Factors associated with skin cancer prevention: primary and secondary behaviors.

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FACTORS ASSOCIATED WITH SKIN CANCER PREVENTION:
PRIMARY AND SECONDARY BEHAVIORS

By

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DEDICATION

This dissertation is dedicated to my late father, who succumbed to metastatic cancer in 2005. His passing changed my life forever at a young age and inspired me to work in healthcare and many of my resultant clinical questions that led to this research.

I realize that I have been granted enormous privileges and opportunities in life. I only hope to live up to my forebears by providing the same caliber of opportunities to my children. Therefore, I dedicate this dissertation to them, hoping they can successfully follow their interests to find academic and professional success, and that they never cease learning.
ACKNOWLEDGEMENTS

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during the Covid-19 pandemic. I am also grateful to my family for their support, my brother Dr. Gregory Bartram’s encouragement and tips on Ph.D. life and research, and my mother’s and my mother-in-law’s support and childcare. A huge thank you goes also to the friends and family who cheered me on and referred me to potential interviewees. I hope this work in health behaviors can help to make a difference in our world and improve outcomes.
Skin cancer, seemingly more innocuous than other cancers, maintains the highest incidence among cancers in the United States. While it is treatable early, metastasized melanoma or other carcinomas present severe illness with high mortality rates and disproportionate 5-year survival rates among ethnic/racial groups. Fortunately, most skin cancer is highly treatable when found in the early stages. However, this necessitates prevention tactics to avoid the causative agent, ultraviolet radiation, and regular skin screening to catch the disease in earlier stages. Unfortunately, these tactics are not widely conducted by adults, despite substantial skin cancer awareness.

Therefore, motivating people to perform these health behaviors is vital, and their attitudes, norms, and self-efficacy influence this process. This dissertation examines the factors critical to skin cancer prevention behaviors, both primary and secondary, and comprises four chapters. Chapter One presents an Introduction to the dissertation. Chapter Two is a scoping literature review of sun protection behavior (SPB) studies, including those addressing a vulnerable population, outdoor workers. The study in
Chapter Three sought to identify the factors influencing sun protection behaviors and sunburn incidence utilizing a nationally representative database, the National Health and Nutrition Examination Survey (NHANES) (U.S. Department of Health and Human Services, 2020). This secondary analysis was limited to participants ages 20 years and older answering dermatology questions (N=3404), providing a large sample size. Statistical procedures were then used with Holman’s Sunburn Risk Model as the theoretical framework (Holman et al., 2019). Finally, additional research recommendations are provided to understand further the demographic and perceived risk differences in SPBs and sunburn prevalence.

Chapter Four presents a qualitative analysis investigating SC prevention among a vulnerable population, presenting a narrowed approach to the national findings in Chapter Two. Chapter Three presents the qualitative study that examined adult outdoor workers’ attitudes and perceptions about skin cancer prevention, including barriers and facilitators of these behaviors. Social constructivism provided the philosophical underpinnings for the grounded theory research process guided by the work of Kathy Charmaz. The primary data source was comprised of eighteen semi-structured interviews with outdoor workers. Facilitators for performing sun protective behaviors were attitudes shaped by the perceived risk of skin cancer, normative beliefs that skin cancer is a minor disease, shaped by healthcare experiences, and perceived control over their health outcomes. Barriers included fatalistic attitudes, lack of trust in healthcare providers and institutions, and lack of preventative healthcare experience. These thematic findings demonstrate that attitudes, norms, and self-efficacy are strongly associated with the performance of skin
cancer prevention behaviors. Finally, recommendations are provided for healthcare providers and public health interventions aimed at OWs.

Chapter Five summarizes the key findings derived from the studies and compares and contrasts themes with the current literature. Finally, the study's limitations, significance to nursing and public health, and implications for future research are presented. These studies illuminate the need for additional research on skin cancer prevention in adults, using interventions to affect both primary and secondary prevention behaviors. In addition, they provide a direction for future research.
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CHAPTER I: INTRODUCTION

Background and Significance

Skin cancer (SC) is the most frequently occurring cancer in the United States, despite being preventable with sun protection (i.e., clothing and hat barriers, shade, and sunscreen) and typically curable with early skin screening (Breitbart et al., 2012; Centers for Disease Control and Prevention, 2019; Holman, Kapelos, et al., 2018; Hung et al., 2022; Janda et al., 2022). Ultraviolet (UV) radiation exposure is associated with a higher risk of SC and melanoma development (Skin Cancer Foundation, 2019; Xiang et al., 2014). SC includes basal and squamous cell carcinoma as well as melanoma. Basal (BCC) and squamous cell carcinomas (SCC) are the most common. Basal cell carcinoma and SCC begin in the top layer of the skin, the epidermis. Once they become cancerous, growth can spread uncontrollably, advancing into further layers of the skin and ultimately metastasizing to other body organs if not treated (American Cancer Society, 2019a). It is estimated up to 9% of all squamous cell carcinomas will lead to metastasis within two years (Weinberg et al., 2007). Melanoma presents an even higher risk of metastasis due to its origination in the melanocytes in the skin (Damsky et al., 2010). Furthermore, these cancers grow slowly and can recur in the same place or new areas. Basal cell carcinoma and SCC comprise approximately 80% and 20% of skin carcinomas, respectively, and they often appear first on sun-exposed body sites, such as the face and ears (American Cancer Society, 2019a). Melanoma is a less common form of SC,
deriving in the skin's melanocytes, but melanoma is more deadly than skin carcinomas if not caught early (American Cancer Society, 2019b).

Incidence is growing in all SC carcinomas and melanoma in the United States. The exact incidence rates of BCC and SCC are not tracked in cancer registries. However, non-melanoma SCs are estimated to be diagnosed in 3.3 million people in the U.S. annually (North American Association of Central Cancer Registries, [NAACCR], 2021); while they only are associated with 2,000 deaths annually, their incidence is rising (American Cancer Society, [ACS], 2022), and mortality of non-melanoma SC rose slightly (from .7 to .8 per 100,000) between 1990 and 2019 (Aggarwal et al., 2021). While Aggarwal et al. (2021) found that melanoma deaths slightly decreased in the United States between 1990 and 2019 (from 2.3 to 2.2 per 100,000 people), more than 8,000 melanoma deaths were reported in 2018 in the United States, making it four times as deadly than non-melanoma SCs, with 2.1 deaths per 100,000 people, down from 2.6 deaths per 100,000 in 1999 (U.S. Cancer Statistics Working Group, 2021). The age-adjusted incidence of melanoma in the United States is 22 per 100,000 people, an increase since 1999 when the incidence was 15 of 100,000 people, and it is the fifth most common type of new cancer cases (U.S. Cancer Statistics Working Group, 2021). In the United States, melanoma incidence rose 2% between 2006 and 2015, with forecasts estimating that it will represent 7.1% of all U.S. cancers by 2030 (Islami et al., 2020).

In Kentucky, the incidence of melanoma is 28.2 (95% CI [27.5, 28.9]) per 100,000, an increase of 2.0 (95% CI [1.7, 2.4]) in the last five years (National Cancer Institute, 2020d). In contrast, Indiana’s incidence of melanoma matches the national
average and is stable (National Cancer Institute, 2020c). The mortality rate of melanoma in Kentucky is 2.5 (95% CI [2.3, 2.7]) per 100,000 people, which has lowered in the last five years but is still above the national average (National Cancer Institute, 2020b). Kentucky also has one of the highest mortality rates of non-melanoma SCs, with 33.2 deaths per 100,000 people, and one of the highest national disability-adjusted life year (DALY) rates due to non-melanoma SCs (Aggarwal et al., 2021). In Indiana, melanoma mortality is slightly above the national average of 2.4 (95% CI [2.2, 2.6]) per 100,000 people, continuing downward since 2011 (National Cancer Institute, 2020a). However, several counties in Indiana demonstrate upward trends in incidence. Kentucky carries a higher-than-average burden for all SC incidence and mortality (Aggarwal et al., 2021).

Ultraviolet radiation exposure causes sunburn and is the primary cause of NMSCs and melanoma. Sun protection behaviors (SPBs), including seeking shade, wearing covering clothing, and using sunscreen to prevent UV exposure, lower the risk of SC (Skin Cancer Foundation, 2019). Using sunscreen alone reduces the incidence of SCC and melanoma by 40% and 50%, respectively (Green et al., 1999; Green et al., 2011; Sander et al., 2020; van der Pols et al., 2006). Performing SPBs, especially sunscreen application, with a higher frequency will reduce UV exposure, attenuating sunburn risk. Sunscreen can block up to 99% of the UV radiation that causes burns from the sun for several hours, depending on the level of sun protection factor (SPF), the intensity of the sun, and the activities performed by the individual (e.g., sweating and swimming can remove sunscreen) (Ambizas & Maniara, 2016). Shade and long sleeves also block UV radiation and are protective against sunburn, but sunscreen has demonstrated higher efficacy (Ou-Yang et al., 2017). Secondary SC prevention includes skin screening by a
healthcare professional or self-screening to identify and remove suspicious lesions before they become problematic. SC is highly treatable when identified in the early stages, and early diagnosis leads to a higher likelihood of a cure (Thomas & Giblin, 2006). Localized melanomas have a higher incidence than later-stage diagnoses (17 in 100,000 versus 3.1 in 100,000, respectively) (Centers for Disease Control and Prevention, 2022). The five-year survival rate of localized (non-spread) melanomas is 99%. In comparison, that of regional and distant-stage melanomas is 68% and 30%, respectively (American Cancer Society, 2022c), indicating that early detection is invaluable.

Populations most vulnerable to UV radiation include children, adolescents, young adults, and employees who work in outdoor occupations (Glanz et al., 2007; Skin Cancer Foundation, 2019). Outdoor workers (OWs) work in various occupations, including construction, maintenance, forestry, recreation, and farming. Kentucky and Indiana have the sixth and tenth highest number of farms in the United States. The states have multiple demographic (i.e., percentage of OWs) and environmental commonalities (commodities, industries, etc.) (Indiana State Department of Agriculture, 2022; Kinghorn, 2015; U.S. Bureau of Labor Statistics, 2022a, 2022b; United States Census Bureau, 2020). In outdoor occupations, employees are most vulnerable to UV radiation (Glanz et al., 2007; Skin Cancer Foundation, 2019). Spending up to 75% of their time working outside (Preda-Naumescu et al., 2022; Rocholl et al., 2020), OWs receive up to eight times the amount of UV exposure of indoor workers, and their cumulative UV exposure has been linked to their SC incidence (Holman et al., 1983; Lushniak, 2006; Vitasa et al., 1990; Xiang et al., 2014). Outdoor workers are people required to work outside for a substantial portion daily, including farmers, farmworkers, construction workers, recreational
workers, and landscapers. OWs are exposed to the sun’s UV radiation and subsequently have a high incidence of SC and related metastatic disease (Glanz et al., 2007).

Gaps in the Literature

Most SC behavior studies worldwide have focused on adolescent and recreational populations, which do not generalize to adults or OWs (Holman et al., 2019; Kirk & Greenfield, 2017; Ragan et al., 2019; Zink et al., 2019). College students are easy to recruit, and young people are regularly outside for recreational activities, necessitating primary prevention. Interventions are needed to encourage younger adults' sun safety habits and affect their attitudes toward tanning. After they enter the workforce, adults over 30 have significantly less favorable attitudes toward intentional tanning (Dennis et al., 2009). Therefore, adults require separate studies about the factors influencing them to prevent SC. The increased incidence for men after age 55 reflects age differences in occupational and recreational exposure to UV radiation, as exposure increases with retirement (American Cancer Society, 2022a). Most of the incidence of SC and melanoma in the U.S. is documented by adults older than 65 (Holman, Freeman, et al., 2018; Rogers et al., 2015), suggesting that secondary SC prevention is essential as people age. Given the growing incidence of SC, the risk of their occupation, and the efficacy of primary and secondary prevention, it is necessary to understand the at-risk population of OWs who are outside of young adulthood (over age 30) and how they perceive SC prevention.

Most efforts to lower SC incidence have focused on primary prevention, especially in the context of recreational activities, and new health promotion approaches are needed (Jongenelis et al., 2018). Multiple interventions designed to increase
knowledge to increase SPBs have been conducted over the last four decades, but primary prevention has been the majority’s focus. More research is recommended to develop interventions targeted specifically at older adult and outdoor worker populations from diverse industries (Horsham et al., 2014). Given the inherent risk of additional outdoor occupational exposure to UV radiation, geographically targeted attention toward OWs is needed, inclusive of secondary prevention.

Despite the occupational risks inherent to OWs (Glanz et al., 2007; Lushniak, 2006; Preda-Naumescu et al., 2022), scant studies of United States OWs and SC prevention are reported in the literature (Glanz et al., 2007; Horsham et al., 2014). Most OW studies are quantitative, and few address the central-eastern region of the United States. Qualitative research freshly examines old problems requiring novel approaches (Strauss & Corbin, 1990), yet there are few qualitative studies on OWs (Zink et al., 2019). One of the more recent qualitative studies interviewed nine Georgia farmers in the 1990s (Parrott et al., 1996). The most recent U.S.-based studies of OWs and SC prevention assessed day laborers in Mississippi and Illinois (Boyas & Nahar, 2018; Boyas et al., 2021), state park workers in Georgia (Nahar et al., 2019), and western ski resort employees (Buller et al., 2012) with quantitative studies.

Theoretical Frameworks

Multiple theoretical approaches support research on SC prevention. Holman’s Sunburn Risk Model (Holman et al., 2019) theorizes that SPBs are related to demographic factors (race, gender, U.S born status, education, and age), exposure time, and perceived sensitivity to the sun. SPBs and perceived sensitivity to the sun predict the
outcome of sunburn, which is associated with SC risk (Wu et al., 2016). This model conceptualizes the factors that contribute to sunburn and SC prevention.

Grounded theory supports qualitative research to inform policy and practice with innovative ideas. This systematic method of qualitative analysis helps to construct theory, generating abstract theoretical explanations of processes in society (Charmaz, 2014). Grounded theory involves simultaneous data collection and analysis, constructing analytic codes and categories from collected data, memo writing to discuss categories, and advancing theory development. The relationship of a priori to grounded theory is essential to acknowledge, as the Theory of Planned behavior supports SC prevention behaviors. A sensitizing theory provides essential insights that inductive grounded theory alone might overlook (Gilgun, 2019).

As a sensitizing framework to grounded theory, the Theory of Planned Behavior (TOPB) provides valuable insights into approaches to change behaviors, especially health behaviors, including nutrition, exercise, and smoking. It posits that attitudes, normative beliefs, and perceived control are antecedents to one’s intention to perform a behavior, in this case, primary and secondary prevention behaviors for SC. The TOPB framework shows how social and psychological determinants influence the individual performance of health behaviors. It proposes that antecedents to performing a particular behavior are attitudes, normative beliefs, intentions, and self-efficacy or perceived control toward the behavior (Ajzen, 1991). With an understanding of these constructs, interventions can be developed as “a point of attack to change” (Ajzen, 1991, p. 206) the behavior at hand. The TOPB concepts have been extensively used to understand how health behaviors are influenced (Sheeran et al., 2016). The TOPB variables are predictive of SPBs and SSE
(Aygun & Ergun, 2014; Babazadeh & Banayejeddi, 2017; Babbin et al., 2015; Bergeron et al., 2019; Boyas et al., 2021; Buchanan Lunsford et al., 2018; Cleary et al., 2014; Cowdell & Dyson, 2014; Heckman et al., 2017; Kasparian et al., 2009; Maddock et al., 2005; Mahler, 2014; Myers & Horswill, 2006; Starfelt Sutton & White, 2016; White et al., 2019). Utilizing the TOPB as a sensitizing framework for grounded theory-based qualitative research is apt to incorporate both inductive and deductive findings.

**purposes of these studies**

These studies aim to illuminate the SC prevention practices of adults in the United States and those relationships to sunburn and perceived risk and to specifically examine a group of vulnerable adult OWs and their perceptions of SC prevention. Therefore, this manuscript dissertation aims to clarify findings on U.S. adults and expand knowledge about OWs’ perceptions. By examining the population of OWs using a qualitative approach, attitudes and perceptions about SC prevention can be better understood. In addition, researchers and policymakers can use this formative research to plan interventions to change this at-risk population's SC prevention behaviors to lower their disease and SC mortality incidence.

**summary of chapters**

This dissertation is comprised of five chapters. Chapter One provides an overview of the phenomenon of interest and the research problems. It also provides the studies' objectives and justifications. Chapter Two provides the state of the science related to skin cancer prevention in the United States and among OWs.
Chapter Three of the dissertation presents a secondary analysis of factors associated with the performance of SPBs and those associated with sunburns. A nationally representative dataset, The National Health and Nutrition Examination Survey (NHANES), was used (U.S. Department of Health and Human Services, 2020). The goal was to elucidate the factors contributing to sun exposure and sunburn incidence among adults in the United States, providing a baseline of data. This study outlines the sample, and statistical procedures used to answer the research questions.

These procedures were then used with Holman’s Sunburn Risk Model as the theoretical framework (Holman et al., 2019). This framework posits that perceived sun sensitivity and SPBs vary by demographic group and influence sunburn's outcome. Perceived sun sensitivity, as well as demographics and exposure, predict the performance of SPBs. Sun exposure and sunburn are attributed to SC incidence (Berwick et al., 2005; Islami et al., 2020).

Chapter Four includes a qualitative study of OW perceptions of skin cancer prevention, adding context to the quantitative data provided in Chapter Three and focusing on a vulnerable population of adults. The aim was to explore OWs’ attitudes, beliefs, and perceptions of SC risk, including factors that promote or hinder primary and secondary prevention. The research methodology and the specific study components are described in detail, including the sample, recruitment, protection of human subjects, interview guide development, and plan for data analysis.

The Theory of Planned Behavior (TOPB) is a theoretical framework that provides valuable insights into approaches to change behaviors, especially health behaviors, including nutrition, exercise, and smoking. The qualitative study utilized constructs from
the TOPB, which posits that attitudes, normative beliefs, and perceived control are antecedents to one’s intention to perform a behavior, in this case, primary and secondary prevention behaviors for SC. The TOPB constructs were used as sensitizing themes to develop the interview questions.

Chapter Five synthesizes findings from Chapters Three and Four. This chapter illustrates how combining these findings optimizes knowledge acquisition in the field of skin cancer prevention, whereby specific factors and behaviors were explored. Finally, Chapter Five illustrates how the synthesized study results add to the body of healthcare knowledge, and implications for further research, interventions, and policy are described.
CHAPTER II: SCOPING LITERATURE REVIEW OF SKIN CANCER PREVENTION RESEARCH

Factors Related to Sun Protection Behaviors and Sunburn

Previous findings about the relationship between demographic factors, skin sensitivity to the sun, and SPBs and sunburn have shown inconsistencies. Some are contradictory, with an overreliance on cross-sectional surveys and convenience samples, and SPBs have varying demographic associations. White people in the United States are significantly more likely than Black, Asian, and Hispanic populations to wear sunscreen and long sleeves, with Black and Hispanic people the least likely to use it. There are no ethnic differences in seeking shade (Calderón et al., 2019). Gender is associated with performing SPBs, with women across all racial groups except Asians performing SPBs with higher frequency than men (Calderón et al., 2019). In general, women use sunscreen more than men (Falk & Anderson, 2013; Heckman et al., 2021; Holman et al., 2015; Widemar & Falk, 2018), but women also tend to sunbathe more (Falk & Anderson, 2013; Widemar & Falk, 2018). Shade-seeking and wearing long sleeves do not consistently differ by gender (Pinault & Fioletov, 2017; Widemar & Falk, 2018). Higher levels of education are associated with the performance of more SPBs (Calderón et al., 2019; Falk & Anderson, 2013; Heckman et al., 2021). No significant differences were found by age for sunscreen use on the face, but for sunscreen use on other exposed body parts, men and women ages 35-44 had the highest prevalence of using sunscreen (Holman et al., 2015).
Among adult melanoma survivors, older age is positively correlated with conducting SPBs (Heckman et al., 2021). A study of a Swedish population found that older age predicted sunscreen use but not other SPBs (Falk & Anderson, 2013).

Demographic risk factors, including race, United States-born status, gender, and age, are related to sunburn risk. Sunburn is associated with being younger, non-Hispanic White, and born in the United States (Holman, Ding, et al., 2018). White people reported the highest prevalence of sunburn in the previous year (42.5%), but up to 13.2% of Black people reported having at least one sunburn as well (Holman, Ding, et al., 2018). Age inversely influences sunburn prevalence, with sunburns decreasing as age increases (Fischer et al., 2016; Holman et al., 2019; Holman, Ding, et al., 2018; Wu et al., 2016). The association of gender with sunburn is less clear: an Australia-based study found women were more likely to experience sunburn than men (Widemar & Falk, 2018); however, a United States study found a similar distribution between the number of sunburns between men and women, and no significant differences between men and women reporting at least one sunburn (Holman, Ding, et al., 2018).

Individuals rated as more sun-sensitive experience more sunburns (Holman, Ding, et al., 2018; Widemar & Falk, 2018). A rural population in Texas with a higher perceived skin sensitivity risk experienced higher sunburn levels (Cunningham et al., 2019). Ultraviolet radiation exposure causes sunburn, a significant factor contributing to SC (Madgwick et al., 2011; Skin Cancer Foundation, 2019). Outdoor UV exposure has increased over the last five decades, even in areas with a relatively low UV index, with sunburn prevalence increasing from increased outdoor activities and suboptimal SPBs (Islami et al., 2020). Sun exposure is linked to sunburn and melanoma incidence, with
severe sunburns attributed to the incidence of melanoma (Berwick et al., 2005; Islami et al., 2020).

Findings also vary regarding the relationships between SPBs and sunburn prevalence in the previous year. Sunscreen use is not always associated with a lower incidence of sunburn, as people using sunscreen may have more extended UV exposure (Fischer et al., 2016; Ghiasvand et al., 2016; Holman, Ding, et al., 2018; Morris & Perna, 2018). However, among beachgoers in the United States, sunscreen use was associated with fewer sunburns (DeFlorio-Barker et al., 2020). In a study of outdoor workers in Australia, increased use of SPBs led to fewer sunburns, yet the reported sunburns were described as more severe (Rye et al., 2014).

**Outdoor Workers and Skin Cancer Prevention**

Quantitative studies of OWs show enormous variation in sun-related knowledge, attitudes, and behaviors (Ziehfreund et al., 2019). Inconvenience and discomfort are cited as frequent barriers across all types of OWs for not using sun protection. However, awareness of SC and compliance with recommendations vary widely among occupational groups and geographical locations (Backes et al., 2017; Boyas & Nahar, 2018; Cetintep et al., 2018; Day et al., 2015; Kearney et al., 2014; Nahar et al., 2019; Nahar et al., 2014; Parrott et al., 1996; Riccò et al., 2020; Ziehfreund et al., 2019), and the studies measure various outcomes such as knowledge of skin cancer prevention and individual SPBs, both prospectively and retrospectively. The goals of the studies also vary. For example, age and having close contact with SC influenced British construction workers’ behaviors (Madgwick et al., 2011), and German OWs have low rates of skin screening and SPBs (Hault et al., 2016; Zink et al., 2018; Zink et al., 2017). Given the heterogeneity of
quantitative OW studies, they are challenging to use to draw conclusions or target interventions aimed at specific OW populations. Existing findings call for identifying “unmet needs” of OWs beyond outcomes-focused cross-sectional surveys (Ziehfreund et al., 2019, p. 1492), as findings across different countries suggest that OWs require tailored SC prevention interventions.

Few qualitative studies are available on OWs, and due to their contextualized nature, they are challenging to draw conclusions from (Rocholl et al., 2020; Zink et al., 2019). For example, only some OWs in Germany wish to wear protective clothing during summer months, finding it restrictive. Most OWs considered sunscreen inconvenient to apply, out of a sample size of seven, including mostly gardeners and landscapers (Rocholl et al., 2020). However, Zink et al. (2019) found that twenty German farmers located in the southern region of the country were more likely to use sunscreen over other SPB options. There is an acute need to understand the underlying behaviors, beliefs, and difficulties facing OWs. Qualitative and quantitative investigations are needed, especially when possible reasons for outcomes require further understanding (Harris et al., 2009). Qualitative studies provide a deeper appreciation of complex issues and underlying reasons behind behaviors and outcomes than quantitative studies. It is vital to have qualitative and quantitative information from formative, theory-based research to inform interventions (Glanz, 2008; Randolph & Viswanath, 2004).

**Summary**

The growing prevalence of SC places a significant burden on the healthcare system. While attention needs to be paid to primary prevention in younger populations and developing habits that will increase SPBs, it is imperative that other vulnerable
populations receive guidance about both primary and secondary SC prevention. This quantitative study will remedy the gaps in the literature about the factors influencing adults in the United States. The qualitative study about OWs will advance the understanding of a vulnerable population in states with a higher-than-average burden for SC and illuminate strategies to improve disease outcomes. The knowledge gained from these studies will inform future research and provide critical information to healthcare professionals and public health officials.
CHAPTER III: PREDICTORS OF SUN PROTECTIVE BEHAVIORS AND SUNBURN IN THE UNITED STATES POPULATION

Skin cancer is the most diagnosed cancer in the United States. Despite years of education about prevention, incidence is increasing. There are mixed findings about sun protection factors' relationship to preventing sunburn. This study aimed to identify the factors associated with the performance of sun protective behaviors and understand sunburn risk factors, which relate to skin cancer risk, controlling for demographic factors. This is a secondary analysis of cross-sectional data from the National Health and Nutrition Examination Survey (NHANES) from 2017-18. Data were subset to United States participants ages 20 and older who answered the dermatology questions, which included 3,404 people. A hierarchical logistic regression analysis was conducted in SPSS to investigate the contribution of several factors predicting sun-protective behaviors while controlling demographic variables. In addition, multiple logistic regression analyses were used to examine potential factors related to getting a sunburn. Statistical significance was \( p < .05 \). Race, education, birth country, gender, and sun sensitivity were significant predictors of sun protection behaviors. Those who used sunscreen with a higher frequency and those with severe sun sensitivity had the highest odds of reporting a
sunburn. Younger age and severe sun sensitivity were associated with multiple sunburns. The discrepancy between the perceived level of sun sensitivity and the incidence of sunburn suggests that people need to be adequately informed about the risks of sunburn. This finding supports the need for additional research to understand the attitudes and health beliefs toward sunburn and skin cancer prevention.

**Keywords:** skin neoplasms, skin cancer, sun protection, sunburn, NHANES, National Health and Nutrition Survey

### Introduction

Skin cancer (SC) is the most common preventable cancer in the United States (Centers for Disease Control and Prevention [CDC], 2019). Nearly 90% of skin cancer is caused by ultraviolet radiation (Kim & He, 2014). SCs include basal cell carcinoma (BCC), squamous cell carcinoma (SCC), and melanoma. (Curti et al., 2022). Ultraviolet (UV) radiation exposure causes sunburn and is the primary cause of non-melanoma skin cancer (NMSCs) and melanoma. Sun protection behaviors (SPBs), including seeking shade, wearing covering clothing, and using sunscreen to prevent UV exposure, lower SC risk (Skin Cancer Foundation, 2019). Precise incidence rates of BCC and SCC are not monitored in cancer registries, but NMSCs are associated with 2,000 deaths annually, a rising number (American Cancer Society, [ACS], 2022; Rogers et al., 2015). Over 8,000 U.S. melanoma deaths were reported in 2018. Melanoma is the fifth most common type of new cancer cases (U.S. Cancer Statistics Working Group, 2021). In the United States, cutaneous melanoma incidence rose by 2% between 2006 and 2015, with estimates that it will represent 7.1% of all U.S. cancers by 2030 (Islami et al., 2020).
Previous literature examined relationships between sunburn, perceived sensitivity, UV exposure, demographic factors, and SPBs; however, findings have varied (Calderón et al., 2019; Fischer et al., 2016; Heckman et al., 2021; Holman et al., 2015; Holman et al., 2019; Pinault & Fioletov, 2017; Widemar & Falk, 2018; Wu et al., 2016). Sunburn is associated with being younger, White, United States-born, and more prevalent among individuals self-rated as more sun sensitive (Fischer et al., 2016; Holman et al., 2019; Holman, Ding, et al., 2018; Widemar & Falk, 2018; Wu et al., 2016). Sunscreen use is not always associated with a lower incidence of sunburn, as people using sunscreen may have extended UV exposure (Fischer et al., 2016; Ghiasvand et al., 2016; Holman, Ding, et al., 2018; Morris & Perna, 2018). This study aims to identify the factors associated with the performance of SPBs and elucidate the risk factors of sunburn utilizing a nationally representative database. Recognizing predictor variables most associated with the conduction of these behaviors will inform future interventions to prevent and identify skin cancer and melanoma earlier. The research questions are:

1. Do demographics (i.e., race/ethnicity, age, gender, country of birth, and education level), sunburn in the previous year, and sun sensitivity predict SPBs?
2. Do SPBs, sun sensitivity, and UV exposure predict the incidence of sunburn?
3. Do demographics, SPBs, sun sensitivity, and UV exposure predict the number of sunburns (or frequency of sunburns in the last year) among individuals reporting at least one sunburn in the past 12 months before the interview?
Theoretical Framework

Holman’s Skin Cancer Risk Model was the framework for this study (Holman et al., 2019). Perceived sun sensitivity and SPBs vary by demographic groups and influence the outcome of sunburn. A higher perceived level of sun sensitivity is directly related to an increased risk for sunburn through UV exposure and SPBs. Performing SPBs, especially sunscreen application, will reduce UV exposure and attenuate sunburn risk.

Sun exposure is linked to sunburn and melanoma incidence, with severe sunburns attributed to SC incidence (Berwick et al., 2005; Islami et al., 2020).

Figure 1. Skin Cancer Risk Model (Holman et al., 2019).

Methods

Design and Sample

The National Health and Nutrition Examination Survey (NHANES) assesses health and health-related behavioral data from non-institutionalized US civilian residents and is conducted by the National Center for Health Statistics (2017). The NHANES dataset is available to the public, so IRB review was not required. This cross-sectional study examined 2017-18 NHANES survey data (U.S. Department of Health and Human Services, 2020), with 9,254 completing the NHANES interview in 30 locations (National
Center for Health Statistics, n.d.). Due to the coronavirus (COVID-19) pandemic, collection of 2019-2020 data was interrupted, and the 2017-18 survey data include the most recent nationally representative data (Centers for Disease Control and Prevention, 2021). This study was limited to participants ages 20 years and older answering dermatology questions (N=3404).

**Measures**

Sunburn was measured by asking about the occurrence of sunburn in the past year. Those respondents reporting at least one sunburn were asked the number of sunburns in the last 12 months.

SPBs were measured using a frequency scale (1, *always* to 5, *never*). They were reverse-coded (1, *never* to 5, *always*) to make the score interpretation more intuitive; larger numeric values relate to a higher SPB frequency. Individual SPBs included staying in the shade, wearing a long-sleeved shirt, wearing pants, and applying sunscreen on a sunny day. Principal component analysis using Varimax (orthogonal) rotation and the scree plot determined that these three items loaded onto one factor. Data reduction techniques typically under- or overestimate the dimension of data (Cangelosi & Goriely, 2007). Although the threshold was .60 (Kaiser, 1970, 1974), a KMO of .58 was considered suitable. Bartlett’s Test of Sphericity was significant ($p < .001$). Therefore, SPB numbers were combined, creating an average score for one of the measures.

Participants were asked the amount of time outdoors to measure UV exposure. Time spent outside 9 am - 5 pm was measured separately in minutes for recreational and work activities. Sun sensitivity was measured as the perceived skin reaction to the sun after being in the sun without sunscreen for a half-hour after several months of no sun exposure.
exposure. This was assessed with a 5-point Likert scale (1, get a severe sunburn with blisters to 5, nothing would happen in half an hour).

Demographic information obtained in this study were age (years), race/ethnicity, gender, birth country (United States or outside), and education level. Participants over 80 years old were recorded as 80 years old. Race/ethnicity was self-reported as White, other Hispanic, Mexican American, Black, Asian, and Multiracial.

Data Analysis

Frequency distributions were used to screen for data entry errors and missing values. Data distributions were checked to determine appropriate statistical analyses. Descriptive statistics were used to describe sample characteristics, including mean, median, standard deviation, and frequency distribution. Demographic differences in prevalence of sunburn, number of sunburns, time spent outdoors, and individual SPBs were examined. Associations between categorical variables were examined using Pearson’s chi-squared test, and the associations between continuous variables were examined using Spearman’s rank correlation. To examine group differences, the t-test was used if the dependent variable was normally distributed. Mann-Whitney U test or the Kruskal-Wallis tests were conducted if the outcome was not normally distributed. The following effect size criteria were used: .1 = small effect, .3 = medium effect, and .5 = large effect (Cohen, 1988).

For research question one, a hierarchical multiple regression analysis examined potential factors predicting SPBs. For research question two, a multiple logistic regression analysis examined potential factors related to getting a sunburn. For question 3, multiple linear regression was initially proposed to examine factors contributing to the

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number of sunburns. The assumption of linearity for linear regression was not met; hence, for question three, the outcome variable number of sunburns was dichotomized into only one sunburn (median) or more than one sunburn. Then, logistic regression examined potential factors related to reporting multiple sunburns vs. one the previous year.

All analyses were performed using IBM SPSS Statistics (Version 29) software. The alpha level was set at .05 for all statistical tests.

Results

Descriptive statistics for all demographic variables are presented in Table 1. The mean sample age was 51.5 (SD = 17.8). In this sample, 48.5% of the individuals were male, and 51.5% were female. The most common educational level was some college or an associate degree (31.9%), and 24% had a bachelor’s degree or more. The largest racial groups were Whites (34.7%), Blacks (23.3%), and Asians (14.6%), and 68.6% of the sample was United States born.
Table 1

**NHANES Sample Characteristics**

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
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<td><strong>Gender</strong></td>
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<td></td>
</tr>
<tr>
<td>Male</td>
<td>2,702</td>
<td>48.5</td>
</tr>
<tr>
<td>Female</td>
<td>2,867</td>
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<td>5,569</td>
<td>100</td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
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<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>51.5</td>
<td>(17.81)</td>
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<tr>
<td><strong>Education level</strong></td>
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<tr>
<td>9-11th grade</td>
<td>638</td>
<td>11.5</td>
</tr>
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<td>HS graduate/GED</td>
<td>1,325</td>
<td>23.8</td>
</tr>
<tr>
<td>Some college/Assoc.</td>
<td>1,778</td>
<td>31.9</td>
</tr>
<tr>
<td>College graduate +</td>
<td>1,336</td>
<td>24.0</td>
</tr>
<tr>
<td>Total</td>
<td>5,556</td>
<td>100</td>
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<td></td>
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<td>1,935</td>
<td>34.7</td>
</tr>
<tr>
<td>Mexican American</td>
<td>735</td>
<td>13.2</td>
</tr>
<tr>
<td>Other Hispanic</td>
<td>517</td>
<td>9.3</td>
</tr>
<tr>
<td>Black</td>
<td>1,298</td>
<td>23.3</td>
</tr>
<tr>
<td>Asian</td>
<td>811</td>
<td>14.6</td>
</tr>
<tr>
<td>Multiracial</td>
<td>273</td>
<td>4.9</td>
</tr>
<tr>
<td>Total</td>
<td>5,569</td>
<td>100</td>
</tr>
<tr>
<td><strong>Country of birth</strong></td>
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<td></td>
</tr>
<tr>
<td>United States</td>
<td>3,829</td>
<td>68.6</td>
</tr>
<tr>
<td>Other</td>
<td>1,737</td>
<td>31.2</td>
</tr>
<tr>
<td>Total</td>
<td>5,566</td>
<td>100</td>
</tr>
</tbody>
</table>

*Note. HS: High school; GED: General Education Diploma*

Sunburn prevalence by demographic is presented in Table 2. Participants reporting sunburn had a lower mean age (37.59, SD = 11.17) than those reporting no sunburn (41.0, SD = 11.65), p < .001. There was no difference between gender and time spent outside for work in sunburn prevalence. Those with some college or more were more likely than those without any college to report a sunburn in the last year. White people were most likely to report a sunburn the previous year, with 59.7% reporting at
least one, while only 9.1% of Black people reported a sunburn. The comparison of the sample with the median number of sunburns is also shown in Table 2. The number of sunburns reported did not differ by SPB, but it was significantly higher among those who reported a higher level of sensitivity to the sun.

Table 2

**Prevalence of Sunburn in the Past Year by Groups and Median Number of Sunburns (if reported sunburn)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>%</th>
<th>P</th>
<th>Mdn.</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td>.90&lt;sup&gt;C&lt;/sup&gt;</td>
<td></td>
<td>.90&lt;sup&gt;C&lt;/sup&gt;</td>
</tr>
<tr>
<td>Male</td>
<td>529</td>
<td>32.9</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>595</td>
<td>33.1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>1124</td>
<td>33.0</td>
<td>&lt;.001&lt;sup&gt;T&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
<td>&lt;.001&lt;sup&gt;C&lt;/sup&gt;</td>
<td>&lt;.001&lt;sup&gt;C&lt;/sup&gt;</td>
<td>.12&lt;sup&gt;MW&lt;/sup&gt;</td>
</tr>
<tr>
<td>&lt; 9&lt;sup&gt;th&lt;/sup&gt; grade</td>
<td>37</td>
<td>17.1</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>9-11&lt;sup&gt;th&lt;/sup&gt; grade</td>
<td>93</td>
<td>25.1</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>HS/GED</td>
<td>248</td>
<td>31.2</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Some college/Assoc.</td>
<td>461</td>
<td>39.8</td>
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<td>1</td>
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<tr>
<td>Bach. deg. +</td>
<td>285</td>
<td>32.9</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Race/ethnicity</td>
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<td></td>
<td>&lt;.001&lt;sup&gt;C&lt;/sup&gt;</td>
<td></td>
<td>.001&lt;sup&gt;KW&lt;/sup&gt;</td>
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<tr>
<td>Mex. Amer.</td>
<td>160</td>
<td>31.1</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Other Hisp.</td>
<td>88</td>
<td>27.7</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>610</td>
<td>59.7</td>
<td>1.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>71</td>
<td>9.1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>128</td>
<td>22</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiracial</td>
<td>67</td>
<td>35.1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country of birth</td>
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<td></td>
<td>.61&lt;sup&gt;MW&lt;/sup&gt;</td>
</tr>
<tr>
<td>United States</td>
<td>883</td>
<td>39.1</td>
<td></td>
<td>1</td>
<td></td>
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<tr>
<td>Other</td>
<td>241</td>
<td>21.0</td>
<td>1</td>
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<tr>
<td>Time outside nonwork</td>
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<td>.74&lt;sup&gt;C&lt;/sup&gt;</td>
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<td>.002&lt;sup&gt;MW&lt;/sup&gt;</td>
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<tr>
<td>&lt;240 min</td>
<td>809</td>
<td>33.2</td>
<td></td>
<td>1</td>
<td></td>
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<tr>
<td>≥ 240 min</td>
<td>314</td>
<td>32.6</td>
<td>2</td>
<td></td>
<td></td>
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</tbody>
</table>
Prevalence of Conducting SPBs by Demographic Variables

The prevalence of conducting each SPB (staying in the shade, wearing long sleeves, using sunscreen) by demographic variables is in Table 3. Compared to men,
women reported more staying in the shade ($z = 12.18, p < .001, r = .21$) and use of sunscreen ($z = 14.41, p < .001, r = .25$), with small effect sizes. Mann-Whitney U tests revealed a significant difference in the use of sunscreen between males ($M = 1.95, Mdn = 2, n = 1608$) and females ($M = 2.65, Mdn = 3, n = 1797$). There was no significant gender difference in wearing long sleeves.

Among those born in the United States versus those born outside the United States, there was a significant difference in staying in the shade ($z = 4.22, p < .001, r = .07$), wearing sleeves ($z = 14.89, p < .001, r = .26$), and sunscreen use frequency ($z = 4.08, p < .001, r = .07$), with small effect sizes. Those born outside of the United States performed all SPBs with a higher frequency than those born in the United States.

There was no significant association by age for staying in the shade ($p = .14$) or sunscreen use ($p = .82$). There was a significant correlation between age and wearing sleeves (Spearman’s rho = .06, $n = 3403, p = .001$), with older age associated with more frequent long sleeve wearing.

Among the education categories, there was a significant difference in sunscreen use ($z = 299.06, p < .001$) and wearing sleeves ($z = 62.06, p < .01$), but not in shade-seeking ($p = .07$). Those with a bachelor’s degree or higher used sunscreen with the highest frequency ($Mdn = 3$). Those with less than a 9th-grade education and a bachelor’s degree or higher used long sleeves the most ($M = 2.87, Mdn = 3; m = 2.41, Mdn = 2$, respectively).

There were differences among racial/ethnic groups for all three SPBs. There were significant differences in sunscreen use ($z = 369.52, p < .001$). Black people were the least likely to wear sunscreen, and Asian and White people were the most likely to use
sunscreen ($m = 2.64$). There were significant differences for the use of long sleeves ($z = 264.52, p < .001$), with Asian and Mexican American groups wearing long sleeves with the highest frequency ($Mdn = 3$). For shade seeking, there were significant differences by race ($z = 78.33, p < .001$), with White people having the lowest and Asian people having the highest frequency of staying in the shade.

Table 3

Sun Protection Behaviors (1, never, to 5, always) by Demographic Variables

<table>
<thead>
<tr>
<th>Sun protection behaviors</th>
<th>Mean</th>
<th>N</th>
<th>SD</th>
<th>Mdn.</th>
<th>P</th>
</tr>
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<tr>
<td>Staying in the shade</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Male</td>
<td>2.97</td>
<td>1608</td>
<td>.96</td>
<td>3</td>
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<tr>
<td>Female</td>
<td>3.37</td>
<td>1796</td>
<td>1.00</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Birth country</td>
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<td></td>
<td></td>
<td>&lt;.001</td>
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<td>U.S. born</td>
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<td>1234</td>
<td>1.25</td>
<td>4</td>
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<tr>
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<td>1.41</td>
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<td>Age</td>
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<td></td>
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<td>.14</td>
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<td>Education</td>
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<td>.07</td>
</tr>
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<td>&lt;9th grade</td>
<td>3.00</td>
<td>217</td>
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<td>9-11th grade</td>
<td>3.12</td>
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<td>1.02</td>
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<td>.96</td>
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<td>.94</td>
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<tr>
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<td></td>
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<td>Education level</td>
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</tr>
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<td><strong>Wearing long sleeves</strong></td>
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<td>US Born</td>
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<td><strong>Age</strong></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
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<tr>
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<td>1.25</td>
<td>1</td>
<td></td>
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<tr>
<td>HS/GED</td>
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<td>792</td>
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<td>1</td>
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<tr>
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*MW: p < .05, KW: p < .001, SR: p = .01*
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<td></td>
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</tbody>
</table>

*Note.* GED: General Education Diploma; HS: High school; MW: Mann-Whitney U test; KW: Kruskal-Wallis test; SR: Spearman’s rho

**How Sunburn in the Previous Year and Sunburn Risk Are Related to SPBs, Controlling for Demographic Variables**

Hierarchical multiple regression was conducted with the average score of SPBs as the outcome variable and demographic variables, reported sunburn in the previous year, and sun sensitivity level as predictors. The results are presented in Table 4. In step 1, only demographic variables were entered. The model was significant, $F(12, 3345) = 48.08, p < .001, R^2 = .14$. In the second step, sun sensitivity and previous year sunburn were entered, explaining 4% more of the variance in SPBs ($R^2$ change = .04, $p < .001$). The overall regression model of the second step was statistically significant and explained 18% of the variance in SPBs, $F(17, 3345) = 44.79, p < .001$. The significant demographic variables were age, gender, country of birth, and race. Women and non-United States-born people performed more SPBs. People reporting the highest sun sensitivity performed more SPBs than people who anticipated no reaction ($p < .001$). Sunburn the previous year was not associated with SPBs. Compared to Whites, other Hispanics, Mexican Americans, and Asians performed more SPBs, while Black and multiracial people had no significant difference.
Hierarchical Regression Predicting Use of Sun Protection (average of 3 sun protective behaviors, 1 – 5, never to always)

<table>
<thead>
<tr>
<th>Model</th>
<th>Variables</th>
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<th>SE (St d)</th>
<th>T</th>
<th>p</th>
<th>Adj. R²</th>
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</thead>
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<td>.09</td>
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<td>.09</td>
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<td>.10</td>
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<td>.53</td>
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</tr>
<tr>
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<td>.69</td>
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<td>.12</td>
<td>5.12</td>
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<td>.10</td>
<td>5.26</td>
<td>01</td>
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<td>Black</td>
<td>Asian</td>
<td>Multiracial</td>
<td>Education (ref. = ≤9th grade)</td>
<td>9-11th grade</td>
<td>HS/GED</td>
</tr>
<tr>
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<td>.34</td>
<td>.07</td>
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<td>-.02</td>
<td>.05</td>
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<td>.44</td>
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</tr>
</tbody>
</table>

*Note. HS = High School; GED = General Education Diploma; ref. = reference group*

**How Individual SPBs, Skin Sensitivity to the Sun, and UV Exposure Predict Sunburn**

Logistic regression was performed to assess the impact of individual SPBs, UV exposure during the day, and sun sensitivity level on the odds that respondents reported a sunburn the last year (coded 0 = *no sunburn*, 1 = *had a sunburn*). The Hosmer-Lemeshow test indicated a good fit of the data ($\chi^2 = 4.85, p = .77$), Cox & Snell $R^2 = .21$. The entire model was statistically significant, $\chi^2 (9, N = 2971) = 694.72, p < .001$ As shown in Table 5, the significant predictors in the model were the individual SPBs, time spent outside for nonwork, and sun sensitivity. People who reported a higher frequency of staying in the shade or wearing long sleeves had lower odds of reporting a sunburn (OR .83 [95% CI: .76, .91], and OR .88 [95% CI: .82, .96], respectively). People who reported
a higher frequency of using sunscreen were more likely to report a sunburn (OR 1.24, [95% CI: 1.16, 1.33]). More time spent outside for nonwork purposes was significantly associated with reporting a sunburn ($p < .001$), but with a small coefficient. Time spent outside for work purposes was not associated with reporting a sunburn the previous year. People who reported that their skin would experience a severe burn when exposed to the sun for 30 minutes were more likely than those anticipating blisters to report a sunburn (OR 3.27 [95% CI: 1.76, 6.07], $p < .001$). Those expecting a mild burn had no significant differences in reporting a sunburn in the previous year than those expecting to blister after 30 minutes in the sun ($p = .14$). Those who expected their skin to darken or nothing to happen were less likely to experience a sunburn (OR .44 [95% CI: .25, .78], $p = .01$, and .20 [95% CI: .11, .35], $p < .001$, respectively).

Table 5

*Logistic Regression Predicting Likelihood of Reporting Any Sunburn in the Last Year (N = 2971)*

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>Sig.</th>
<th>OR</th>
<th>95% C.I. for OR Lower</th>
<th>95% C.I. for OR Upper</th>
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<td>14.43</td>
<td>&lt;.001</td>
<td>.83</td>
<td>.76</td>
<td>.91</td>
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<td>Wear long sleeves</td>
<td>-.12</td>
<td>.04</td>
<td>9.85</td>
<td>.002</td>
<td>.88</td>
<td>.82</td>
<td>.96</td>
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<td>Use sunscreen</td>
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<td>.04</td>
<td>37.28</td>
<td>&lt;.001</td>
<td>1.24</td>
<td>1.16</td>
<td>1.33</td>
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<td>Outdoors 9-5 workday</td>
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<td>.000</td>
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<td>.71</td>
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<td>1.00</td>
<td>1.00</td>
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<td>Outdoors 9-5 nonwork</td>
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<td>.000</td>
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<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
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<td>.32</td>
<td>14.08</td>
<td>&lt;.001</td>
<td>3.27</td>
<td>1.76</td>
<td>6.07</td>
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<td>Mild burn</td>
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<td>1.52</td>
<td>.87</td>
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<td>7.98</td>
<td>.01</td>
<td>.44</td>
<td>.25</td>
<td>.78</td>
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<tr>
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<td>.03</td>
<td>.85</td>
<td>.94</td>
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<td></td>
</tr>
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</table>
Note. Stay in the shade, wear long-sleeved shirt, use sunscreen measured as 1, never to 5, always; ref. = reference group

How SPBs, Skin Sensitivity to the Sun, UV Exposure, and Demographics Are Related to the Number of Sunburns among Individuals Who Had Sunburn in the Past 12 Months

Sunburn data were dichotomized based on the median score of one, with the option of one sunburn or more than one sunburn the previous year. Logistic regression was performed to examine how SPBs, sunburn risk factors of UV exposure and sun sensitivity, and demographics predicted that the respondents reported multiple sunburns. The regression coefficients are presented in Table 6. The Hosmer-Lemeshow test showed that the model presented a good fit, \( \chi^2 = 9.25, p = .32 \), Cox & Snell \( R^2 = .10 \). The full model containing all predictors was statistically significant, \( \chi^2 (21, N = 987) = 106.06, p < .001 \), indicating that the model could distinguish between respondents who reported one versus multiple sunburns. Respondents expecting that they would have a milder burn than a blister had higher odds of reporting more than one sunburn than those anticipating a blistering sunburn after 30 minutes in the sun (severe burn OR 6.27 [95% CI: 2.42, 16.25], mild burn OR 2.68 [95% CI: 1.69, 4.24], darken OR 2.14 [95% CI: 1.47, 3.13], \( p < .001 \)). Older age was associated with a lower likelihood of reporting more than one burn (OR .96 [95% CI: .95, .97], \( p < .001 \)). Education, race, country of birth, gender, time spent outside for work, and individual sun protective behaviors were not associated with reporting more than one sunburn the previous year.

Table 6

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>Sig.</th>
<th>OR</th>
<th>95% C.I. for OR</th>
</tr>
</thead>
</table>

**Logistic Regression Predicting Likelihood of Reporting More than One Sunburn in the Past Year (N = 987)**
<table>
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<th></th>
<th>Lower 1</th>
<th>Lower 2</th>
<th>Upper 1</th>
<th>Upper 2</th>
</tr>
</thead>
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<td>.001</td>
<td>1.19</td>
<td>1.001</td>
</tr>
<tr>
<td>Min. outdoors 9-5 not work</td>
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<td>.001</td>
<td>5.00</td>
<td>1.001</td>
</tr>
<tr>
<td>Sunburn sensitivity (ref. = blister)</td>
<td>36.13</td>
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<td>1.001</td>
<td>1.000</td>
</tr>
<tr>
<td>Severe burn/peel</td>
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<td>.49</td>
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<td>&lt;.001</td>
</tr>
<tr>
<td>Mild burn, peel</td>
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<td>.24</td>
<td>17.57</td>
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</tr>
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<td>Darken, no burn</td>
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<tr>
<td>Constant</td>
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<td>.56</td>
<td>.04</td>
<td>.85</td>
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</table>

*Note.* ref. = reference group

**Discussion**

This study examined the relationships among sun exposure risk factors, sunburn, and SPBs in American adults. Gender, country of birth, sun sensitivity, and race/ethnicity were found to be significant factors associated with conducting SPBs, consistent with other studies (Calderón et al., 2019; Falk & Anderson, 2013; Fischer et al., 2016; Heckman et al., 2021; Holman et al., 2015; Widemar & Falk, 2018). In the current study, age was associated with wearing long sleeves but not shade-seeking or sunscreen.
use. Education was not associated with a higher level of overall SPB performance, but there were distinctions among those with a bachelor’s degree, which are likely related to socioeconomics.

Gender differences were present in this study for sunscreen use and shade-seeking, suggesting that women are more motivated to protect their skin, possibly due to antiaging or other health concerns. Black people were not any more or less likely than White people to conduct SPBs, and all other racial/ethnic groups were more likely to perform SPBs than Whites. When looking at individual sun protection behaviors, sunscreen use was highest among Whites compared to other groups. However, Whites performed the other SPBs less frequently than other racial groups, differing from other findings (Calderón et al., 2019). “Sunburn” or “burning” terminology may not always resonate with Black people; instead, terms such as “rash,” “darkening,” “irritation,” and “blisters” are used. Skin cancer knowledge is low in Black and Hispanic communities (Buchanan Lunsford et al., 2018; Eilers et al., 2013; Pichon et al., 2010). These behavioral differences in ethnicity warrant additional investigation to understand knowledge and perceptions of skin cancer prevention and screening strategies, especially in the Black population, with disproportionately low survival rates when diagnosed with skin cancer (Qian et al., 2021; Wu et al., 2011). The lack of perceived risk and knowledge by Hispanic and Black people is possibly related to a lack of representation in health messaging about skin cancer and sunburn risk (Buchanan Lunsford et al., 2018; Calderón et al., 2019).

More frequent sunscreen use was associated with reporting a sunburn or multiple sunburns, while using other forms of sun protection was associated with a lower
likelihood of reporting sunburn. Our result suggests other reasons for this, such as improper sunscreen application and tanning motivations, and may reflect that White people tend to select sunscreen over other SPBs. Using sunscreen alone reduces the incidence of SCC and melanoma by 40% and 50%, respectively (Green et al., 2011; Sander et al., 2020). Sunscreen blocks up to 99% of sunburn-causing UV radiation for several hours, depending on the sun protection factor (SPF) level, intensity of the sun, and activities performed by the individual (Ambizas & Maniara, 2016). Shade and long sleeves block UV radiation, but sunscreen has higher efficacy (Ou-Yang et al., 2017), yet sunscreen users may not apply and reapply it as recommended, especially when sweating or swimming. They may also engage in more outdoor activities with little shade, or sleeves are uncomfortable. Outdoor UV exposure increased over the last five decades, even in areas with a relatively low UV index, due to increased outdoor activities and suboptimal SPBs (Islami et al., 2020). SPBs attenuate UV exposure with barriers to UV radiation. Results of this study supported other findings associating sunscreen usage with a higher sunburn likelihood (Fischer et al., 2016; Ghiasvand et al., 2016; Holman, Ding, et al., 2018; Morris & Perna, 2018). This non-intuitive finding requires future studies to examine the confounding factors, such as proper SPB performance and sunscreen SPF value.

Congruent with other research (Holman, Ding, et al., 2018; Widemar & Falk, 2018), a higher anticipated sensitivity level after 30 minutes in the sun was associated with reporting at least one sunburn, with the exception that the people who expected a blistering sunburn (the most severe) were least likely to report any sunburn. This suggests a difference in sun sensitivity perceptions and the danger of sunburns. On the one hand, it
is encouraging that the most sun-sensitive people (those who blister) avoid multiple sunburns, but on the other hand, minor and severe sunburns require prevention. Education about vulnerability to sunburn and clarification of skin damage (i.e., tanning) is needed. These findings elucidate the need for education on the dangers of a peeling sunburn, even if it is unlikely to blister.

This study's strengths include using an extensive, nationally representative database. Limitations include self-reported data and recall bias. Also, no data were collected to indicate the severity of sunburn experienced the previous year. Future studies may include questions asking respondents about their sunburn timing, knowledge, attitudes toward sunburn and its consequences, sunscreen application knowledge, and cultural norms.

In conclusion, this cross-sectional study found associations between demographics and sun sensitivity using three primary sun protection behaviors and sunburn prevalence related to sunscreen use, demographic factors, and perceived sun sensitivity. These factors warrant additional study, especially differences in attitudes related to SPBs and perceived sun sensitivity among ethnic groups, to develop interventions to reduce the disease burden.
CHAPTER IV: OUTDOOR WORKERS’ PERCEPTIONS OF SKIN CANCER PREVENTION: A QUALITATIVE STUDY

Purpose and Research Questions

Outdoor workers are at increased risk for skin cancer and melanoma. This qualitative study aimed to explore outdoor workers’ perspectives and experiences of primary (i.e., sun protection) and secondary prevention, i.e., skin self-examination (SSE) of skin cancer.

Methods

Purposive and snowball sampling was used to recruit outdoor workers in Kentucky and Indiana. Semi-structured interviews via telephone or videoconference of approximately 45 minutes were conducted with interviewer probes and questions about perceptions of cancer risk, prevention, and screening techniques conducted, perceived barriers and facilitators, and preferences for health dissemination venues. The recordings were transcribed verbatim and anonymized. Analysis involved constructivist grounded theory coding strategies with the Theory of Planned Behavior as a sensitizing framework. Using peer debriefing and consensus building around themes, the researcher established a codebook for all interviews to utilize within Dedoose software for systematizing and organizing data.

Results
Eighteen interviews were conducted. Interviewees (N=18) ranged in age from 35 to 78 years, with three females. Outdoor industries included agriculture, maintenance, and recreation. Themes derived from the data showed the underlying factors and perceptions that influence outdoor workers to conduct primary and secondary cancer prevention activities. Level of alarm attributed to disease and level of trust in information contribute to intentions to conduct activities. The intentions and trust toward healthcare institutions and providers drive the primary or secondary prevention behaviors. Cultural and contextual factors included masculinity and self-sufficiency, familial and occupational priorities, and community ties.

Conclusions

These data provide a basis for developing future communications and interventions to decrease skin cancer incidence in outdoor workers. They indicate that secondary prevention and building self-efficacy in conducting SSE should be emphasized in tandem or over primary skin cancer prevention methods in this population. Trusted local healthcare providers should primarily provide prevention information, and materials should utilize testimonials from the local community to best influence this population. Communications and training interventions are needed in this population to induce a proactive level of alarm about cancer and result in the performance of SSE.

Keywords: occupational exposure, skin cancer, primary prevention, secondary prevention, sun protection factor, melanomas
Introduction

Background and Significance

Skin cancer (SC) is the most frequently occurring cancer in the United States, despite being preventable and curable with sun protection (i.e., clothing and hat barriers, shade, and sunscreen) and early skin screening, respectively (Breitbart et al., 2012; Centers for Disease Control and Prevention, 2019; Holman, Kapelos, et al., 2018; Hung et al., 2022; Janda et al., 2022). Ultraviolet (UV) radiation exposure is associated with a higher risk of SC and melanoma development (Skin Cancer Foundation, 2019; Xiang et al., 2014). Incidence is growing in all SC carcinomas and melanoma in the United States. In the United States, melanoma incidence rose 2% between 2006 and 2015, with forecasts estimating that it will represent 7.1% of all U.S. cancers by 2030 (Islami et al., 2020). Kentucky and Indiana are states carrying a higher-than-average burden for all SC incidence and mortality (Aggarwal et al., 2021).

In the last four decades, most efforts to lower SC incidence have focused on primary prevention, especially in the context of recreational activities and in youth populations, necessitating new health promotion approaches (Jongenelis et al., 2018). Secondary prevention involves skin self-examination (SSE) and regular skin checks by a healthcare professional to screen for suspicious lesions. When identified in early stages, SC is highly treatable, and early diagnosis leads to a higher likelihood of a cure (Thomas & Giblin, 2006). Further, adults over 30 have significantly less favorable attitudes toward intentional tanning (Dennis et al., 2009). Therefore, adults require separate studies about the factors influencing them to prevent SC. The increased incidence for men after age 55 reflects age differences in occupational and recreational exposure to UV radiation, as exposure increases with retirement (American Cancer Society, 2022a). Most SC and
melanoma incidence in the U.S. is documented by adults older than 65 (Holman, Freeman, et al., 2018; Rogers et al., 2015), suggesting that secondary SC prevention is vital as people age. Given the growing incidence of SC among older adults and the efficacy of combining primary and secondary prevention, it is necessary to understand older adults’ perceptions of SC prevention.

Despite the occupational risks inherent to OWs (Glanz et al., 2007; Lushniak, 2006; Preda-Naumescu et al., 2022), few studies address SC prevention in OWs. Quantitative OW studies of OWs demonstrate heterogeneous results in sun-related knowledge, attitudes, and behaviors Field (Ziehfreund et al., 2019), making it challenging to draw conclusions or target interventions. Existing analysis calls for identifying “unmet needs” of OWs beyond outcomes-focused cross-sectional surveys (Ziehfreund et al., 2019, p. 1492). Unfortunately, few qualitative studies are available on OWs, the most recent in Germany (Rocholl et al., 2020; Zink et al., 2019). Given this acute need to understand the underlying behaviors, beliefs, and difficulties facing OWs, it is vital to have qualitative and quantitative information from formative, theory-based research to inform culturally appropriate interventions (Glanz, 2008; Randolph & Viswanath, 2004).

The Theory of Planned Behavior (TOPB) conceptualized this qualitative study, serving as the sensitizing theoretical framework to orient it (Gilgun, 2019; Polit & Beck, 2021). The TOPB shows how social and psychological determinants influence the individual performance of health behaviors. It proposes that antecedents to performing a particular behavior are attitudes, normative beliefs, intentions, and self-efficacy or perceived control toward the behavior (Ajzen, 1991), shaped by external factors (Figure 2). With an understanding of these constructs, interventions can be developed as “a point
of attack to change” (Ajzen, 1991, p. 206) the behavior at hand. The TOPB constructs predict sun protection and skin self-examination behaviors (Aygun & Ergun, 2014; Babazadeh & Banayejeddi, 2017; Bergeron et al., 2019; Boyas et al., 2021; Heckman et al., 2017; Mahler, 2014; Starfelt Sutton & White, 2016).

Figure 2.

Theory of Planned Behavior in the Context of Skin Cancer Primary/Secondary Behaviors

![Diagram of the Theory of Planned Behavior](image)

Given the growing incidence of SC, the risk of their occupation, and the efficacy of primary and secondary prevention, it is necessary to understand the at-risk population of OWs outside of young adulthood (over age 30) and how they perceive SC prevention. Therefore, this study aimed to explore outdoor workers’ attitudes, beliefs, and perceptions of SC risk, including factors that promote or hinder primary and secondary prevention.

**Research Design and Methods**

This cross-sectional, qualitative study featured a grounded theory design using a social constructivist paradigm. Sensitizing TOPB concepts provided initial ideas about the topics being raised within the interview guide and for a priori coding of the transcripts.
to develop ideas about the data, representing a partially deductive approach to the data analysis (Charmaz, 2014; Gilgun, 2019; Zoellner et al., 2012). The interview questions were developed based on existing literature about TOPB-based studies (Deskins et al., 2006; Hardin-Fanning & Ricks, 2017; Krueger & Casey, 2015; Maryland Tobacco Control Resource Center, n.d.; Montano, 2008; World Health Organization, 2008; Zoellner et al., 2012), with semi-guided questions (Appendix A) steered by TOPB constructs. Standards for the Reporting of Qualitative Research (SRQR) were used to report this study (O'Brien et al., 2014) (Appendix B).

**Data Sample**

Participants were purposively and snowball sampled based on their occupation and location to achieve maximum variation in profession, age, and ethnicity. Eligibility criteria included residing in Kentucky or Indiana, being over 30, working primarily outdoors in any occupation for at least three hours daily, and being English-speaking.

**Recruitment**

Flyers (Appendix C) were sent to key informants in agricultural and construction communities to obtain referrals for potential participants. After contacting the researcher, OWs were screened for eligibility, explained the study purpose and process, and provided assurance of confidentiality. If they showed interest in participating, arrangements were made to contact them individually.

**Procedure**

Each participant was provided with a preamble/unsigned informed consent containing disclosure of the study's aims. This study was approved by the Institutional
Review Board at the University of Louisville. The plan for maintaining confidentiality of data was explained. Data regarding the facilities where the participants worked was not documented, and interviews occurred when the participants could hold a privately recorded conversation at a convenient time. Interviews were digitally audio or video recorded via video conference or telephone. Demographic data (Appendix D) were assessed.

**Data Management**

Interviews of 30-90 minutes were conducted within one year, starting in July 2021. Analytic memos were written to actively engage the researcher in the materials, the development of ideas, and critical reflexivity. After each interview, the recording was uploaded to an encrypted, password-protected cloud location to protect participants' information, after which the original recording was deleted from the recording device. Data were deidentified and transcribed verbatim by the researcher. The sample size was considered sufficient once the data reached saturation and no new data were discovered.

**Data Analysis**

Demographic data were entered into IBM Statistics SPSS Version 29.0 to attain descriptive statistics related to the participants. Transcripts were uploaded to the software Dedoose Version 9.0.17, a web application for managing, analyzing, and presenting qualitative and mixed-method research data (Dedoose Version 9.0.17, 2021). The data were explored by reading through the entire transcripts, memos, and notes written to gather initial ideas as they occurred. The analysis of the transcripts was an iterative process that involved reducing the data into themes and condensing it into groups of information called codes, which were placed into categorical groups to create a codebook.
After the codebook was established, the researchers separately coded all interviews. After coding four transcripts, independent coders met to examine codes, their names, and highlighted sections. To increase rigor of the study, the researcher and a public health student compared coding to establish intercoder agreement, with a minimum of 80% agreement (Creswell, 2013). Informal member checks were also conducted during interviews to validate the emerging research themes.

The research team maintained reflexivity by challenging assumptions about OWs and maintaining cultural and self-awareness. The leading researcher, who conducted the interviews, is an oncology nurse of Caucasian descent. The researcher made conscious efforts to avoid making assumptions about participants’ SC attitudes and knowledge and to permit the participants to drive the direction of the interviews. Participants were also reassured of the nonjudgmental intent of the interviews to persuade them to provide honest answers about their perceptions and behaviors. The coding team members consisted of researchers of Asian-American and Caucasian descent.

Results

Eighteen interviews of outdoor workers in Kentucky and Indiana were conducted. All interviewees ranged from age 34 to 78 and spent more than three hours daily in the sun. Three participants were female, 15 were male, eight worked outdoors in agricultural environments, three worked outdoors with recreational equipment, and seven worked in construction. Two of the participants reside in Indiana, while 16 reside in Kentucky. Out of the participants, 15 reported being White, two reported being African American, and one reported being Hispanic. The average age of the sample was 52.3 years, with one-
third of participants between the ages of 51 and 60. Two participants reported a history of SC, and three reported a family history of SC. Descriptive statistics are in Table 7.

Table 7

*Demographic Characteristics of the Sample*

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<th>Characteristic</th>
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<td>31-40</td>
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<tr>
<td>41-50</td>
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<td>51-60</td>
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<tr>
<td>61-70</td>
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<tr>
<td>71-80</td>
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<td>Race</td>
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<td>White</td>
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<tr>
<td>Black</td>
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<tr>
<td>Hispanic</td>
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<tr>
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<tr>
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<td>Divorced</td>
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<tr>
<td>Education level</td>
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<tr>
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<td>Some college/trade school</td>
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<td>Bachelor degree</td>
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<tr>
<td>Construction</td>
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<tr>
<td>Recreation/landscaping</td>
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<tr>
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<tr>
<td>Family history of skin cancer (yes)</td>
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</tr>
<tr>
<td>History of any cancer (yes)</td>
<td>11.11%</td>
</tr>
<tr>
<td>Family history of any cancer (yes)</td>
<td>38.89%</td>
</tr>
<tr>
<td>Sufficient income to meet expenses (yes)</td>
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<tr>
<td>State of primary residence</td>
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</tr>
<tr>
<td>Indiana</td>
<td>11.11%</td>
</tr>
<tr>
<td>Kentucky</td>
<td>88.89%</td>
</tr>
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</table>
Themes were discerned from the data, utilizing the TOPB constructs as a sensitizing framework to examine the underlying factors and perceptions of OWs to conduct primary and secondary cancer prevention. The sensitizing themes of attitudes, normative beliefs, and perceived control in relation to SC prevention behaviors are described here, along with subthemes and illustrative quotes from participants.

**Attitudes**

Participant attitudes toward SC prevention were largely ambivalent, with some participants having a more positive attitude. All participants were aware of SPBs, and most believed they were effective means of SC prevention, although there were doubters about the efficacy of SPBs. Many participants had negative attitudes toward performing SPBs, disliking the feeling of sunscreen and the coverage offered by clothing. Many also had false knowledge, including beliefs that a burn before a tan is protective from sun damage. Quotes evidencing these attitudes toward SPBs include the following:

*Sometimes it [sunscreen] doesn’t seem like it works.* (Recreational Worker, Male)

*If you’re working, you’re going to be sweating, and I can’t stand my eyes to burn.*

(Farmer, Male)

Their attitudes were shaped by their level of alarm toward SC in light of other diseases, the experiences of acquaintances with cancer, and views toward illness, health, healthcare systems, and providers. The level of alarm for SC was low compared to other diseases. OWs viewed internal cancers “something that’s incurable, that you can’t cure” as more alarming. They believed SC was a minor issue that could be resolved quickly, “cut off.” Pancreatic, colon, and reproductive cancers were explicitly mentioned, with participants relaying the experiences of their friends who had endured those diseases,
usually fatally. However, the term “melanoma” had symbolic traction for several participants, triggering more SC alarm. Several quotes described this alarm for SC:

I don’t think most of us view skin cancer as a serious thing. (Farmer, Male)

Melanoma probably concerns me probably more…a little bit more. I don’t want either. (Farmer, Female)

Melanoma can kill you, can kill you dead. (Farmer, Male)

If they just said skin cancer, I don’t know that people would be as alarmed, as they’d be with lung, liver, brain cancer. (Farmer, Female)

Skin cancer, melanoma, one doesn’t have a different ring than the other.

(Construction Worker, Male)

Perceived risk for SC also influenced attitudes toward skin cancer prevention. Personal risk factors, such as light skin, freckles, history of suspicious lesions, and family history, influenced the OWs. For example, one OW’s experiences with suspicious growths influenced them to take SSE seriously. Having darker skin and tanning after burning were viewed as protective in SC, negating the need for protective behaviors. Participants with higher perceived risk were not necessarily performing more prevention and screening behaviors. One participant with a history of BCC admitted an improved attitude toward skin protection and screening since his diagnosis. Still, another with a close relative who died of melanoma did not acknowledge a higher risk for SC. A few described changing risk perceptions due to aging, with more urgency behind antiaging and avoiding sun exposure. Multiple quotes describe risk perceptions of OWs:

You wanted to get burnt early on and then you were good. (Farmer, Male)
I know what I’m supposed to do…. I’ve gotten better as I’ve gotten older about wearing long sleeve shirts when I’m outside…I’m aware. I have these big freckles on my arm from working outside…you know how you have stuff on your skin…. I’m not real worried about it, but I’m aware that I probably should be using sunscreen and not burning my skin. (Recreation Worker, Male)

I think a lot of folks….think well, it ain’t going to happen to me, and I just do as I want to, you know, and especially around the younger ages, and when it proves out it’s like uh-oh, I’d better do something about this. (Farmer, Male)

The anxiety or fear of OWs toward disease risk affected their performance of health behaviors. When pressure is low, the OW was unlikely to perform protective behaviors because they perceived little risk of not doing the behavior or little reward for performing them. However, when the OW was highly fearful about a health risk, they became demotivated to perform health behaviors. One OW admitted suffering from a severe heart condition and refusing prescribed medication, as his fatalistic attitude rendered him unwilling to proceed with treatment. All the OWs interviewed were aware of SC; they justified their indifference toward SC prevention by either invoking fatalism or describing a low level of alarm toward the disease in light of other, more severe diseases. They minimized the threat by convincing themselves they were safe from SC because they tanned or reminded themselves of instances when someone experienced an idiopathic disease. Many participants grappled with questions of faith and fatalism as they considered the pros and cons of skin cancer and other disease prevention efforts. On the one hand, faith and religion gave many participants hope that they could overcome or
avoid health issues with little action. On the other hand, many OWs, especially those with high alarm levels, took a fatalistic view of disease, believing they could not do much to prevent it, as evidenced by the following statements:

I’ve been outside all this time, why should I worry about this now, something’s going to kill me anyway. (Farmer, Male)

Something’s going to get me one of these days. (Construction Worker, Male)

You know, it is what it is. And then if that’s what takes me out… (Construction Worker, Male)

Attitudes were affected by overall views of healthcare, where pain and extreme situations are the only reason to seek healthcare, which was viewed as overkill by many OWs. Several described pessimism toward healthcare providers as “pill pushers” and only “in it for the money.” In addition, pessimism toward healthcare systems and treatment, viewing cures as often worse than diseases, shaped attitudes toward SC prevention and screening, as described by the following quotes:

I don’t really listen to my regular doctors much because they’re always really quick to throw pills at me for whatever reason. (Farmer, Male)

There’s certain people, they wake up in the morning, their big toes hurt, and lord, they’re going to the emergency room. I’m not one of those kind of people. (Farmer, Male)

**Normative Beliefs**

Family and friends having cancer experiences, whether SC or not, influenced participants’ behaviors and intentions to prevent SC. Having a close family member or friend with healthcare knowledge, whether a nurse, medical assistant, radiology
technician, physician, or pharmacist, influenced the participants' behaviors. Having a positive personal connection to healthcare providers (such as a mutual friend) brought a sense of confidence to performing any healthcare behaviors. However, when there was a negative experience with the provider or healthcare institution by the OW or their acquaintance, the trust in performing any healthcare-related behavior or screening decreased. Thus, normative beliefs often worked against the intention to conduct SPBs. Many participants described family members or friends who lacked risk factors for disease receiving inexplicable cancer diagnoses such as pancreatic. Others described family members as smoking for years but living long, healthy lives, believing that this showed the futility of disease prevention. Quotes on trust included the following:

Male farmers trust their wives or spouses or significant others more so than almost anybody else. It’s almost a caregiver relationship sometimes. Whether that makes or not. I think female farmers probably trust their doctors the most…. And then male farmers the second line of trust is probably their own family doctor.

(Farmer, Male)

I don’t pay more attention to her [my doctor] than my dog. (Farmer, Male)

Appearance norms were important to many of the OWs. Most wanted to avoid “looking silly,” and some aimed to tan or prevent wrinkles. However, “gruesome” was used to describe some of the damage incurred by SC. Having a tan and looking good shirtless was the motivation for one participant in his thirties, while some female OWs were concerned with premature aging and covered their faces and necks. Several OWs discussed their preferences for clothing and hats, citing the style as important:
I’ve got a couple buddies who are losing their hair, so they might wear… a wide-brimmed hat like Crocodile Dundee, cowboy hat, floppy hat, whatever. (Farmer, Male)

I wear a hat… but this is the thing; honestly, I do it more for wrinkles; I’m more worried about wrinkles than skin cancer. (Recreational Worker, Female)

Folks look at me side-eyed because I’m wearing a long sleeve shirt; it’s not a real popular thing to see folks, male folk people, in ag, in long sleeve shirts unless you’re out west somewhere. (Farmer, Male)

Many of the participants, who were accustomed to occupational accidents, normalized the removal of body parts. The inability to escape danger at work was frequently discussed. Many OWs believed that SC was minor cancer that could be cut off in most instances. While many OWs elaborated that they would not like to be disfigured, this risk did not affect their behaviors. One OW was missing a foot due to a work accident, and another shared photos of a dismembered finger with the researcher during the interview. Several described other OWs losing body parts during work. Cutting out cancer was also frequently described as the OWs shared stories of acquaintances. Skin cancer was consistently considered a trivial cancer that could be easily cut out. An example of the blasé attitude toward cutting out SC is evidenced by this quote:

I had some you know burned off skin cancers, and I’ve had one, two, three, four, four cut out. (Farmer, Male)

Another norm was bodily autonomy and resistance to governmental or healthcare institutions’ suggestions. These interviews were conducted in 2021-22, during the coronavirus pandemic and amid early vaccination mandates. Multiple interviewees
discussed how the government pandemic response lowered their trust in healthcare institutions like the CDC. Several expressed vaccine hesitancy and resented the differentiation of people between those receiving the vaccination and those choosing not to, as evidenced by the following statements:

- It’s my body. I know my body. (Farmer, Male)
- I mean it’s my life, I’m not afraid of this, I’m going to keep living, I’m not going to let you put me in a box, tell me how I’m gonna live. (Construction Worker, Male)
- I’m like, why don’t people just be concerned with themselves. (Farmer, Male)

Perceived Behavioral Control

Perceived behavioral control and confidence in preventing SC was a significant antecedent to the intention and performance of primary and secondary behaviors by the OWs. All the OWs expressed the ability to perform SPBs, yet most did not. Themes included their doubts that they could effectively avoid danger at work and perceived control over their bodies and futures.

Most participants expressed their inability to avoid danger in their occupations. They noted that they signed up for the job and expected some risk from multiple hazards, from equipment to environmental conditions. Nevertheless, the OWs viewed control of their bodies as very important. Several described health behaviors, including bodybuilding, dieting, and regular chiropractic or naturopath care, and the OWs over age 50 tended to have a regular PCP. However, SPBs were not among the areas of health that most OWs chose to control. One farmer described willfully ignoring his doctor’s advice to perform primary SC prevention. All participants knew SC was a threat that could be
prevented, but SPBs were not included in health routines. Multiple participants acknowledged the inherent dangers of their occupations and being unable to escape those:

  Working outdoors is more safety about machines than it is for the skin cancer.

  (Farmer, Male)

  It’s work in the sun, and my hands are out in the sun…we can’t always be under something. (Farmer, Male)

  I work outside all the time. I’m constantly manual labor, you know. (Construction Worker, Male)

  My job is going on regardless, it’s kind of like the medical profession. We haven’t had a chance to just stop and go home. We’ve been working you know. (Farmer, Male)

  I do have to work outdoors. (Farmer, Male)

  Many OWs believed they were not ultimately in control of their futures, rendering behaviors less critical. When there was a severe health situation, many thought that a higher power or fate eventually controlled the outcome, more so than any medical intervention. Multiple participants stated that they felt like their actions were unimportant, considering that they viewed life and health as uncontrollable:

  I’d seen how quick life was over, and nothing we do here means much of anything. (Construction Worker, Male)

  One farmer described the recovery of a family member as a miracle that amazed the medical professionals and outperformed their prognoses. A construction worker described multiple people being cured of cancer through faith, not out of any behavioral change or medical intervention. Multiple OWs described health situations where a
supposedly harmful behavior was not responsible for the demise of someone, several describing relatives living long lives, despite smoking. Many OWs believed prevention and screenings did not necessarily ensure better health outcomes.

**Intentions and Behaviors**

Among the OWs in this study, adherence to primary prevention SC behaviors was low. Wearing covering clothing was more common among the farmers than the construction workers, although OWs from all occupations admitted removing their shirts during summer. Most wore hats when outside, but few described full-brim hats. Most OWs mentioned shade-seeking as challenging to do. They could not control their hours of sun exposure, citing a need to tend to their fields and animals and the variability of shade access at construction and landscaping sites. Sunscreen was rejected by most participants, with a few wearing it on their faces or limbs. Multiple OWs described sunscreen as inconvenient to apply and reapply, uncomfortable or “stinging” their eyes, and they considered sleeves cumbersome.

Generally, hot weather increased the OWs’ awareness of the need to perform SPBs. However, when there was shade or mild to cold temperatures, SPBs were not conducted. Several OWs indicated that if the heat outside was comfortable, they would not consider conducting sun protection, even if it was available. Further, nearly all the OWs differentiated between work and recreational sun, citing a need to protect themselves when outside for recreational purposes, even if they did not typically protect themselves while working outside as their occupations.

Skin self-examination was described by many OWs when prompted, although their descriptions of what to look for on the skin, the frequency of conducting SSE, and
plans for follow-up were vague. Most participants assumed they could notice anything unusual on their bodies while bathing but could not articulate what they would look for. The OWs needed more certainty about the issues indicative of SC and melanoma, and other common skin concerns from insects or injuries faced by outdoor workers may need to be clarified. Few described using a mirror or having a partner check for SC. A couple of OWs described checking their bodies for ticks in the summer, assuming they would notice anything alarming. Statements about skin screening included the following:

I would know if something’s wrong. (Farmer, Male)

I would look just for a dark spot or even a light spot, um. Something that’s kind of raised in the skin, seems like it’s growing out or something, maybe. (Recreation Worker, Male)

The level of trust toward healthcare information drove whether many OWs in this study believed a risk is real and the behavior is worthwhile. Many participants indicated the importance of a one-on-one trusting relationship with a healthcare provider who understood the OW’s occupation and comorbidities and knew the individual as a person. Most OWs admitted issues they depend on health providers to address. Community kinship and relationships were essential to the OWs, especially the farmers, which increased their trust in healthcare advice. Multiple OWs stated that they preferred healthcare providers that shared their values, such as honesty, and understood their occupation:

I listen to them [my doctor] because their philosophy seems in line with my lifestyle. (Recreation Worker, Female)
You could tell her anything, was very honest. She was like, you’re fat, and you’re diabetic, and we got to take care of that, and that’s how she’d present it. Honesty is my favorite thing….they don’t sugarcoat it; they just tell ya, which I would much rather prefer. So I mean, I have a good relationship… where I trust what they say. (Farmer, Male)

**Discussion**

Multiple OWs noted the desire to avoid discomfort from sunburn. Yet, several mentioned doubts about sunscreen efficacy, and many had dismissive attitudes toward SPBs. This demonstrated the negative attitudes leading to lower behavioral compliance, even when contradictory to their wish to avoid the discomfort of a sunburn. The perception of SC risk was affected by a lower alarm toward it amid other internal cancers and diseases, which led to a more negative attitude toward SC prevention efforts. Multiple participants were confident that even when faced with SC, it could be “cut away.” This resulted in an “unrealistic optimism” toward their health (Hault et al., 2016; Renner et al., 2000; Zink et al., 2019). Consistent with the only recent qualitative studies of OWs, these OWs generally underestimated their risk for SC (Rocholl et al., 2020; Zink et al., 2019). The OWs in our study showed a higher risk estimation as they aged, and more of their connections were affected by skin or other types of cancers, but this did not always result in more SPBs or screening behaviors. Results of this study were not congruent to previous research on the issue of vicarious concern, as SPBs among this sample did not increase when a family member had SC (Madgwick et al., 2011; Zink et al., 2019).
As overall vulnerability increased, leading to more positive attitudes, SPBs increased in some OWs in this study. But, like attitudes, negative normative beliefs also worked against the intention to conduct SPBs. A lack of trust in healthcare providers and institutions influenced the OWs to perform fewer SPBs, while a trusted relationship with a family member or healthcare provider encouraged SPBs.

Another finding was that the intention to conduct SPBs was attenuated by the inability to avoid danger in their work and the belief that disease and injury were inevitable outcomes, with injury a higher priority to prevent. This loss of control is the missing link between risk perception and SPBs. Other qualitative studies on OWs and SC prevention did not utilize the TOPB as a sensitizing framework, yet they identified self-efficacy as an essential construct to affect through interventions to increase SPBs in OWs (Rocholl et al., 2020; Zink et al., 2019). Indeed, many OWs discussed their need for bodily autonomy and the multiple ways they care for their health.

Unlike Zink et al. (2019), the OWs in this study discussed multiple aspects of SPBs, with some selecting protective clothing over sunscreen for protection and most wearing hats, although not full-brimmed ones. The OWs in this study also associated recreational activities with the need for sunscreen (Grandahl et al., 2018; Zink et al., 2019). Sunscreen application was often done incorrectly, consistent with Rocholl et al. (2020). More research is needed.

Strengths of this study include a more extensive and relatively more representative sample than other qualitative studies of OW perceptions of SC prevention, with sex and race representation. Limitations include a need for more generalizability to other populations.
Conclusions

Participant attitudes, normative beliefs, and perceived behavioral control are antecedents to behavioral change. Describing these TOPB motivators can improve the efficacy of interventions aimed at disease prevention, including SC prevention in OWs. The TOPB provides the framework to understand OWs better, so appropriate interventions and communications can be developed to target their values. Based on these results, attitudes toward SC risk should be addressed by leveraging the symbolic traction of melanoma and clarifying the dangers of sunburns and tanning in educational materials. Communications need to appeal to the sense of perceived control of the OWs, addressing their attitudes that prevention is futile and comparing SC prevention to other health behaviors that they may engage in. Further, skin screenings should be conducted more frequently for this population at work sites or other events with OWs present. This study contributes to the understanding of a population vulnerable to SC.
CHAPTER V: CONCLUSIONS

This dissertation contained studies with dual purposes. The first study aimed to understand the factors associated with the performance of SPBs and the relationship between sunburn and perceived skin sensitivity to the sun. The second study aimed to understand the perceptions of a specific vulnerable group of people, OWs, regarding skin cancer prevention. Both studies enhance the understanding of adult SC prevention and the influences on intentions to conduct SPBs.

Demographic differences in SPB performance highlighted by these studies warrant additional research. The secondary analysis found that White people are less likely to perform SPBs but are more likely than other racial groups to wear sunscreen. Qualitative findings also supported ethnic and racial differences between SPBs, as the Black participants cited low knowledge about SC prevention and compliance with recommended SPBs. However, the participant identifying as Hispanic mentioned high awareness and performance of SPBs. More research on various racial and ethnic groups’ perceptions of SC prevention is warranted.

Perceived skin sensitivity to the sun influenced behaviors and perceptions of SC prevention in both studies, and these factors merit more investigation. The expectation of the severity of a reaction to the sun was associated with the likelihood of reporting a sunburn. Those expecting the most severe reaction, blistering, avoided the sun and sunburns. However, those expecting a severe sunburn (but not a blister) after 30 minutes
unprotected in the sun were likelier to report a sunburn. This reflects the belief that a seasonal sunburn and tan are protective, which the OW study corroborated. Interventions are needed to teach proper SPBs and the dangers of tanning, describing it as sun damage. This also suggests that information about combining SPBs is essential to provide. Also, everyday UV exposure at work must be discussed as a risk.

The qualitative study provides insights on effectively approaching SC prevention in a vulnerable population. The Theory of Planned Behavior (TOPB) and the questions around attitudes, normative beliefs, and perceived control concerning SC prevention served as a practical sensitizing framework for the semi-guided interviews and analysis. Attitudes toward conducting SPBs and skin screening were shaped by the alarm level and perceived risk, fatalism, anxiety, or fear about health. OWs lack alarm for SC in light of other cancers, yet this alarm is necessary to influence them to change their behaviors. Given their fatalistic attitude toward disease, it is essential not to overwhelm them with information, as increasing their anxiety and fear levels will overwhelm them and discourage action altogether. With too much fear, the OWs felt that preventative behaviors or screening were futile, validating their indifference toward SC prevention. Still, these findings indicate that melanoma and SCC and their risk of metastasis and death must be discussed, leveraging the symbolic traction of melanoma at the level of alarm. Future messaging and interventions must avoid blaming individuals for SC, which activates OWs preexisting biases and attitudes. Using blame can make OWs more resistant to changing their behaviors, as they minimize the threat compared to other diseases, taking a fatalistic view of the disease as impossible to prevent.
Normative beliefs were less influential than attitudes or perceived control on the intention to perform SC prevention behaviors. Still, friends and family members helped shape normative beliefs about SC, appearance motivations, the desire for bodily autonomy, self-reliance toward healthcare, and the normalization of removing body parts due to accidents or to remove the disease. In addition, many OWs reported speaking with family members or friends in healthcare fields for information about how to be healthy and researching healthcare information to find consistent guidance among sources.

Perceived control was shaped by the OW’s sense of being unable to avoid danger or affect their future with healthcare behaviors. Control was a significant barrier, as multiple OWs felt they could not avoid danger in their work or prevent skin cancer. However, they had strong feelings about their bodily autonomy, and multiple participants expressed frustration about previous healthcare experiences and ongoing Covid-19 mandates. Traditionally, farmers have viewed governmental agencies with distrust (Rust et al., 2022), which was reflected in this study. OWs view health recommendations cautiously, preferring to make independent decisions without pressure to perform healthcare activities. However, the OWs were not averse to health-seeking behaviors, as several described elaborate diet and exercise regimens and regular chiropractic care. This suggests they are willing to perform health behaviors when they see positive outcomes through their efforts or others’. Given the importance of self-efficacy and perceived control within multiple theoretical frameworks (Redding et al., 2006), further research on this critical behavioral construct is necessary.

The results of these studies show low compliance with SPBs and vague or non-existent skin screening behaviors. Given the increasing prevalence of SC with age,
secondary prevention needs to be emphasized in the adult OW population. Future interventions aiming to affect SC prevention behaviors in OWs must consider their sense of independence and mistrust toward healthcare information sources and acknowledge the multiple dangers faced by outdoor workers. Message framing can appeal to the independent and autonomous nature of the participants. It is crucial to disseminate the findings of this study so that skin cancer prevention interventions can be designed and improved.
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https://doi.org/10.1111/jdv.15525


https://doi.org/10.1111/jdv.15095


https://doi.org/10.1111/jdv.14281
**APPENDIX A**

*Semi-structured interview questions based on the Theory of Planned Behavior constructs*

<table>
<thead>
<tr>
<th>Behavior construct</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attitudes</strong></td>
<td>What are your biggest health worries as someone who works outdoors?</td>
</tr>
<tr>
<td></td>
<td>What motivates you to prevent/screen for diseases, including skin cancer?</td>
</tr>
<tr>
<td></td>
<td>Tell me about what your peers think about skin cancer prevention activities (skin examination, sun protection etc.).</td>
</tr>
<tr>
<td><strong>Normative beliefs</strong></td>
<td>How confident are you about your ability to prevent/identify skin cancer and/or other diseases?</td>
</tr>
<tr>
<td></td>
<td>What factors or circumstances would make things easier to conduct skin cancer prevention activities?</td>
</tr>
<tr>
<td></td>
<td>Tell me about your sun protection activities (shade seeking, covering clothing, sunscreen etc.).</td>
</tr>
<tr>
<td><strong>Perceived behavioral control/self-efficacy</strong></td>
<td>How often do you or someone else screen your skin?</td>
</tr>
<tr>
<td><strong>Behavioral intention/behavior</strong></td>
<td></td>
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</tbody>
</table>
## Checklist of the Standards for Reporting Qualitative Research (SRQR)

<table>
<thead>
<tr>
<th>Section</th>
<th>S</th>
<th>R</th>
<th>Q</th>
<th>R</th>
<th>How the manuscript adheres to the reporting standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>S1 Concise description of the nature and topic of the study. Identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended.</td>
<td>The topic of the study was described.</td>
<td></td>
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<tr>
<td>Abstract</td>
<td>S2 Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions.</td>
<td>Key elements of the study were described in the abstract.</td>
<td></td>
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<tr>
<td>Introduction</td>
<td>S3 Description and significance of the problem/phenomenon studied; review of relevant theory</td>
<td>The research question and a review of</td>
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<td>Section</td>
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<td>S4</td>
<td>Purpose of the study and specific objectives or questions were included. The purpose of the study and specific research questions were described.</td>
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<tr>
<td>S5</td>
<td>Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/interpretivist) is also recommended; rationale Grounded theory, the research paradigm, and the sensitizing framework are identified in the Methods.</td>
<td></td>
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<tr>
<td>S6</td>
<td>Researchers’ characteristics that may influence the research, including personal attributes, The people who conducted the key informant</td>
<td></td>
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</tbody>
</table>
and reflexivity qualifications/experience, relationship with participants, assumptions, and/or presuppositions; potential or actual interaction between researchers’ characteristics and the research questions, approach, methods, results, and/or transferability

<table>
<thead>
<tr>
<th>Methods:</th>
<th>S7 Setting/site and salient contextual factors; rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>The study setting is described.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Methods:</th>
<th>S8 How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling strategy</td>
<td>The eligibility criteria, recruitment method, and point of saturation are described.</td>
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<table>
<thead>
<tr>
<th>Methods: Ethical issues pertaining to human subjects</th>
<th>S9 Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Methods section states that the study was approved by the University of</td>
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<tr>
<td>Methods</td>
<td>Data collection methods</td>
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<tr>
<td>---------</td>
<td>-------------------------</td>
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<tr>
<td>Setting and description of sample</td>
<td>The data collection procedures are described.</td>
</tr>
<tr>
<td>Methods</td>
<td>S12 Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results)</td>
</tr>
<tr>
<td>collection and data processing</td>
<td>procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale.</td>
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<tr>
<td>--------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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<tr>
<td>S11 Description of instruments (e.g., interview guides, questionnaires) and devices (e.g., audio recorders) used for data collection; if/how the instrument(s) changed over the course of the study</td>
<td></td>
</tr>
<tr>
<td>S13 Methods for processing data prior to and during analysis, including Transcription.</td>
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</tbody>
</table>
The transcripts were NOT returned to the participants.
Field notes and analytic memos were used.

<table>
<thead>
<tr>
<th>Methods</th>
<th>Research ethics and data management</th>
</tr>
</thead>
<tbody>
<tr>
<td>S9</td>
<td>Ethical issues pertaining to human subjects.</td>
</tr>
<tr>
<td>S13</td>
<td>Data entry, data management and security, verification of data integrity, data coding, and anonymization/deidentification of excerpts</td>
</tr>
</tbody>
</table>

Oral informed consent was obtained from all participants prior to the interview, and this was described.

<table>
<thead>
<tr>
<th>Methods</th>
<th>Data analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>S14</td>
<td>Process by which inferences, themes, etc., were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale</td>
</tr>
</tbody>
</table>

The number of data coders, the process by which themes were identified in the data were disclosed. A
<table>
<thead>
<tr>
<th>S15 Techniques to enhance trustworthiness and credibility of data analysis (e.g., member checking, audit trail, triangulation); rationale</th>
<th>deductive analysis strategy was described.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results</td>
<td>S16 Main findings (e.g., interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory</td>
</tr>
<tr>
<td>S17 Evidence (e.g., quotes, field notes, text excerpts, photographs) to substantiate analytic findings</td>
<td>Quotations were presented to substantiate the analytical findings. The results are clearly presented.</td>
</tr>
<tr>
<td>Discussion</td>
<td>S18 Short summary of main findings; explanation of how</td>
</tr>
<tr>
<td>Interpretation</td>
<td>The main findings within</td>
</tr>
<tr>
<td>of findings</td>
<td>findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application/generalizability; identification of unique contribution(s) to scholarship in a discipline or field</td>
</tr>
<tr>
<td>Discussion Limitations</td>
<td>S19 Trustworthiness and limitations of findings</td>
</tr>
<tr>
<td>Other</td>
<td>S20 Potential sources of influence or perceived influence on study conduct and conclusions; how these were managed</td>
</tr>
<tr>
<td>Other</td>
<td>S21 Sources of funding and other support; role of funders in data collection, interpretation, and reporting</td>
</tr>
</tbody>
</table>
APPENDIX C

Recruitment Flyer

"Sun Protection in Outdoor Workers" Research Project
We are actively recruiting participants

This project aims to understand behaviors associated with skin cancer prevention, including sun protection activities and skin-self examination. This project is focused on understanding how to best prevent skin cancer in outdoor workers who are regularly exposed to sunshine.

This project will consist of a 30-45 minute interview via telephone or video chat.
Eligibility criteria includes:
- Over 35 years old
- Outdoor occupation in Kentucky or Indiana area
- Outside for 3 or more hours per day
- Must have a way to communicate via telephone or video chat (smartphone, laptop, tablet)

Offered by:
UNIVERSITY OF LOUISVILLE
SCHOOL OF NURSING

If you are interested in learning more about this study, please contact Jeanne Ward at
jeanne.ward@louisville.edu or 502-509-6754
Primary Investigator: Dr. Lesley Harris lesley.harris@louisville.edu 502-852-8396
APPENDIX D

Interview Guide Demographic Questions

• Age
• Occupation, Industry
• Full vs. part-time work
• Number of hours outdoors daily/weekly for work,
• Race, ethnicity
• Gender identity
• Is your household income adequate to meet your living expenses? Yes No Refused
• What is the highest level of education you have?
• What is your marital status?
• Do you have a history of Melanoma? In Family?

You do not have to answer any question you do not want to.

Also, I am not here to judge, although I am a nurse – no right/wrong answers.
CURRICULUM VITAE

Jeanne M. Ward, MSN, RN, MPA

Louisville, KY 40205
Jeanne.Ward502@gmail.com

EDUCATION

**PhD Candidate** University of Louisville, Nursing May 2023 (expected)
  Committee Chair: Dr. Frances Hardin-Fanning, PhD, RN

**BSN, MSN** University of Louisville, Nursing May 2018

**MPA** University of Louisville, Public Administration May 2007
  Concentration in Public Policy

**AB** Washington University, Spanish, Marketing majors May 2004
  Minor in Anthropology

HONORS AND AWARDS

**ResearchLouisville! Nursing Student Poster Award** 2022

**Norton Scholar** 2016

Norton Healthcare

**Ignite Louisville** 2012-13

Leadership Louisville

**Outstanding MPA Student Award** 2007

University of Louisville

PROFESSIONAL EXPERIENCE
Raising Hope KY, University of Louisville, Louisville, KY 2022 - 2023

Project Liaison, Advisor: Dr. Cheryl Witt, PhD, RN

University of Louisville, Louisville, KY 2020 - 2022

Graduate Research Assistant, Nursing

Cactus Communications, Remote 2019 - present

Freelance Editor, Medical division

Norton Healthcare, Louisville, KY 2018 - 2019

Staff Nurse, Step-Down Oncology

Jewish Hospital, Louisville, KY 2016 - 2017

Jefferson County Public Schools, Louisville, KY 2011 - 2015

Instructor

Oliver Group/Wipfli, Louisville, KY 2007 - 2016

Marketing Communications Manager

Research Analyst

Humana, Louisville, KY 2006

Communications Consultant, Government Relations

American Red Cross, Louisville, KY 2004 – 2005

FUNDING

Raising Hope KY 2023-24

Rural suicide prevention initiative, Kentucky Department of Agriculture, $38,100

International Society of Agricultural Safety & Health 2022

Conference Scholarship
Ruth Craddock Funding  2022
University of Louisville School of Nursing, $1200

University of Louisville Graduate Student Council  2022
Travel grants

Sharon & Robert D. Harris Scholarship  2016-18
University of Louisville School of Nursing

PUBLICATIONS


PRESENTATIONS

*International*


*National*


*Regional*

Miller, L., Witt, C., Hardin-Fanning, F., Jones, S., & Ward, J. *Effectiveness of the Challenge Coin Presentation as a Protective Factor of Depressive Symptoms in Farmers*


**Local**


**PROFESSIONAL AFFILIATIONS**

International Society of Agricultural Health and Safety (ISASH)

Midwest Nursing Research Society (MNRS)

American Nurses Association, Kentucky Nurses Association
American Association of Colleges of Nursing (AACN), Graduate Nursing Student Academy (GNSA)
Sigma Theta Tau, Nursing Honorary, Iota Zeta Chapter

PROFESSIONAL TRAINING

Registered Nurse KY License #1158181, Expiration 10-31-2023
Certified Health Professions Educator (CHPE)
University of Louisville School of Education & Human Development, 2022
Question-Persuade-Refer (QPR) Suicide prevention training, September 2021
Graduate Teaching Assistant Academy Certificate University of Louisville, 2020-21
Basic Life Support (BLS) American Heart Association, Expiration 2024
LGBTQ+ Affirming Healthcare Certificate
LGBT Center at the University of Louisville, 2020
Basic Certificate in Quality and Safety Institute for Healthcare Improvement, 2018
Professional in Human Resources (PHR) Human Resources Certification Institute, 2009 – 2018

Predictive Index® Analyst PI Worldwide, 2007

CONTINUING EDUCATION

Collaborative Assessment for the Management of Suicidality (CAMS)
March 26, 2023

CRUSH-ing Farmer Suicide, ANCC, UK Healthcare CE Central March 22, 2022

PROFESSIONAL SERVICE

University of Louisville School of Nursing
Research & Scholarship Committee, 2021-23
NURS 358 Nursing Research for Evidence-Based Practice, Online Module, *Identifying Clinical Practice Guidelines*, November 7, 2022


COMMUNITY PRESENTATIONS


Kentucky Women in Agriculture, Annual Conference, Owensboro, KY. *The Challenge Coin: A compassion intervention for suicide prevention training*. October 11, 2022

COMMUNITY SERVICE

Washington University Alumni & Parents Admissions Committee

Chair, Louisville, KY, 2005-present

LouVAX

COVID-19 injector/pharmacy, Louisville, KY, 2021

Louisville Youth Philanthropy Council

Advisory Board Member, Marketing Committee, Louisville, KY, 2013-16

Louisville Society for Human Resource Management

Board Member, Director of Communications, Louisville, KY, 2012-14

University of Louisville MPA Student Group

President, Louisville, KY, 2006-07

COMPUTER SKILLS

Applications: SPSS, EndNote, WordPress