8-13-2025

The Association Between Sunlight Exposure Duration, Region of Birth and Skin Conditions Linked to Skin Cancer Risk Among Migrant Hispanic Farmworkers

Uchechukwu Fidelia Nnoruka
Walden University

Walden University

College of Health Sciences and Public Policy

This is to certify that the doctoral study by

Uchechukwu Fidelia Nnoruka

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

Review Committee
Dr. Heba Athar, Committee Chairperson, Public Health Faculty
Dr. Marshae McNeal, Committee Member, Public Health Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2025

Abstract

The Association Between Sunlight Exposure Duration, Region of Birth and Skin Conditions Linked to Skin Cancer Risk Among Migrant Hispanic Farmworkers

by

Uchechukwu Fidelia Nnoruka

MPH, Health Services Administration, University of Arizona, 2020

BS, University of Illinois at Chicago, 2017

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

Walden University

May 2025

Abstract

Prolonged exposure to sunlight increases the risk of developing skin conditions linked to skin cancer. Migrant Hispanic farmworkers are especially at risk due to extended outdoor labor, limited access to preventive care, and minimal occupational protections. The purpose of this quantitative study was to examine the association between sun exposure duration and region of birth with the presence of skin conditions associated with skin cancer among migrant Hispanic farmworkers in the United States. This study was grounded by the Social Ecological Model, which provided a comprehensive framework for examining multilevel factors influencing skin health outcomes. Using a cross-sectional design, secondary data from the 2015 National Health Interview Survey (NHIS) were analyzed for 155 migrant Hispanic farmworkers aged 18 to 85 years. Descriptive statistics were used to summarize sample characteristics, and logistic regression was conducted to analyze associations between key variables. Finding from the chi-square test revealed a statistically significant association between duration of sun exposure and the presence of skin conditions, $\chi^2(2) = 19.19$, $p < .001$. No statistically significant association was found between region of birth and presence of skin conditions, as indicated by the logistic regression model, $\chi^2(6) = 8.97$, $p = .175$. Field-based products developed from this study included recommendations for advocacy groups and policymakers. Implications for positive social change include the development of culturally appropriate sun safety education, improved access to preventive healthcare, and the promotion of workplace protections for this vulnerable population.

The Association Between Sunlight Exposure Duration, Region of Birth and Skin Conditions Linked to Skin Cancer Risk Among Migrant Hispanic Farmworkers

by

Uchechukwu Fidelia Nnoruka

MPH Health Services Administration, University of Arizona, 2020

BS, University of Illinois at Chicago, 2017

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

Walden University

May 2025

Dedication

I dedicate this doctoral study first and foremost to God, my safe place when everything felt overwhelming. Even with what felt like small faith at times, I always found the strength through Him to keep going.

Secondly, to my family, especially my mom and dad, who believed in me and paved the way for success through their own examples as high achievers. To my close friends and support system, Phebean, Brigitte, Olivia, Chioma, Chiamaka, Meso, Richline, Anderson, Neto, Paula, Mariam, Maggie, Stephanie, Danelle, Oge, Maame, Precious, Mary, and especially, Dr. Arrington, to mention but a few, your encouragement, understanding, prayers, unwavering belief in me helped carry me through this journey. Thank you for being my anchor. To my spouse, here is a reminder that no dream is too big and no obstacle too great. Stay committed and your perseverance will lead you there. To my children, I hope you grow up believing that achieving success in anything is possible through commitment, consistency, perseverance, and effort. To my manager, Nigel, thank you for seeing the best in me, offering valuable feedback, and always cheering me on. You can call me Dr. Uche now just like you've always wanted.

Finally, I dedicate this work to myself for staying committed and pushing forward, even when everything felt like it was falling apart. I made a promise to myself to finish no matter how long it took. And I DID IT.

Yes, my dream finally came through and I am a Doctor of Public Health!

Acknowledgments

My doctoral study journey was one of the most challenging educational experiences I have had. Nothing could have fully prepared me for the setbacks I encountered, particularly during the dissertation stage of this study. As a family and career-oriented woman balancing many responsibilities with limited time, each day presented its own struggles. However, with the unwavering support and guidance from my family, close friends, career mentor, therapist, Walden Library staff, Ms. Julie, and my Chair, Dr. Athar, I was able to complete this journey.

Becoming a Doctor of Public Health is the final chapter of my academic journey, and I am proud to say I achieved it. I could not have done it without each and every one of you. Thank you all for your support.

Table of Contents

List of Tables

List of Figures

Section 1: Foundation of the Study and Literature Review

Introduction to the Study

Prolonged exposure to sunlight increases the risk of developing skin conditions linked to skin cancer. Skin conditions affect the structure and function of the skin. While some are easily treatable, others cause long-term damage and increase cancer risk (Arcury et al., 2007). The skin is the largest organ of the body and plays an essential role as the primary barrier against environmental hazards, including exposure to sunlight. It is made up of three primary layers. The epidermis contains keratinocytes, which guard against external damage, and melanocytes, which produce melanin to protect against ultraviolet (UV) radiation. The dermis provides structural support through connective tissues, blood vessels, nerves, and immune cells. The hypodermis, the innermost layer, is composed of fat and connective tissue that help insulate the body and absorb shock (American Cancer Society, 2025). Damage to these skin layers, particularly from chronic skin conditions or prolonged UV exposure, can promote carcinogenesis, the process of cancer development (American Cancer Society, 2025).

One common precancerous skin condition associated with an increased risk of skin cancer is actinic keratosis. It typically presents as rough, scaly patches on sun-exposed areas such as the face, scalp, and hands due to prolonged UV exposure (National Cancer Institute, n.d). Chronic UV radiation causes DNA mutations in keratinocytes, resulting in uncontrolled cell growth. Additionally, chronic inflammatory skin conditions such as psoriasis also contribute to cancer risk. Psoriasis is characterized by chronic immune activation and excessive skin cell turnover, increasing susceptibility to UV-

induced DNA mutations (National Cancer Institute, n.d). Studies indicate a higher risk of non-melanoma skin cancers in psoriasis patients, particularly those receiving immunosuppressive treatments. Other conditions, including severe rashes, blisters, eczema, or atopic dermatitis, weaken the skin due to persistent inflammation, making it more vulnerable to environmental carcinogens (Cadet et al., 2020).

Certain viral infections have also been linked to skin cancer, highlighting the complex relationship between sunlight exposure and skin conditions. The progression from chronic skin conditions to skin cancer is influenced by prolonged inflammation, genetic mutations, immune system dysfunction, and environmental exposures, particularly UV radiation (Kliniec et al., 2023). Sun exposure causes mild to severe symptoms such as skin rashes and sunburn, with severe cases leading to skin cancer (Castillo et al., 2020). In addition, skin conditions such as actinic keratosis, combined with prolonged UV exposure, increase the risk of developing skin cancer (CDC, 2024).

Subsequently, skin cancer is the most severe type of skin condition that develops slowly over several years on the epidermis, the outermost skin layer, due to UV radiation from sunlight (CDC, 2024). Some types, such as melanoma, non-melanoma, basal cell carcinoma (BCC), and squamous cell carcinoma (SCC), occur frequently with unique symptoms among farmworkers due to the prolonged sun exposure in addition to other factors. For instance, in 2020, 1,774 new cases of melanoma were reported among Hispanic people, and 260 died from the disease (CDC, 2024). For every 100,000 Hispanic individuals, four new melanoma cases were reported, and at least one person died (CDC, 2024). Development of skin conditions is one of the most common problems

in light-skinned individuals who experience sunburn easily, have multiple moles, and a history of skin conditions contributing to skin cancer (Feldman et al., 2007). Prolonged exposure to sunlight is a major cause of skin cancer (CDC, 2024).

The lack of sunscreen use, sun hats, and decreased awareness and education on the adverse effects of sun exposure are key factors contributing to the increased rate of skin conditions linked to skin cancer among Hispanic farmworkers (Kuehn, 2021). Due to the nature of their work, migrant Hispanic farmworkers are exposed to sunlight for extended periods, usually one hour or longer (Arcury et al., 2007). While further research is needed to assess other racial groups, migrant Hispanic farmworkers have a higher risk of developing skin conditions linked to skin cancer (CDC, 2024). Although studies have explored the relationship between sun exposure and skin cancer, more research is needed specifically for the migrant Hispanic population to examine sun behaviors and other health issues contributing to skin cancer. Studies show that the migrant Hispanic population is more likely to develop skin conditions linked to skin cancer than non-Hispanic populations (Kearney et al., 2023).

The purpose of this quantitative study was to examine the association between prolonged exposure to sunlight, region of birth, and skin conditions contributing to skin cancer. It also explored the influence of sociodemographic factors such as age, sex, marital status, and region of birth among migrant Hispanic farmworkers in the United States. By investigating the individual, interpersonal, organizational, community, and policy risk factors associated with prolonged sun exposure and skin cancer, this study

contributes to greater awareness of sun exposure risks and promotes better health outcomes for the migrant Hispanic population.

Section 1 of this study provides information on the background, problem statement, purpose of the study, research questions, and hypotheses of this study. It is also followed by the theoretical framework, nature of the study, literature review, scope, assumptions, limitations, delimitations, and finally, the significance.

Background

Prolonged exposure to sunlight increases the risk of developing skin conditions that contribute to skin cancer. Skin conditions can be severe and are a major public health issue, particularly among migrant Hispanic farmworkers who are often exposed to prolonged high levels of sunlight due to their outdoor work (Rosenbaum & Shin, 2005). Exposure to ultraviolet (UV) radiation from prolonged exposure to sunlight is one of the key risk factors for developing skin conditions that contribute to skin cancers such as basal cell carcinoma, squamous cell carcinoma, and melanoma (Alli, S., et al., 2023).

Migrant Hispanic farmworkers face unique challenges when it comes to sun exposure and skin conditions linked to skin cancer risk. Many migrant Hispanic farmworkers come from countries such as Mexico, Cuba, and Puerto Rico, with higher levels of sunlight exposure than the United States, increasing their risk for developing severe skin conditions when further exposed to long hours of UV light in the sun (Liu et al., 2023). As migrants working as farmworkers, they are often expected to work long hours between 10 am to 4 pm in the sunlight with limited access to shade or protective clothing. Mangum et al. (2015) argue that prolonged exposure to UV radiation increases

the risk of developing skin conditions linked to skin cancer for migrant Hispanic farmworkers.

Moreover, Castillo et al. (2021) argue that migrant Hispanic farmworkers may face different barriers to accessing quality healthcare due to having limited access to preventive care services and other specialty care services like dermatology. Oftentimes, this results in them facing delays in seeking treatment for those skin conditions, which leads to poorer health outcomes and increases their risk of developing skin cancer (May & Arcury, 2020).

Efforts to address the association between prolonged exposure to sunlight and skin conditions linked to skin cancer among migrant Hispanic farmworkers should focus on increasing educational and awareness about sunlight effects on skin risk factors and prevention strategies, providing access to protective exterior work clothing and sunscreen and improving access to healthcare services for early detection and treatment options of all skin conditions including those linked to skin cancer (Mott, 2020). By addressing these issues, the rate of skin conditions and diseases among migrant Hispanic farmworkers can be reduced, and their overall health and well-being can be improved.

Problem Statement

Skin conditions associated with prolonged sunlight exposure, particularly among migrant Hispanic farmworkers, remain one of the most significant and growing public health concerns. These individuals form a critical workforce in the U.S. agricultural sector, where their labor is crucial. Without farmworkers, millions of crops, including fruits and vegetables, would go unharvested, affecting national food security (Rosenbaum

& Shin, 2005). Despite their crucial contributions, migrant Hispanic farmworkers endure harsh working conditions that adversely affect their health. One of the most serious issues they face is the elevated risk of developing skin conditions linked to skin cancer due to chronic, unprotected exposure to ultraviolet (UV) radiation from the sun.

Some severe types of skin conditions that increase the risk of skin cancer development include Actinic keratosis (AK). It is a precancerous condition caused by prolonged UV exposure. Other non-melanoma skin cancers, such as basal cell carcinoma (BCC) and squamous cell carcinoma (SCC), are among the most prevalent in the US, with UV radiation as the primary risk factor (American Cancer Society, n.d). While the association between prolonged sun exposure and skin conditions linked to skin cancer is documented, there remains a critical gap in understanding how occupational exposure and region of birth, particularly among migrant Hispanic farmworkers, contribute to skin conditions (Coups et al., 2008). This gap is intensified by the lack of comprehensive, population-specific research that accounts for the unique socio-economic, occupational, and regional factors influencing sun exposure and related health outcomes. Migrant Hispanic farmworkers are disproportionately affected by the development of skin conditions linked to skin cancer due to a combination of environmental, occupational, and socioecological factors (Castillo et al., 2021). They often work during peak UV radiation hours without access to protective measures such as sunscreen, hats, or UV-protective clothing, which significantly increases their risk (CDC, 2022).

Additionally, unhealthy climatic conditions, high temperatures, and pesticide exposure further contribute to adverse health outcomes, increasing the likelihood of

chronic skin conditions like skin cancer (Bloss et al., (2022). Limited healthcare access often results in undetected and untreated conditions, worsening outcomes. The majority of the U.S. farmworker population is foreign-born, with a significant proportion being Hispanic. More than 80% of the U.S. farming workforce consists of foreign workers, and approximately 15% are migrant Hispanic farmers (CDC, 2022). Many come from regions with high UV radiation and, due to the nature of their work and face prolonged exposure to harmful sunlight (Arcury et al., 2005). Despite this elevated risk, more epidemiological data are needed to link skin cancer rates in this population to cumulative sun exposure and geographic background.

Previous studies, such as those by Hu et al. (2004), predominantly focused on non-Hispanic white populations, who have different risk profiles for skin conditions linked to skin cancer due to their lighter skin pigmentation. Thus, these studies fail to capture the distinct risk factors for migrant Hispanic farmworkers, whose melanin levels offer some protection but do not make them immune to UV damage. A major obstacle in addressing this public health issue is the limited access to preventive resources, specifically for migrant Hispanic farmworkers. Many workers lack access to basic protective measures such as sunscreen, protective clothing, and shaded rest areas, increasing their risk of harmful effects of sun exposure.

In addition, these workers face significant barriers to healthcare access, including a lack of health insurance, cultural and linguistic differences, and the transient nature of their labor. These challenges worsen their susceptibility to developing skin conditions such as skin blemishes, sun burns, blisters, and an increased risk of developing skin

cancer. The socio-economic status of migrant Hispanic farmworkers further increases their susceptibility. Many live in poverty and lack the financial means to access healthcare or preventive tools (Lagacé et al., 2023). Moreover, a large portion of these workers are undocumented, which increases their difficulty in accessing health care services. For instance, fear of deportation may deter workers from seeking medical attention, even when they exhibit symptoms of skin conditions linked to skin cancer (Corazza et al., 2021). The lack of access to healthcare worsens their already elevated risk of skin conditions linked to skin cancer, as early diagnosis and treatment are often unavailable.

Addressing the issue among migrant Hispanic farmworkers requires a multi-faceted approach. Enhancing current preventive measures and creating additional interventions specifically tailored to this susceptible population is essential. Additionally, reducing the duration of sun exposure for farmworkers through stricter labor regulations, such as mandated rest periods in shaded areas and the provision of UV-protective gear, is a critical step. Access to affordable or free sunscreen should be prioritized, and educational campaigns targeting both farmworkers and farm owners are also necessary to raise awareness about the dangers of prolonged sun exposure and the importance of preventive measures.

Strengthening the association between skin conditions linked to skin cancer prevention and sun exposure, along with improving healthcare access for migrant Hispanic farmworkers, is crucial to effectively addressing this public health crisis. The development of culturally competent healthcare services, enhanced healthcare outreach

programs, and better legal protections for migrant workers are necessary to mitigate skin conditions linked to skin cancer risks in this population. Only by addressing these socio-economic, cultural, and environmental barriers can public health officials reduce the incidence of skin conditions development and improve the overall health outcomes of this vulnerable and essential workforce.

In conclusion, the link between prolonged sunlight exposure and skin conditions is well-established, particularly for outdoor workers like farmworkers. However, the risk factors specific to migrant Hispanic farmworkers, including their specific country of origin, socio-economic status, and limited access to protective measures, remain understudied. This gap in the literature highlights the need for more comprehensive research that addresses these factors. Until such research is conducted, public health interventions and policy reforms focused on prevention and quality healthcare access remain the most effective ways to reduce the risk of developing skin conditions linked to skin cancer among migrant Hispanic farmworkers.

Purpose of the Study

The purpose of this quantitative study was to determine if there is an association between prolonged exposure to sunlight, region of birth, and skin conditions linked to skin cancer. The study explores social demographics such as age, sex, and marital status for migrant Hispanic farmworkers in the United States. Although researchers have investigated some of these issues, there is a paucity of literatures regarding the association between individual risk factors associated with prolonged exposure to sunlight and skin conditions linked to skin cancer among migrant Hispanic farmworkers,

assessing age, sex, marital status, region of birth, and length of time of exposure to sunlight (1 hour and long term). Previous research explained that exposure to sunlight contributes to a high risk of developing skin conditions that contribute to skin cancer (Quandt et al., 2008). However, migrant Hispanic farmworkers have a higher risk of exposure to sunlight due to being outdoors for a prolonged length of time. Regardless of being aware of this, there is still a significant gap in the literature concerning the specific factors that contribute to this rate of prolonged exposure to sunlight in the migrant Hispanic population.

Research Questions and Hypotheses

The research questions for this quantitative study were essential to analyze the key risk factors associated with the development of skin conditions linked to skin cancer among migrant Hispanic farmworkers due to their prolonged exposure to sunlight.

Research Question one (RQ1): Is there a significant relationship between skin conditions based on length of time of exposure (1 hour vs long-term) among migrant Hispanic farmworkers after controlling for cofounding variables, including age, sex, and marital status??

Null Hypothesis 1 ($H_0$1): There is no significant relationship between skin conditions based on length of time of exposure (1 hour vs long-term) among migrant Hispanic farmworkers after controlling for cofounding variables, including age, sex, and marital status.

Alternate Hypothesis one (H_A1): There is significant relationship between skin conditions based on length of time of exposure (1 hour vs long-term) among

migrant Hispanic farmworkers after controlling for cofounding variables, including age, sex, and marital status

Research Question two (RQ2): Is there a significant relationship between region of birth and skin conditions among migrant Hispanic farmworkers after controlling for cofounding variables, including age, sex, and marital status?

Null Hypothesis two ($H_0$2): There is no significant association between region of birth and skin conditions among migrant Hispanic farmworkers after controlling for cofounding variables, including age, sex, and marital status.

Alternate Hypothesis two (H_A2): There is a significant association between region of birth and skin conditions among migrant Hispanic farmworkers after controlling for cofounding variables, including age, sex, and marital status.

Theoretical Foundation for the Study

Understanding the development of skin conditions linked to skin cancer among migrant Hispanic farmworkers requires a multidimensional lens that considers not just individual behavior but also the broader social, cultural, and environmental influences that shape health outcomes. Thus, the social-ecological model (SEM) is the most preferred for this study.

Social-Ecological Model (SEM)

This study is grounded in the SEM, also known as the ecology of human development. It was developed by psychologist Urie Bronfenbrenner in the late 1970s (Mcleroy et al., 1980). The SEM is grounded in ecological systems theory and highlights how individuals are shaped by and also influence a variety of social and environmental

factors. Originally refined by McLeroy et al. (1988), the model serves as a framework for promoting health behavior change by recognizing that behavior is influenced by multiple interconnected levels, including individual, interpersonal, community, and societal factors (Kumar et al., 2012). The levels include individual (age, sex, education, knowledge, attitudes, beliefs, and skill etc.), interpersonal (associations and interactions on health behavior, family dynamic), organizational (institutions, workplaces), community (social norms, cultural values, and community impact), and policy (laws, regulations, policies on health behaviors and outcomes).

The social-ecological model further guides the identification, determination, and summarization of the evidence concerning various risk factors associated with the development of skin conditions for migrant Hispanic farmworkers, how these factors impact their health, and to determine potentially promising interventions. Since the model focuses on determining the complex connections between individual, interpersonal, community, and societal factors that influence health behaviors and outcomes, it provides an avenue to understand the multifaceted nature of an effective intervention to resolve this public health issue.

The SEM has been widely applied in public health research to explore the multilevel influences on health behaviors, particularly among vulnerable populations. For example, SEM was used by Quandt et al. (2013) to investigate occupational health risks and sun protection behaviors among Latino farmworkers, revealing how individual, interpersonal, organizational, and societal factors impact health outcomes. Similarly, Arcury et al. (2012) applied the SEM to assess pesticide exposure and health behaviors in

migrant farmworker communities, highlighting the role of employer practices, cultural beliefs, and regulatory systems. These studies align with the current research by examining how structural and contextual factors shape health risks like sun exposure within marginalized populations.

The SEM is an appropriate theoretical framework for this study because it allows for a comprehensive examination of the multiple, interrelated factors influencing skin cancer risk among Hispanic migrant farmworkers. This population is not only affected by individual-level choices (e.g., sun protection behaviors) but also by broader systemic and environmental factors, such as working conditions, health care access, immigration policies, and cultural norms. The SEM facilitates the exploration of these layered determinants, making it possible to identify intervention points at various levels: individual, interpersonal, organizational, community, and policy.

One of the key strengths of using the SEM in this context is its capacity to move beyond individual-level analysis and account for the complex interplay of social and environmental influences on health. This is particularly important for migrant farmworkers, whose exposure to the sun and barriers to preventive care are often shaped by structural inequities. The model supports the development of multi-level interventions that can address workplace policies, access to education and healthcare, and community support systems. By framing the issue through the SEM, this study can provide more holistic, impactful public health recommendations that address root causes rather than just symptoms.

While the SEM offers a comprehensive framework for understanding health behaviors and outcomes, its application comes with limitations. One major challenge is the difficulty in measuring and isolating the influence of each level of the model; individual, interpersonal, organizational, community, and policy, especially in large, population-based studies. Additionally, interventions designed at multiple levels often require substantial time, funding, and cross-sector collaboration, which can be difficult to implement and sustain, particularly in underserved populations like migrant farmworkers. Another limitation is that the SEM is descriptive rather than prescriptive; it outlines factors that influence health but does not provide specific strategies for intervention or address the power dynamics and systemic barriers that may prevent change at higher levels (e.g., policy or community). These complexities may limit the practical application of the SEM in designing and evaluating targeted, resource-constrained public health programs.

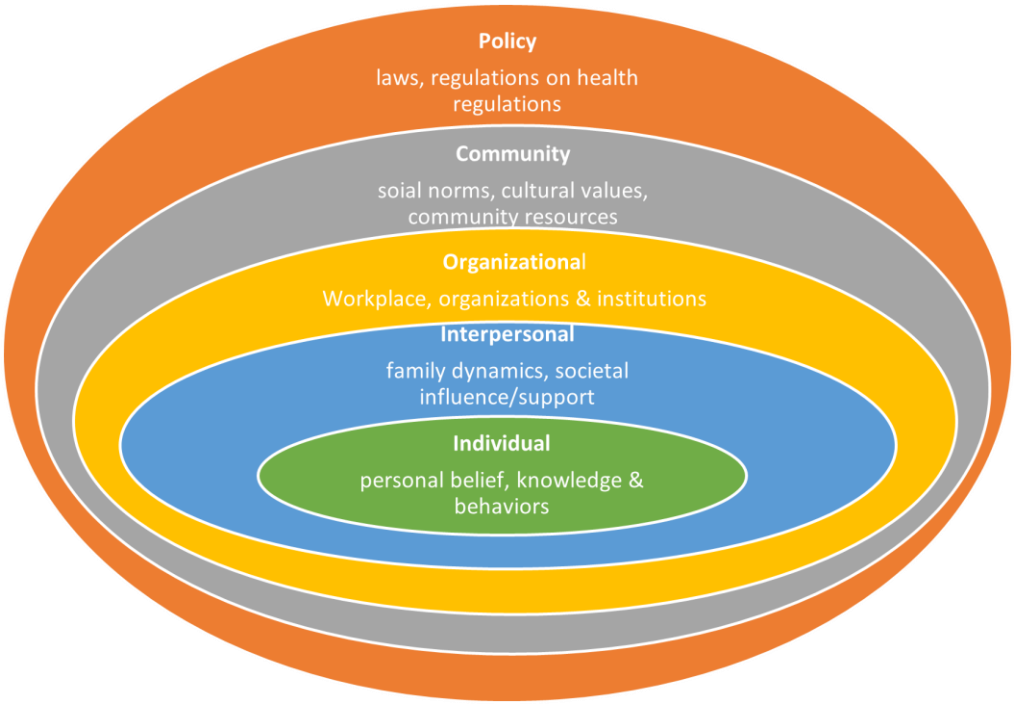
The logical connections between the framework presented and the nature of my study include the five levels of the social-ecological model to better understand skin conditions, cancer, and the effect of potential prevention strategies. This model considers the complex association between individual, interpersonal, organizational, community, and political factors (Kumar et al., 2012). It provides an opportunity to explore various factors that increase the risk of skin conditions associated with skin cancer among migrant Hispanic farmworkers. The factors within one level of this model can impact those at other levels.

Figure 1 displays the breakdown of the components of the socioecological model for migrant Hispanic farmers, illustrating the interconnected layers of intrapersonal, interpersonal, organizational, community, and political factors influencing their health behaviors and outcomes (Kumar et al., 2012). At an intrapersonal level, factors such as personal beliefs, behaviors, and knowledge play a role in shaping health behaviors. Interpersonal associations within family dynamics and social networks also influence health choices and practices. Additionally, organizational factors related to employment, access to healthcare services, and workplace policies impact health outcomes for migrant Hispanic farmers. Furthermore, community-level factors, including social norms, cultural norms, social support networks, and access to resources, contribute to the health and well-being of this population. Finally, broader political factors such as laws and regulations towards healthcare also shape their health experiences.

Understanding how these factors interact is crucial for designing effective interventions and policies that address the specific health needs of migrant Hispanic farmworkers. To effectively reduce the rate of sun-related skin conditions and support long-term prevention among migrant Hispanic farmworkers, a comprehensive strategy should involve several levels of influence simultaneously. Taking this multi-layered approach can boost the sustainability of sun safety efforts and create meaningful change at the population level.

Figure 1

Social-ecological Model (SEM)



Note: Adapted from McLeroy, K.R., Bibeau D, Steckler A, Glanz K (1988). An ecological perspective on health promotion programs. *Health Educ Quarterly. 15*(4), 351–77. https://doi.org/10.1177/109019818801500401

Individual Level

At the individual level, the focus is on the farmworker's personal knowledge, awareness, and behaviors related to sun exposure and skin health. Many farmworkers may not fully understand the cumulative effects of ultraviolet (UV) radiation or recognize the early signs of skin conditions that can lead to skin cancer. Cultural beliefs, educational background, and limited access to health information often contribute to a lack of awareness (Castillo et al., 2021). Therefore, targeted educational interventions are

critical. These should emphasize the importance of daily sun protection, the risks associated with repeated sunburns, and the benefits of early detection. Individual-level interventions may include bilingual informational pamphlets, one-on-one counseling sessions, and visual demonstrations. Providing access to personal protective equipment such as wide-brimmed hats, sun visors, lightweight UPF-rated clothing, and high-SPF water-resistant sunscreen empowers farmworkers to take preventive action and builds self-efficacy in managing their own health risks (Arcury et al., 2007). These efforts can foster a culture of self-care and responsibility in daily work routines.

Interpersonal Level

The interpersonal level addresses the role of relationships and social interactions in influencing health behaviors. Family members, peers, supervisors, and community leaders can all significantly shape an individual's attitudes and practices. For migrant Hispanic farmworkers, interpersonal influences often include familial obligations, cultural norms, and relationships with coworkers or crew leaders (Li and Hu, 2022). Employers and supervisors play a particularly important role in shaping workplace behavior and health practices. Employers should conduct annual sun safety training sessions that are both culturally appropriate and language-accessible. These sessions can include interactive workshops, testimonials from fellow farmworkers, and real-life demonstrations of UV-related skin damage (Castillo et al., 2021). Promoting ongoing communication around health and safety helps reinforce learning and provides a space for peer encouragement and accountability. When workers see sun protection as a shared

value within their community or crew, they are more likely to adopt and maintain these practices.

Organizational Level

At the organizational level, the focus shifts to workplace policies, resources, and institutional support. Agricultural employers and labor contractors are positioned to implement practical changes that protect farmworkers from prolonged sun exposure. Employers should establish formal sun safety protocols that include scheduled breaks during peak UV hours, job rotation to limit exposure duration, and distribution of protective clothing and sunscreen as part of standard equipment (CDC, 2022). Conducting regular audits and safety inspections ensures that these practices are consistently applied and evaluated. Organizations should also install permanent or mobile shaded areas in fields and work zones, particularly in remote or off-site locations (Arcury et al., 2007). Beyond physical protections, organizations can foster a culture of health and safety by integrating sun protection into orientation programs, safety briefings, and signage in break areas. When sun safety is treated as a core component of occupational health rather than an optional practice, it reinforces the value of worker well-being within the organization (Kuehn, 2021).

Community Level

The community level encompasses the social and cultural environment in which farmworkers live and work. Community norms, beliefs, and resources all contribute to shaping perceptions about health and prevention (Buster et al., 2012). In many agricultural communities, sun exposure is normalized as part of the job, and there may be

limited discussion around its long-term health risks (Leijen and van Herk, 2021). To shift these norms, community-based organizations, advocacy groups, and health clinics should collaborate to provide ongoing education and outreach focused on skin health and cancer prevention. Community centers can host workshops, offer free or low-cost skin screenings, and distribute sun protection materials (Castillo et al., 2021). Public health campaigns using local media, radio stations, churches, and markets can promote sun safety as a collective value. Visual storytelling, culturally tailored messaging, and trusted local voices are particularly effective in reaching farmworker communities (Lagacé et al., 2023). Ensuring that community gathering spaces include shaded outdoor break areas or covered meeting spaces can also serve as practical models for sun safety. These collective efforts help embed prevention as a shared responsibility within the broader cultural and social fabric of the community.

Policy Level

At the policy level, the framework emphasizes the critical role of government regulations, institutional policies, and broader legislative actions in shaping health outcomes for migrant Hispanic farmworkers. Given the high rates of prolonged sunlight exposure and the associated risk of developing skin conditions that contribute to skin cancer, policy interventions must address systemic gaps in occupational health protections and access to preventive resources. This study underscores the need for comprehensive sun safety regulations within the agricultural sector. Such policies should mandate the provision of protective equipment for farmworkers, including wide-brimmed hats, UPF-rated clothing, visors, and broad-spectrum sunscreen with high SPF.

Employers should be legally required to ensure that workers have access to shaded rest areas, particularly during peak sun intensity hours, and that they receive regular training on sun safety practices. These measures would directly reduce the duration and intensity of harmful UV exposure, which is a significant risk factor in skin cancer development.

Additionally, policies should support improved access to culturally competent healthcare services, including dermatological screening and education campaigns tailored to the linguistic and cultural backgrounds of migrant Hispanic farmworkers. Government-sponsored programs should offer mobile clinics or community-based health outreach services in agricultural regions, particularly targeting those who may be undocumented and less likely to access traditional healthcare systems due to fear of deportation or financial limitations.

Labor laws and occupational safety guidelines should be expanded to include clear standards for sun protection and enforce compliance through regular inspections and penalties for noncompliance. Policymakers must also consider providing incentives or subsidies for farm owners who implement sun safety protocols and actively participate in worker education and protection programs. By embedding sun safety and healthcare access into formal policy structures, these interventions have the potential to create sustainable change at the population level. They move beyond individual responsibility and place accountability on institutions and systems that influence working conditions. Addressing this public health issue at the policy level ensures that migrant Hispanic farmworkers are not only informed but also protected and supported through enforceable, evidence-based interventions.

Overall, SEM illustrates that addressing skin conditions linked to skin cancer among migrant Hispanic farmworkers requires a multi-level approach. Interventions should not only focus on individual behaviors but also consider interpersonal relationships, workplace environments, community resources, and policy measures. By integrating these levels of influence, public health efforts can create sustainable and effective solutions that reduce the risk of sun exposure-related skin conditions in this vulnerable workforce.

Nature of the Study

Using a secondary data from NHIS (IPUMS). a cross-sectional design was used to determine if there is an association between the duration of sunlight exposure (one hour vs long term), region of birth and the development of skin conditions while controlling for sociodemographic factors (i.e., age, sex, marital status) among migrant Hispanic farmworkers. The design was also used to determine if there is an association between the length of time exposure to sunlight (>1 hour), region of birth and the development of skin cancer while utilizing the same sociodemographic and controlling factors. Statistical analysis using binary logistic regression and chi-square test were used for the study. This study can be used to improve current prevention strategies and inform better public health policies and ultimately reduce the rate of development of skin conditions linked to skin cancer within the migrant Hispanic farmworker's population.

Literature Search Strategy

This research study involved an exhaustive literature search to determine the existing gap within the scope of prolonged sunlight exposure and skin conditions linked

to skin cancer among migrant Hispanic farmworkers. The scope of the literature review covered publications from the past 10 years to ensure the inclusion of current research, while also incorporating seminal literature foundational to the study of occupational health, skin conditions linked to skin cancer, and migrant farmworker populations. Sources included peer-reviewed journal articles, government health reports, and academic databases such as PubMed, Scopus, and Google Scholar. The review emphasized empirical studies, public health policy analyses, and epidemiological data relevant to sun exposure, skin cancer risk, and the unique vulnerabilities of Hispanic migrant farmworkers.

The literature review was conducted using Walden University Thoreau multi-database, consisting of MedLine/PubMed, CINAHL Plus with Full Text, and Academic Search Complete. Other database used for literature and skin conditions linked to skin cancer statistics search include Center for Diseases and Control Prevention (CDC), Google Scholar, APA PsycINFO, SocINDEX, and ScienceDirect, U.S Bureau of Statistics, American Cancer Society, National Cancer Institute, National Farmworker Health, International Agency for Cancer, Social Sciences Citation Index, Directory of Open Access Journals, and several others.

The keywords searched were *Skin cancer, skin conditions linked to skin cancer, skin protection methods, Hispanic farmers, farmworker, agricultural workers, sun exposure education, community support, skin conditions linked to skin cancer in Hispanic farm workers skin cancer in Hispanic farmers, skin conditions linked to skin cancer and latin* farm workers, skin conditions that contribute to skin cancer, migrant Hispanic*

farmers, and *Farmworkers OR agricultural workers Or Hispanic farmworkers Or Hispanic Farmers or sun-related diseases or farmworkers or migrant farm workers or agricultur* or laborer OR skin conditions linked to skin cancer or melanoma or ultraviolet radiation or basal cell carcinoma or squamous cell carcinoma or merkel cell cancer*.

Literature Review Related to Key Variables

This section involves an extensive review of the key independent and dependent variables associated with the study. Independent variables include the length of exposure (greater than 1 hour), region of birth, and socio-demographics such as age, sex, and marital status. The dependent variable associated with these independent variables is skin conditions that contribute to skin cancer.

Length of Time of Exposure to Sunlight (I hour and long-term)

The duration individuals spend outdoors correlates with an increased risk of skin conditions linked to skin cancer development (Slavinsky et al., 2023). The variations in ultraviolet radiation exposure depend on factors such as sun elevation and cumulative years spent in outdoor work (Slavinsky et al., 2023). Limited time spent in shade, coupled with inadequate public sun safety awareness, increases the risk of skin conditions linked to skin cancer development. Slavinsky et al. (2023) further explained that although the risk of skin conditions linked to skin cancer varies among all types of outdoor work. Compared to other outdoor workers, farmworkers, particularly migrant Hispanic farmworkers, face a higher risk due to prolonged sunlight exposure (Slavinsky et al., 2023). Skin conditions linked to skin cancer development are cumulative due to the more

time spent outside in the sun without following adequate sun-safety behaviors, such as wearing protective clothing, including sun hats, visors, etc., and sunscreen, poses a greater risk of developing skin conditions linked to skin cancer over time for migrant Hispanic farmworkers.

Region of Birth

Geographical location significantly influences the intensity and duration of sunlight exposure during outdoor work, including farm labor (Fivenson et al., 2023). Regions closer to the equator, such as the southern region, experience higher UV index levels, leading to prolonged and intense sunlight exposure for farmworkers (Fivenson et al., 2023).

Age

Age is a crucial factor in skin conditions linked to skin cancer development, with variations depending on the type. Melanoma, the most common type of skin cancer with an increased rate linked to prolonged sun exposure and indoor tanning, is common among younger individuals aged 20 to 30 years (Ali et al., 2023). Other common skin conditions that contribute to skin cancers, including actinic keratosis, eczema, psoriasis, and rosacea, are more prevalent among individuals aged 40 to 60, although younger individuals exposed to prolonged sunlight can also develop these types (Niino & Matsuda, 2021). Individuals under 50 are less likely to develop Basal Cell Carcinoma (BCC) and Squamous Cell Carcinoma (SCC) compared to older individuals with similar risk factors (Slavinsky et al., 2023).

Sex

Sex disparities exist in the incidence rates of skin conditions linked to skin cancer types, with BCC and SCC being more common in men (CDC, 2024). Men, who often experience higher rates of outdoor occupational exposure, face increased risks of BCC and SCC due to prolonged sunlight exposure (Ali et al., 2023). Conversely, women have a higher risk of melanoma compared to men (CDC, 2024). Women experience less sun exposure compared to men due to their choice of clothing (Lagacé et al., 2023).

Marital Status

Marital status plays a significant role in skin conditions risk, with genetic predispositions and access to healthcare being key factors. Family history of skin conditions that contribute to skin cancer, combined with socio-economic barriers limiting access to dermatological care, increases susceptibility among married individuals (CDC, 2024). Additional factors such as cultural norms, social practices, and economic disparities also influence the impact of marital status on skin conditions linked to skin cancer risk. In many cultures, marriage is not only a personal choice but also a social obligation deeply rooted in cultural traditions (Li & Hu, 2022). Being married involves a loss of autonomy, which can extend to healthcare decisions, including seeking dermatological care for skin conditions linked to skin cancer prevention and early detection. Li and Hu (2022) further emphasized that women often have a greater influence on the health behaviors of their partners. Lagacé et al. (2023) emphasized that women generally pay closer attention to their skin for any type of changes or those of their spouse compared to men.

Moreover, cultural beliefs surrounding health and illness can shape the perception and management of skin conditions linked to skin cancer within married populations (Leijen & van Herk, 2021). The stigma associated with having skin conditions linked to skin cancer, particularly in societies where illness is viewed as a weakness, can deter individuals from seeking timely medical attention (Leijen & van Herk, 2021). This stigma is compounded for married individuals, as concerns about social standing and familial reputation may take precedence over their health needs.

Economic factors significantly impact access to healthcare services, including dermatological care for skin conditions linked to skin cancer screening and treatment for married individuals. Individuals who are married and come from lower socioeconomic backgrounds frequently encounter major obstacles in obtaining quality healthcare because of limited financial resources (Leijen & van Herk, 2021). Limited health insurance coverage, high out-of-pocket expenses, and lack of transportation infrastructure worsen these challenges. Furthermore, the distribution of healthcare resources is often unequal, with individuals in rural and underserved areas facing significant healthcare disparities. Married individuals residing in these regions may encounter difficulties in accessing dermatologists or specialized skin conditions linked to skin cancer clinics, leading to delayed diagnosis and treatment (Leijen & van Herk, 2021). The intersectionality of marital status with other social determinants of health, such as region of birth, sex, and age, increases the vulnerability of specific populations to skin conditions linked to skin cancer risk. For example, Hispanic married individuals belong

to racial or ethnic minorities who face heightened barriers to healthcare due to systemic inequities.

This detailed analysis provides a comprehensive understanding of the various factors contributing to skin conditions linked to skin cancer risk among farmworkers, aiding in the development of targeted interventions and policies.

Definition of Key Terms Related to the Study

To better understand the risk factors associated with the development of skin conditions linked to skin cancer among migrant Hispanic farmworkers, this study focused on a set of key variables grounded in both the purpose of the research and existing literature. The primary goal of this study was to examine the association between prolonged exposure to sunlight, region of birth, and the presence of skin conditions that contribute to skin cancer while considering the influence of sociodemographic factors such as age, sex, and marital status. Current literature highlights prolonged ultraviolet (UV) radiation exposure as a major contributor to skin damage and cancer risk, especially for individuals engaged in outdoor labor (Castillo et al., 2021; Arcury et al., 2007). While these associations are well documented in general populations, limited studies have explored how these variables interact specifically within the migrant Hispanic farmworker community. This section defines and operationalizes the key variables used in the study to establish a clear framework for examining these relationships.

Skin conditions: Conditions that clog, irritate, or inflame the skin and cause changes in the appearance of the skin, and often increase the risk of skin cancer development, if left untreated (CDC, 2024).

Skin Cancer: It is a type of cancer that begins in the skin cells, often resulting from DNA damage caused by UV radiation from the sun. Prolonged, unprotected exposure to UV radiation increases the risk of skin mutations that can lead to basal cell carcinoma, squamous cell carcinoma, and melanoma (CDC, 2024).

Sunburn: It is a skin condition caused by overexposure to ultraviolet (UV) rays from the sun, leading to redness, pain, and peeling of the skin (CDC, 2024). It occurs due to prolonged exposure to UV radiation, which damages the skin's outer layers.

Age: Age is the length of time a person has lived, measured in years. It is important for this study because according to Yu et al. (2023), the risk of developing skin cancer increases with age.

Basal Cell Carcinoma (BCC): It is a common form of skin cancer that typically appears as a pearly or waxy bump or a flat, flesh-colored scar-like lesion. Long-term exposure to UV radiation leads to mutations in basal cells (the skin's deepest layer), which can cause this type of cancer (Skin Cancer Foundation, 2025). It mostly develops on skin areas exposed to the sun, such as the face, ears, neck, scalp, shoulders, and back.

Squamous Cell Carcinoma (SCC): It is a type of skin cancer that usually appears as a red, scaly bump or ulcer that doesn't heal. UV radiation damages the skin's squamous cells, often arising from actinic keratosis or pre-existing lesions.

Melanoma: It is a type of skin cancer that develops from the melanocytes. Melanocytes are cells that make the skin color pigment (Skin Cancer Foundation, 2025).

Non-Melanoma: A type of skin cancer that develops on the top layer of the skin. The two main types are basal cell carcinoma (BCC) and squamous cell carcinoma (SCC).

Squamous cell carcinoma (SCC): It is an uncontrolled growth of abnormal cells arising from the squamous cells in the outmost layer of skin (epidermis) (Skin Cancer Foundation, 2025).

Melasma: Melasma is a condition where dark patches, often brown or gray, appear on the skin, especially on the face. This happens when exposure to sunlight increases the amount of melanin, the substance that gives skin its color. Individuals with darker complexions are more prone to developing melasma, as their skin responds differently to ultraviolet rays. Research by Pathak and Perry (2022) notes that people with darker skin process UV exposure in a way that differs.

Actinic Keratosis (AK): A precancerous condition marked by rough, scaly patches of skin that develop due to sun exposure. Chronic UV exposure damages the skin cells, leading to abnormal growths that can develop into squamous cell carcinoma if left untreated.

Sun Allergy (Polymorphic Light Eruption): A rash that appears after exposure to sunlight, typically in the form of red, itchy bumps or blisters. The exact cause is unknown, but it is believed to be an abnormal immune system reaction to UV light, with factors like genetics, medications, and sensitivity to sunlight contributing to its development.

Photosensitivity (Drug-Induced): A skin reaction to UV radiation caused by certain medications, resulting in severe sunburn or rashes. Some medications, such as antibiotics, antidepressants, and diuretics, can make the skin more sensitive to sunlight, leading to an increased risk of burning or rash when exposed to the sun.

Heat Rash (Miliaria): Occurs when sweat ducts become blocked, and sweat accumulates under the skin, often in hot and humid conditions. Prolonged exposure to the sun and overheating causes sweat buildup, resulting in red bumps or blisters.

Sun-Induced Hives: A condition where hives or welts form on the skin after exposure to sunlight. UV radiation or visible light triggers an allergic reaction, causing the skin to break out in hives.

Erythema Multiforme: A skin condition marked by red, target-shaped patches that develop on the skin after sun exposure. UV radiation can trigger erythema multiforme in certain individuals, often due to an immune system response.

Solar Lentigines (Age Spots): Dark, flat spots that appear on sun-exposed areas of the skin, typically in older adults. Chronic sun exposure leads to an increase in melanin production, causing these spots to form, particularly on the face, hands, and shoulders.

Undocumented Workers: Workers who are employed without legal authorization to work in a country. Many migrant Hispanic farmworkers fall into this category, which creates additional barriers to accessing healthcare, legal protections, and other essential services.

UV-Protective Clothing: Specialized clothing designed to protect the skin from the harmful effects of UV radiation. It is made from tightly woven fabrics or treated with UV-inhibiting compounds to block UV rays.

Sun Protection Factor (SPF): A measure of how well a sunscreen product protects the skin from UVB rays, which cause sunburn and contribute to skin conditions

that contribute to skin cancer. Higher SPF values provide greater protection against sunburn and skin damage.

Culturally Competent Healthcare: Providing healthcare that aligns with the cultural values and language preferences of patients is essential. For migrant Hispanic farmworkers, this means offering services in Spanish and being mindful of the cultural influences that shape their health choices and access to medical care.

Prolonged Sunlight Exposure: Extended periods of time during which an individual is exposed to direct sunlight without adequate protection. This significantly increases the risk of developing skin-related conditions, including skin conditions that contribute to skin cancer, due to the cumulative effects of UV radiation.

Migrant Hispanic Farmworkers: Individuals, predominantly of Hispanic origin, who migrate to work in agriculture, often under temporary conditions, in various regions, particularly in the U.S. They form a significant portion of the workforce responsible for harvesting crops. These workers are highly vulnerable to occupational hazards, including prolonged sun exposure and limited access to healthcare.

UV Radiation: Ultraviolet (UV) radiation is a form of electromagnetic energy emitted by the sun, which can damage the DNA in skin cells. It is categorized into UVA, UVB, and UVC types, with UVA and UVB being primarily responsible for sunburns, skin aging, and skin conditions that contribute to skin cancer.

Public Health Issue: A widespread health issue impacting a significant segment of the population that calls for a coordinated response. Skin conditions linked to skin cancer

among migrant Hispanic farmworkers is considered a public health issue due to its prevalence and the systemic barriers that prevent effective prevention and treatment.

Protective Measures: Strategies and tools used to safeguard individuals from harmful environmental or occupational exposures. In the context of sun exposure, this includes sunscreen, UV-protective clothing, hats, sunglasses, and access to shaded areas.

Occupational Hazards: Risks or dangers associated with a specific occupation, in this case, the agricultural work performed by migrant Hispanic farmworkers. Prolonged sun exposure is one of the key occupational hazards for this group, increasing their likelihood of developing skin conditions that contribute to skin cancer.

Health Disparities: Variations in health status and access to medical care experienced by different groups, often shaped by income, race, ethnicity, and where people live. Migrant Hispanic farmworkers face significant health disparities, particularly in terms of access to skin conditions linked to skin cancer prevention and treatment.

Socio-Economic Status: An overall assessment of a person's or group's standing in society, typically determined by factors such as income, level of education, and type of employment. Low socio-economic status among migrant farmworkers contributes to limited access to healthcare and preventive resources, exacerbating their health risks.

Preventive Measures: Actions taken to reduce the risk of illness or injury before it occurs. In the context of skin conditions that contribute to skin cancer, preventive measures include using sunscreen, wearing protective clothing, reducing time spent in direct sunlight, and undergoing regular skin exams.

Healthcare Access: The ability of individuals to obtain necessary medical services, including preventive, diagnostic, and treatment services. Limited healthcare access among migrant Hispanic farmworkers plays a major role in the late detection and treatment of skin conditions that can lead to skin cancer.

Statistical Assumptions

To assess the association between sun exposure and the development of skin conditions linked to skin cancer, particularly among migrant Hispanic farmworkers, the dataset from the National Health Interview Survey (NHIS) Integrated Public Use Microdata [IPUMS] was utilized as secondary data. This dataset was chosen for its extensive collection of health-related information, including variables on occupation, demographics (age, sex, marital status), and health conditions, such as sun exposure and related skin issues. Given the high risk of prolonged sun exposure within the migrant farmworker population, the NHIS IPUMS dataset provided valuable insights into potential links between sun exposure and skin conditions that are associated with skin cancer development.

This approach was supported by previous literature, which emphasized a direct connection between prolonged sun exposure and an increased risk of developing skin conditions that contribute to skin cancer. For instance, studies by Kearney et al. (2014) and Arcury et al. (2007) indicated that migrant farmworkers, particularly those of Hispanic origin, face higher risks of occupational UV exposure due to the nature of their work, which often involves long hours outdoors. Castillo et al. (2021) further highlighted that a lack of protective measures, such as the use of sunscreen, protective clothing, and

access to shade, increase their susceptibility, potentially leading to higher rates of skin conditions that could contribute to skin cancer. Based on these findings, the hypotheses for this study suggested that prolonged sun exposure would correlate with a higher incidence of skin conditions linked to skin cancer among migrant Hispanic farmworkers.

Upon initial analysis of the IPUMS (NHIS) data, there was a noticeable indication that participants experienced severe skin conditions related to sun exposure. Response from the participants indicating sunburns, skin rashes, and other sun-induced skin conditions were prevalent among participants. This result suggested that this population face substantial sun exposure without adequate protection. These preliminary findings seemed to support the assumption that prolonged sun exposure is a significant occupational hazard for migrant Hispanic farmworkers and could lead to a higher prevalence of skin conditions linked to skin cancer. This was in line with the existing literature and reinforced my expectation that the data would support the alternative hypotheses that prolonged sun exposure correlates with a higher incidence of skin cancer-related skin conditions.

However, upon further examination to assess the direct association between sun exposure and skin cancer, the results did not align with these expectations. Despite the presence of clear evidence linking sun exposure to negative skin effects through literature reviews, the data did not adequately support the alternative hypotheses. This was primarily because the majority of participants did not report having skin cancers that are directly linked to sun exposure. This discrepancy between the expected and actual findings raised important considerations, suggesting that the assumed relationship

between sun exposure and skin cancer may not be as direct as previously thought, at least within the constraints of the available dataset.

Interestingly, while the data failed to support the hypotheses for a direct correlation between sun exposure and skin cancer in this specific cohort, other research continues to emphasize a significant link between sun exposure and skin cancer risk. These conflicting results indicate that, while sun exposure is undoubtedly a major risk factor for the development of skin conditions and skin cancer, the factors influencing its impact on different populations, such as migrant Hispanic farmworkers, are complex and may require more targeted data obtained overtime and further research to draw definitive conclusions.

Scope and Delimitations

This study examines the association between prolonged sunlight exposure, region of birth, and the development of skin conditions associated with skin cancer among migrant Hispanic farmworkers in the United States. The focus on this population is based on their disproportionate exposure to ultraviolet (UV) radiation due to outdoor labor, limited access to protective measures, and significant barriers to healthcare (Castillo et al., 2021; CDC, 2020). Quantitative data were drawn from the 2015 National Health Interview Survey (NHIS) Integrated Public Use Microdata Series (IPUMS), with an emphasis on demographic variables such as age, sex, marital status, and region of birth.

Geographically, the study is confined to the United States, where a large portion of the agricultural workforce is composed of Hispanic migrant farmworkers (Rosenbaum & Shin, 2005). Many of these individuals originate from Mexico, Puerto Rico, and the

Caribbean, where pre-migration climate exposure may influence skin cancer risk (Liu et al., 2023). The study focuses on individual and environmental risk factors, guided by the Social Ecological Model (McLeroy et al., 1988), and does not incorporate additional behavioral or psychosocial theories. Due to the limited number of Hispanic farmworkers in the dataset and the absence of reported skin cancer diagnoses, the generalizability of the findings is constrained. The sample may not fully reflect the broader migrant Hispanic farmworker population, particularly undocumented individuals or those not captured in the NHIS sampling frame (Arcury et al., 2007). Nevertheless, the research contributes valuable exploratory insights that can inform future public health interventions and scholarly inquiry.

Delimitations

Several delimitations were established to maintain a focused and methodologically consistent study. First, the population is limited to individuals who identified as Hispanic and reported working in farming, fishing, or forestry occupations during the year 2015. Non-Hispanic individuals and workers in other sectors were excluded. Second, the study is restricted to secondary, cross-sectional data collected during a single year, which prevents longitudinal or causal analysis (Maier et al., 2023). Third, the research concentrates specifically on skin conditions linked to skin cancer, while other occupational health risks, such as pesticide exposure or musculoskeletal injuries, are not examined. In addition, while region of birth is considered a central variable, the dataset categorizes countries into broad regions, limiting the ability to assess

cultural or environmental nuances between specific countries. The study also does not include qualitative data or primary data collection efforts

Potential biases that may influence the study outcomes include recall bias due to the self-reported nature of sun exposure and health conditions, selection bias stemming from the dataset's sampling frame, and information bias related to the limited variables available for detailed behavioral or environmental exposure assessment (Kearney et al., 2014). These biases were addressed by clearly acknowledging them in the limitations, interpreting the findings with caution, and focusing on descriptive and exploratory analysis rather than making causal inferences. Additionally, the study's transparency in data sourcing and methodological constraints helps support its credibility and provides direction for future, more targeted research.

In summary, while this research aims to provide a thorough analysis of the factors influencing skin conditions linked to skin cancer development among migrant Hispanic farmworkers, its scope is delimited by its reliance on 2015 IPUMS NHIS data, its specific focus on sunlight exposure and skin conditions linked to skin cancer, and its attention to migrant Hispanic farmworkers within the U.S. These delimitations ensure that the study remains focused and manageable, while also recognizing areas for future research to expand upon.

Limitations of the Study Related to Design

This study has several limitations, primarily related to the cross-sectional design and the use of secondary data from the 2015 National Health Interview Survey (NHIS) Integrated Public Use Microdata Series (IPUMS). As a cross-sectional study, the data

captured information at a single point in time, which limited the ability to draw causal inferences between sunlight exposure, region of birth, and the development of skin conditions linked to skin cancer. While associations can be identified, this design does not allow for temporal sequencing, which is essential to establish causality.

A key methodological weakness is the reliance on self-reported data. Participants' responses regarding their length of exposure to sunlight and the presence of skin conditions may be subject to recall bias or misclassification. Such inaccuracies can affect the reliability of the findings. In addition, because the study uses secondary data not specifically designed for this research topic, certain relevant variables were either unavailable or grouped in broad categories. For example, the region of birth was categorized into grouped areas, which limited the ability to assess potential variations in sun exposure behavior or skin condition prevalence among specific countries of origin. This constraint affects construct validity, as the variables may not have fully captured the nuanced factors influencing the development of skin conditions linked to skin cancer.

Internal validity may be compromised by unmeasured confounding variables such as genetic predisposition, occupational safety practices, sunscreen usage, or access to dermatological care. Although this study controlled for some sociodemographic variables including age, sex, and marital status, other potential confounders may have influenced the observed associations. External validity is also limited. The study focuses solely on migrant Hispanic farmworkers included in the 2015 NHIS dataset, which may not fully represent the broader population of migrant farmworkers in the United States, particularly undocumented workers who may not have participated in the survey due to legal or

language barriers. These limitations reduce the generalizability of the study findings to other time periods or populations.

Biases that may influence the study outcomes include selection bias and response bias. Selection bias arises from the fact that not all migrant Hispanic farmworkers are represented in the dataset, especially those who may lack legal documentation or access to national health surveys. Response bias may occur if participants underreport or misreport their sun exposure habits or health conditions due to misunderstanding, stigma, or cultural perceptions about illness. These biases could influence the validity of the results.

To address these limitations, future research should consider longitudinal study designs that can observe changes in sun exposure and skin health over time, allowing for stronger causal inferences. Primary data collection that incorporates direct clinical assessments of skin conditions, detailed occupational histories, and the use of sun protection methods would enhance both construct and internal validity. Culturally sensitive data collection methods and outreach strategies should be employed to include hard-to-reach populations, such as undocumented farmworkers. Additionally, expanding the geographic and temporal scope of future studies would improve external validity and allow for more representative conclusions.

Despite these limitations, this study contributes important insights into the association between sun exposure, region of birth, and skin conditions among a vulnerable and underserved population. It provides a foundation for future research aimed at improving occupational health outcomes for migrant Hispanic farmworkers.

Significance

The significance of this this research aims to explore all the risk factors associated to the development of skin conditions linked to skin cancer for migrant Hispanic farmworkers as it continues to be recognized as a growing public health concern. Skin conditions such as skin cancer is a challenging health condition that is of a deteriorating economic burden to individuals and families.

This research addresses a critical gap in understanding the public health risks faced by migrant Hispanic farmworkers, specifically in relation to prolonged exposure to sunlight and the development of skin conditions such as skin cancer. These workers, who are essential to the agricultural sector in the U.S., are exposed to UV radiation due to the nature of their outdoor work, which significantly increases their risk of developing skin conditions. Despite this high level of risk, little attention has been paid to their specific circumstances, such as the lack of protective measures and barriers to accessing healthcare services (Castillo et al., 2021).

The study's significance lies in its contribution to creating awareness and driving public health initiatives tailored to this vulnerable group. The findings from this study can be used to inform the development of preventive strategies, such as implementing stronger occupational safety regulations and increasing access to healthcare services for migrant farmworkers. By shedding light on the socio-demographic and occupational factors that increase skin conditions linked to skin cancer risk, this research will help public health officials and policymakers better understand the unique challenges faced by this population and create more effective interventions to mitigate these risks.

Furthermore, it provides a foundation for future research into the broader health impacts of farm work on this demographic over an extended period of time.

Summary and Conclusions

Section 1 of this study explored the background, problem statement, purpose, research questions, hypotheses, and theoretical framework, as well as key variables and concepts relevant to the association between sun exposure and skin conditions linked to skin cancer among migrant Hispanic farmworkers. The study is grounded in the Social-ecological model, which examined how individual, community, and policy-level factors interact to affect health outcomes. The literature review highlighted that while sun exposure is a well-documented risk factor for skin conditions that contribute to skin cancer, the specific risks faced by migrant Hispanic farmworkers have not been adequately studied. Farmworkers are frequently exposed to harmful UV radiation due to their work environment, yet they often lack access to protective resources such as sunscreen and adequate clothing (Lagacé et al., 2023). The barriers to healthcare, including cultural and linguistic differences and fear of deportation, further exacerbate the situation, making it difficult for them to receive preventive care or early treatment.

Given the growing importance of farmworkers in ensuring food security in the U.S., it is essential to prioritize their health and safety. This study highlights the need for stronger public health policies, including preventive measures and improved healthcare access, to protect farmworkers from the harmful effects of sun exposure. By addressing the health disparities faced by migrant Hispanic farmworkers, this research can contribute

to reducing their risk of skin conditions linked to skin cancer and improving overall health outcomes in this critical workforce.

In the next section, section 2 of this study described the research study design and methodology for this study. This will include a brief introduction, research design and rationale, methodology, instrumentation and operationalization of concepts, data analysis plan, threats to validity, ethical procedures, and summary.

Section 2: Research Design and Data Collection

Introduction

The purpose of this study was to determine if there is an association between the length of time of exposure to sunlight (one hour and long term), region of birth, and skin conditions linked to skin cancer among migrant Hispanic farmworkers, exploring sociodemographic factors such as age, sex, and marital status. The secondary data was collected from the National Health Interview Survey (NHIS) Integrated Public Use Microdata (IPUMS). Data for independent and dependent variables for the survey questionnaire based on sociodemographic information, such as age, sex, marital status, region of birth, occupational history, effects of sun exposure history, specifically exploring length of time of sunlight exposure (one hour and long term), were collected. For the dependent variable, skin conditions details such as self-reported skin conditions linked to skin cancer were collected to analyze. The rest of this section, the research design and rationale, the methodology used, instrumentation and operationalization of concepts, data analysis plan, threats to validity, ethical procedures, and summary were discussed.

Research Design and Rationale

In this quantitative study, a cross-sectional research design was used to analyze the secondary data. The research questions are designed to examine the association between the length of time of exposure to sunlight (one hour and long term), region of birth, and skin conditions linked to skin cancer while exploring sociodemographic factors (i.e., age, sex, marital status, region of birth) among migrant Hispanic farmworkers. This

design allows for data collection from a population at a single point in time (Wang & Cheng, 2020). It also allows for a depiction of the association between the independent and dependent variables. According to Maier et al. (2023), a cross-sectional study enables researchers to examine and describe the occurrence or distribution of specific variables within a given population at a single point in time.

Additionally, the use of a cross-sectional research design inherently presents certain time and resource constraints. Cross-sectional studies involve analyzing data collected at a single point in time, which limits the ability to assess changes in variables or establish temporal relationships. In this study, data from the 2015 National Health Interview Survey (NHIS) were used, providing a snapshot of the conditions, exposures, and demographic characteristics of Hispanic migrant farmworkers during that year.

Consequently, the study does not capture seasonal variations in sun exposure or long-term health outcomes such as the progression of skin conditions over time. In terms of resources, cross-sectional designs are typically more cost-efficient than longitudinal studies, particularly when secondary data are utilized. However, the reliance on existing data limits control over the types of variables available, the specificity of measures related to sun exposure and health outcomes, and the sampling of subpopulations. Collecting primary data, such as conducting clinical assessments or field-based observations, was outside the scope of this research due to constraints in time, personnel, and funding. These limitations were mitigated by applying descriptive and exploratory analyses and by clearly acknowledging the study's restricted capacity to make causal inferences.

Methodology

The research methodology established for this study seeks to address the core questions that guide this study, which are framed in the examination of the previously stated research questions (RQs). To effectively tackle these questions, I identified two phases. In the first phase, I focused on understanding the length of time the population spends outside in the sunlight while farming. In the second phase, I will analyze the region of birth to determine how the region of birth is an indicator of developing skin conditions that contribute to skin cancer. In this section, the population will be examined for this study, the sampling and sampling procedures, and the sampling size and calculations will be described.

Study Population

Participants for this research study include 155 migrant Hispanic men and women who are farmworkers in the United States between January and December of 2015. All participants of the study are aged 18 years and up to 60 years, have experienced prolonged exposure to sunlight for one hour or more, and fall into the category of the specified region of birth at the time of the health survey and interview.

Sampling and Sampling Procedures

For this research study, publicly available secondary data were obtained from the National Health Interview Survey (NHIS) through the Integrated Public Use Microdata Series (IPUMS) database. The NHIS employs a multistage, stratified sampling strategy designed to produce nationally representative estimates of the noninstitutionalized U.S.

population. This rigorous sampling approach enhances the generalizability and reliability of the data, which are widely recognized and frequently used in public health research.

The focus of the current study is on individual-level risk factors, specifically the length of time exposed to sunlight and the region of birth, as they relate to the development of skin conditions linked to skin cancer. Inclusion criteria for this study consisted of individuals who self-identified as Hispanic and reported working in farming, fishing, or forestry occupations. Exclusion criteria included respondents who were not Hispanic, were not engaged in outdoor agricultural work, or lacked responses to key variables related to sun exposure or region of birth. The IPUMS database is publicly accessible and requires account creation to ensure secure access and proper tracking of data use. Datasets can be saved for future reference, although each saved extract expires within 72 hours, access can be easily renewed through the IPUMS portal. The NHIS and IPUMS are considered reputable data sources due to their robust methodology, consistent data collection practices, and frequent use in peer-reviewed epidemiological and public health research.

Sample Size and Power Calculations

Power calculation is a crucial aspect of experimental design and statistical analysis. Power calculation helps determine the likelihood of detecting an effect if it truly exists, given certain sample sizes and assumptions (Kemal, 2020). It involves factors like effect size, significance level, and sample size, and it helps researchers plan studies to ensure they have sufficient statistical power to detect significant effects.

G* Power has a significant importance in data analysis as it serves as a vigorous and adaptable tool for statistical power analysis, and it aids researchers in determining the sample size required to achieve adequate power for their study designs (Kemal, 2020). G*Power is used by researchers to determine the optimal sample size needed for their studies. By inputting parameters such as effect size, significance level, and desired power, researchers can use G*Power to calculate the sample size required to detect meaningful effects reliably (Kemal, 2020). It facilitates the optimization of experimental designs by allowing researchers to assess the impact of different factors on statistical power. Researchers can conduct sensitivity analyses to evaluate how variations in effect size and sample size influence statistical power, enabling them to refine their experimental designs accordingly.

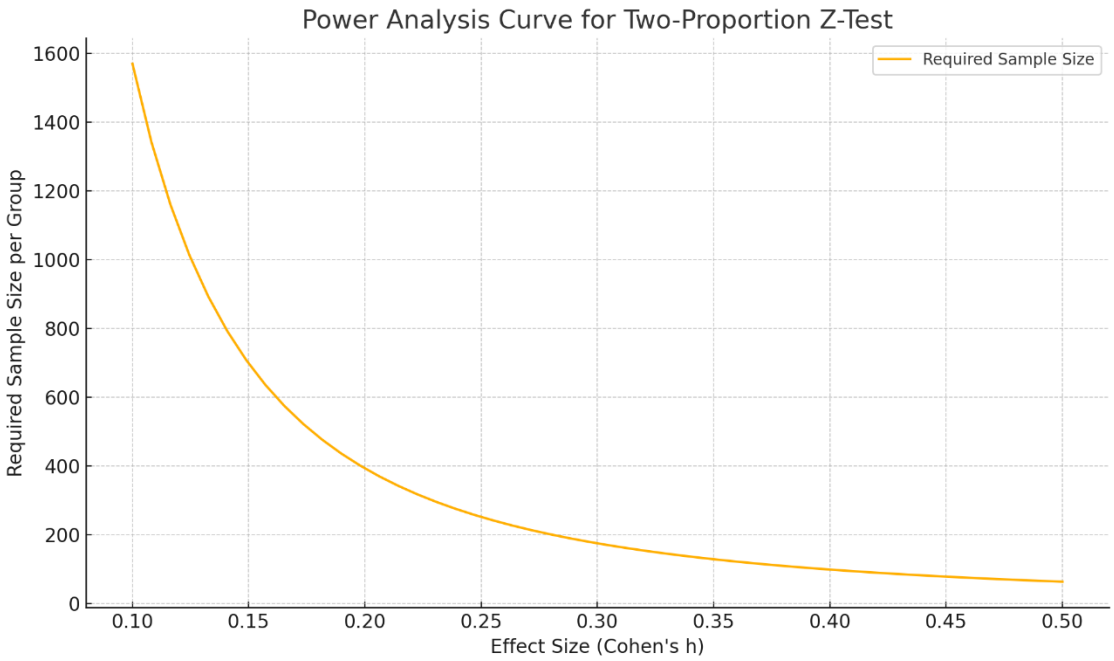
In addition, resource allocation is one significant value of G*Power as it provides researchers the avenue to make informed economic decisions about resource allocation by providing insights into the trade-offs between sample size, effect size, and statistical power (Kemal, 2020). By accurately estimating the sample size needed to achieve adequate power, researchers can allocate resources effectively and maximize the likelihood of detecting meaningful effects within their budget constraints. It is used to ensure that adequate statistical power is essential for producing reliable and replicable research findings. By using G*Power to conduct power analyses and validate sample size decisions, this study's quality and credibility will be enhanced. This, in turn, increases the likelihood of successful publication and dissemination of the research findings within the scientific community.

Overall, G*Power plays a crucial role in data analysis by allowing researchers to optimize their study designs, allocate resources efficiently, and produce reliable research findings with sufficient statistical power. Its versatility and user-friendly interface make it a crucial tool for researchers across various disciplines involved in experimental research (Kemal, 2020). The selected sample for this quantitative study includes migrant Hispanic farmworkers in the US between January 1, 2015, and December 31, 2015.

Power Calculation and Justification

Figure 2

Power Analysis Curve for Two Proportion Z-Test



To determine the appropriate sample size for this cross-sectional, observational study, a power analysis was conducted using the NormalIndPower module from the statsmodels Python library, which is suitable for estimating required sample sizes when

comparing two independent proportions. A two-tailed test was selected to reflect the exploratory nature of the analysis, where differences in either direction were of interest. An effect size of Cohen's h = 0.3 was used as the reference point, representing a moderate difference between proportions. This choice was based on Cohen's (1988) guidelines for interpreting effect size, where values of 0.2, 0.3, and 0.5 correspond to small, medium, and large effects, respectively. The selected effect size was considered appropriate given the expected variation in skin condition prevalence across regions of origin and levels of sunlight exposure. The alpha level was set at 0.05, the conventional threshold for statistical significance, which indicates a 5% probability of committing a Type I error. A statistical power level of 0.80 was selected, in line with established standards in public health research. This threshold reflects an 80% likelihood of detecting a true effect if one exists (Cohen, 1988).

Based on these parameters, the power analysis indicated that a sample size of approximately 88 to 150 participants per group would be required to detect a small to moderate effect (Cohen's h = 0.2 to 0.3). However, the actual number of Hispanic farmworkers included in the 2015 NHIS dataset was lower than these estimates, thereby limiting the statistical power of the study. This limitation underscores a constraint inherent in the use of secondary data for exploratory research. The power calculations and corresponding sample size curve were generated using the statsmodels (version 0.13.5) Python library. This tool is widely recognized and frequently used in epidemiological and clinical research for its reliability in estimating statistical power and required sample sizes (Seabold & Perktold, 2010).

Instrumentation and Operationalization of Concepts

This research is based on a publicly available secondary data from the NHIS (IPUMS) database analyzing the association between the length of time of exposure to sunlight (one hour and long term), region of birth and skin conditions linked to skin cancer while exploring variables of the sociodemographic (i.e., age, sex, marital status) among migrant Hispanic farmworkers. The NHIS (IPUMS) included the data collection exercises.

All variables in the study were measured rather than manipulated, given the observational, cross-sectional nature of the dataset. The independent variable, length of sun exposure, was measured using a self-reported survey item that asked respondents how many hours they typically spent in direct sunlight per day and what skin conditions they experienced based on their length of sun exposure. Responses were recorded in discrete hourly values and later categorized into groups, such as one hour and long-term exposure, to align with the research focus. The second independent variable, region of birth, was measured through a categorical variable indicating the respondent's place of birth. IPUMS recoded these responses into broader geographic regions, including Mexico, Central America, South America, and the Caribbean. This variable was analyzed on a nominal scale. The dependent variable, the presence of skin conditions linked to skin cancer, was measured using an ordinal response to questions asking about specific skin conditions developed after exposure to sunlight. In addition, the development of skin cancer was measured using a binary response to a question asking whether the respondent had ever been diagnosed with skin cancer (melanoma or non-melanoma). As this variable

was self-reported, it was treated as a dichotomous variable for analysis. Additional demographic control variables, such as age, sex, and marital status, were included to support descriptive and subgroup analyses. Age was measured in years and treated as a continuous variable, while sex and marital status were categorized and analyzed as nominal variables. All variables were coded according to IPUMS documentation. No composite scores or scales were calculated, as the variables were drawn directly from validated NHIS survey items and analyzed using their original categorical or continuous formats as defined in the dataset.

Study Variables

The objective of this study is to use the secondary data set obtained from previously mentioned database to examine if there are associations of length of time of exposure to sunlight (one hour and long term), region of birth and skin conditions linked to skin cancer among migrant Hispanic farmworkers while exploring the sociodemographic (i.e., age, sex and marital status). The independent variables are (a) age, (b) sex, (c) marital status, (d) length of time of exposure to sunlight (1 hour and long-term) and (e) region of birth. The age groups for study were coded as “1” for 18-35 years old, “2” for 36 to 45 and “3” for greater than or equal to 46 years old. (b) Sex was coded as “1” for male and “2” for female. (c) Marital status was coded as “1” or “yes” for married; married -spouse present; married- spouse not in household; married-spouse in household unknown; separated and “2” or “no” for never married; widowed; divorced; unknown marital status, and not in universe (NIU). (d) Length of time of exposure (in sun 1 hour effect on skin & in sun a long time, effect on skin) was coded as “1” or “Yes”

for get severe sunburn with blisters, have severe sunburn with peeling, burn mildly with some or no tanning, turn darker without sunburn, say that nothing would happen, get very dark & deeply tanned, moderately tanned, mildly tanned, only freckled or no suntan at all, and repeated sunburns and "2" or no effect was coded as "no" or "2" for NIU, do not go out in sun, unknown-refused, unknown-not ascertained, unknown-don't know, and other. (e) Region of birth was (global region of birth) was coded as "1" for United States; "2" as Mexico, Central America, Caribbean Islands and "3" for South America.

The dependent variable of this study is the development of skin conditions that contribute to skin cancer. Each response to development of a skin condition was coded as 1= Yes for get severe sunburn with blisters, have severe sunburn with peeling, burn mildly with some or no tanning, turn darker without sunburn, get very dark & deeply tanned, moderately tanned, mildly tanned, only freckled or no suntan at all, and repeated sunburns. Other severe skin conditions 2=no or negative effects or no effect, NIU, do not go out in sun, unknown-refused, unknown-not ascertained, unknown-don't know, and other. The additional variable analyzed was skin cancer. An individual was coded as "1" or "Yes" or "unknown/ascertain" if the person ever had skin cancer (melanoma or non-melanoma) and "2" or "no" or "not mentioned" if the person never had skin cancer (melanoma or non-melanoma).

Table 1

Operational Measures for key Independent and Dependent Variables

Variable	Description	Response category	Variable type
Age	The individual's age, in years at the time of development of skin conditions	18–85 years old 1=18-38 2=39-59 3=59-85	Ordinal
Sex	Sex at the time of the interview	1=male 2=female	Nominal
Marital status	Current Legal marital status at the time of the interview	1= Yes/Positive married-spouse present; married- spouse not in household; married-spouse in household unknown; separated 2=No/ never married; widowed; divorced; unknown marital status, and not in universe (NIU).	Nominal
Region of birth	Region of birth of Individuals identified as Mexicans/Central Americans/Caribbean Islanders	1 = US origin 2 = Mexico/Central America/Caribbean Islands	Nominal
Skin condition	The length of time exposed in sunlight exposure >1 hour: In sun 1 hour effect on skin In sun long time, effect on skin	1= Yes for get severe sunburn with blisters, have severe sunburn with peeling, burn mildly with some or no tanning, turn darker without sunburn, get very dark & deeply tanned, moderately tanned, mildly tanned, only freckled or no suntan at all, and repeated sunburns. Other severe skin conditions 2=no or negative effects or no effect, NIU, do not go out in sun, unknown-refused, unknown-not ascertained, unknown-don't know, and other.	Ordinal
Skin cancer development	Ever had skin cancer(melanoma) Ever had skin cancer (don't know what kind) Ever had skin cancer(non-melanoma)	1= "Yes" or "unknown/ascertain" if the person ever had skin cancer (melanoma or non-melanoma) and 2= "no" or "not mentioned" if the person never had skin conditions linked to skin cancer (melanoma or non-melanoma)	Nominal

Note. From Blewett, L. A., Drew, J. A. R., King, M. L., Williams, K. C. W., Chen, A., Richards, S., & Westberry, M. (2023). IPUMS Health Surveys: National Health Interview Survey (NHIS) (Version 7.3) [Dataset]. IPUMS. https://doi.org/10.18128/D070.V7.3

Data Analysis Plan

The purpose of this study was to explore the association between prolonged sun exposure, region of birth, and the incidence of skin conditions linked to skin cancer among migrant Hispanic farmworkers in the United States. The data for this analysis were drawn from the 2015 National Health Interview Survey (NHIS) Integrated Public Use Microdata [IPUMS] dataset, which offered comprehensive information on health status, demographic variables, and occupational factors relevant to this population. Given the vulnerability of farmworkers to occupational hazards, particularly harmful ultraviolet (UV) radiation from outdoor labor, a thorough quantitative analysis was necessary to identify key risk factors contributing to skin conditions linked to skin cancer development.

The IBM Statistical Package for Social Sciences (SPSS) Version 29 was utilized for data analysis. Both descriptive and inferential statistics were generated to provide an overview of the dataset and analyze the relationship between the dependent variable of skin conditions linked to skin cancer development and the independent variables, including age, sex, length of time of sun exposure, marital status, and region of birth.

Binomial logistic regression was used in the analysis due to its suitability for predicting a binary outcome, such as the presence or absence of skin conditions linked to skin cancer. This method is particularly beneficial when analyzing multiple independent variables simultaneously, as it allows for the control of confounding variables like age, sex, and marital status. By employing binomial logistic regression, the study was able to

assess the combined influence of these variables on skin conditions, providing a more comprehensive understanding of the potential interactions between them.

To conduct the analysis, it was essential to define and categorize the variables relevant to this study. The primary aim was to determine whether there was an association between the length of time exposure to sunlight (one hour and long term), region of birth, and the development of skin conditions linked to skin cancer among migrant Hispanic farmworkers, while examining how age, sex, and marital status served as confounding variables. This approach provided valuable insights into the risk factors associated with skin conditions linked to skin cancer in this population and guided recommendations for future public health interventions aimed at reducing these risks.

Research Questions and Hypotheses

Research Question 1 (RQ1): Is there a significant relationship between skin conditions based on length of time of exposure (1 hour vs long-term)?

Null Hypothesis two ($H_0 2$): There is no significant relationship between skin conditions based on length of time of exposure (1 hour vs long-term).

Alternate Hypothesis two ($H_A 2$): There is significant relationship between skin conditions based on length of time of exposure (1 hour vs long-term).

Research Question 2 (RQ2): Is there a significant relationship between region of birth and skin conditions among migrant Hispanic farmworkers after controlling for cofounding variables, including age, sex, and marital status?

Null Hypothesis one ($H_0$1): There is no significant association between region of birth and skin conditions among migrant Hispanic farmworkers after controlling for cofounding variables, including age, sex, and marital status.

Alternate Hypothesis one (H_A1): There is a significant association between region of birth and skin conditions among migrant Hispanic farmworkers after controlling for cofounding variables, including age, sex, and marital status.

Statistical Tests for the Study Outcome

For RQ1, the independent variable is the length of time of sunlight exposure (1 hour vs Long-term) and the dependent variable is skin conditions. The confounding variables are age, sex and marital status. A binary logistic regression was used to analyze and identify the predictor variable and skin conditions linked to skin cancer development. A chi-square test was used to determine if there is a statistically significant association between the length of time of exposure (>1 hour) and the dependent variable which was skin conditions that contribute to skin cancer. A descriptive analysis was conducted to provide basic summary about the sample and measures such as mean, median, and mode including measures of variability (range, variance, standard deviation), and finally to determine data distribution and identifying any patterns, trends or outliers. A p-value <0.05 indicated the null hypothesis was rejected.

For RQ2, the independent variable was the region of birth and co-founding variables were age, sex, and marital status. The dependent variable was skin conditions. A Chi-square test for independence was used to test the association between region of birth and skin conditions linked to skin cancer. A binary logistic regression was used to

determine the probability of developing skin conditions linked to skin cancer based on region of birth and the confounding variables (age, sex and marital status). A descriptive analysis was conducted to provide basic summary about the sample and measures such as mean, median, and mode including measures of variability (range, variance, standard deviation), and finally to determine data distribution and identifying any patterns, trends or outliers. A p-value <.05 indicated the null hypothesis was rejected.

Threats to Validity

Validity is a critical component of quantitative research, as it determines the accuracy and trustworthiness of study findings. It encompasses several domains, including internal validity, external validity, construct validity, statistical conclusion validity, and conclusion validity (Matthay & Glymour, 2020). Each type of validity reflects distinct aspects of research design and interpretation. Internal validity addresses the degree to which the observed relationship between independent and dependent variables reflects a true causal connection, free from the influence of confounding factors, selection bias, or measurement errors (Matthay & Glymour, 2020).

Construct validity pertains to how accurately the research variables are defined and measured. Statistical conclusion validity focuses on the appropriate use of statistical techniques and the reliability of conclusions drawn from data. These forms of validity are particularly relevant to the current study, given its reliance on cross-sectional, observational data

Due to the study's cross-sectional design, certain threats to internal validity are minimized while others remain. Threats such as history and maturation are not

applicable, as data were collected at a single point in time, removing the potential for time-related changes among participants. However, testing and instrumentation present more relevant concerns. Since the NHIS dataset relies on self-reported responses, differences in how participants interpret or recall information such as sun exposure or prior diagnoses may affect data accuracy.

To address this, the study relies on the NHIS survey, a standardized and nationally validated instrument that has been widely used and tested for reliability in public health research. Threats such as statistical regression and experimental mortality are minimal in this design. Statistical regression is typically associated with repeated measures or extreme scores moving toward the mean over time, which does not apply in this one-time data collection. Experimental mortality is also irrelevant due to the absence of longitudinal tracking. However, the potential for selection-related threats persists.

The NHIS sampling frame, while nationally representative, may not fully capture undocumented or transient migrant farmworkers. This introduces limitations in external validity and restricts the generalizability of findings to all members of the target population. Threats to construct validity are evident in how key variables were operationalized. For example, sunlight exposure was measured by asking respondents to estimate the number of hours spent in direct sunlight during a typical day. This measure does not account for variations in UV intensity, the use of protective clothing, or cumulative exposure over time. Similarly, region of birth was categorized broadly, limiting the ability to detect country-specific cultural or environmental differences. These

limitations were acknowledged in the study, and the operational definitions of variables were clearly explained to enhance transparency and interpretability.

Statistical conclusion validity is also challenged by the small sample size of Hispanic farmworkers within the 2015 NHIS dataset. This limited sample reduces the power of the analysis and increases the likelihood of a Type II error, which occurs when true relationships go undetected due to insufficient statistical sensitivity. To address this, a power analysis was conducted to estimate the required sample size and clarify the limitations posed by the actual dataset. Furthermore, descriptive and exploratory analyses were used to avoid overstating conclusions, and potential sources of bias, such as recall and selection bias, were explicitly recognized. These strategies contribute to a cautious and context-sensitive interpretation of the study's results.

By identifying and addressing these threats to validity, the study strengthens the overall credibility and rigor of its design, analysis, and conclusions. This process supports the reliability of findings and their potential contribution to the broader understanding of occupational health disparities among migrant Hispanic farmworkers.

Ethical Procedures

This study was conducted with ethical values as a foundational component. Ethics in research are essential for ensuring that participants' rights, welfare, and dignity are protected throughout the research process (Ali, 2023). In addition to safeguarding human subjects, ethical standards also promote the integrity and credibility of research findings, particularly in public health where vulnerable populations are often the focus.

This quantitative study utilized secondary data that were publicly available through the National Health Interview Survey (NHIS) Integrated Public Use Microdata Series (IPUMS). The NHIS is a national survey that is reviewed and approved by the Research Ethics Review Board of the National Center for Health Statistics (NCHS) and the United States Office of Management and Budget (CDC, 2022). The dataset is fully de-identified, and no personally identifiable information (PII) was included or accessible. All data shared through the IPUMS NHIS platform have been stripped of direct identifiers prior to public release. Therefore, the anonymity of participants is fully preserved, and the data meet the ethical criteria for non-human subjects' research.

Access to the NHIS IPUMS dataset required the creation of a personal user account on the IPUMS platform. As part of this process, the researcher was required to provide personal and institutional information, agree to the terms of data use, and submit the purpose of the study for review. This step ensured that all users accessing the data are held accountable for ethical data use. Upon approval, the requested datasets were made available for download in a secure manner. The data files were stored in a restricted user space within the IPUMS platform and expired automatically within seven days. This design feature limits long-term exposure or misuse of data and ensures that each access is logged and reviewed

Since the dataset was de-identified at the source, there were no identifiers present at any point during the research process. The removal of identifiers was conducted by the NCHS prior to making the data available through IPUMS. This includes removal of names, addresses, and any other personal information that could be traced back to

individual respondents. No attempt was made to re-identify participants. Only the principal investigator had access to the downloaded dataset, which was stored securely on a password-protected, encrypted institutional device. Data dissemination, if necessary, will only include aggregate, non-identifiable information. Consistent with ethical research practices, all downloaded data files will be deleted following the completion of the study and any related dissemination efforts.

Ethical Issues in Public Health Research

The design and conduct of public health research, particularly involving vulnerable populations such as migrant farmworkers, raises important ethical considerations. Two significant ethical issues relevant to this study include the potential for stigmatization and informed consent in secondary data use.

First, even though the dataset is de-identified, there is a potential ethical concern around stigmatization of specific populations based on health-related findings. For example, reporting a high prevalence of skin conditions among Hispanic farmworkers could unintentionally reinforce stereotypes or result in negative consequences if misinterpreted. To address this, results are presented with cultural sensitivity and contextualized within broader structural and occupational health disparities, avoiding any language that places blame on individuals or communities.

Second, while informed consent is typically not required for use of public, de-identified secondary data, it remains an ethical obligation to ensure that the original data collection process involved voluntary participation. The NHIS obtains oral consent from all participants prior to data collection (CDC, 2022). Additionally, the public release of

the data complies with federal privacy laws and ethical research standards, and researchers accessing the dataset must agree to terms of use that restrict any unethical application of the data.

In summary, this study adheres to ethical principles by ensuring secure access to publicly available, de-identified data, maintaining confidentiality throughout the research process, and recognizing the broader ethical implications of working with health data related to historically underserved populations. These measures align with the principles of respect for persons, beneficence, and justice in research.

Summary

The goal of this research study is to determine if there is an association between prolonged exposure to sunlight, region of birth and skin conditions linked to skin cancer exploring social demographics such as age, sex, marital status, as other independent variables among migrant Hispanic farmworkers in the United States. I conducted a retrospective, quantitative study using a cross-sectional design. I utilized secondary data publicly available from National Health Interview Survey (NHIS) Integrated Public Use Microdata [IPUMS], focusing on migrant Hispanic men and women who identified as farmworkers between January 2015 and December 2015.

In this section, 2 provided a comprehensive detail on the research methods and design applied for this study. The study methodology comprised of descriptions of the study populations, participants and the sampling methods for data collection. I explained the sample size and power calculation using G* Power. I discussed each variable's operationalization which comprises of level of measurement, response categories and

descriptions. The research questions and hypotheses were clearly stated, along with a thorough explanation of the statistical methods applied to address them, including the software utilized for data analysis. Possible threats to validity were identified, as well as the strategies implemented to strengthen conclusion validity. Ethical procedures related to accessing secondary data were described. The following section will present and interpret the study's results and findings.

Section 3: Presentation of the Results and Findings

Introduction

This section presents the results and findings of the study, focusing on examining the association between the length of time of sunlight exposure, region of birth, and the presence of skin conditions linked to skin cancer among migrant Hispanic farmworkers, while controlling for age, sex, and marital status. The purpose of this quantitative study was to determine whether there is an association between the length of time of sun exposure, region of birth, and the development of skin conditions linked to skin cancer among migrant Hispanic farmworkers in the United States. In addition, the study examined how sociodemographic factors such as age, sex, and marital status relate to these conditions. The study uses secondary data from the 2015 NHIS (IPUMS) to analyze the risk factors associated with skin conditions in this population. This study aimed to provide valuable insights into the association between prolonged sunlight exposure and skin conditions linked to skin cancer among migrant Hispanic farmworkers, focusing on the role of socio-demographic factors such as age, sex, marital status, and region of birth.

Research Questions and Hypotheses

The following two research questions guided this study.

Research Question 1 (RQ1): Is there a significant relationship between skin conditions based on length of time of exposure (1 hour vs long-term) among migrant Hispanic farmworkers after controlling for cofounding variables, including age, sex, and marital status??

Null Hypothesis 1 ($H_0$1): There is no significant relationship between skin conditions based on length of time of exposure (1 hour vs long-term) among migrant Hispanic farmworkers after controlling for cofounding variables, including age, sex, and marital status.

Alternate Hypothesis one (H_A1): There is significant relationship between skin conditions based on length of time of exposure (1 hour vs long-term) among migrant Hispanic farmworkers after controlling for cofounding variables, including age, sex, and marital status

Research Question 2 (RQ2): Is there a significant relationship between region of birth and skin conditions among migrant Hispanic farmworkers after controlling for cofounding variables, including age, sex, and marital status?

Null Hypothesis two ($H_0$2): There is no significant association between region of birth and skin conditions among migrant Hispanic farmworkers after controlling for cofounding variables, including age, sex, and marital status.

Alternate Hypothesis two (H_A2): There is a significant association between region of birth and skin conditions among migrant Hispanic farmworkers after controlling for cofounding variables, including age, sex, and marital status.

Section 3 begins with an overview of the analytical process and details how data from the National Health Interview Survey (NHIS), accessed through the Integrated Public Use Microdata Series (IPUMS), were obtained and prepared for statistical analysis. This section provides a description of the demographic characteristics of the study sample and outlines any deviations from the original research plan, including the

unavailability of direct skin cancer variables and the use of broad regional categories for place of birth. The section continues by addressing the statistical assumptions necessary for the analyses and presents the results from both descriptive and inferential statistical procedures, including chi-square tests and logistic regression analyses. Each research question is addressed individually, with findings supported by test statistics, p-values, and appropriate interpretations. Section 3 concludes with a summary of the key results and serves as a transition to Section 4, which will discuss the implications of these findings for public health practice and social change

Accessing the Data Set for Secondary Analysis

Timeframe of Data Collection

The data used for this research study were obtained from the 2015 IPUMS NHIS database. The dataset was accessed for secondary analysis through a systematic process that involved obtaining the necessary permissions and ensuring compliance with ethical standards. The 2015 data, which originally served different research purposes, was made available for secondary analysis through a data repository that archives large-scale survey data, the National Health Interview Survey (NHIS) Integrated Public Use Microdata (IPUMS).

To begin, the dataset was identified as a suitable source of information for my research on the association between sunlight exposure, region of birth, and skin conditions linked to skin cancer among Hispanic farmworkers. This was due to the dataset containing all the variables needed for the study. Once the dataset was identified, I submitted a request to access the data. This process typically involves account creation,

although the documentation is freely available. However, to download a customized data extract, users must agree to specific conditions for responsible use. Upon approval of the data access request, I received the dataset, which was anonymized to protect the privacy and confidentiality of the participants. The data were then carefully reviewed to assess their suitability for answering the specific research questions of my study. This involved an in-depth examination of the variables available in the dataset, particularly those related to participants' occupation, sun exposure status, skin health, and region of birth.

Given that the dataset was not originally designed to study skin conditions linked to skin cancer among Hispanic farmworkers, certain limitations became apparent during this review process, as discussed in the limitations section. Despite these limitations, the dataset provided a valuable opportunity to explore associations between sun exposure and skin conditions that contribute to skin cancer, albeit within the constraints of the available data. The secondary analysis was conducted following standard statistical procedures, with careful consideration given to the dataset's limitations and how they might impact the study's findings. Throughout this process, all analyses were performed in accordance with the ethical guidelines for secondary data analysis, ensuring that the research was conducted responsibly and with respect for the original participants' contributions.

Discrepancies from Original Research Plan

The research design outlined in Section 2 aimed to explore the association between prolonged sun exposure, region of birth, and the development of skin conditions linked to skin cancer among migrant Hispanic farmworkers. However, during the implementation phase using the 2015 National Health Interview Survey (NHIS) data

accessed via the Integrated Public Use Microdata Series (IPUMS), certain discrepancies emerged. The first discrepancy pertained to the availability of a direct measure for skin cancer diagnosis. While the original research plan anticipated utilizing self-reported responses to identify cases of skin cancer, no respondents within the filtered dataset of Hispanic farmworkers reported such a diagnosis. Consequently, the study employed the presence of skin conditions associated with skin cancer as an alternative outcome variable. This adaptation aligns with established practices in secondary data analysis, where researchers often adjust variables to reflect the closest measurable proxy when original constructs are unavailable (Cheng & Phillips, 2014).

A second discrepancy involved the structure of the region of birth variable. The initial plan intended to examine country-specific differences in relation to sun exposure and skin condition prevalence. However, the IPUMS NHIS dataset grouped respondents into broader geographic regions such as Mexico, Central America, South America, and the Caribbean. This limitation reduced the specificity of the analysis and prevented a more detailed exploration of cultural or environmental factors unique to specific countries of origin. Such challenges are common in secondary analyses, where researchers are constrained by the granularity of existing data structures (Johnston, 2014).

Despite these discrepancies, the study maintained alignment with its overall research questions and theoretical framework. Adjustments were made transparently and ethically, preserving the integrity of the research process. This adjustment allowed for the analysis to proceed with a change from analyzing skin cancer to skin conditions linked to

skin cancer but the lack of specificity in geographic data limited the precision of the results.

Missing Data and Variable Grouping

This study did not encounter missing data in the variables selected from the 2015 National Health Interview Survey (NHIS), accessed through the Integrated Public Use Microdata Series (IPUMS). All variables required for the analysis, including length of sun exposure, region of birth, skin condition status, age, sex, and marital status, were complete and available for all respondents who met the inclusion criteria. As such, no data imputation or exclusion for missing responses was necessary. This level of completeness is a noted strength of well-maintained secondary datasets, which are often designed to support large-scale population-level research (Johnston, 2014).

However, a noteworthy limitation involved the structure of the region of birth variable within the IPUMS dataset. Rather than capturing specific countries of origin, the dataset grouped respondents into broader geographic regions such as Mexico, Central America, South America, and the Caribbean. This grouping limited the ability to examine country-specific cultural or environmental differences that may influence sun exposure patterns, health behaviors, or skin cancer risk. Such limitations are common in secondary data analysis, where researchers are constrained by the existing structure and scope of the dataset rather than having the ability to design customized data collection instruments (Cheng & Phillips, 2014). Although this issue did not represent missing data in the conventional sense, it restricted the level of analytical detail available for understanding nuanced regional variations. This limitation was acknowledged in the interpretation of

results and is addressed in the discussion of the study's findings and implications for future research.

Descriptive and Demographic Characteristics of the Sample

Descriptive statistics and frequency tables were employed to assess the demographic characteristics of the participants, as shown in Table 1. A total of 155 survey responses from the participants were included in the analysis for this study. The age range of the participants spanned from 18 to 65+, with 50% (n=78) identifying as middle-aged, 34% (n=53) as young adults, and 15% (n=24) as elderly or seniors. Sex distribution revealed that 38% of participants identified as female, while 62% identified as male. Regarding region of birth, 73% of participants identified their birthplace as Mexico, Puerto Rico, the Caribbean, or Central America, while 27% did not respond. In terms of nationality and ethnicity, 87% of participants identified as Mexican, 4.5% as Central or South American, 3.2% as "Other Hispanic," 3.2% as Puerto Rican, and 1.9% as Mexican American. All participants (100%) identified as Latinx. Marital status distribution showed that 68% of participants were married, while 32% were single or unmarried.

In a separate analysis, descriptive statistics and frequency tables were used to calculate outcomes related to sunlight exposure, which was categorized by participants' reported effects on the skin. The categories included sunburn, rashes, blisters, peeling, tanning, darker skin, freckles, or no effect. Responses to the effects of one-hour sun exposure showed that 64.52% of participants experienced mild effects, 24.52% reported no effect, 5.16% had no sun exposure, and 5.81% did not respond. For long-term

exposure (one hour and long term), 40.6% of participants reported extreme effects, 20.6% reported mild effects, 32.9% did not respond, 0.6% reported no effect, and 5.2% had no sun exposure. These results indicate a significant variance in the participants' responses to sun exposure, both short-term and long-term, with a considerable proportion reporting extreme effects from prolonged exposure.

External Validity

In this study, data were drawn from the 2015 National Health Interview Survey (NHIS), a nationally representative dataset that uses a multistage probability sampling design to capture the civilian, noninstitutionalized population of the United States. However, while the overall NHIS dataset is representative at the national level, the analytic sample for this study was intentionally restricted to Hispanic respondents who reported working in farming, fishing, or forestry occupations and met the inclusion criteria relevant to migrant farmworkers. This narrower subset reflects a form of nonprobability sampling with respect to the specific target population, migrant Hispanic farmworkers. As a result, the sample may not fully reflect the broader demographic, geographic, and occupational diversity of the national migrant farmworker population, particularly those who are undocumented, transient, or less likely to participate in large national surveys (Moyce & Schenker, 2018). These limitations affect the generalizability of the findings and suggest that conclusions should be interpreted with caution when applied to populations beyond those captured in the dataset. Despite these limitations, the use of a large, nationally recognized dataset such as NHIS supports the study’s internal validity and provides valuable insights into health patterns within the sampled group. The

study findings contribute to the existing literature by identifying potential associations that may warrant further investigation using more targeted, community-based sampling methods to improve external validity.

Results

Descriptive Statistics

A total of 155 participants responded to the survey. The survey was fully completed by all the participants.

Demographics

A majority of participants originated from Mexico (*n* = 135, 87.10%). The sample consisted of 96 males (61.94%) and 59 females (38.06%). Approximately half of the sample was middle-aged (*n* = 78, 50.32%). A majority of the sample was married (*n* = 105, 67.74%). Table 1 presents the frequencies and percentages of the demographic variables. Bar charts for the demographic variables are presented in Figures 1-4.

Table 2

Frequencies and Percentages for Demographics

Variable	*n*	*%*
Region of birth		
Mexico	135	87.10
Central or South America	7	4.52
Other	13	8.39
Sex		
Male	96	61.94
Female	59	38.06
Age		
Young	53	34.19
Middle-aged	78	50.32
Senior	24	15.48
Marital Status		
Single	50	32.26
Married	105	67.74

Figure 3

Bar Chart for Region of Birth.

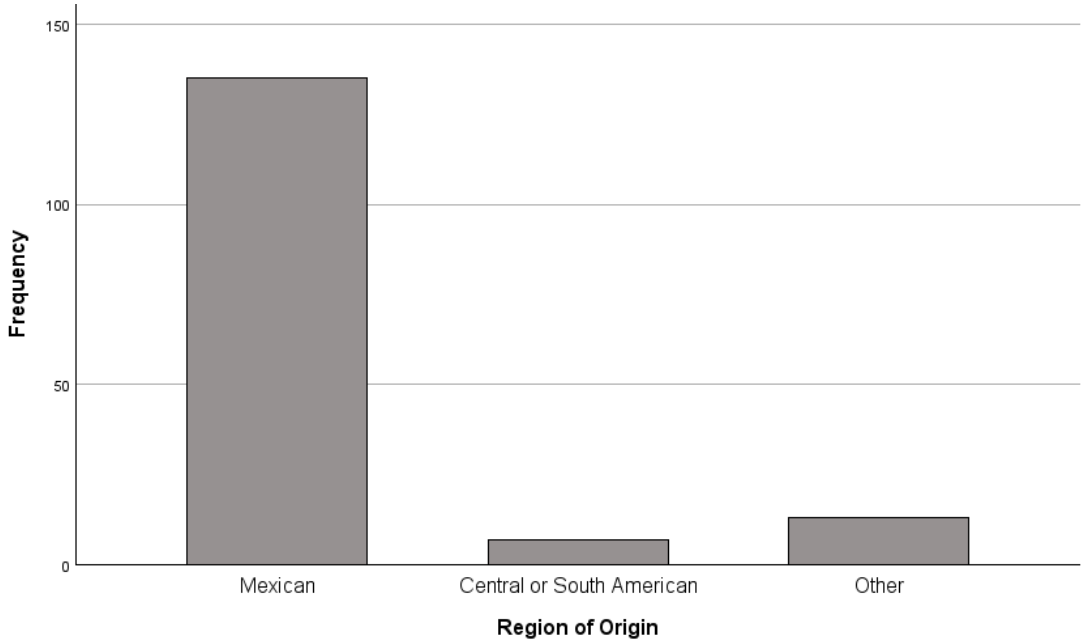


Figure 4

Bar Chart for Sex

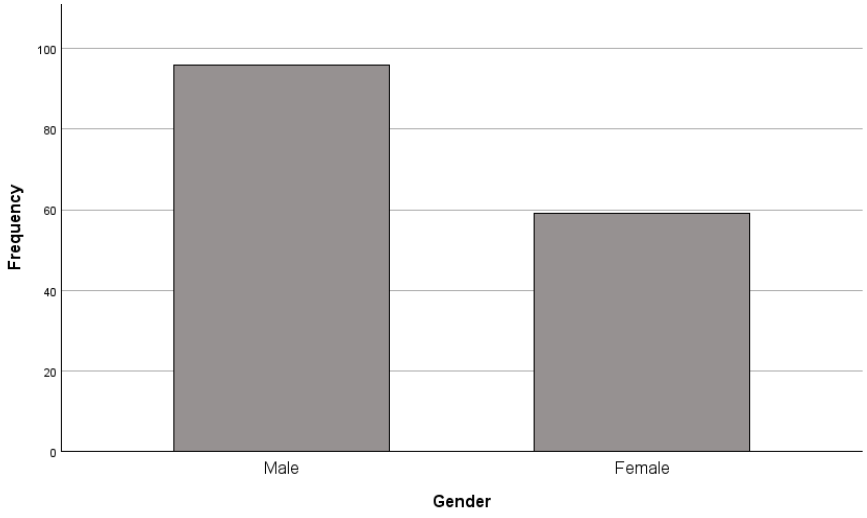


Figure 5

Bar Chart for Age

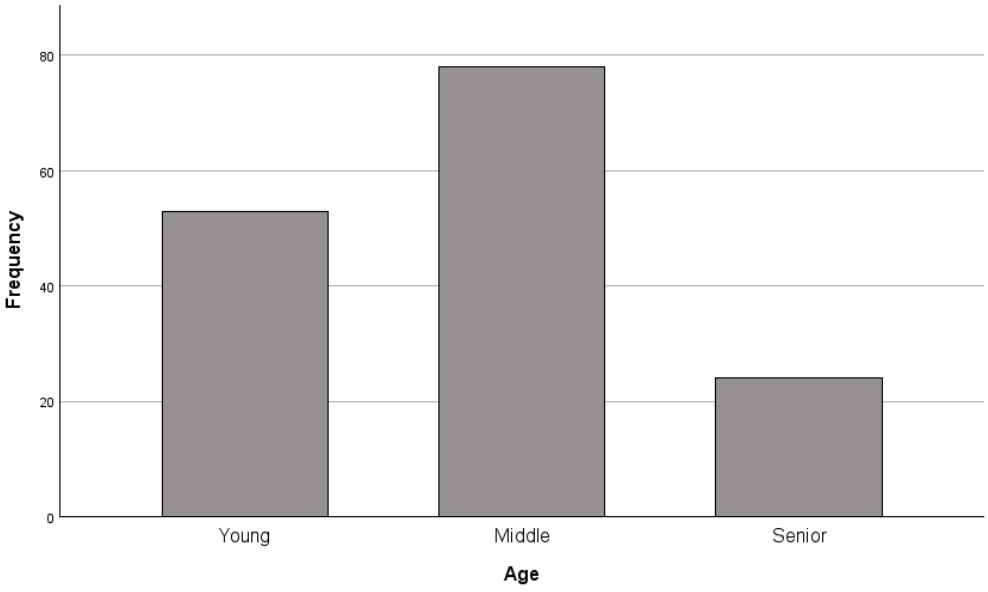
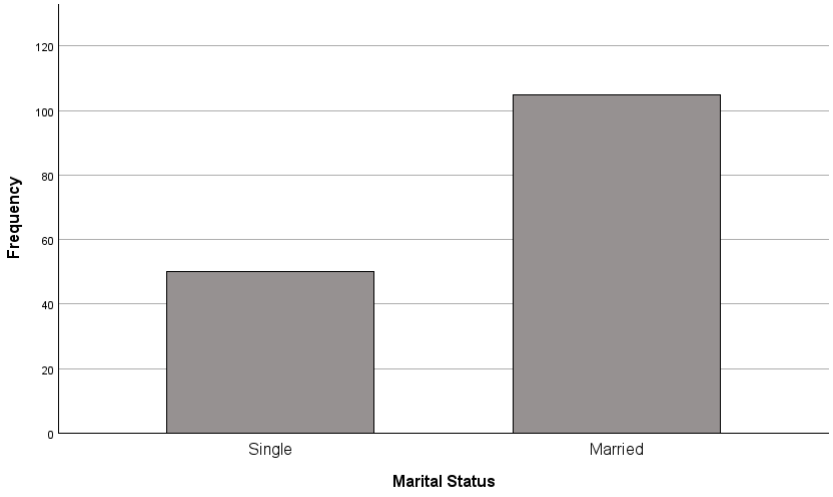


Figure 6

Bar Chart for Martial Status



Impact of Sun Exposure

Most participants indicated that they had a mild effect from sun exposure for one hour (n = 100; 64.52%). For long-term sun exposure, participants indicated no effect (n = 60, 38.71%), mild effect (n = 32, 20.65%), and extreme effect (n = 63, 40.65%). No participants were diagnosed with skin cancer. Table 2 presents the frequencies and percentages for sun exposure impact. Figures 6 and 7 present bar charts for sun exposure impact.

Table 3

Frequencies and Percentages for Sun Exposure Impact

Variable	*n*	*%*
Sun exposure impact (1 hour)		
No effect	55	35.48
Mild effect	100	64.52
Sun exposure impact (long-term)		
No effect	60	38.71
Mild effect	32	20.65
Extreme effect	63	40.65
Skin cancer		
Yes	0	0.00
No	155	100.00

Figure 7

Bar Chart for Sun Exposure Impact (1 hour)

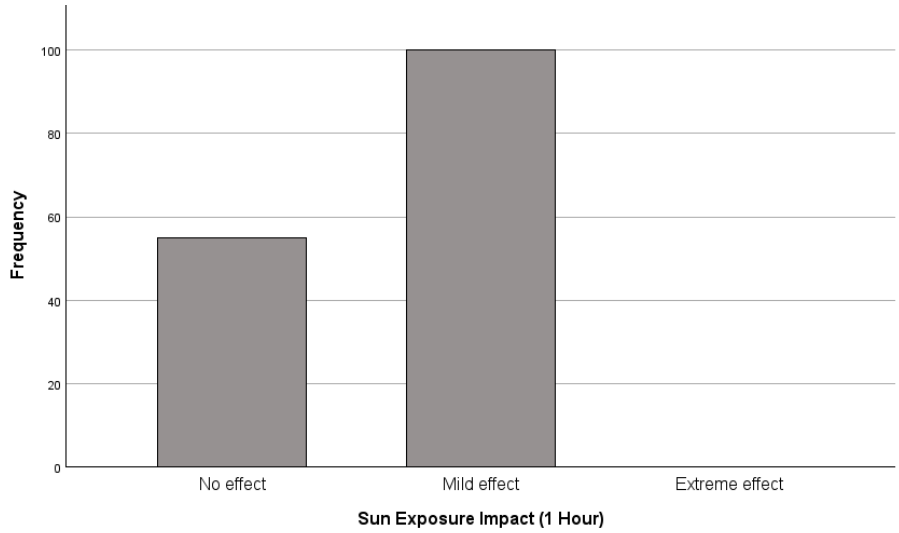
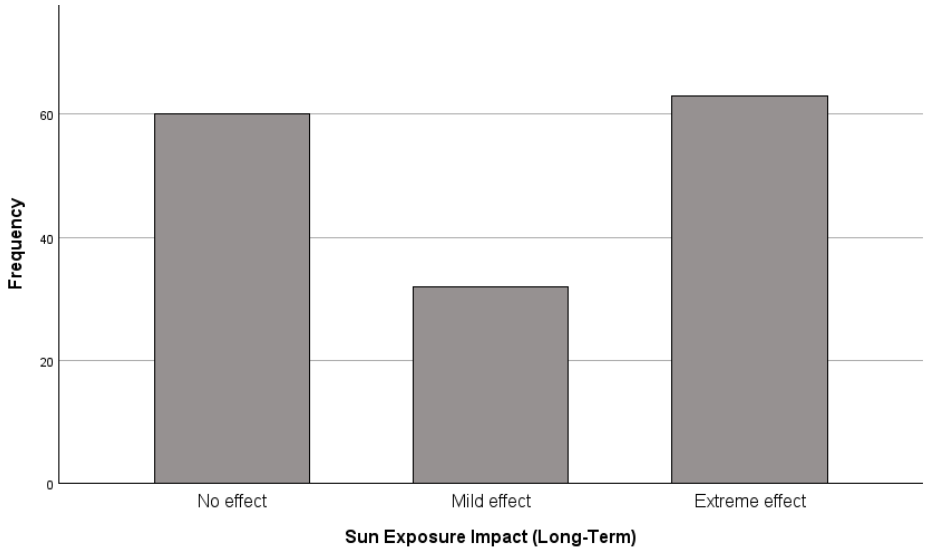


Figure 8

Bar Chart for Sun Exposure Impact (long-term)



Inferential Analysis

The study was guided by the following research questions:

Research Question 1 (RQ1): Is there a significant relationship between skin conditions based on length of time of exposure (1 hour vs long-term)?

Null Hypothesis one ($H_0 1$): There is no significant relationship between skin conditions based on length of time of exposure (1 hour vs long-term).

Alternate Hypothesis one ($H_A 1$): There is significant relationship between skin conditions based on length of time of exposure (1 hour vs long-term).

To address research question one**,** a chi-square test of independence was conducted to analyze the relationship between skin conditions for participants who experienced 1 hour vs long-term sun exposure. The findings of the chi-square test were statistically significant ($\chi^2(2) = 19.19$, $p < .001$), indicating that there were significant differences in skin conditions based on length of time of exposure. A total of 49 participants who indicated a mild effect for 1 hour of sun exposure also indicated an extreme effect for long-term sun exposure. A total of 14 participants who indicated no effect for 1 hour of sun exposure also indicated an extreme effect for long-term sun exposure. Table 4 presents the findings of the chi-square tests.

Table 4

Chi-Square Tests for Skin Conditions Based on Length of Time of Exposure

	Sun Exposure Impact (1 Hour)			
Variable	No effect	Mild effect	χ^2	*p*
Sun Exposure Impact (Long-term)			19.19	<.001
No Effect	34 (61.8%)	26 (26.0%)		
Mild Effect	7 (12.7%)	25 (25.0%)		
Extreme Effect	14 (26.5%)	49 (49.0%)		
Total	55 (100.0%)	100 (100.0%)		

Research Question 2 (RQ2): Is there a significant relationship between region of birth and skin conditions among migrant Hispanic farmworkers after controlling for cofounding variables, including age, sex, and marital status?

Null Hypothesis one ($H_0$2): There is no significant association between region of birth and skin conditions among migrant Hispanic farmworkers after controlling for cofounding variables, including age, sex, and marital status.

Alternative Hypothesis one (H_A2): There is a significant association between region of birth and skin conditions among migrant Hispanic farmworkers after controlling for cofounding variables, including age, sex, and marital status.

Chi-Square Tests for Sun Exposure Impact (1 Hour).

The cross-tabulations of region of birth, age, sex, and marital status with sun exposure impact for 1 hour are presented in Table 6. None of the chi-square tests were statistically significant at the $\alpha = .05$ level, indicating that region of birth, age, sex, and marital status were not significantly related to sun exposure impact for one hour.

Table 5

Chi-Square Tests for Demographics with Sun Exposure Impact (1-Hour)

Variable	Sun Exposure Impact (1 Hour)		χ^2	*p*
	No effect	Mild effect		
Region of birth			2.31	.315
Mexican	48 (87.27%)	87 (87.00%)		
Central or South American	4 (7.27%)	3 (3.00%)		
Other	3 (5.45%)	10 (10.00%)		
Total	55 (100.00%)	100 (100.00%)		
Age grouped			3.41	.182
Young	15 (27.27%)	38 (38.00%)		
Middle	28 (50.91%)	50 (50.00%)		
Senior	12 (21.82%)	12 (12.00%)		
Total	55 (100.00%)	100 (100.00%)		
Sex			1.12	.289
Male	31 (56.36%)	65 (65.00%)		
Female	24 (43.64%)	35 (35.00%)		
Total	55 (100.00%)	100 (100.00%)		
Marital status			1.37	.242
Single	21 (38.18%)	29 (29.00%)		
Married	34 (61.82%)	71 (71.00%)		
Total	55 (100.00%)	100 (100.00%)		

Binary Logistic Regression for Sun Exposure Impact (1-Hour)

A binary logistic regression was conducted with region of birth, age, sex, and marital status predicting sun exposure impact for 1 hour. Due to the nominal nature of the predictors, the variables were dummy-coded prior to entry into the regression model. The overall binary logistic regression model was not statistically significant, $\chi2(6) = 8.97$, $p = .175$, indicating that region of birth, age, sex, and marital status did not significantly predict sun exposure impact for 1 hour. In addition, none of the individual predictors were statistically significant in the model. Table 7 summarizes the results of the regression model.

Table 6

Binary Logistic Regression with Region of birth, Age, Sex, and Marital Status Predicting Sun Exposure Impact for 1 Hour

Variable	*B*	*SE*	χ^2	*p*	*OR*
Region of birth (reference group: Mexican)					
Central or South America	-0.96	0.80	1.46	.227	0.38
Other	0.74	0.70	1.11	.292	2.09
Age (reference: Young)					
Middle aged	-0.54	0.41	1.75	.186	0.58
Senior	-1.03	0.52	3.85	.050	0.36
Sex (reference: Male)					
Female	-0.31	0.35	0.78	.377	0.73
Marital status (reference: Single)					
Married	0.55	0.38	2.09	.149	1.74

Note. Overall model fit: $\chi^2(6) = 8.97$, $p = .175$

Chi-Square Tests for Sun Exposure Impact (Long-Term)

The cross-tabulations of region of birth, age, sex, and marital status with sun exposure impact for long-term are presented in Table 8. None of the chi-square tests were statistically significant at the $\alpha = .05$ level, indicating that region of birth, age, sex, and marital status were not significantly related to skin conditions development for long-term sun exposure.

Table 7

Chi-Square Tests for Demographics with Sun Exposure Impact (Long-Term)

	Sun Exposure Impact (Long-Term)				
Variable	No effect	Mild effect	Extreme effect	χ^2	*p*
Region of birth				4.39	.356
Mexican	51 (85.00%)	27 (84.38%)	57 (90.48%)		
Central or South American	2 (3.33%)	1 (3.12%)	4 (6.35%)		
Other	7 (11.67%)	4 (12.50%)	2 (3.17%)		
Total	60 (100.00%)	32 (100.00%)	63 (100.00%)		
Age grouped				4.51	.341
Young	16 (26.67%)	10 (31.25%)	27 (42.86%)		
Middle	32 (53.33%)	18 (56.25%)	28 (44.44%)		
Senior	12 (20.00%)	4 (12.50%)	8 (12.70%)		
Total	60 (100.00%)	32 (100.00%)	63 (100.00%)		
Sex				1.16	.561
Male	34 (56.67%)	21 (65.62%)	41 (65.08%)		
Female	26 (43.33%)	11 (34.38%)	22 (34.92%)		
Total	60 (100.00%)	32 (100.00%)	63 (100.00%)		
Marital Status				0.66	.718
Single	21 (35.00%)	11 (34.38%)	18 (28.57%)		
Married	39 (65.00%)	21 (65.62%)	45 (71.43%)		
Total	60 (100.00%)	32 (100.00%)	63 (100.00%)		

Multinomial Logistic Regression for Sun Exposure Impact (Long-Term)

A multinomial logistic regression was conducted with region of birth, age, sex, and marital status predicting sun exposure impact for long-term. The overall multinomial logistic regression model was not statistically significant, $\chi^2(6) = 8.97$, $p = .175$, indicating that region of birth, age, sex, and marital status did not significantly predict sun exposure impact for long-term. In addition, none of the individual predictors were statistically significant in the model. Table 9 summarizes the results of the regression model.

Table 8

Multinomial Logistic Regression with Region of birth, Age, Sex, and Marital Status Predicting Sun Exposure Impact for Long-Term

Variable	Long-Term Sun Exposure Impact*	*B*	*SE*	χ^2	*p*	*OR*
Region of birth (reference group: Mexican)						
Central or South America	Mild	-0.06	1.25	0.00	.964	0.94
Other	Mild	0.06	0.68	0.01	.927	1.06
Age (reference: Young)						
Middle aged	Mild	-0.12	0.52	0.05	.824	0.89
Senior	Mild	-0.61	0.71	0.74	.389	0.54
Sex (reference: Male)						
Female	Mild	-0.36	0.46	0.61	.433	0.70
Marital status (reference: Single)						
Married	Mild	0.01	0.49	0.00	.990	1.01
Region of birth (reference group: Mexican)						
Central or South America	Extreme	0.53	0.90	0.35	.552	1.70
Other	Extreme	-1.31	0.84	2.46	.117	0.27
Age (reference: Young)						
Middle aged	Extreme	-0.76	0.43	3.08	.079	0.47
Senior	Extreme	-0.97	0.57	2.92	.087	0.38
Sex (reference: Male)						
Female	Extreme	-0.33	0.38	0.74	.388	0.72
Marital status (reference: Single)						
Married	Extreme	0.39	0.42	0.88	.349	1.48

Note. Overall model fit: $\chi^2(12) = 11.30$, $p = .503$ *****Reference category for outcome variable – long-term sun exposure impact – was no effect.

Overall, a series of chi-square tests and logistic regressions were utilized to examine the relationships between region of birth, age, sex, and marital status with sun exposure impact (1 hour and long-term) to further examine the data.

Summary

Based on these findings, the results of this study indicated a significant association between the duration of sunlight exposure and the incidence of skin conditions. The binomial logistic regression analyses showed that either exposure for one

hour or prolonged exposure beyond one hour demonstrated a statistically significant relationship with skin conditions linked to skin cancer risk. Although the biological effects of sunlight on the skin are well-established, the findings suggest that duration alone may not be a key determinant of skin conditions linked to skin cancer within the studied population. Other factors, such as cumulative exposure over time, genetic predisposition, or intensity of exposure, may play a more influential role.

Additionally, the study found no significant association between region of birth and skin conditions linked to skin cancer risk. Despite controlling for age, sex, and marital status, the analysis did not reveal a significant relationship. A major limitation was the dataset's lack of specific country-level data, which restricted the ability to assess regional impacts with precision. This suggests that broader geographic classifications may not adequately capture potential variations in skin conditions linked to skin cancer risk. Future research with more detailed country or regional data may provide a clearer understanding of how geographic background influences skin conditions linked to skin cancer risk.

In summary, in Section 3, the study presented the results and findings of the analysis. The chapter also discussed how the dataset was accessed for secondary analysis, detailed the process of cleaning and preparing the data, and described the statistical methods used. Additionally, it addressed discrepancies observed from the original research plan, such as limitations in the available variables and the unexpectedly low number of skin cancer cases among Hispanic farmworkers, which impacted the study's ability to detect meaningful associations.

Section 4 explores ways the study's findings can inform public health practice, contribute to professional development, and support meaningful social change. It highlights the need for improved awareness, culturally tailored education, and preventive strategies to protect migrant farmworkers.

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

Introduction

Prolonged exposure to ultraviolet (UV) radiation from the sun is a leading risk factor for skin conditions that contribute to skin cancer. Skin conditions are one of the most common predictors of cancer worldwide (CDC, 2022). Migrant Hispanic farmworkers, a key labor force in U.S. agriculture, are particularly vulnerable to skin conditions due to the nature of their outdoor work, which often involves extended exposure to sunlight. This study focused on examining the association between the length of time of sun exposure, region of birth, and skin conditions among migrant Hispanic farmworkers. Despite the clear link between UV exposure and skin conditions that contribute to skin cancer, there is a notable lack of research specifically addressing this demographic. Factors such as limited access to healthcare, socioeconomic challenges, and inadequate protective measures further exacerbate their vulnerability. This research aimed to fill this gap by examining how these factors intersect, contributing to better preventive strategies and public health interventions. Through quantitative analysis of secondary data from the 2015 National Health Interview Survey (NHIS) Integrated Public Use Microdata (IPUMS), this study explored how social demographics and environmental factors influence skin conditions in this population.

Interpretation of the Findings

This research aimed to explore the association between prolonged sunlight exposure, region of birth, and the development of skin conditions among migrant Hispanic farmworkers. The data analysis was conducted using the 2015 National Health

Interview Survey (NHIS) Integrated Public Use Microdata (IPUMS) database, which provided a valuable, though limited, set of secondary data. Four research questions were explored: first, whether there was an association between length of time of sun exposure (1 hour vs long-term) and skin conditions; second, whether there was an association between region of birth and skin conditions; thirdly, whether there was an association between the length of sun exposure (>1 hour) and skin cancer; and lastly, whether there was an association between region of birth and skin cancer while controlling for confounding variables such as age, sex, and marital status.

The descriptive statistics were used to analyze all the research questions. It confirmed that participants experienced negative effects from sun exposure, with a significant proportion reporting skin conditions such as sunburn, rashes, blisters, tanning, and other extreme symptoms. The inferential statistical analysis provided support for the alternative hypotheses that prolonged sun exposure was significantly associated with the development of skin conditions linked to skin cancer in this population, as explained in research question 1. As a result, the alternative hypothesis for research question 1 was supported by the data. On the other hand, there was no significant association between region of birth and the development of skin condition, as explained in research question two.

This outcome was surprising given the extensive literature that supports a clear association between prolonged exposure to ultraviolet (UV) radiation and the development of skin cancer, particularly among outdoor laborers such as farmworkers. Previous studies, such as those by Slavinsky et al. (2023) and Kearney et al. (2023),

indicated that farmworkers, especially those with Hispanic backgrounds, are at higher risk for skin conditions such as skin cancer due to their long hours of outdoor work, often with inadequate sun protection.

The strong link between skin conditions and skin cancer is primarily due to the damage caused by sun exposure. Prolonged UV radiation from the sun can damage the DNA in skin cells, leading to mutations that accumulate over time (American Cancer Society, 2025). These mutations can cause uncontrolled cell division, resulting in the formation of tumors. Skin conditions like sunburn, actinic keratosis, and chronic skin inflammation are particularly linked to skin cancer (American Cancer Society, 2025). Actinic keratosis, for instance, is a precancerous lesion often caused by long-term sun exposure, with geographical location also a factor increasing its risk (Skin Cancer Foundation, n.d). Chronic conditions such as eczema and psoriasis can also create an environment in the skin that promotes genetic mutations and immune suppression, both of which increase the risk of developing skin cancer (Skin Cancer Foundation, n.d). UV radiation also weakens the skin's immune defenses, allowing abnormal cells to evade detection and potentially develop into cancer (Skin Cancer Foundation, n.d).

Additionally, genetic conditions such as xeroderma pigmentosum, which impair the DNA repair mechanisms, make individuals more vulnerable to sun-induced skin damage and subsequent skin cancers (Skin Cancer Foundation, n.d). In essence, frequent or intense sun exposure causes skin conditions that disrupt normal cellular processes, making the skin more susceptible to mutations that can lead to skin cancer. Therefore,

managing sun exposure and early detection of these skin conditions are crucial in reducing the risk of skin cancer.

In summary, this study found a significant association between skin conditions and sun exposure. However, there was no significant association between region of birth and skin conditions linked to skin cancer, and these findings highlight important areas for future research. The lack of reported skin conditions linked to skin cancer cases highlights the need for improved healthcare access and early detection programs for migrant Hispanic farmworkers. Moreover, future studies should aim to collect more comprehensive data on this population, including longitudinal studies that can capture the long-term effects of sun exposure on skin health. Despite the limitations of this study, it contributes valuable insights into the challenges of studying skin conditions linked to skin cancer risk in vulnerable populations and highlights the need for continued research in this area.

Limitations of the Study

One significant limitation of the study was the dataset used, specifically the 2015 data, which, despite its considerable size, presented challenges that affected the study's outcomes. The 2015 dataset included over 3,000 participants, a substantial sample size that would typically be advantageous in research. However, within this large pool, fewer than 200 participants identified themselves as farm workers. This small subset posed a critical limitation, particularly because none of these participants reported having skin cancer, even though they reported skin conditions they developed from sun exposure. This absence of skin cancer cases among these farm workers made it difficult to further

explore any significant links between sun exposure and skin cancer in this specific population.

Moreover, the dataset's lack of granularity regarding participants' countries of origin further limited the study. Instead of providing data on individual countries, the 2015 dataset grouped participants' origins into broader regions. This aggregation required a shift in focus from the originally intended research question, which aimed to explore the association between country of origin and skin conditions linked to skin cancer, to a broader question, examining the association between region of birth and skin conditions linked to skin cancer. This modification inevitably led to a loss of accuracy, as it masked potential variations in skin conditions linked to skin cancer risk that might exist between different countries within the same region.

Another crucial limitation of the study is that the 2015 data do not fully represent the Hispanic farmworkers who work in the United States. The dataset’s limited representation of this population means that the findings may not accurately reflect the broader experiences and risks faced by Hispanic farmworkers across the country. Given the small number of farmworkers included and the lack of specific country-level data, the study's ability to generalize its findings to the wider population of Hispanic farmworkers is significantly compromised. This lack of comprehensive representation further highlights the challenges in answering the research questions and highlights the potential gaps in the dataset that could have influenced the study's conclusions.

As a result, the dataset's limitations in accurately reflecting participants' country of birth made it challenging to address the research questions on region of birth

effectively. The aggregated regional data inadvertently supported the null hypothesis, suggesting no association between region of birth and skin conditions that contribute to skin cancer. However, this outcome might not accurately reflect reality but rather be a consequence of the dataset's lack of detail and the small number of farm workers included in the study.

Recommendations for Future Research

Given the limitations and findings of this study, future research should focus on several key areas to better understand the link between prolonged sunlight exposure and skin conditions linked to skin cancer among migrant Hispanic farmworkers. Longitudinal studies are necessary to track workers over time, as skin conditions linked to skin cancer can take years to develop, providing more robust evidence on long-term risks and intervention points. Improved diagnostic and reporting mechanisms are also critical; culturally appropriate screening programs and on-site skin cancer screenings could enhance case detection and provide timely treatment.

Furthermore, examining country-specific risk factors would offer a nuanced understanding of how sun exposure behavior and skin conditions linked to skin cancer risk vary, particularly for workers from regions closer to the equator. Future research should also investigate structural barriers to healthcare access that hinder migrant farmworkers from seeking care, including issues such as insurance gaps, language differences, and fear of deportation. Understanding how socioeconomic and cultural factors influence sun protection behaviors could guide the development of culturally sensitive public health interventions.

Finally, policy-oriented research is needed to assess the impact of existing labor laws and occupational safety regulations on sun exposure, and to advocate for better healthcare access and workplace protections for this vulnerable population. These research directions are vital for developing comprehensive strategies to mitigate skin conditions linked to skin cancer risks and improve health outcomes for migrant Hispanic farmworkers.

Implications for Professional Practice and Social Change

The findings of this study have important implications for public health practice and social change, particularly for improving health outcomes among migrant Hispanic farmworkers who experience prolonged sun exposure. The significant association between long-term sun exposure and skin conditions highlights the need for targeted occupational health interventions. Public health experts should advocate for increased awareness and education on sun protection strategies, including the use of protective clothing, wide-brimmed hats, and high-SPF sunscreen. Employers and policymakers should implement workplace policies that ensure access to shaded areas, mandatory rest breaks, and educational programs on skin cancer prevention.

Expanding access to healthcare services for migrant farmworkers is essential in addressing disparities in skin cancer prevention and treatment. Many farmworkers have limited access to routine healthcare, which may delay the diagnosis and treatment of skin conditions linked to skin cancer (Castillo et al., 2021). Ragan et al., (2019) also emphasized the need for better and quality healthcare provision for agricultural workers to due to their extremely high levels of UV radiation exposure from the sun. Culturally

and linguistically appropriate health information sessions and campaigns can help bridge gaps in awareness and encourage preventive behaviors. These campaigns should emphasize the use of protective measures including sun protective clothing such as sun hates, sun visors, etc. other than sunscreen use (Sabzevari et al., 2021). Community health programs should focus on early detection strategies and provide mobile dermatological screenings to increase access to care.

The findings also support broader public health efforts to promote environmental and policy-level changes. Ward (2023) emphasized the need for prevention strategies to be shared through all avenues including policy changes. Legislative actions that mandate employer-provided sun protection resources and ensure proper enforcement of occupational safety regulations could significantly reduce the burden of sun-related skin conditions in this population. Social change initiatives should prioritize the rights and well-being of farmworkers by addressing structural barriers such as immigration status, employment conditions, and socioeconomic challenges that contribute to health disparities.

By integrating these findings into public health practice, policymakers, researchers, and advocacy groups can work toward to reduce occupational health risks for farmworkers, improving early detection efforts, and implementing sustainable prevention strategies. Future research should explore long-term health effects of sun exposure in this population and assess the effectiveness of interventions designed to reduce the risk of developing skin conditions linked to skin cancer.

Conclusion

The findings of this study provide meaningful insights into the association between prolonged sunlight exposure, region of birth, and skin conditions development among migrant Hispanic farmworkers. The results revealed a statistically significant relationship between the length of sun exposure (1 hour vs Long-term) and the development of skin conditions, reinforcing the understanding that prolonged exposure to ultraviolet radiation (UV) plays a critical role in dermatological health risks within this population. However, no significant association was found between region of birth and the incidence of skin conditions, suggesting that other factors such as cumulative sun exposure, occupational conditions, and access to protective measures may have a stronger influence on skin health outcomes.

The significant variance in reported skin effects between short-term and long-term sun exposure highlights the need for targeted interventions. A large proportion of participants who reported mild effects from one-hour exposure later experienced extreme effects with prolonged exposure, emphasizing the significant impact of cumulative sun exposure. These findings align with existing literature that highlights the increased risk of sun-induced damage among farmworkers, who often work extended hours under direct sunlight with limited access to protective resources. Despite the robust statistical association found between sun exposure and skin conditions, certain limitations in the dataset restricted broader conclusions. The reliance on self-reported data may have led to underreporting or misclassification of skin conditions, and the dataset's grouping of

regions instead of individual countries limited the ability to assess specific regional differences.

Additionally, while the study found strong evidence of sun exposure effects, no participants reported a formal skin cancer diagnosis, highlighting a potential gap in early detection and access to healthcare services among this vulnerable workforce. These findings highlight the crucial need for improved sun protection measures for migrant Hispanic farmworkers. Employers, policymakers, and public health officials should prioritize interventions such as mandatory sun protection policies, increased access to sunscreen and protective clothing, and regular dermatological screenings to mitigate long-term health risks. Implementing stronger workplace protections, such as providing sun-protective equipment, increasing awareness of sun safety practices, and ensuring access to regular skin health screenings, can significantly reduce exposure-related risks.

The Social-ecological model used in this study remains a valuable framework for understanding skin conditions linked to skin cancer risk in migrant Hispanic farmworkers. The model emphasizes the interplay between individual behaviors, interpersonal influences, organizational factors, community support, and policy measures. Effective interventions must be multifaceted, incorporating education on sun safety, workplace regulations, improved healthcare access, and culturally competent public health initiatives tailored to the unique needs of farmworkers. Addressing these factors collectively will ensure that preventive strategies are both sustainable and impactful in reducing skin cancer risks.

In conclusion, this study highlights the significant role of prolonged sun exposure in increasing skin-related health risks among migrant Hispanic farmworkers. While region of birth was not a significant determinant of skin conditions, the findings reinforce the need for comprehensive workplace protections and public health initiatives including safety measures for this essential workforce population. Future research should explore longitudinal studies that assess cumulative sun exposure effects, incorporating biological markers and clinical diagnoses to strengthen the evidence base. Addressing these challenges through targeted interventions and policy-driven protections will be critical in reducing the burden of sun-related skin conditions and improving the overall well-being of farmworkers in the United States.

Synthesis of DrPH Foundational and Program-Specific Competencies

I designed a quantitative research study using the 2015 National Health Interview Survey (NHIS) data, accessed through IPUMS, to examine the association between length of sun exposure, region of origin, and the risk of skin cancer or skin conditions among migrant Hispanic farmworkers. This secondary data analysis allowed for an in-depth examination of occupational health disparities within a historically underserved and hard-to-reach population. By applying logistic regression models and performing descriptive analyses, I demonstrated my ability to design and conduct rigorous public health research grounded in epidemiological and statistical methods. I applied the social ecological model (SEM) as a guiding framework to understand how individual, occupational, and environmental factors contribute to prolonged sun exposure and related health outcomes. I critically assessed the usefulness and limitations of this model in

capturing the complexity of health behaviors and disparities among migrant farmworkers. This reflects my ability to apply theoretical frameworks to public health research (DrPH Competency 3), while considering real-world contextual limitations.

Ethical considerations were central to the study. Although secondary data were used, I ensured strict adherence to data use agreements and upheld principles of respect for persons and social justice by analyzing marginalized voices often underrepresented in public health data. This approach aligns with DrPH Competency 10, emphasizing ethical reasoning and integrity in research. I also recognized limitations in the dataset such as the lack of specificity in regional data and the absence of direct indicators for farmworkers, which I addressed transparently to maintain the rigor and credibility of my findings.

Communication of results was tailored to support the needs of various stakeholders including public health professionals, occupational safety organizations, and policymakers. I presented clear, culturally relevant recommendations to improve sun protection practices, enhance data collection methods, and expand access to healthcare services among migrant workers. This supports DrPH Competency 13, which focuses on strategic communication to diverse audiences to drive evidence-based policy and practice.

Throughout the project, I synthesized DrPH foundational and program-specific competencies by leveraging evidence-based methods to explore structural inequities impacting Hispanic farmworkers. I evaluated the quality and representativeness of national datasets (Program Competency A), interpreted statistical outcomes within a policy and practice context (Program Competency B), and proposed occupational health

interventions that account for cultural and systemic barriers (Program Competency D). I also demonstrated ethical practice in secondary data use (Program Competency C) and used findings to support equity-focused public health strategies.

By identifying data gaps, advocating for more inclusive surveillance, and recommending preventative interventions such as education on sun safety and access to protective resources, this study contributes to improving occupational health equity and advancing social change within vulnerable agricultural communities.

References

Alli, S., LeBeau, J., Hasbani, A., Lagacé, F., Litvinov, I. V., & Peláez, S. (2023). Understanding the perceived association between sun exposure and melanoma in Atlantic Canada: A consensual qualitative study highlighting a "sunscreen paradox." *Cancers*, *15*(19), 4726. https://doi.org/10.3390/cancers15194726

American Cancer Society. (2025). *Skin cancer*. Available from: www.cancer.org/cancer/skin-cancer.html.

Arcury, T. A., Feldman, S. R., Schulz, M. R., Vallejos, Q., Verma, A., Fleischer, A. B....& Quandt, S. A. (2007). Diagnosed skin diseases among migrant farmworkers in North Carolina: prevalence and risk factors. *Journal of Agricultural Safety and Health*, *13*(4), 407–418. https://doi.org/10.13031/2013.23926

Bloss J. E, LePrevost C. E., Zahra A. et al. (2022). Advancing the health of migrant and seasonal farmworkers in the United States: Identifying gaps in the existing literature, 2021. *Health Promotion Practice*, *23*(3), 432–444. https://doi.org/10.1177/15248399211033308

Buster, K. J., You, Z., Fouad, M., & Elmets, C. (2012). Skin cancer risk perceptions: a comparison across ethnicity, age, education, sex, and income. *Journal of the American Academy of Dermatology*, *66*(5), 771–779. https://doi.org/10.1016/j.jaad.2011.05.021

Cadet, J. M., Bencherif, H., Cadet, N., Lamy, K., Portafaix, T., Belus, M., Brogniez, C., Auriol, F., Metzger, J. M., & Wright, C. Y. (2020). Solar UV radiation in the tropics: Human exposure at Reunion Island (21° S, 55° E) during summer outdoor

activities. *International Journal of Environmental Research and Public Health*, *17*(21). https://doi.org/10.3390/ijerph17218105

Castillo, F., Mora, A. M., Kayser, G. L., Vanos, J., Hyland, C., Yang, A. R., & Eskenazi, B. (2021). Environmental health threats to Latino migrant farmworkers. *Annual review of public health*, *42*, 257–276. https://doi.org/10.1146/annurev-publhealth-012420-105014

Centers for Disease Control and prevention. (2024*). Data and statistics on skin cancer* https://www.cdc.gov/cancer/dataviz

Cheng, H. G., & Phillips, M. R. (2014). Secondary analysis of existing data: Opportunities and implementation. *Shanghai Archives of Psychiatry*, *26*(6), 371–375. https://doi.org/10.11919/j.issn.1002-0829.214171

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Lawrence Erlbaum Associates.

Corazza, M., Ferretti, S., Scuderi, V., & Borghi, A. (2021). Socioeconomic status and skin cancer incidence: a population-based, cohort study in the province of Ferrara, northern Italy. *Clinical and Experimental Dermatology*, *46*(7), 1285–1289.

Feldman, S., Vallejos, Q., Whalley, L., Quandt, S., Brooks, T., Cabral, G., Earp, P., Bischoff, W., & Arcury, T. (2007). Blistering eruption in a Latino migrant farmworker. *Journal of Agromedicine*, *12*(4), 81–85. https://doi.org/10.1080/10599240801986322

Fivenson D, Sabzevari N, Qiblawi S, Blitz J, Norton B.B, Norton S.A. (2020). Sunscreens: UV filters to protect us. Part 2: Increasing awareness of UV filters

and their potential toxicities to us and our environment. *Int J Women's Dermatol.* *7*(1), 45–69.

Johnston, M. P. (2014). Secondary data analysis: A method of which the time has come. *Qualitative and Quantitative Methods in Libraries*, 3, 619–626.

Kearney, G. D., Phillips, C., Allen, D. L., Hurtado, G. A., & Hsia, L.-L. B. (2014). Sun protection behaviors among Latino migrant farmworkers in eastern North Carolina. *Journal of Occupational and Environmental Medicine*, *56*(12), 1325–1331. https://www.jstor.org/stable/46001026

Kemal Ö. (2020). Power analysis and sample size, when and why? *Turkish archives of otorhinolaryngology*, *58*(1), 3–4. https://doi.org/10.5152/tao.2020.0330

Kliniec, K., Tota, M., Zalesińska, A., Łyko, M., & Jankowska-Konsur, A. (2023). Skin cancer risk, sun-protection knowledge and behavior in athletes—A narrative review. *Cancers*, *15*(13), 3281. https://doi.org/10.3390/cancers15133281

Kuehn B. M (2021). Why farmworkers need more than new laws for protection from heat-related illness. *JAMA*. *326*(12), 1135–1137. http://doi.org/10.1001/jama.2021.15454

Kumar, S., Quinn, S. C., Kim, K. H., Musa, D., Hilyard, K. M., & Freimuth, V. S. (2012). The social ecological model as a framework for determinants of 2009 H1N1 influenza vaccine uptake in the United States. *Health education & behavior: the official publication of the Society for Public Health Education*, *39*(2), 229–243. https://doi.org/10.1177/1090198111415105

Lagacé, F., Noorah, B. N., Conte, S., Mija, L. A., Chang, J., Cattelan, L., LeBeau, J.,

Claveau, J., Turchin, I., Gulliver, W., Gniadecki, R., Netchiporouk, E., Miller Jr., W. H., Salopek, T. G., Rahme, E., Peláez, S., & Litvinov, I. V. (2023). Assessing Skin Cancer Risk Factors, Sun Safety Behaviors and Melanoma Concern in Atlantic Canada: A Comprehensive Survey Study. *Cancers*, *15*(15), 3753. https://doi.org/10.3390/cancers15153753

Leijen, I., & van Herk, H. (2021). Health and Culture: The association between healthcare preferences for non-acute conditions, human values and social norms. *International journal of environmental research and public health*, *18*(23), 12808. https://doi.org/10.3390/ijerph182312808

Li, Y. & Hu, C. (2022). Marital status and its correlation with age, race, and sex in prognosis of tonsil squamous cell carcinomas. *Open Medicine*, *17*(1), 1773-1779. https://doi.org/10.1515/med-2022-0568

Liu, A., Garcia-Torres, L. C., Johnson, C., Haver, M. K., Gwede, C. K., & Christy, S. M. (2023). Cancer screening educational interventions in rural and farmworker communities: a systematic literature review. *Ethnicity & Health*, *28*(3), 335-357. https://doi.org/10.1080/13557608.2022.2056145

Maier, C., Thatcher, J. B., Grover, V., & Dwivedi, Y. K. (2023). Cross-sectional research: A critical perspective, use cases, and recommendations for is Research. *International Journal of Information Management*, *70*, 102625. https://doi.org/http://doi.org/10.1016/j.ijinfomgt.2023.102625

Mangum, B P. and Buckley, William and Dacanay, Paul, (2015). Sociocultural construction of skin cancer risk perception: Correlates and recommendations for

community-based prevention programmes. http://dx.doi.org/10.2139/ssrn.3043052

Matthay, E. C., & Glymour, M. M. (2020). A Graphical Catalog of Threats to Validity: Linking Social Science with Epidemiology. *Epidemiology (Cambridge, Mass.)*, *31*(3), 376–384. https://doi.org/10.1097/EDE.0000000000001161

May, J.J.& Arcury, T.A. (2020). Occupational injury and illness in farmworkers in the eastern United States. Latinx Farmworkers in the Eastern United States. *Springer, Cham*. https://doi.org/10.1007/978-3-030-36643-8_3

McLeroy, K.R., Bibeau D, Steckler A, Glanz K (1988). An ecological perspective on health promotion programs. *Health Educ Q.* 15(4):351-77. https://doi.org/10.1177/109019818801500401

Mott, B. (2020). Increasing skin cancer awareness in southeastern North Carolinian farmers. (Doctoral project, East Carolina University). The Scholarship. https://thescholarship.ecu.edu/handle/10342/8666

Moyce, S. C., & Schenker, M. (2018). Migrant workers and their occupational health and safety. Annual Review of Public Health, 39, 351–365. https://doi.org/10.1146/annurev-publhealth-040617-013714

Niino, M., & Matsuda, T. (2021). Age-specific skin cancer incidence rate in the world. *Japanese Journal of Clinical Oncology*, *51*(5), 848–849. https://doi.org/10.1093/jjco/hyab057

Pathak, A., & Perry, M. (2022). Dermatological conditions in skin of colour. *InnovAiT*, *15*(8), 450–455. https://doi.org/10.1177/17557380221102975

Quandt, S. A., Schulz, M. R., Vallejos, Q. M., Feldman, S. R., Preisser, J. S., & Arcury, T. A. (2008). Skin-related quality of life among migrant farmworkers. *Journal of cutaneous medicine and surgery*, *12*(1), 1-7.

Ragan, K. R., Buchanan Lunsford, N., Thomas, C. C., Tai, E. W., Sussell, A., & Holman, D. M. (2019). Skin cancer prevention behaviors among agricultural and construction workers in the United States, 2015. *Preventing Chronic Disease*, *16*, E15. https://doi.org/10.5888/pcd16.180446

Sabzevari N, Qiblawi S, Norton SA, Fivenson D. (2021). Sunscreens: UV filters to protect us. Part 1: Changing regulations and choices for optimal sun protection. Int J Womens Dermatol.7(1):28–44.

Seabold, S., & Perktold, J. (2010). Statsmodels: Econometric and statistical modeling with Python. Proceedings of the 9th Python in Science Conference, 57–61.

Slavinsky, V., Helmy, J., Vroman, J., & Valdebran, M. (2023). Solar ultraviolet radiation exposure in workers with outdoor occupations: a systematic review and call to action. *International Journal of Dermatology*. https://doi.org/10.1111/ijd.16877

Skin Cancer Foundation. Sun protection: your daily sun protection guide. (n.d). www.skincancer.org/prevention/sun-protection.

Wang, X., & Cheng, Z. (2020). Cross-sectional studies. *Chest*, *158*(1). https://doi.org/10.1016/j.chest.2020.03.012

Ward, J. (2023). Factors associated with skin cancer prevention: primary and secondary behaviors. *Electronic Theses and Dissertations.* Paper 4086. https://doi.org/10.18297/etd/4086

Yu, S.-Y., Hirsch, A., Zaslavsky, O., & Cochrane, B. B. (2023). Risk factors and early prevention of skin cancer in rural older outdoor workers: A scoping review. *Geriatric Nursing*, *54*, 37–45.

Appendix A: Public Health Practice and Field-Based Products

Title: Enhancing Sun Protection for Migrant Hispanic farmworkers: A Policy Approach for Health Equity

Background/Context and Importance of the Problem:

Migrant Hispanic farmworkers are disproportionately exposed to prolonged sunlight due to their outdoor work, significantly increasing their risk of developing skin conditions linked skin cancer. Despite their vital role in the agricultural industry, they lack access to proper sun protection, face barriers to healthcare, and are not covered under strong occupational safety regulations regarding sun exposure. Research indicates that prolonged UV exposure, limited protective measures, and inadequate access to screening services place farmworkers at a significant risk of preventable skin condition, including skin cancer. Additionally, employers are not mandated to provide sun protection resources, leaving workers vulnerable to heat-related illnesses and long-term skin damage. Addressing this public health disparity is essential to protecting their well-being and economic productivity.

Policy Recommendation:

To ensure the long-term success of this intervention, policy changes are necessary at the workplace, community, and legislative levels:

1. Employer-Provided Sun Protection Resources. Employers must provide workers with the following:
    - Mandate free distribution of UV protective clothing, wide-brimmed hats, lightweight UV-protective clothing and SPF 30+ sunscreen at no cost

- Require job rotations and mandatory shaded break areas every 2-3 hours.

2. Workplace Training, Awareness and Safety Enforcement
    - Implement annual mandatory sun safety training for all farmworkers and supervisors.
    - Distribute bilingual educational materials on sun safety, UV risks, and early skin cancer detection.
    - Conduct regular worksite inspections to ensure compliance to ensure compliance with sun protection guidelines.
    - Implement fines for non-compliant employers who fail to provide protective equipment.
3. Expand Access to Mobile Healthcare & Early Screening Programs
    - Establish mobile dermatology clinics for routine skin cancer screenings and treatments
    - Establish Free or low-cost treatment for sun-related skin conditions.
    - Increase federal and state funding for migrant healthcare services to ensure ongoing preventive care.
4. Strengthen Legislative Protection
    - Introduce state and federal policies requiring employers to provide free sun protection
    - Expand OSHA regulations to include UV exposure and sun safety training in agricultural workplaces

Conclusion:

Implementing these policy changes will significantly improve health outcomes and reduce skin cancer risks for migrant Hispanic farmworkers. We urge policymakers, agricultural employers, and community leaders to support and implement these sun protection policies.

Appendix B: Community Health Intervention Plan

Title: Shielding the Skin: A Community-Based Sun Protection Initiative for Migrant Hispanic Farmworkers

Public Health Problem: Migrant Hispanic farmworkers are disproportionately exposed to prolonged sunlight due to the nature of their work, increasing their risk of developing skin conditions linked to skin cancer. Limited access to sun protection resources, preventive education, and healthcare further exacerbates their vulnerability.

Summary of Findings: This study found that prolonged sun exposure and region of birth are associated with an increased risk of skin conditions among migrant Hispanic farmworkers. Lack of protective measures, such as sunscreen, hats, and UV-protective clothing, in addition to limited awareness, contributes to this risk. These findings highlight the crucial need for an intervention that promotes physical (clothing, hats) and chemical (sunscreen) protection before sun exposure.

Target Population: The intervention is designed for migrant Hispanic farmworkers in the U.S., particularly those working outdoors for extended hours with limited access to sun protection resources.

Flowchart: Implementation Process for the Intervention & Policy Actions

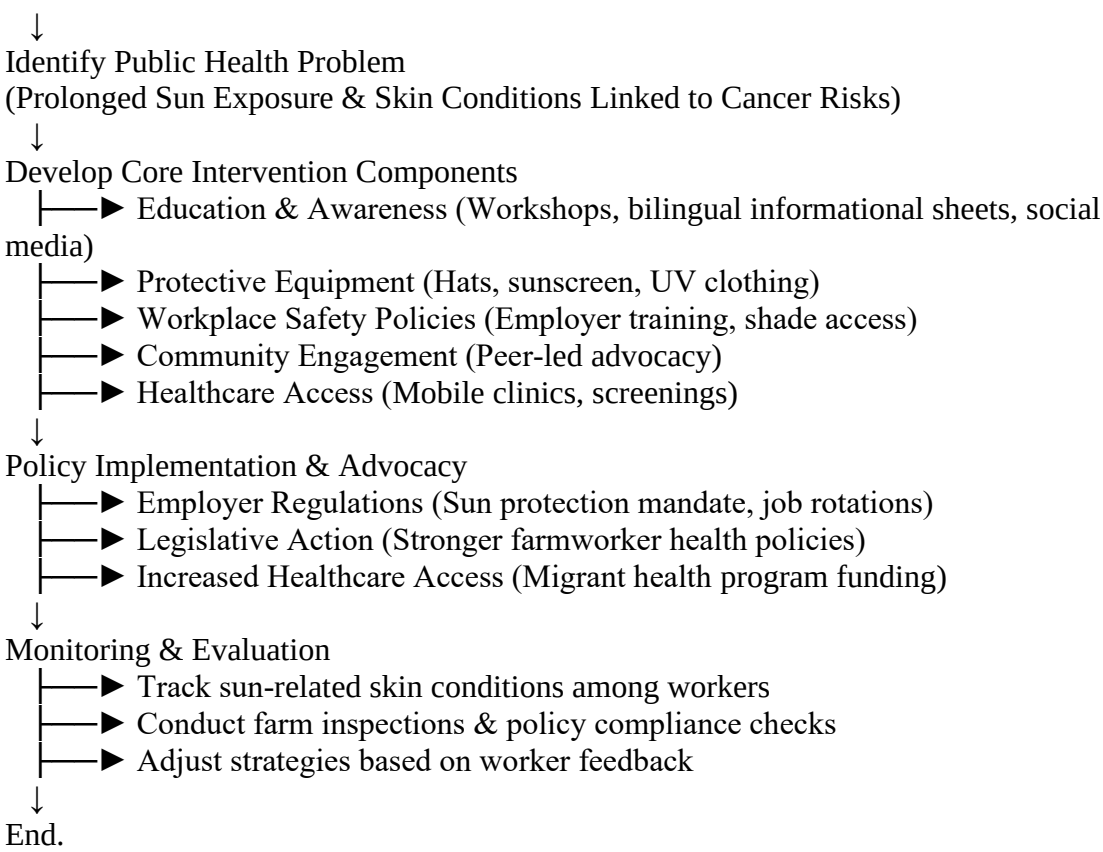


Table 9

Visual Representations of the Intervention Plan Framework

Intervention Components	Specific Elements	Mode of Delivery
1) Provide Educational Information & Awareness	Training on Sun safety, UV risks, and sunscreen application	Workshops, bilingual fact sheets/informational sheets and pamphlets, social media sunscreen use Workshops, and social media
2) Provide Protective Equipment	Mandate free distribution of UV-protective clothing, wide-brimmed hats, SPF 30+ sunscreen at all farm sites	Employer partnership and community distribution events
3) Modify Workplace Safety Policies	Mandate shaded breaks areas and job rotations to reduce sun exposure	Farm regulations, employer training sessions
4) Develop Community Support & Engagement	Establish peer-led sun safety advocacy programs	Farmworker ambassadors, community workshops
5) Enhance Healthcare Access	Provide free or low-cost dermatology screening and sun-burn treatment	Mobile health clinics, partnership with local health centers
6) Modify and Strengthen Legislative & Policy Advocacy	Enforce employer-provided sun protection regulations	Collaboration with labor organization, policy advocacy groups

Appendix C: Information Fact Sheet

Skin at Risk: The Facts About Sun Exposure

Sun exposure is a major contributor to skin damage and conditions ranging from sunburn to skin cancer. Outdoor workers, such as Hispanic farmworkers, face increased risks due to prolonged exposure to ultraviolet (UV) rays

Fast Facts

Skin cancer is the most common cancer in the U.S resulting from sun exoposure. It typically develops in areas frequently exposed to the sun, including the face, arms, and neck. Risk increases with cumulative sun exposure and lack of protective measures

Contributing Factors

1. Sunlight Exposure – UV radiation damages skin cells, potentially leading to cancer
2. Region of Origin – Melanin levels vary, affecting sensitivity to sun exposure
3. Occupation – Farm-workers and others who work outdoors face long-term, daily exposure to harmful uv rays

At-Risk Populations

Outdoor workers, particularly Hispanic farmworkers, are often at higher risk for developing sun-related skin conditions. They may lack access to protective equipment, healthcare, or awareness about the risks of UV exposure

Prevention Tips

- Wear long sleeves, wide-brimmed hats, and sunglasses
- Use broad-spectrum sunscreen with SPF 30 or higher
- Take breaks in the shade during peak sun hours (10 AM–4 PM)
- Conduct regular skin self-exams and seek medical advice for changes

Did You Know?

Many farmworkers are unaware of their increased risk for skin cancer. Raising awareness, promoting sun safety, and improving access to preventive resources can make a significant difference in outcomes

References

Centers for Disease Control and Prevention. (2023). Sun safety. U.S. Department of Health & Human Services. https://www.cdc.gov/skin-cancer/sun-safety/index.html

Appendix D: Policy Brief Memo

POLICY BRIEF

Enhancing Sun Protection For Migrant Hispanic Farm Workers
A Policy Approach For Health Equity

SUMMARY

Migrant Hispanic farm workers are disproportionately exposed to prolonged sunlight due to their outdoor work, significantly increasing their risk of developing skin conditions linked to skin cancer.

Despite their vital role in the agricultural industry, they lack access to proper sun protection, face significant barriers to accessing healthcare and are not covered under strong occupational safety regulations regarding sun exposure.

Prolonged UV exposure, minimal protective resources, and limited access to early screening significantly heighten their risk. Employers are not required to provide sun protection gear, leaving workers vulnerable to both heat-related illnesses and long-term skin damage.

This is a public health disparity that must be addressed to ensure health equity and protect the economic contributions of this essential workforce.

Addressing this disparity is essential to protecting the well-being of these Hispanic farm workers and their economic productivity.

DESCRIPTION

Research indicates that prolonged UV exposure, limited protective measures and inadequate access to screening services place farm workers at a significant risk of preventable skin condition, including skin cancer.

Additionally, employers are not mandated to provide sun protection resources, leaving workers vulnerable to heat-related illnesses and long-term skin damage.

OVERVIEW

Policy changes are necessary at the workplace, the community and at the legislative levels to ensure protection for a vulnerable yet vital cog in our agricultural sector.

These policy changes will protect these migrant hispanic farm workers who are faced with financial barriers, language and cultural barriers, lack of awareness, fear of deportation and other barriers impacting their health and well being.

CONCLUSION

Adopting these policy changes will reduce skin cancer risks and improve long-term health outcomes for migrant Hispanic farmworkers.

Policymakers, agricultural employers, and community leaders must take action to implement these recommendations and ensure health protections are equitable and inclusive.

PROPOSED POLICIES

Many labor laws and protection standards enacted through federal and state governments, which are designed to protect the health, safety and interests of migrant workers, have a few exemptions for agricultural employers. Furthermore, the worker protection standards that do apply to the agricultural industry are often not enforced.

Strengthening Legislative Protection by introducing state and federal policies requiring employers to provide not just free sun protection but also workplace training, awareness and mandatory safety enforcement to include ultraviolet (UV) exposure and sun safety trainings in agricultural workplaces.

POLICY RECOMMENDATION

Multi-Level Policy Action Is Needed

1. **Employer-Provided Sun Protection**
- Provide wide-brimmed hats, lightweight UV-protective clothing, and SPF 30+ sunscreen at no cost
- Require shaded rest areas and job rotations every 2–3 hours.

2. Training, Awareness & Safety Enforcement
- Annual mandatory sun safety training for all farmworkers and supervisors
- Distribute bilingual materials about sun safety and early skin cancer signs
- Conduct workplace inspections and fine non-compliant employers.

3. Mobile Healthcare & Early Screening Access
- Launch mobile dermatology clinics for screenings and treatment
- Offer free or low-cost treatment for sun-related skin conditions
- Increase federal and state funding for preventive migrant healthcare services.

4. Legislative Action
- Mandate employer provision of sun protection
- Expand OSHA regulations to include UV exposure and sun safety training.

REFERENCES

Centers for Disease Control and Prevention. (2023). Sun safety. U.S. Department of Health & Human Services. https://www.cdc.gov/skin-cancer/sun-safetyd index.html

Kearney, G. D., Phillips, C., Allen, D. L., Hurtado, G. A., & Hsia, L.-L. B. (2014). Sun protection behaviors among Latino migrant farmworkers in eastern North Carolina. Journal of Occupational and Environmental Medicine, 56(12), 1325–1331. https://www.jstor.org/stable/46001026

Kuehn B. M (2021). Why farmworkers need more than new laws for protection from heat-related illness. JAMA. 326(12):1135–1137. http://doi.org/10.1001/jama.2021.15454

Appendix E: Social-Ecological Model

Mode Level	Definition	Potential Change Strategies
Individual Level	Focuses on personal knowledge, attitudes, and behaviors regarding sun safety	Conduct workshops. Provide training on sun safety, UV risks, and proper sunscreen use. Distribute bilingual fact sheets, pamphlets, and social media content on sun safety
Interpersonal Level	Addresses social relationships and peer influence in promoting sun safety.	Establish peer-led sun safety advocacy programs. Train farmworker ambassadors to educate and encourage sun protection behaviors.
Organizational Level	Targets employer policies and workplace environments to ensure safer conditions.	Mandate free distribution of UV-protective clothing, wide-brimmed hats, and SPF 30+ sunscreen at all farm sites. Require shaded break areas and job rotations to reduce sun exposure. Conduct employer training on sun safety policies.
Community Level	Engages local organizations and resources to support sun safety initiatives	Organize community-wide distribution events for sun protection equipment. Develop partnerships with local health centers to provide mobile dermatology screenings and sunburn treatment. Conduct community workshops on sun safety.
Policy Level	Focuses on legislative actions and regulations to support sun protection for farmworkers.	Advocate for employer-provided sun protection regulations. Collaborate with labor organizations and policy advocacy groups to strengthen workplace safety laws.