management and Budget (CDC, 2022b). Additionally, all respondents provided oral consent prior to participating in the survey (CDC, 2022b). As per the respondent's identification, the NHIS has taken care that any of the data is identifiable. All interviews are performed by computer-assisted personal interviews, face-to-face interviews conducted in the respondent's home. And follow-up interviews can be conducted through phone (CDC, 2022b). Once I got the data, I downloaded it into my computer, got secured that none of the data was identifiable and lastly, was kept

confidential in my computer. My computer has a lock with password protection. The data stored in my computer was used for this study only and will be destroyed after five years of the completion of this present study. Additionally, the data was downloaded once the Walden IRB approved the proposal. Sun exposure and protective behaviors are environmental public health risks that need our attention and care, and by collecting the data as a secondary survey, no psychological consequences are present for this study. Finally, no other ethical considerations are present in this study.

Summary

In the preceding section 2, I discussed the methodology proposed for this research topic, including research design and rationale for this research (including methodology and threats of validity), and ethical procedures within this study. This study used ordinal logistic regression and binomial logistic regression to answer the research questions: what is the association between sociodemographic factors (age, gender, marital status, educational attainment, and income), and sunburns reported, the sun's effect on skin, wearing a cap/visor, and sunscreen use among U.S. Hispanic farmworkers? The sample population included all participants within the 2015 NHIS who met inclusion criteria: considered as Hispanic, 21-years and older, and noninstitutionalized civilian population who resides in the District of Columbia and within the 50 states at the time of the NHIS interview. The IVs are sociodemographic factors (age, gender, marital status, educational attainment, and income) and the DV were sun protective behaviors (sunburns reported, the sun's effect on skin, wearing a cap/visor, and sunscreen use). Additionally, binomial logistic regression was used to answer the second research question: what is the

association between skin cancer and sunburns reported, the sun's effect on skin, wearing a cap/visor, and sunscreen use among U.S. Hispanic farmworkers, controlling for age, marital status, gender, educational attainment, and income? Additionally, throughout the section, I discussed operationalization of the variables, and how the variables will be analyzed to answer all research questions. Finally, I discussed threats to external, internal, and statistical conclusion validity, as well as the ethical values and assumptions to be taken into consideration when this study is performed.

In Section 3, I will present the research findings and statistical analysis of the dataset collected from the 2015 NHIS. Section 4 will indicate the summary and conclusions of this study along with the social change and the implications for future investigations.

Section 3: Presentation of the Results and Findings

The purpose of this study was to determine if there was an association between sociodemographic factors (i.e., age, gender, marital status, educational attainment, and income) and skin cancer with the level of sun exposure (sun's effect on skin, sunburns reported) and protective behaviors (use of cap/visor, use of sunscreen) among adult Hispanic farmworkers in the United States. The research questions were designed to establish this association while adjusting for age, earnings, educational attainment, and marital status in the second question. This was done using ordinal logistic regression and binomial logistic regression.

Section 3 outlines the analysis and outcomes of this present research. It describes how the data were accessed and the study results, including the descriptive statistics, statistical assumptions of the multiple linear regression, and statistical findings and analysis. The conclusion of Section 3 includes the overall discussion of the analysis performed in the study.

Accessing the Data for Secondary Analysis

The data used for this research was from the 2015 IPUMS NHIS. This was available free and electronically on the IPUMS website. This data covered more than 100,000 people in 45,000 households. These data are the principal health source of information for the United States population, which covers topics such as the distribution of chronic and acute diseases, general health status, health behaviors, functional limitations, and others (IPUMS Health Surveys, n.d.). The 2015 IPUMS NHIS data were made available by the IPUMS Health Surveys website by selecting the year sample,

selecting the variables, and extracting the data. The reliability and validity of the IPUMS NHIS data set were previously accessed in the Ragan et al. (2019) study. External and internal validity was also evaluated and verified for this study. This research was a cross-sectional design study, for which internal validity was addressed. The generalizability of the study was only for U.S. Hispanic farmworkers, and although this dataset may affect generalizability, it was chosen due to the variables selected.

Discrepancies From the Original Research Plan

After a first review of the variables and their frequencies, there were three discrepancies found in the use of the data set from the plan presented in Section 2. The first discrepancy was that the question of skin cancer was not in the universe of the 2015 adult sample studied. This question was identified as a series of questions regarding cancer as “Ever had cancer: melanoma,” “Ever had cancer: skin (non-melanoma),” and “Ever had cancer: skin (don’t know what kind)”. All three questions were part of the combined data provided for this survey to answer Research Question 2. According to the IPUMS Health Surveys (n.d.), the cancer variables description (CNSKM, CNMELN, and CNSKDK) coded responses to “What kind of cancer was it?” The series of dichotomous variables indicated whether a particular type of cancer, such as melanoma or skin, was mentioned by a participant who was ever diagnosed with cancer. The 2015 IPUMS NHIS cancer questions were not included in the 3,289 sample adults who were asked these questions; participants outside of the sample adult (universe) criteria were coded as NIU (not in the universe). Hispanic farmworkers were considered part of the NIU code in the 2015 IPUMS NHIS data set. Therefore, Research Question 2 could not be answered.

Given the complexity and inclusion of four dependent variables in RQ 1, this was deemed acceptable.

The second discrepancy found in the dataset was that the dependent variables needed to be recoded so that the models would fit. The dependent variables recoded were the use of cap/visor, the sun's effect on the skin, and the use of sunscreen (see Table 3). Once the needed DVs were recoded, DVs fit the model for OLR.

Table 3

Dependent Variable Recoding

Variable	Original categories	Recoded categories
use of a cap/visor	1 = don't go out in the sun 2 = never 3 = rarely 4 = sometimes 5 = most of the time 6 = always	1 = never 2 = sometimes 3 = always
sun's effect on the skin	1 = do not go out in the sun 2 = say that nothing would happen 3 = turn darker without sunburn 4 = burn mildly with some or no tanning 5 = have severe sunburn with peeling 6 = get severe sunburn with blisters 7 = other	1 = say nothing would happen 2 = turn darker or mildly burn 3 = severe sunburn with peeling or blister
use of sunscreen	1 = don't go out in the sun 2 = never 3 = rarely 4 = sometimes 5 = most of the time 6 = always	1 = never 2 = sometimes 3 = always

The last discrepancy found was that independent variables needed to meet Assumption #4 of the binomial logistic regression. Independent variables (marital status, educational attainment, and income) were recoded to meet the minimum 15 cases per category of every independent variable of the study. When I analyzed the original categories of every IV, some of the categories did not meet the assumption of having at least 15 cases, so categories were recoded to meet this assumption. More details are explained in Assumption #4 of the binomial logistic regression.

Sample Representativeness

For this study, I used all respondents who had an occupation of agricultural workers (farmworkers), were considered Hispanics, and were 21 years or older, who completed the 2015 IPUMS NHIS. The data showed participants who fell under the desired variables of this study. Out of the 103,789 participants of the 2015 IPUMS NHIS, the data of this study was of 112 participants under inclusion criteria. External validity error was limited by the performed categorization of participants to the inclusion criteria. By this, the sample representativeness of this study is for U.S. Hispanic farm-working individuals and not for all U.S. farm workers.

Results

Descriptive Statistics

After the initial analysis of the data set, descriptive statistics and frequency tables were performed as shown in Table 4. Most participants identified themselves as Mexicans (79.5%; see Figure 7). Hispanic farmworkers are between 21 and 81 years. There were 68 (60.7%) of participants who were male, and 44 (39.3%) were female. Sixty-three (56.3%) of Hispanic farmworkers were married at the time of completing the survey, and 43.8% were not married. Fifty-five percent (55.4%) of the included participants had completed at least 6th grade (see Figure 8). Twelve percent (12.5%) of Hispanic farmworkers have a range of income between $15,000 and $19,999 (see Figure 9).

Descriptive statistics and frequency tables were also performed for the outcome variable, which is also included in Table 4. Responses to how often the cap/visor was worn outside on a sunny day for over 1 hour showed that 37.5% answered always (see Figure 10). Fifteen percent (15.2%) responded to having severe sunburn with peeling when in the sun for 1 hour, effect on the skin (see Figure 11). Additionally, 62.5% of respondents answered that they never use sunscreen if outside on a sunny day for over 1 hour (see Figure 12). Finally, 17.9% of respondents reported having sunburn in the past 12 months, and 82.14% reported they had not.

Table 4

Baseline Descriptive Statistics/Frequencies for Respondents from the 2015 IPUMS NHIS

Variable name	Category	Number of responses (N)	Percentage (%)
Hispanic Heritage	Mexican	89	79.5%
	Mexican-American	11	9.8%
	Puerto Rican	6	5.4%
	Central or South American	7	5.4%
Gender	Male	68	60.7%
	Female	44	39.3%
Income	$01 to $9,999	62	55.4%
	$10,000 to $24,999	28	25.0%
	$25,000 or more	22	19.6%
Educational attainment	Kinder to 6th grade	62	55.4%
	7th to 12th grade (no diploma)	30	26.8%
	Completed High School / AA / Bachelor	20	17.9%
Marital Status	Married	63	56.3%
	Not Married	49	43.8%
Sunburns reported	No sunburn	92	82.1%
	Yes, had sunburn	20	17.9%
Sun effect on skin	Say nothing will happen	32	28.6%
	Turn darker or mildly burn	56	50.0%
	Severe sunburn with peeling or blister	24	21.4%
Wearing a cap/visor	Never	32	28.6%
	Sometimes	30	26.8%
	Always	50	44.6%
Sunscreen use	Never	70	62.5%
	Sometimes	22	19.6%
	Always	20	17.9%

Figure 7

Sample Distribution by Hispanic Ethnicity

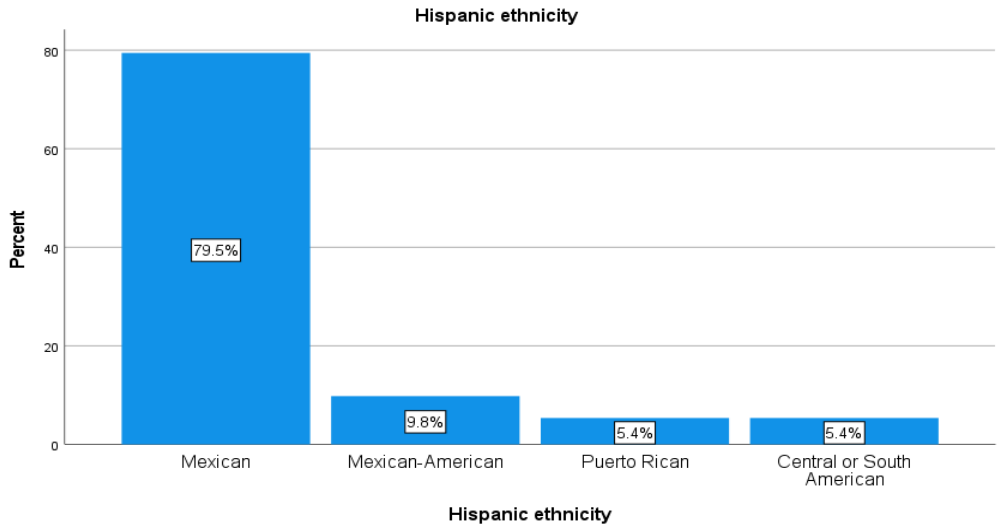


Figure 8

Sample Distribution for Educational Attainment (N = 112)

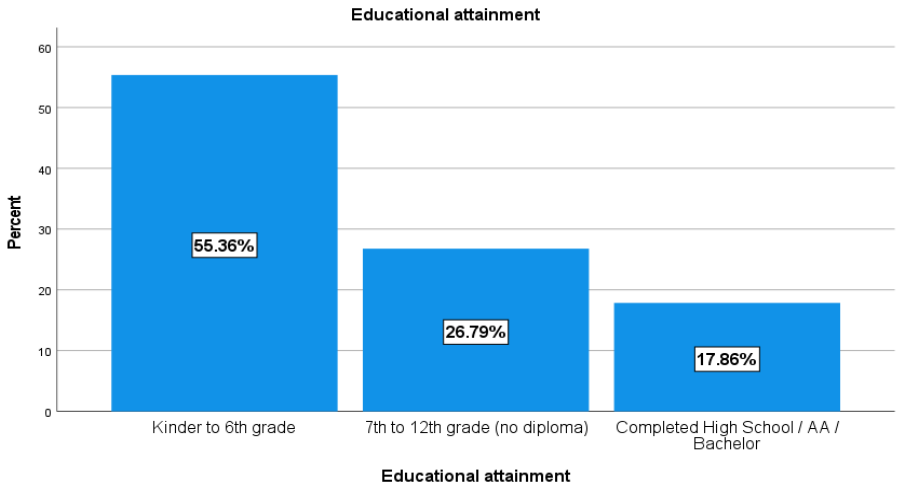


Figure 9

Sample Distribution for Hispanic Farmworker's Income in the Previous Year (N=112)

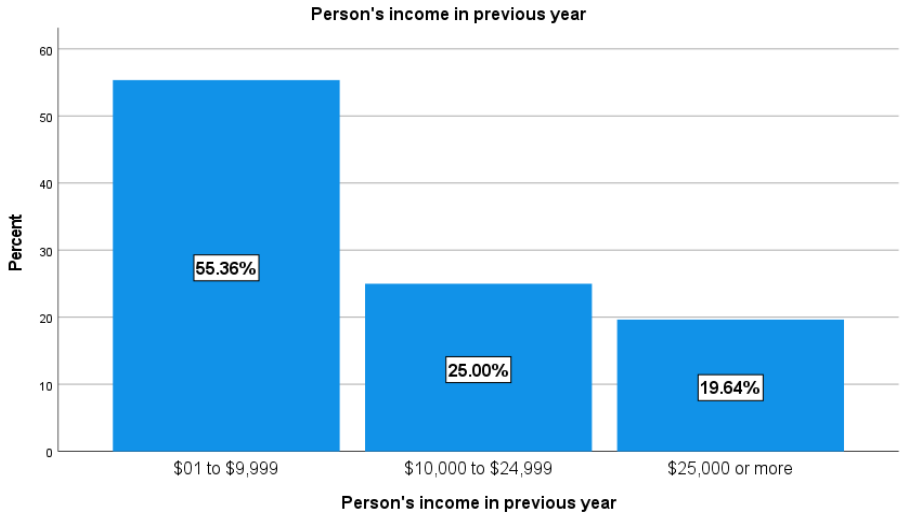


Figure 10

Sample Distribution for How Often Cap/Visor Worn if Outside on a Sunny Day for Over 1 Hour (N=112)

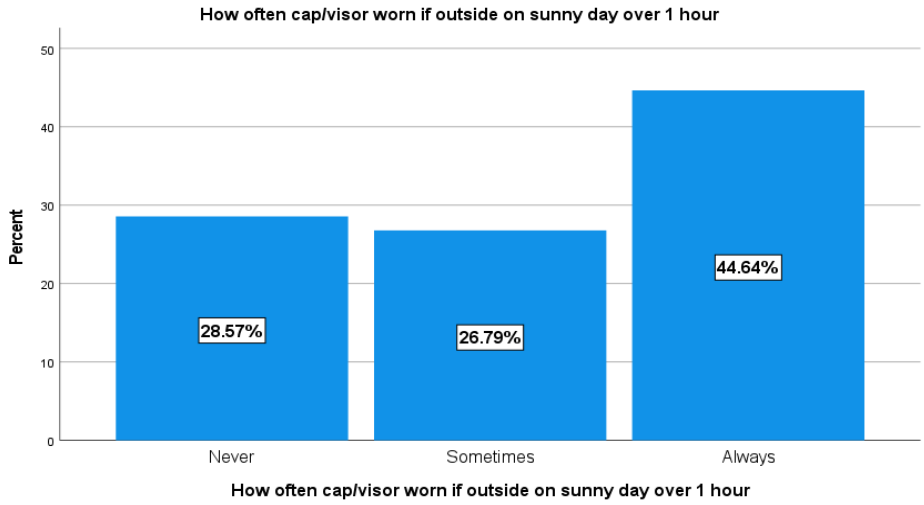


Figure 11

Sample Distribution of in Sun 1 Hour, the Effect on the Skin (N = 112)

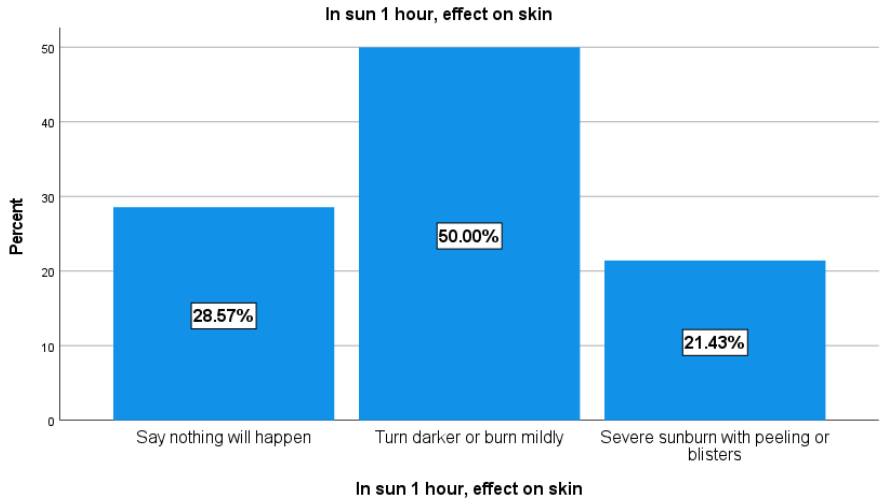
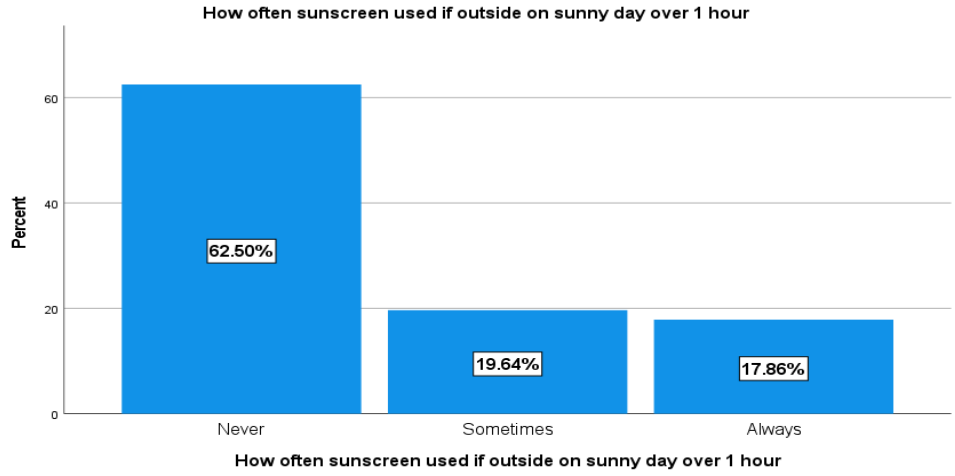


Figure 12

Sample Distribution of How Often Sunscreen is Used if Outside on a Sunny Day Over 1 Hour (N = 112)



Statistical Assumptions

Ordinal Logistic Regression

Before running the ordinal logistic regression, I ensured that the research variables and data for the ordinal logistic regression met the following assumptions: have one ordinal dependent variable, one or more independent variables are continuous or categorical, no multicollinearity, and proportional odds (Laerd Statistics, 2023). Three out of the four dependent variables (use of cap/visor, use of sunscreen, and sun effect on skin) used this statistical analysis and met the assumptions. In this section, I provide information on how I evaluated each assumption before running the ordinal logistic regression.

Assumption #1: Have One Ordinal Dependent Variable. I confirmed that the dependents variables used in this research met this assumption separately. The first DV was the use of a cap/visor outside on a sunny day for one hour, which was measured as 1 = never, 2 = sometimes, and 3 = always (*Table 4*). The second DV was Sun's effect on the skin, which was measured as 1 = say nothing would happen, 2 = turn darker or burn mildly, and 3 = Severe sunburn with peeling or blisters (*Table 4*). The third DV was sunscreen used if outside on a sunny day for over one hour, which was measured as 1 = never, 2 = sometimes, and 3 = always (*Table 4*). The three ordinal DVs were evaluated separately and met the assumption for the ordinal logistic regression.

Assumption #2: One or More Independent Variables That Are Continuous, Ordinal, Or Categorical (Including Dichotomous Variables). Each independent variable included in the ordinal logistic regression must be continuous, ordinal, or

categorical. The IVs included in this research are age (continuous), gender (categorical), marital status (categorical), income (ordinal), and educational attainment (ordinal). The five (5) IVs met this assumption and fit the ordinal logistic regression.

Assumption #3: No Multicollinearity. To test for multicollinearity, two or more continuous independent variables are needed in the study. Since this research has no continuous independent variable, I do not need to test for multicollinearity. This met the assumption and fit the ordinal logistic regression.

Assumption #4: There Should Be Proportional Odds. This assumption assumes that the explanatory variables have the same effect on the odds regardless of the threshold. After running the full likelihood test for the three DVs comparing the fit of the proportional odds model to a model with varying location parameters, the assumption was met for all three DVs (use of cap/visor $\chi^2(7) = 8.446$, $p = 0.295$; sun effect on skin $\chi^2(7) = 10.009$, $p = 0.188$; use of sunscreen $\chi^2(5) = 0.584$, $p = 0.989$. Table 5 shows the full likelihood test for the three dependent variables that met the assumption.

Table 5

Dependent Variables Full Likelihood Ratio Test

DV	Model	-2 Log Likelihood	Chi-square	df	Sig.
Use of cap/visor	Null Hypothesis	213.860			
	General	205.413	8.446	7	0.295
Sun effect on skin	Null Hypothesis	212.538			
	General	202.529	10.009	7	0.188
Use of sunscreen	Null Hypothesis	183.320			
	General	182.737	0.584	5	0.989

The null hypothesis states that the location parameters (slope coefficients) are the same across response categories.

a. Link function: Logit

Binomial Logistic Regression

Before running the binomial logistic regression, I ensured that the research variable and data for the binomial logistic regression met the following assumptions: have one dichotomous dependent variable, one or more independent variables that are continuous or nominal, there should be independence of observations, every independent variable should have a minimum of 15 cases, there is a linear relationship between the continuous IV and the logit transformation of the DV, no multicollinearity, no significant outliers (Laerd Statistics, 2023). In this section, I will provide information on how I evaluated each assumption before running the multiple linear regression.

Assumption #1: Have One Dichotomous Dependent Variable. I confirmed that the fourth dependent variable (sunburn reported) used in this research met and fit this assumption. The fourth DV was originally a continuous variable (for which respondents answered the number of sunburns in the last twelve (12) months). To meet this

assumption, the DV needed to be recoded into a categorical dichotomous variable (yes, had sunburn or No sunburn). Once the variable was changed from continuous to dichotomous, the DV was evaluated and met the assumption for the binomial logistic regression.

Assumption #2: One or More Independent Variables that are Continuous or categorical. Each independent variable included in the binomial logistic regression must be continuous or categorical. The IVs included in this research are age (continuous), gender (categorical nominal), marital status (categorical nominal), income (categorical ordinal), and educational attainment (categorical ordinal). The five (5) IVs met this assumption and fit the binomial logistic regression.

Assumption #3: There Should be Independence of Observations. Looking at the independence of observations and the categories of the dichotomous dependent variable (sunburn reported; No, Yes) and the independent variables (age, gender, educational attainment, income, and marital status) they are mutually exclusive and exhaustive. In conclusion, this assumption is met for the binary logistic regression.

Assumption #4: Bare Minimum Of 15 Cases Per Category of Each Independent Variable. To test this assumption, a review of the cases per independent variable was performed. The original dataset contained four (4) of the five (5) independent variables with more than 3 categories, and some of those categories were less than 15 cases (see Table 6). To meet this assumption, independent variable categories were recoded into the same variable. After the recode, all categories of the independent variables have more than 15 cases. In conclusion, this assumption is met.

Table 6

Independent Variable Re-Coding

Independent variable	Original categories	Frequency	Re-coded category	Frequency
Marital	Married – spouse present	56	1 Not-married	49
Status	Married – Spouse not in household	8	10 Married	63
	Widowed	6		
	Divorced	6		
	Separated	9		
	Never Married	27		
Educational	102 Never attended/kindergarten	6	1 Kinder to 6th grade	62
Attainment	only	1	2 7th to 12th grade (no	30
	104 grade 1	7	diploma)	
	105 grade 2	7	3 Completed High	20
	106 grade 3	4	School/AA/BS	
	107 grade 4	6		
	108 grade 5	38		
	109 grade 6	3		
	110 grade 7	4		
	111 grade 8	11		
	113 grade 9	2		
	114 grade 10	6		
	115 grade 11	4		
	116 12th grades, no diploma	14		
	201 High school graduates	2		
	202 GED or equivalent	1		
	301 Some college, no degree	1		
	302 AA degree technical/ vocational/ occupational	2		
	400 Bachelor's degree (BA,AB,BS,BBA)	3		
	999 Unknown – not know.			
Income	0 NIU	31	1 $01 to $9,999	62
	1 $01 to $4,999	6	2 $10,000 to $24,000	28
	2 $5,000 to $9,999	8	3 $25,000 or more	22
	3 $10,000 to $14,999	10		
	4 $15,000 to $20,999	14		
	5 $20,000 to $24,999	4		
	6 $25,000 to $34,999	11		
	7 $35,000 to $44,999	9		
	8 $45,000 to $54,999	1		
	9 $55,000 to $64,999	1		
	10 $65,000 to $74,999	2		
	Unknown refused	15		
	Unknown don't know			

Assumption #5: Linear Relationship. The linearity of the continuous variables with respect to the logit of the dependent variable was assessed via the Box-Tidwell (1962) procedure (Laerd Statistics, 2023). A Bonferroni correction was applied using all eleven terms in the model resulting in statistical significance being accepted when $p < 0.005$. Based on this assessment, the continuous independent variable was found to be linearly related to the logit of the dependent variable.

Assumption #6: No Multicollinearity. To test for multicollinearity, two or more independent variables cannot have a correlation with each other. Evaluating the correlation matrix table through linear regression with SPSS v.28, none of the independent variables have correlations greater than 0.7 (Table 7). Additionally, this assumption has been met if the Tolerance value is greater than 0.1. Therefore, this assumption is met and fits the binomial logistic regression.

Table 7

Correlation Between Independent Variables Demonstrates no Multicollinearity

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
(Constant)	.291	.243		1.200	.233		
Age	-.005	.003	-.213	-2.124	.036	.885	1.130
Sex	.072	.080	.092	.902	.369	.867	1.153
Current marital status	-.001	.008	-.017	-.174	.862	.945	1.059
Educational attainment	-.006	.051	-.012	-.113	.910	.857	1.166
Person's income in the previous year	.026	.050	.053	.511	.610	.846	1.182

a. Dependent Variable: Sunburn reported in the last 12 months

Assumption #7: No Significant Outliers. There were six standardized residuals with a value of 2.062, 2.135, 2.045, 2.129, 2.026, and 2.062 standard deviations, which were kept in the analysis because the dataset contains only 112 cases. By this, all available data will be utilized and not deleted.

Statistical Findings

Research Question 1

To answer this question, an ordinal logistic regression and a binomial logistic regression were used to determine the association of socio-demographic factors (age, gender, educational attainment, income, and marital status) and sunburns reported, use of cap/visor, use of sunscreen, and the sun's effect on the skin among U.S. Hispanic farmworkers. I used SPSS v. 28 for this analysis. To describe both regression analyses, this section was divided per dependent variable results.

The data is appropriately fitted for two variables (use of cap/visor and use of sunscreen) for the ordinal logistic regression analysis indicating that there is a significant improvement in fit as compared to the null model, hence the model is showing a good fit. Meanwhile, for the effect on the skin variable, the model is not a good fit. Table 8 shows the goodness of fit test which indicates that the model is a good fit.

Table 8

Model Fit Information for Dependent Variables

Variable	Model	-2 Log Likelihood	Chi-square	df	Sig.
Use of cap/visor	Intercept only	234.317			
	Final	213.860	20.458	7	0.005
Effect on skin	Intercept only	223.433			
	Final	212.538	10.895	7	0.143
Sunscreen use	Intercept only	220.774			
	Final	183.320	17.454	5	0.004

Link function: Logit

Table 9

The Goodness of fit Test on the Use of Cap/Visor, the Effect of the Sun on the Skin, Sunscreen Use, and Sunburn Reported

Variable	Model	Chi-square	df	Sig
Use of cap/visor	Pearson	203.720	201	0.433
	Deviance	208.315	201	0.347
Effect on skin	Pearson	206.848	201	0.374
	Deviance	204.220	201	0.423
Sunscreen use	Pearson	192.892	203	0.683
	Deviance	177.775	203	0.899

Link function: Logit

As for the fourth variable, sunburn reported, a binary logistic regression was performed. The Hosmer and Lemeshow Test value (see Table 10) suggests that the model is not a poor fit. Table 11 explains the variance found in the model. The Nagelkerke R Square shows that 9.6% of the variance regarding sunburn reported in the last twelve months was explained by this model.

Table 10

Hosmer and Lemeshow Test Goodness of Fit Test

Variable	Chi-square	df	Sig
Sunburn Reported	11.497	8	0.175

Table 11

Model Summary Binomial Logistic Regression

Step	-2 Log-likelihood.	Cox & Snell R Square	Nagelkerke R Square
1	98.360	0.058	0.096

a. Estimation terminated at iteration number 5 because parameter estimates changed to less than 0.001.

Use of Cap Visor. Ordinal logistic regression was run to determine the association between socio-demographic factors and the use of cap/visor among U.S. Hispanic farmworkers (see Table 12). Age is associated with using a cap/visor, a statistically significant effect $\chi2(1) = 0.030$, $p = 0.026$, (95% CI, 0.004 to 0.056), as a result, older Hispanic farmworkers are more likely to use a cap/visor than younger Hispanic farmworkers. Therefore, the null hypothesis is rejected. Gender is associated with using a cap/visor, a statistically significant effect $\chi2(1) = 8.903$, $p = 0.003$, (95% CI, 0.423 to 2.042), as a result, males are more likely to use a cap/visor than females. Therefore, the null hypothesis is rejected. Marital status is not associated with using a cap/visor, Wald $\chi2(1) = 0.000$, $p = 0.983$, (95% CI, -0.769 to 0.753), therefore, the null hypothesis is accepted. Educational attainment, kindergarten to sixth (6th) grade (Wald $\chi2(1) = 1.377$, $p = 0.241$, (95% CI, -1.665 to 0.418), and from 7th to 12th grade with no diploma (Wald $\chi2(1) = 0.376$, $p = 0.540$, (95% CI, -0.783 to 1.497), is not associated

with using a cap/visor, therefore, the null hypothesis is accepted. Income is not associated with using a cap/visor, $01 to $9,999 (Wald $\chi2(1) = 2.883$, $p = 0.090$ (95% CI, -0.136 to 1.904), However, income of $10,000 to $24,999 is associated with the use of cap/visor (Wald $\chi2(1) = 6.340$, $p = 0.012$ (95% CI, 0.329 to 2.642). Therefore, the null hypothesis is accepted for the income between $01 to $9,999, and the null hypothesis is rejected for the $10,000 to $24,999 income.

Table 12

Parameter Estimates for Dependent Variable Use of Cap or Visor

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[SUN1CAP = 1]	1.611	0.880	3.352	1	0.067	-0.114	3.335
	[SUN1CAP = 2]	2.922	0.911	10.290	1	0.001	1.137	4.707
Location	AGE	0.030	0.013	4.957	1	0.026	0.004	0.056
	[MARST=1]	-0.008	0.388	0.000	1	0.983	-0.769	0.753
	[MARST=10]	0a			0			
	[SEX=1]	1.232	0.413	8.903	1	0.003	0.423	2.042
	[SEX=2]	0a			0			
	[INCOME=1]	0.884	0.521	2.883	1	0.090	-0.136	1.904
	[INCOME=2]	1.485	0.590	6.340	1	0.012	0.329	2.642
	[INCOME=3]	0a			0			
	[EDUC=1]	-0.623	0.531	1.377	1	0.241	-1.665	0.418
	[EDUC=2]	0.357	0.582	0.376	1	0.540	-0.783	1.497
	[EDUC=3]	0a			0			

The Effect on the Skin After 1 Hour in the Sun. Ordinal logistic regression was run to determine the association between socio-demographic factors and the sun's effect on the skin among U.S. Hispanic farmworkers (see Table 13). Age does not have a statistically significant association with the sun's effect on the skin, however, there may be a clinically significant effect $\chi2(1) = 3.689$, $p = 0.055$, (95% CI, -0.051 to 0.001). While the null hypothesis cannot be rejected, it was close to significant and warrants further study. Gender is not associated with the sun's effect on the skin, a non-statistically significant effect $\chi2(1) = 0.113$, $p = 0.736$, (95% CI, -0.915 to 0.647). Therefore, the null hypothesis is accepted. Marital status is not associated with the sun's effect on the skin, Wald $\chi2(1) = 3.084$, $p = 0.079$, (95% CI, -1.448 to 0.079), therefore, the null hypothesis is accepted. Educational attainment is not associated with the sun's effect on the skin, kindergarten to sixth (6th) grade (Wald $\chi2(1) = 3.043$, $p = 0.081$, (95% CI, -0.114 to 1.968), and from 7th to 12th grade with no diploma (Wald $\chi2(1) =2.688$, $p = 0.101$, (95% CI, -0.185 to 2.080). Therefore, the null hypothesis is accepted. Income is not associated with the sun's effect on the skin, \$01 to \$9,999 (Wald $\chi2(1) = 0.076$, $p = 0.783$ (95% CI, -0.865 to 1.148)) and \$10,000 to \$24,999 (Wald $\chi2(1) = 0.602$, $p = 0.438$ (95% CI, -0.669 to 1.546) Therefore, the null hypothesis is accepted.

Table 13

Parameter Estimates for Dependent Variable Sun's Effect on the Skin

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[SUN1HR = 1]	-1.522	0.864	3.100	1	0.078	-3.216	0.172
	[SUN1HR = 2]	0.863	0.855	1.020	1	0.312	-0.812	2.539
Location	AGE	-0.025	0.013	3.689	1	0.055	-0.051	0.001
	[MARST=1]	-0.684	0.390	3.084	1	0.079	-1.448	0.079
	[MARST=10]	0a			0			
	[SEX=1]	-0.134	0.399	0.113	1	0.736	-0.915	0.647
	[SEX=2]	0a			0			
	[INCOME=1]	0.142	0.514	0.076	1	0.783	-0.865	1.148
	[INCOME=2]	0.438	0.565	0.602	1	0.438	-0.669	1.546
	[INCOME=3]	0a			0			
	[EDUC=1]	0.927	0.531	3.043	1	0.081	-0.114	1.968
	[EDUC=2]	0.947	0.578	2.688	1	0.101	-0.185	2.080
	[EDUC=3]	0a			0			

Link function: Logit

a. This parameter is set to zero because it is redundant.

Use of Sunscreen After Being Outside for 1 Hour. Ordinal logistic regression was run to determine the association between socio-demographic factors and the use of sunscreen among U.S. Hispanic farmworkers (see Table 14). Age is not associated with the use of sunscreen after being outside for one (1) hour effect, Wald $\chi2(1) = 0.184$, $p = 0.668$, (95% CI, -0.021 to 0.032). Therefore, the null hypothesis is accepted. Gender is associated with the use of sunscreen after being outside for one (1) hour, a statistically significant effect $\chi2(1) = 14.953$, $p = 0.000$, (95% CI, -2.592 to -0.848), as a result, females are more likely to use sunscreen than males. Therefore, the null hypothesis is

rejected. Marital status is not associated with the use of sunscreen after being outside for one (1) hour, Wald $\chi2(1) = 0.131$, $p = 0.718$, (95% CI, --0.947 to 0.652), therefore, the null hypothesis is accepted. Educational attainment is not associated with the use of sunscreen after being outside for one (1) hour (Wald $\chi2(1) = 1.647$, $p = 0.199$, (95% CI, -0.188 to 0.900). Therefore, the null hypothesis is accepted. Income is not associated with the use of sunscreen after being outside for one (1) hour (Wald $\chi2(1) = 0.044$, $p = 0.834$, (95% CI, -0.496 to 0.615). Therefore, the null hypothesis is accepted.

Table 14

Parameter Estimates for Dependent Variable Use of Sunscreen After Being Outside for 1 Hour.

		Estimate	Std. Error	Wald	df	Sig.	95% C.I.	
							Lower	Upper
Threshold	[SUN1SNS = 1]	0.333	0.990	0.113	1	0.737	-1.607	2.273
	[SUN1SNS = 2]	1.497	1.000	2.242	1	0.134	-0.462	3.456
Location	AGE	0.006	0.013	0.184	1	0.668	-0.021	0.032
	INCOME	0.059	0.283	0.044	1	0.834	-0.496	0.615
	EDUC	0.356	0.277	1.647	1	0.199	-0.188	0.900
	[MARST=1]	-0.147	0.408	0.131	1	0.718	-0.947	0.652
	[MARST=10]	0a			0			
	[SEX=1]	-1.720	0.445	14.953	1	0.000	-2.592	-0.848
	[SEX=2]	0a			0			

Link function: Logit

Sunburns Reported in the Previous Year. Binomial regression was performed to ascertain the association between age, educational attainment, gender, income, and marital status, and sunburns reported among U.S. Hispanic farmworkers (see Table 15). The binomial logistic regression model was not statistically significant $\chi2(8) = 11.49$, $p = 0.175$. The model explained 9.6% (Nagelkerke R^2) of the variance of sunburn reported in

the previous year and correctly classified 82.1% of cases. Specificity was 100.0%, positive predictive value was 0%, and negative predictive value was 82.1%. Of the ten predictor variables, only one was statistically significant: age. There was no statistically significant relationship between gender (p = 0.429), marital status (p = 0.991), educational attainment (p = 0.969), and income (p = 0.685). Increasing age was associated with a decreased likelihood of sunburn reported, $\chi 2(1) = 3.764$, p = 0.052, (95% CI, 0.921 to 1.000).

Table 15

Contributions of Independent Variables to Model

							95% CI for EXP(B)	
	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Sex(1)	0.439	0.554	0.626	1	0.429	1.551	0.523	4.596
Age	-0.041	0.021	3.764	1	0.052	0.96	0.921	1
Current marital status(1)	-0.006	0.545	0	1	0.991	0.994	0.342	2.891
Educational attainment			0.063	2	0.969			
Educational attainment(1)	-0.022	0.659	0.001	1	0.974	0.978	0.269	3.563
Educational attainment(2)	-0.178	0.735	0.059	1	0.808	0.837	0.198	3.532
Income			0.757	2	0.685			
Income (1)	0.523	0.607	0.742	1	0.389	1.688	0.513	5.55
Income (2)	0.304	0.718	0.18	1	0.672	1.356	0.332	5.534
Constant	-0.195	1.143	0.029	1	0.864	0.823		

Summary

Based on these findings, I partially reject the null hypothesis because there is an association between age, gender, income (10,000 to $24,999) with the use of cap/visor, and age with sunburns reported among U.S. Hispanic farmworkers. For the dependent variables use of cap/visor, sun effect on the skin, and use of sunscreen, an ordinal logistic regression was performed for which only age, income, and gender were statistically significant. As a result of these findings, I can conclude than older Hispanic farm worker males with an average income of $10,000 to $24,999 are more likely to use a cap/visor, and females are more likely to use sunscreen. For the variable sunburn reported, a binomial logistic regression was performed, for which the predictor age was the only statistically significant value of the dependent variable.

In the last Session, I discussed the results of the presented analyses. The results are interpreted in a meaningful way, and they are related to the literature review presented in Section 1. The results of this research will be contextualized for public health professionals and associated with positive social change impact implications.

Section 4: Application to Professional Practice and Implications for Social Change

Sun exposure and behaviors are one of the most dangerous public health and environmental health threats farmworkers are exposed to. The purpose of this quantitative, cross-sectional study was to determine the association between sociodemographic factors (i.e., age, gender, marital status, educational attainment, and income) and skin cancer with the level of sun exposure (sun's effect on skin, sunburns reported) and protective behaviors (use of cap/visor, use of sunscreen) among adult Hispanic farmworkers in the United States. This study was performed using secondary data collection of the 2015 NHIS.

According to the ordinal and binary logistic regressions performed to analyze the dataset, the findings of this study showed that the best predictors for sun exposure and behaviors are age and gender. Meanwhile, marital status, educational attainment, and income are mostly not associated with sun exposure and behaviors. Since no data were collected in the 2015 IPUMS NHIS dataset for the association between skin cancer and sun exposure and behaviors, the second research question could not be answered. The results of this study can help current literature to expand knowledge in sun exposure and behaviors of Hispanic farmworkers and to aim future research in separate Hispanic farmworkers delineated by region of origin.

Interpretation of the Findings

The findings in this study extend knowledge with what was previously found in the peer-reviewed literature. U.S. Hispanic farmworkers are exposed to several environmental public health threats, including sun exposure (Ragan et al., 2019). Sun

exposure in Hispanic farmworkers is represented in this study by the sun's effect on the skin and sunburn reported in the past 12 months. Gender, marital status, educational attainment, and income were not significantly related to sun's effect on skin after exposure to the sun after 1 hour and sunburn reported. Though not statistically significant, age is clinically significant to the sun's effect on skin after being in the sun for more than an hour, and a significant relationship with less reporting sunburns.

Sun protective behaviors (use of cap/visor, use of sunscreen) help reduce the risk of sun's effect on skin and having to report sunburns (Niu et al., 2022). Using a cap/visor is considered as a sun protective behavior to avoid any sun exposure risk as sunburns (Boyas & Nahar, 2018; Ragan et al., 2019). Age, gender, and income between $10,000 to $24,999 were found to have significant relationship on Hispanic farmworkers that uses a cap or visor after being in the sun for 1 hour in the current study. However, marital status, educational attainment, and income between $01 to $9,999 did not have a significant relationship with the use of cap/visor after being in the sun for 1 hour. Another sun protective behavior observed in the study was the use of sunscreen. Gender did have a significant relationship, but age, marital status, educational attainment, and income did not have a significant relationship with the use of sunscreen.

This study yields similar results to previous research within the United States about sun exposure and protective behaviors. According to research, educational attainment and marital status in Hispanic farmworkers reports less sunburns and less apply sun protective behaviors (Culp &Tonelli, 2019; Luque et al., 2019; Mutic et al., 2019; Niu et al., 2022), however, the results of the ordinal and binomial logistic

regression of this study showed that educational attainment and marital status are not related to any sun exposure or protective behaviors. An increase in age (expressed in years) and income was associated with an increase in the odds of considering using a cap/visor as a sun protective behavior to prevent sun exposure, which is consistent with other studies (see Boyas & Nahar, 2018). Additionally, older age is associated with a decreased likelihood of sunburn reported, which is also consistent with previous research (see Ragan et al., 2019). The results of this study showed that male Hispanic farmworkers are more likely to adopt sun protective behaviors like the use of cap/visor, than females, which is in contradiction to cited studies that found that male Hispanic farmworkers are less likely to adopt sun protective behaviors (Kuehn, 2021; Luque et al., 2020, Mutic et al., 2018; Niu et al., 2022). But this study showed similar results to studies in which Hispanic farmworkers who have an income between $10,000 to $24,999 are more likely to use of cap/visor than those with less than $10,000 or higher than $24,999 (Luque et al., 2020; Smith et al., 2020).

More research is necessary to understand the association between sociodemographic factors and sun exposure and protective behaviors in Hispanic minorities categorized by region of origin (e.g., Puerto Rico, Mexico, Guatemala, etc.) To better understand the necessity of promoting reduced sun exposure and protective behaviors, it is necessary to research Hispanic sub-ethnicities delineated by region of origin to better understand their perception about protecting themselves and family from sun and to avoid future illnesses or conditions due to sun exposure. The findings and recommendations of this study is supported by other studies (Bloss et al., 2021).

The theoretical framework used for this research was the health belief model. The HBM, as it pertains to the results of this study, shows that while Hispanic farmworkers increase in age, there is an increase in the perceived susceptibility of using a cap/visor; therefore, high-aged Hispanic farmworkers are more aware of how to avoid sun exposure related health problems by using a cap/visor than younger Hispanic farmworkers. Males are also more likely to perceived susceptibility by using cap/visor than females. As per the HBM construct perceived severity, there was no association between sociodemographic factors and the effect of the sun on the skin after one hour outside. Self-efficacy construct relates to an individual's belief that they can achieve the behavior needed to gain the outcome (LaMorte, 2019). This study showed that females are more like to engage in using sunscreen to avoid sunburn than men, therefore, female Hispanic farmworkers are more likely to practice self-efficacy than males. Lastly, cues to action are factors which stop or trigger to get to action (LaMorte, 2019). This study concluded that less-aged Hispanic farmworkers are more likely to report sunburns because of lower usage of cap/visor. Therefore, younger Hispanic farm workers are less likely to use cap/visors to prevent sunburns and sun's effect on the skin.

As found in the literature, the HBM helps influence health behavior change and increase awareness in farmworkers (Mott, 2020; Nahar et al., 2019). Creating more safety and health awareness programs among Hispanic farmworkers can affect positively the farmworker's behaviors towards sun exposure prevention. Studying Hispanic farm workers by region of origin, and not as a combined whole, can help identify and propose protective health related behaviors based on the farmworker's region of origin. Sun

exposure and protective behaviors in Hispanic farmworkers based on their region of origin should be a topic for further research to formulate possible prevention strategies for sun exposure and understanding sun protective behaviors towards sun exposure in these populations.

Limitations of the Study

There were several limitations for this research that should be acknowledged. First, the data used for this research was from 2015. While a more recent dataset would have been more ideal, this was not possible as the 2020 data did not have the needed coded variables for the study (2020 dataset recoded sun exposure and behavior variables) and was not available by the time of the research creation. Second, when the first analysis was performed with the skin cancer variables, it was found that the 2015 IPUMS NHIS survey did not include the universe population for the studied dependent variables. To this, I did not have available data to answer research question 2 and this represented a lack of accuracy due to data collection method. Third, since is a cross-sectional study, causation cannot be addressed. Fourth, the original population of the study was going to be only Puerto Ricans (Hispanic farm working minority) but due to limited amount of data of this population, the study was performed accounting all Hispanic farmworkers (Spanish speakers). Lastly, the secondary dataset chosen for this study does not show a full representation of the Hispanic farmworkers that work in the US which could affect the generalizability of the study by not guaranteeing that the results of this research will occur in every Hispanic farmworker in the US and will only be applied to the IPUMS

respondents. Although this dataset may affect generalizability, it was still chosen due to the variables selected for the study.

Recommendations

In this research, I aimed to expand knowledge and fill in the gap of current literature about the association of socio-demographic factors and sun exposure and sun protective behaviors. There was a statistically significant relationship between age and gender and the use of cap/visor, gender and use of sunscreen, and age was clinically significant to the use of sunscreen. This study showed an inverse relationship between age and sunburn reported in the past twelve months. I recommend that further research should be done to determine how Hispanic farmworkers, delineated by region of origin be, exhibit sun protective behaviors (use of cap/visor, use of sunscreen) and sun exposure (sun's effect on the skin, sunburn reported). As stated in the limitations, the study used an aggregated Hispanic farmworker population and not look at subgroups delineated by region of origin due to lack of data on many of the subgroups. As stated in the peer-reviewed literature, studying Hispanic farmworkers based on region of origin will help gain more knowledge about sun exposure and protective behaviors and may create awareness for all Hispanic farmworkers. Any additional research could assist in detailing where the need will be for interventions in the farm working industry.

Studying Hispanic farm workers helps determine perceptions, attitudes, and behaviors this population has towards sun exposure and related negative health outcomes. I recommend using the Health Belief Model to gain more knowledge and acquire better understanding of Hispanic farmworker's behaviors. The Health Belief Model could be a

beneficial framework of study for public health practitioners specializing in Hispanic farmworkers. The ability of the framework to identify health perceptions (susceptibility, severity, and cues to actions) helps this research, future research, policies, and law makers gain more knowledge identifying and addressing those gaps.

Based on the results of the study, age and gender appear to be a specific factor that contributes to sun protective behaviors and sun exposure among Hispanic farmworkers. Further research may find differing results of Hispanic farmworkers, delineated by region of origin, in sun exposure and protective behaviors using factors as age and gender. By this, the results of this current study can have the potential capacity to guide future and better safety and health interventions and campaigns that are targeted to Hispanic farmworker populations regarding sun exposure and protecting behaviors. With the evidence discovered in this research, as age increases, the adoption of sun protective behaviors increases and sun exposure decreases, and females are more likely to adopt sun protective behaviors than men. All of this may uncover additional information on how behaviors are adopted by Hispanic farmworker, delineated by region of origin, separately and sun exposure is perceived by them.

Lastly, this research couldn't perform the skin cancer research question due to lack of data in the IPUMS NHIS data set. I recommend including Hispanic farmworkers in the universe population of the overall variables, especially variables related to skin cancer. There is a necessity of studying skin cancer among Hispanic farmworkers since, as explained throughout this research, they are exposed to sun in their occupational setting and adopt less sun protective behaviors in younger ages leading to skin cancer in

the longer term. By this, future research on skin cancer in Hispanic farmworkers is needed.

Implications for Professional Practice and Social Change

Professional Practice

The findings of this study revealed that the age and gender of Hispanic farmworkers were a significant factor in predicting sun exposure and protective behaviors among U.S. Hispanic farmworkers. Educational attainment, marital status, and lower income were not significant to sun exposure and protective behaviors. Hispanic farmworkers are at risk of several environmental public health threats, i.e., sun exposure, and being a younger farm worker, being a male, has an income between $01 and $9,999, and lower educational attainment have an impact in adopt sun protective behaviors to avoid sun exposure related illnesses and conditions.

Based on these findings, public health professionals, local and federal government, educators, and local officials should address, review, and update all policy guidelines regarding sun exposure and preventive measures involving Hispanic farmworkers as their primary population since more than 70% of all agricultural workers were foreign born (63% Mexicans, 30% Puerto Ricans, and 5% from Central American countries) (National Center for Farmworker Health, Inc., 2020).

When talking in context of previous research and guidance from several federal and local agencies, i.e., Occupational, Health, and Safety Administration (OSHA), and the National Center for Farmworker's Health (NCFH), this research has a potential methodological implication that can help improve educational materials and on-site

training to farmworkers so that they can have needed information to secure and protect their health from sun exposure. As per empirical implications of the study, public health practitioners should gain more information about sun exposure and protective behaviors among U.S. Hispanic farmworkers, and then gain awareness of how this population adopt to perceived behaviors and cues to action. Additionally, public health practitioners should develop and implement public health initiatives in the farm industry so that farm companies can create and maintain sun exposure and prevention initiatives throughout their Hispanic workers to avoid a public health threat pertaining sun illnesses. Lastly, the message for all interventions based on this research findings should be to prevent sun exposure in Hispanic farmworkers and to adopt sun protective behaviors (use of cap/visor, use of sunscreen) at all times while exposed to the sun for more than an hour. Research showed that younger Hispanic farmworkers are more exposed to sun exposure and less adopt to sun protective behaviors, so the main focus of interventions should be to younger Hispanic farm workers. Public health interventions in the farming industry, especially to Hispanic farmworkers, is necessary and providing the adequate tools to this populations will help minimize future health complications, like skin cancer.

Positive Social Change

This research potentially provides positive social change on the individual, family, organizational, societal, and policy level. Positive social change implications could be increasing knowledge of sun exposure and sun protection behaviors among Hispanic farmworkers and could inform interventions and policies aimed at reducing sun-related illnesses among Hispanic farmworkers in the United States. Sun exposure is one

of the environmental threats Hispanic farmworkers are exposed to and a leading cause of skin cancer (Ragan et al., 2019). This impacts the perceived ability of Hispanic farmworkers to adopt sun preventive behaviors (Mott, 2020) positively or negatively.

On the individual level, the results of this study will offer positive contributions to Hispanic farmworkers by providing them the necessary tools to adopt sun protective behaviors to avoid sun exposure. Detecting that older Hispanic farmworkers are more likely to use cap/visor and less likely to report sunburn indicates that older Hispanic farmworkers adopt more protective behaviors than younger individuals to avoid sun exposure effect. By this, early intervention with younger Hispanic farmworkers will help them adopt individually positive sun protective behaviors and avoid sun exposure effects. Example of potential interventions of this population would be educative educational material, preventive announcements, and public health and safety toolboxes.

In the family level, a Hispanic farmworker adopting sun preventive behaviors will help contribute to a healthy family environment. Being exposed to sun can contribute to having short- and long-term effects in their health, and by this, creating a tense environment within their family due to other determinants that sun exposure could affect. Therefore, this research helps Hispanic farmworkers protect themselves from sun exposure and creating awareness within Hispanic farmworkers and their families. This, at the family level, will create social change between the family members and can transform negative sun exposure behaviors into positive sun exposure behaviors. Example of potential interventions could be workshops for all family members for which targeted

educational materials (for children, teens, adults, and older farmworkers) can be addressed.

In the organizational level, organizations are an important component of physical and social environment of Hispanic farmworkers. Organizations influence considerably over the choices that Hispanic farmworkers can make towards sun exposure and behaviors. Organizations can provide with the necessary tools and resources to Hispanic farmworkers to help them aid in the correct choices and help mitigate the work factors that do affect those choices. Therefore, organizations need to support Hispanic farmworkers health and adopt procedures that facilitate sun protective behaviors on the part of the Hispanic farm working population. The more health-enhancing procedures an organization has, the more likely it is to be perceived as having a health-conscious culture (Feder, 2021). For this, this research can help develop this health-conscious culture regarding sun exposure and protective behaviors in the Hispanic community.

In the societal level, this research helps federal and local governments, non-profit organizations, and agricultural companies to compromise in sun protective interventions that help Hispanic farmworkers to engage in positive sun protective behaviors. The potential impact of those industries to promote sun protection behaviors will allow Hispanic farmworkers to understand the benefit of protecting for the sun and that their health is important while they work, by this, engaging in these behaviors will protect their health in a long term and they will feel that their farm company, government, and other entities, do care about their health.

In the policy level, policies may include additional avenues to improve sun protective behaviors among Hispanic farmworkers. Although, several sun exposure campaigns are in place for farmworkers in the United States, this research will help specialize the sun prevention campaigns to Hispanic farm working population. Additionally, these policies could extend to other occupational settings, i.e., construction workers, since working under the sun is a similar environmental threat to construction workers (Niu et al., 2022). However, additional interventions according to income status could help prevent sun exposure and engage in sun protecting behaviors.

Conclusion

The results of this study indicated that Hispanic farmworkers adopts higher sun protective behaviors when are older and being female, and younger Hispanic farmworkers are more likely to be exposed to sun exposure than older adults. Based on these results, further research can be performed to expand knowledge about how Hispanic farmworker heritages adopt sun protective behaviors to avoid sun exposure. Educating individuals and society will help gain more trust and self-confidence individuals to protect themselves from the sun by using a cap/visor and sunscreen, and by this help reduce skin illnesses at a later age. Showing the results of this study will help gain more knowledge about socio-demographic factors and their association with sun protective behaviors and sun exposure to revise and implement sun preventive measures and campaigns targeting Hispanic farmworkers. Lastly, this study help identify that skin cancer research is needed in this population since no data was available to answer the second question, so the need for further studies and inclusion of the population in the

variables is extremely high and will contribute to better knowledge of this illness in this population.

The HBM could be a beneficial framework of study for public health practitioners specializing in Hispanic farmworkers. The ability of the framework to identify health perceptions (susceptibility, severity, and cues to actions) helps this research, future research, policies, and rule makers gain more knowledge identifying and addressing those gaps.

Sun exposure and protective behaviors among Hispanic farmworkers in the United States have been less studied than in other farm working populations. Farmworkers represent the frontline of bringing food to U.S. tables and are exposed to several dangerous environmental threats, one being sun exposure, which causes heat-related illnesses and skin cancer (Castillo et al., 2021). By this, we need to protect Hispanic farm workers from the sun's effect on their skin and sunburns by promoting protective behaviors. They are important in our "From farm to table" chain, and without them, we will not have any food on our tables. Sun exposure is preventable. Hispanic farmworkers are my priority. Protect Hispanic farmworkers. Promote Sun Protective Behaviors. Prevent Sun Exposure.

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Appendix A: IRB Approval

Claudia Delgado

From:	IRB <irb@mail.waldenu.edu>
Sent:	Tuesday, May 23, 2023 9:52 AM
To:	Claudia Delgado
Cc:	IRB; Shanna L. Barnett
Subject:	IRB Materials Approved - Claudia Delgado

Dear Claudia Delgado,

This email is to notify you that the Institutional Review Board (IRB) confirms that your doctoral capstone entitled, "Sun Exposure and Protective Behaviors Among US Puerto Rican Farmworkers," meets Walden University's ethical standards. Since this project will serve as a Walden doctoral capstone, the Walden IRB will oversee your capstone data analysis and results reporting. Your IRB approval number is 05-23-23-0530171, which expires when your student status ends.

This confirmation is contingent upon your adherence to the exact procedures described in the final version of the documents that have been submitted to IRB@mail.waldenu.edu as of this date. This includes maintaining your current status with the university and the oversight relationship is only valid while you are an actively enrolled student at Walden University. If you need to take a leave of absence or are otherwise unable to remain actively enrolled, this is suspended.

If you need to make any changes to the project staff or procedures, you must obtain IRB approval by submitting the IRB Request for Change in Procedures Form. You will receive confirmation with a status update of the request within 10 business days of submitting the change request form and are not permitted to implement changes prior to receiving approval. Please note that Walden University does not accept responsibility or liability for research activities conducted without the IRB's approval, and the University will not accept or grant credit for student work that fails to comply with the policies and procedures related to ethical standards in research.

When you submitted your IRB materials, you made a commitment to communicate both discrete adverse events and general problems to the IRB within 1 week of their occurrence/realization. Failure to do so may result in invalidation of data, loss of academic credit, and/or loss of legal protections otherwise available to the researcher.

Both the Adverse Event Reporting form and Request for Change in Procedures form can be obtained on the Tools and

Guides page of the Walden website: https://academicguides.waldenu.edu/research-center/research-ethics/tools-guides

Doctoral researchers are required to fulfill all of the Student Handbook's Doctoral Student Responsibilities Regarding Research Data regarding raw data retention and dataset confidentiality, as well as logging of all recruitment, data collection, and data management steps. If, in the future, you require copies of the originally submitted IRB materials, you may request them from Institutional Review Board.

Both students and faculty are invited to provide feedback on this IRB experience at the link below:

http://www.surveymonkey.com/s.aspx?sm=qHBJzkJMUx43pZegKlmdiQ_3d_3d

Sincerely,
Caroline Wright
Research Ethics Support Specialist
Research Ethics, Compliance, and Partnerships
Walden University
100 Washington Avenue South, Suite 1210

1

Minneapolis, MN 55401
Email: irb@mail.waldenu.edu
Phone: (612) 257-6505

Information about the Walden University Institutional Review Board, including instructions for application, may be found at this link:
http://academicguides.waldenu.edu/researchcenter/orec

Claudia Delgado

From:	IRB <irb@mail.waldenu.edu>
Sent:	Friday, June 9, 2023 10:35 AM
To:	Claudia Delgado
Cc:	IRB; Shanna L. Barnett
Subject:	Request for Change in Procedures - Approved

Dear Claudia Delgado,

This e-mail serves to inform you that your request for a change in procedures, submitted on 6/5, has been approved. You may implement the requested changes effective immediately. The approval number and expiration date for this study will remain the same.

Both students and faculty are invited to provide feedback on this IRB experience at the link below:

http://www.surveymonkey.com/s.aspx?sm=qHBJzkJMUx43pZegKlmdiQ_3d_3d

Sincerely,
Caroline Wright
Research Ethics Support Specialist
Research Ethics, Compliance, and Partnerships
Walden University
100 Washington Avenue South, Suite 1210
Minneapolis, MN 55401
Email: irb@mail.waldenu.edu
Phone: (612) 257-6505

Information about the Walden University Institutional Review Board, including instructions for application, may be found at this link:
http://academicguides.waldenu.edu/researchcenter/orec