2013

Skin Cancer Knowledge, Beliefs, Self-Efficacy, And Preventative Behaviors Among North Mississippi Landscapers

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SKIN CANCER KNOWLEDGE, BELIEFS, SELF-EFFICACY, AND PREVENTATIVE BEHAVIORS AMONG NORTH MISSISSIPPI LANDSCAPERS

A Thesis
presented in partial fulfillment of requirements
for the degree of Master of Science
in the Department of Health, Exercise Science and Recreation Management
The University of Mississippi

by

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May 2013

ABSTRACT

Skin cancer is a significant public health problem in the US. Each year over 3.5 million cases of skin cancer are diagnosed in more than two million individuals, resulting in nearly 12,000 deaths (American Cancer Society, 2012). Many studies have been conducted on outdoor workers to assess quantitative data of sun exposure and sun protection behaviors, with the majority of studies carried out on farmers, construction workers, and postal workers (Saraiya et al., 2004). Nonetheless, far too little attention has been given to members of other occupational groups who mainly work outdoors, such as landscapers. It was estimated in the US that there are slightly over one million workers in the landscape service industry. Moreover, no US based study was identified that targeted landscapers, one of the most common outdoor workers, who are at high risk of UV damage which increases the individuals' risk of skin cancer development (Centers for Disease Control and Prevention, 2012). This cross-sectional study determined landscapers' skin cancer knowledge, health beliefs, self-efficacy, and sun protective behaviors. Additional purpose was to assess relationship between selected Health Belief Model (HBM) variables (i.e., perceived threat, perceived benefits minus perceived barrier, and self-efficacy) and sun protection behavior. Of 140 landscapers from 23 companies contacted, 117 participated (83.6% response rate). Questionnaires were mailed to 22 companies and one company requested on-site administration. Data were collected via a modified version of the *Skin Cancer Survey*, which included demographics, knowledge, preventive behaviors, and HBM variables (Marlenga, 1995). Descriptive statistics and Pearson correlations were performed to analyze the survey data. Alpha level of 0.05 was set a priori. The sample (n = 109) had a mean age of 37.06 years (±

12.18), with 94.5% males, and 77.1% White. Participants spent an average of 5.36 hours/day in the sun during peak sun hours. Participants correctly answered 67.1% of the knowledge questions, 69.7% believed they were more likely than the average person to get skin cancer, and 87.2% perceived that skin cancer is a severe disease. Participants believed the use of wide-brimmed hats, long sleeved shirts/long pants, and sunscreen were beneficial. However, participants reported low use of these and other sun protective strategies. The primary barriers for not using sun protection were "I forget to wear it" and "it is too hot to wear." Of the HBM variables, perceived benefits minus perceived barrier (r = 0.285, p = .003) and self-efficacy (r = .538, p = .001) were correlated with sun protection. The HBM proposes that individual's likelihood to engage in protective behavior is based on perceived threat. This HBM proposition is not supported in the present study. However, the results indicate that perceived benefits outweighing the perceived barriers to sun protection is associated with sun protection behaviors. Furthermore, self-efficacy to engage in sun protection is associated with sun protection behaviors. The factors that account for absence of the relationship between perceived skin cancer threat and sun protection behaviors could be lack of skin cancer knowledge, low rate of personal or family skin cancer history, and several barriers to sun protection.

DEDICATION

I dedicate this thesis work to my family. I also would like to dedicate this work to my beloved master, OSHO whose following words regarding courage kept me going.

"To accept the challenge of the unknown is courage, in spite of all fears. The fears are there; but if you go on accepting the challenge again and again, slowly, slowly those fears disappear. Because the experience of the joy that the unknown brings, the great ecstasy that starts happening with the unknown makes you strong enough; gives you certain integrity; makes your intelligence sharp. For the first time, you start feeling that life is not just boredom, but an adventure. Then slowly, slowly fears disappear. Then you are always searching and seeking for some adventure. Courage is risking the known for the unknown; the familiar for the unfamiliar, for some unknown destination. One never knows whether one will be able to make it or not. It is gambling. But only the gamblers know what life is." OSHO, Never Born Never Died, Only Visited this Planet Earth between Dec 11 1931 – Jan 19 1990.

ACKNOWLEDGEMENTS

First and Foremost, I would like to express my deepest gratitude to my all committee members, Dr. Allison Ford-Wade, Dr. Jeffery S. Hallam, Dr. Martha A. Bass for their guidance, support, patience, and persistent encouragement throughout my thesis.

Most importantly, many thanks to all landscaping companies who agreed to participate in this study which would not have been possible without their participation.

I am most indebted to Michael A. Vice for being a great friend who always offered his support and believed that sooner or later I will make it. I would also like to thank Amanda Hutcheson for her invaluable assistance in data entry.

My special thanks to Alicia Pugh Cambron, one of my closest friends, for listening and supporting me.

Finally, I would like to thank Mr. David Waddell and my amazing friends Brad Martin, Bob Davis, and Jimmie Forrest Bryan for helping me in data collection. We did it !!!

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CHAPTER 1

INTRODUCTION

Skin cancer is a significant public health problem in the US (Balk, 2011; Glanz, Carbone, & Song, 1999). Each year over 3.5 million cases of skin cancer are diagnosed in more than two million individuals, resulting in nearly 12,000 deaths (American Cancer Society [ACS], 2012; Rogers et al., 2010). Moreover, the incidence rate of skin cancer is rising: Non Melanocytic Skin Cancer (NMSC), the most common type of skin cancer, appears to be increasing by roughly six percent annually and Cutaneous Malignant Melanoma (melanoma), the most fatal type of skin cancer, by five percent to six percent annually (Creech & Mayer, 1997; Ma, Collado-Mesa, Hu, & Kirsner, 2007; Marks, 1994; Miller & Weinstock, 1994; Skin Cancer Foundation [SCF], 2012; Wang, Balagula, & Osterwalder, 2010). Skin cancer also has a substantial impact on the economy. It was estimated that the cost of skin cancer treatment in US is approximately $ 1 billion per year (Housman et al., 2003).

There is compelling evidence that Ultra-Violet Radiation (UVR), a part of the electromagnetic spectrum that is emitted by the sun, is the key risk factor in the development of skin cancer (Callister, Galtry, & Didham, 2011; English, Armstrong, Kricker, & Fleming, 1997; Goldstein & Tucker, 1993; Hall, Miller, Rogers, & Bewerse, 1999, Osterlind, 1991; Rundhaug & Fisher, 2008; Soehnge, Ouhtit, & Ananthaswamy, 1997). On the basis of physical and biological properties, UVR is subdivided into: UV-A (>315-400nm), UV-B (>280-315nm), and UV-C (>100-280nm) (International Agency for Research on Cancer [IARC], 2006). UVR wavelengths shorter than about 310 nm (high energy and extremely destructive) are absorbed or filtered by

the ozone layer of the earth's outer atmosphere (stratosphere) before they reach to earth's surface (Rass, 2006; Young, 2009). Therefore, 90-99% of UV-A and 1-10% of UV-B that penetrate the atmosphere and reach the skin, play an important causal role in inducing structural damage to DNA of skin cells (Armstrong & Kricker, 2001; Miller et al., 1998; Pastila & Leszczynski, 2007). This damage leads to genetic mutations and eventually results in skin carcinogenesis (Brenner & Hearing, 2008). NMSC development is commonly caused by chronic cumulative lifetime UVR exposure, while melanoma risk increases with intense intermittent exposure to the UVR (Wang et al., 2010). Other risk factors that influence the chance of skin cancer include having fair skin, blue or green eye color, blonde or red hair color, many moles and freckles, and personal and family history of skin cancer (Armstrong & Kricker, 2001; Creech & Mayer, 1997; Marks, 1994; Rhodes, 1987). Also, evidence suggests that having a history of sunburn can increase an individual's risk of melanoma by two-fold (Gandini et al., 2005; Elwood & Jopson, 1997)

Approximately 90 percent of all skin cancer cases are attributable to UVR exposure (Glanz, Buller, & Saraiya, 2007; Schober-Flores, 2001; Stock et al., 2009). Skin cancer risk can be reduced by limiting exposure of the skin to sunlight, which is the major source of UVR (Dobbinson et al., 2008; Glanz et al., 1999; Nole & Johnson, 2004; Sinclair & Foley, 2009; Saraiya et al., 2004). The cancer societies and other organizations recommended sun protection behaviors including use of shade, avoiding being outdoors during the hours of highest sun intensity (between 10:00 AM and 4:00 PM), use of sun protective with clothing, hats, sunglasses and sunscreen, preferably one with a sun protection factor (SPF) of 15 or more (American Academy of Dermatology [AAD], 2012, ACS, 2012; SCF, 2012).

Background and Significance

In the US, there are millions of workers in outdoor occupations (construction, agriculture, forestry, fishing, land surveying and mapping, gardeners, landscapers, mail carriers, amusement park or recreational center attendants, etc.) who have the potential for overexposure to UVR as a result of their occupational patterns (Centers for Disease Control and Prevention [CDC], 2012; Saraiya et al., 2004). Additionally, a vast majority of outdoor jobs in the US are held by fair skinned individuals who are increasingly at risk of developing skin cancer (Armstrong & Kricker, 2001; Callister et al., 2011; Glanz et al., 2007; Gies, Glanz, O'Riordan, Elliott, & Nehl, 2009; Lewis, Mayer, & Slymen, 2006; Pichon et al., 2005; SCF, 2012; Stock et al., 2009). However, several studies reported that some outdoor workers are engaging in sun protection practice but a large majority of outdoor workers continues to show inadequate levels of sun protection (Cioffi, Wilkes, & Hartcher-O' Brien, 2002; Glanz et al., 2007; Gies et al., 2009; Lewis et al., 2006; Madgwick, Houdmont, & Randall, 2011; Marlenga, 1995; Parrott, Steiner, & Goldenhar, 1996; Pichon et al., 2005; Sales, Mayer, & Hoerster, 2005; Shoveller, Lovato, Peters, & Rivers, 2000; Stepanski & Mayer, 1998; Woolley, Buettner, & Lowe, 2002). This use of inadequate levels of sun protective behaviors amongst outdoor workers could be due to many of the outdoor workers being males, who often engage in lower levels of sun protection behaviors than females across wide range of situations, whether it is using sunscreen, wearing protective clothing, or seeking shade (Abroms, Jorgensen, Southwell, Geller, & Emmons, 2003; Branstrom, Ullen, & Brandberg, 2004; Campbell & Birdsell, 1994; Hall, May, Lew, Koh, & Nadel, 1997; McCool, Reeder, Robinson, Petrie, & Gorman, 2009; Purdue, 2002; Rosenman, Gardiner, Swanson, Mullan, & Zhu, 1995; Scerri, Aquilina, Amato, & Dalmas, 2002; Stock et al., 2009).

A number of research studies were conducted on outdoor workers to assess quantitative data of sun exposure and sun protection behaviors, with the majority of studies carried out on farmers, construction workers, and postal workers. Nonetheless, far too little attention was given to members of other occupational groups that work outdoors, such as landscapers. It was estimated in the US that there are slightly over one million workers in the landscape service industry (CDC, 2012). Moreover, no US based study was identified that targeted landscapers, one of the most common outdoor workers, who are at high risk of UV damage which increases the individuals' risk of skin cancer development (CDC, 2012; Brenner & Hearing, 2008; Saraiya et al., 2004). Thus, it is extremely important to study landscapers' behaviors regarding sun exposure and sun protection, as well as, determine their skin cancer risk perception, and how these perceptions and other cognitive factors are associated to their sun protection practices. Such information could be best achieved with theoretically driven research, since theories help explain the structural and psychological determinants of behavior and provide direction for how to develop more effective ways to achieve behavior change (Glanz & Bishop, 2010; Glanz, Rimer, & Viswanath, 2008; Painter et al., 2008; Redding, Rossi, Rossi, Velicer, & Prochaska, 2000).

Theoretical Framework

The Health Belief Model (HBM) is one of the most extensively used theories that was developed in the early 1950s by Hochbaum, Kegels and Rosenstock (Glanz, Rimer, &Viswanath, 2008; National Cancer Institute [NCI], 2012; Rosenstock, 1991). The HBM helps to explain why people may or may not take action to adopt healthy behaviors. The constructs of HMB include: *perceived threat* consists of two parts: *perceived susceptibility* and *perceived severity*. The former refers to one's belief about probability of the risk of contracting a disease or

condition. The construct of *perceived severity* is an individual's belief about the seriousness of the disease. The next construct of this model is *perceived benefit* which addresses the belief of an individual about values or usefulness of a new behavior to reduce threat of illness (i.e. perceived benefits outweigh perceived barriers). *Perceived barrier* is one's evaluation of obstacles in his/her way that may prevent or hinder to engage in new behavior. *Cues to action* are stimuli which may be internal (e.g. symptoms) or external (e.g. events, people, and flyers) that increase motivation of people to change their behavior. *Self-efficacy* refers to strong belief about one's ability to successfully execute a particular behavior required to produce the desired outcome (Bandura, 1977). Modifying factors comprised of demographic, socio-psychological, and structural factors (i.e. knowledge about the disease and prior contact with the disease) that indirectly influence health-related behavior by affecting an individual's perceived threat.

Statement of Purpose

The present study focuses specifically on landscape service workers of North Mississippi. The primary purpose of this study is to determine and explain landscapers' health beliefs with regard to skin cancer, level of skin cancer knowledge, cues to sun protective actions, self-efficacy to engage in sun protection practices and current sun protection behaviors. Moreover, this study will examine the utility of selected individual HBM constructs in explaining why landscapers engage in sun protection behavior. To the best of my knowledge, this will be the first theoretically grounded study focusing on landscaping service workers. Therefore, the present study will add to the literature on sun protection behaviors of outdoor workers which is limited to certain occupations.

Public Health Significance of the Study

By assessing the level of skin cancer knowledge, perceptions of skin cancer, and frequency of sun protection measures use among landscapers of North Mississippi, public health professionals will gain valuable insights regarding development, implementation, and evaluation of interventions to prevent skin cancer in this population. In addition, the information related to barriers to sun protection will provide a deeper understanding of how to modify or design sun protection intervention strategies that will well match the specific needs of landscapers which will ultimately help in changing their sun protection behaviors, as well as, reduce the risk and rates of skin cancer among this high risk target groups.

Research Questions

The following research questions were posed in the study:

1. What are landscapers' health beliefs (i.e. perceived susceptibility, perceived severity, perceived benefits, and perceived barriers) concerning skin cancer?
2. How often do landscapers engage in sun protection practices when out in the sun for 15 minutes or more?
3. What reasons will be cited by landscapers as barriers to engage in sun protection practices?
4. What sources of information will be identified by landscapers as cues to action to protect from too much sun?
5. What is landscapers' level of skin cancer knowledge?
6. What is landscapers' level of self-efficacy to perform sun protection?
7. Do landscaping companies in North Mississippi have written policy to encourage their employees to protect themselves from sun when they work outdoors? If yes,

then do companies' workers know whether their respective companies have a workplace sun protection policy or not?

8. What is landscapers' long-term and daily UVR exposure?
9. Is there a significant relationship between perceived threat (perceived susceptibility × perceived severity) and sun protection behaviors?
10. Is there a significant relationship between perceived benefits minus perceived barriers and sun protection behaviors?
11. Is there a significant relationship between self-efficacy and sun protection behaviors?

Hypothesis

Ho1: There is no significant relationship between perceived threat (perceived susceptibility × perceived severity) and sun protection behavior.

Ho2: There is no significant relationship between perceived benefits minus perceived barriers and sun protection behavior.

Ho3: There is no significant relationship between self-efficacy and sun protection behavior.

CHAPTER 2

REVIEW OF LITERATURE

Skin cancer, one of the most common forms of malignancies in Whites, is conventionally classified into two major categories: Non Melanocytic Skin Cancer (NMSC) and Cutaneous Malignant Melanoma (melanoma) (Breitbart, Greinert, & Volkmer, 2006; Narayanan, Saladi, & Fox, 2010). The former is further divided patho-histologically into two main types Basal (BCC) and Squamous Cell Carcinoma (SCC) (Woolley et al., 2002).

Skin Cancer Risk Factors

There are environmental and genetic factors known to influence a person's risk of developing skin cancer in his or her lifetime. A large body of evidence supports that ultraviolet radiation (UVR) is the principal external etiological factor of skin cancer development (Brady, Kaushal, Ko, & Flaherty, 2011; Cokkinides et al., 2006; Elwood & Jopson, 1997; Kricker, Armstrong, & English, 1994; Nolen, Beebe, King, Bryn, & Limaye, 2011; Reynolds et al., 1996; Rundhaug & Fischer, 2008; Wang et al., 2010). Furthermore, non-modifiable inherited or constitutional predisposition (genotypic and phenotypic characteristics), in combination with UVR exposure may play a more significant role in an individual's risk for developing skin cancer, and these include fair skin complexion, skin type (the susceptibility of the skin to burn), eye color (blue or green), hair color (blonde or red), and presence of a large number of moles or freckles (Armstrong & English, 1996; Creech & Mayer, 1997; Douglas, McGee, & Williams, 1997; Harris & Alberts, 2004; Kricker, Armstrong, English, & Heenan, 1991; Scotto, Fears, Kraemer, & Fraumeni, 1996; Saraiya et al., 2004; Tucker & Goldstein, 2003). Moreover, risk of

skin cancer is greater among those with a history of sunburn early in life, and a positive personal and familial history of skin cancer (Cummins et al., 2006; Parrish, 2005; Sober et al., 2001; Wagner, Gordon, Chuang, & Coleman, 2001).

Skin Cancer Prevention

Since UVR exposure is the greatest modifiable risk factor for all forms of skin cancer, nearly 90% of skin cancers are considered to be preventable (Armstrong, 2005; Glanz, Lew, Song, & Murakami-Akatsuka, 2000). Skin cancer prevention is categorized into primary, secondary, and tertiary prevention. Primary prevention (prevention of occurrence) refers to a set of strategies that focus on reduction or elimination of the risk factors for skin cancer, mainly sun exposure and sunburn (Borland et al., 1990; Mackie, 1998; Marks, 1999; Turner, 1998). Some of these strategies are staying in the shade, limiting the direct exposure to sun in the middle of the day when UVR is strongest (between 10:00 AM and 4:00 PM), wearing sunglasses, covering skin with a hat or clothes, and sunscreens with a sun protection factor (SPF) of 15 or greater (AAD, 2012; ACS, 2012; SCF, 2012). In addition, secondary prevention strategies include finding skin cancer at an early stage by self-examination and full body skin examinations (Mahon, 2003). Most of the skin cancers can be cured if detected early and managed in timely fashion (Gohara & Perez, 2012). The survival rate for early stages of melanoma is 99% if the tumor is caught early and removed before it has penetrated the skin (Huang & Halpern, 2005). Lastly, tertiary prevention aims on better surgical methods, new medicines, and life-long screening to prevent reoccurrence of skin cancer in those individuals that have been already diagnosed (CDC, 2012; Markovic et al., 2007).

Burden of Skin Cancer

The incidence of skin cancer is increasing rapidly in the US, predominantly among White with the projections suggesting that this trend will continue (Alam & Ratner, 2001; Lu et al., 2005). The projected increase in skin cancer rates is mainly linked to a marked increase in UV radiation on our planet due to depletion of stratospheric ozone layer, which blocks and protects people from the sun's harmful UV rays (Geller & Annas, 2003; Pons & Quintanilla, 2006). Additionally, increased skin cancer public awareness, longer life expectancy, and improved surveillance (increased reporting and screening by clinicians) heightened skin cancer rates (Berwick & Wiggins, 2006; Linos, Swetter, Cockburn, Colditz, & Clarke, 2009; Purdue, Freeman, Anderson, & Tucker, 2008; Talalay et al., 2007). Other possible contributing factors are increased sun or ultraviolet light exposure due to an upward trend in the last decades in outdoor leisure activities and sunbathing habits, growth in the sunbed industry, and preferences for clothing styles which do not provide enough sun protection (inadequate prevention measure) (Gilchrest, Eller, Geller, & Yaar, 1999; Lim, Paver, & Penas, 2009; Preston & Stern, 1992; Welch, Woloshin, & Schwartz, 2005; World Health Organization [WHO], 2012).

Non Melanocytic Skin Cancer (NMSC)

NMSC is regarded as one of the most frequently diagnosed malignancies across the US with over 1.3 million new cases recorded per year and it was estimated that this incidence will be doubled in the following 30 years period (Rogers et al., 2006; Rhee et al., 2007; Stebbins & Hanke, 2011). Moreover, NMSC incidence in the US is nearly 11-14 times higher in Whites than in Hispanics (Harris et al., 2001). Men tend to be more commonly affected by NMSC and generally they have 30% higher incidence rates compared to women (Nolen et al., 2011; Staples, Marks, & Giles, 1998). Of all NMSC cases, between 80 and 85% are BCC and the average

lifetime risk to develop this condition in Whites is around 30% (Suarez et al., 2007; Samarasinghe, Madan, & Lear, 2011). At the population level, the likelihood of occurring SCC tumors is less than BCC; nevertheless, SCC metastasizes (spreads and invades other body tissues) more frequently and has a higher mortality rate (Rittie et al., 2007). Recently reported SCC deaths within the US were about 2,500 annually (ACS, 2011). Although NMSCs do not account for high mortality rates, these malignancies cause significant morbidity and leading to enormous annual health care costs (Rogers et al., 2010). The total financial cost per annum for NMSC care is $426 million for the Medicare population and $650 million for the overall US population, making it the fifth most expensive cancer to treat in the Medicare population (Chen et al., 2001; Fleischer et al., 2001; Housman et al., 2003).

Melanoma

Melanoma, a potentially fatal form of skin cancer which accounts for more than 75% of all skin cancer deaths, represents a major and growing public health concern in the US. Incidence of melanoma has increased in the past 60 years and continues to be on the rise at a rate of roughly 5% a year in Whites (Goldberg et al., 2007; Harris & Alberts, 2004; Landis, Murray, Bolden, & Wingo, 1999; Lu et al., 2005; Olson et al., 2007). Since 1975, the annual age-adjusted incidence rate for melanoma among Whites has risen approximately three times, from 8.7 cases per 100,000 in that year to 26.4 cases per 100,000 in 2005 (Surveillance, Epidemiology, and End Results [SEER], 2008). In the US, one in 39 White men and 1 in 58 White women are diagnosed with melanoma during their lifetime (Brady et al., 2011). Moreover, the ACS estimated that in 2012 approximately 76,250 new cases of melanoma were diagnosed (about 44,250 in men and 32,000 in women) in the US and roughly 9,180 deaths were attributed to this form of cancer (about 6,060 men and 3,120 women). This is an increase from the 54,000

new cases in 2003 and the 7,600 deaths (Zhang, 2007). In the 1930s, the risk of Americans developing melanoma during their lifetime was one in 1,500, whereas, according to the most recent projections, this rate is now one in 59 (Rigel, 2010). Furthermore, the lifetime risk of developing melanoma varies considerably with race or ethnicity. Currently, it is estimated that one in 50 Whites, one in 1,000 Blacks, and one in 200 Hispanics in US will develops melanoma at some point in their lifetime (ACS, 2012).

Population at High Risk

All individuals are at risk of developing skin cancer; however, there are groups, most notably outdoor workers, who are more vulnerable to skin cancer compared to other populations (Pichon et al., 2005; Saraiya et al., 2004). This is quite obvious considering the regular and considerable amount of time they spend exposed to UVR during work – at least two to eight hours per day (Gies & Wright, 2003; Batra, 2010). In addition, it was documented that outdoor workers exposure to UVR is extremely excess of the recommended guidelines (Gies & Wright, 2003).

There is substantial evidence in the literature to support the significant association between skin cancer and cumulative, as well as, intermittent sun exposure in outdoor workers (Gruber, Armstrong, Schottenfeld, Fraumeni, 2006; Hakansson et al., 2001; Perez-Gomez et al., 2004; Vitasa et al., 1990, Saraiya et al., 2004; Severi & English, 2004). In addition, the solar UVR dose received by outdoor workers is about six to eight times higher than indoor workers and outdoor workers have a greater chance of being diagnosed with skin cancer (Armstrong & Kricker, 2001; Fritschi & Siemiatycki, 1996; Gies & Wright, 2003; Severi & English, 2004; Mayer et al., 2007; Radespiel-Troger et al., 2008). Also, high incidence and mortality rates of

skin cancer have been found in occupational groups that work outdoors (Gruber et al., 2006; Young, 2009).

Outdoor workers make up a sizable proportion of the work population which spreads across a wide range of jobs. According to the US Census Bureau (2000), occupational groups that work outdoors represent more than eight percent of the total US national work force (over 9 million workers). These groups tend to have an ethno-racial majority of fair skinned individuals which is strongly linked with an elevated risk for skin cancer, primarily due to inherently low amounts of melanin present in the skin, the pigment responsible for skin color and protection against harmful UVR (Brenner & Hearing, 2008; Callister et al., 2011; Glanz et al, 2007; SCF, 2012; Stock et al., 2009; US department of Labour, 2012).

Furthermore, several epidemiological studies noted that men are at significantly higher skin cancer risk than women (ACS, 2012; Buettner & Raasch, 1998; Hall et al., 1997; McCarthy, Ethridge, & Wagner, 1999). Existence of skin cancer development disparity between men and women is not natural, but due to greater percentage of men in outdoor occupations, as well as, differences in skin protection behavior and lifestyle choices (Giles et al., 1996; Hall, May, Lew, Koh, & Nadel, 1997; McCarthy, Ethridge & Wagner, 1999; SCF, 2012; Stock et al., 2009; Woolley et al, 2002; Woolley, Lowe, Raasch, Glasby, & Buettner, 2008).

Purpose of the Literature Review

Given the above considerations concerning outdoor workers' vulnerability to skin cancer, the primary objective of this review is to synthesize and integrate the data available in the selected literature on personal factors (i.e. socio-demographic and psychological) related to sun protection behaviors in outdoor workers. Additional purposes are to provide an overview of sun

exposure among outdoor workers, and to describe the sun protection behavior of outdoor workers

Methods of Literature Search and Selection Criteria

To identify the studies for the review, a comprehensive computerized systematic search was performed in the EBSCO, PubMed, PsycInfo, MEDLINE, and ERIC databases. The terms "skin cancer," "melanoma," "sun protection," "sun exposure," "sun behavior," "skin cancer prevention in outdoor workers," and "HBM" were searched as keywords or phrases. Additional searches were performed in the websites of following organization: The CDC, ACS, AAD, Skin Cancer Foundation, and Melanoma Foundation of Australia, to explore the literature regarding skin cancer and sun safety among outdoor workers. The bibliographies of the articles were manually searched to obtain potentially pertinent articles that were missed during initial search.

The search was limited to studies published in English to reflect the language competency of the reviewer. In the last two decades, there has been a surge in interest and research on the topic of skin cancer, therefore, the decision to review articles published from 1990 to the present was made to include seminal research within the last 20 years and the most up-to-date information and literature. Research studies specifically emphasizing outdoor workers skin cancer or sun protection-related knowledge, belief, behavior, and attitudes towards sun safety were considered eligible for inclusion in the review. On the other hand, articles were excluded if (1) the results of the article were not relevant to the aims of the review; (2) article appeared to examine the clinical issues or effect of specific treatments/settings; (3) article described sun protection behavior of different population groups along with outdoor workers; (4) articles' major focus was on measuring sun exposure dose among outdoor workers; (5) article was duplicate, conference abstract, survey, editorial, case report, letter, and commentary.

The electronic search located 370 citations. All citations were examined, and 275 were excluded on the basis of aforementioned inclusion and exclusion criteria. Titles and abstracts of remaining 95 citations were screened and then the 40 articles that were considered suitable for inclusion in the review were fully read by a reviewer. The reference lists of all 40 articles were reviewed, and any articles that met the selection criteria were included, and these were also read thoroughly. After full-text review, a total of 18 of articles which fulfilled the eligibility for inclusion criteria were selected. Articles that did not meet inclusion criteria during the initial process were eliminated. Finally, 15 articles were deemed relevant to review. The summary of reviewed studies is provided in Table 2.1. This table categorizes pertinent information on the 15 selected articles that pertains to the study objective, description of sample, measures, results, and conclusion of the research. The entire process of the literature search is illustrated in Figure 2.1.

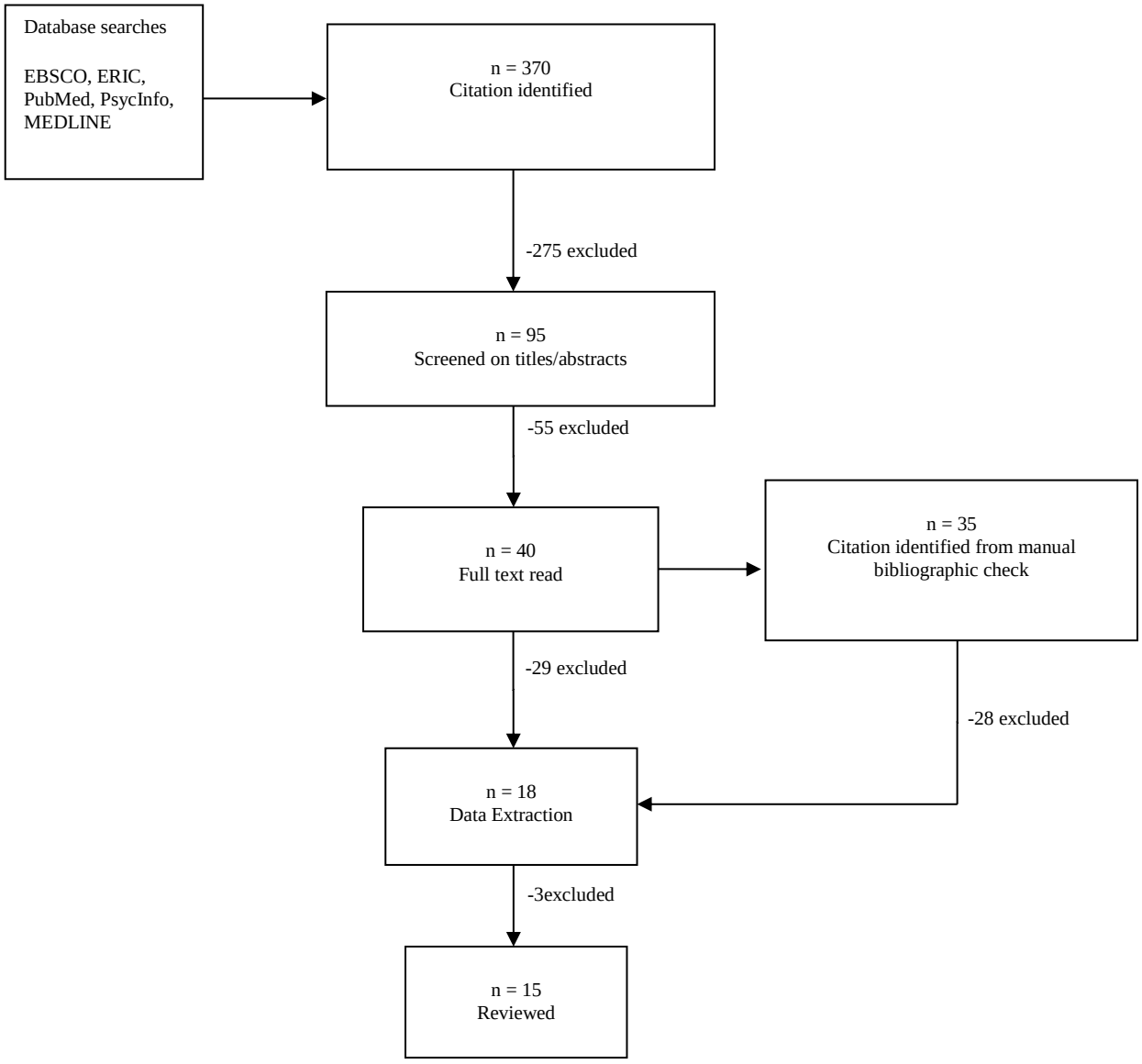

Figure 2.1: Flow chart of the literature search.

Factors Related To Sun Protection Behavior

Disparity between Men and Women

Of five studies which reported sun protection behavior of both male and female outdoor workers, four studies documented differences between men and women in sun-related behavior. Rosenman, Gardiner, Swanson, Mullan, and Zhu (1995) found that female farmers in Michigan were much likely to practice some type of sun protection behavior than male farmers. Further support for gender differences was found in studies on postal workers (Pichon et al. 2005; Lewis et al., 2006). Results showed that female postal workers were more likely to wear sunscreen, whereas males were more likely to wear a hat. Another important finding noted by Lewis, Mayer, and Slymen (2006) was that being female was the only common predictor of sunscreen use for both working and non-working days. Moreover, in a New Zealand study with a large sample of outdoor workers (n = 1,283), consistent with the previous studies McCool, Reeder, Robinson, Petrie, and Gorman (2009) found that, females were significantly more likely to wear sunscreen than males. On the other hand, Stepanski and Mayer (1998) did not find a difference in UVR protection behavior between male and female outdoor workers. However, this similarity in sun protective behaviors may have been due to the impact of mandatory clothing policies enforced by the companies.

Age

There is evidence to elucidate the relationship between age of outdoor workers and skin cancer prevention behaviors, although the aforementioned study by Stepanski and Mayer (1998) demonstrated no correlation between age and sun protection behavior. Rosenman et al. (1995) showed that increasing age influenced individuals to use protective measures against sun exposure. Moreover, in-depth interview conducted by Parrott, Steiner, and Goldenhar (1996)

reported that older participants were more willing to engage in sun protection practices than younger counterparts. Supporting this, McCool and colleagues (2009) noted that a greater likelihood of sunscreen use was related to being older. Madgwick, Houdmont, and Randall (2011) found that age was positively correlated with wearing of long sleeved, loose fitting tops and trousers.

Ethnicity

Ethnic background was recognized in the following studies as one of the factors related with outdoor workers sun protection behavior. Pichon et al. (2005) surveyed 2,660 participants (non-Latino, Whites, Latino, Asian American, African American, and pacific Islanders) to compare sun-safety behavior across ethnoracial groups employed as letters carriers at United States Postal Service (USPS). Results showed that ethnicity was significantly associated with the use of sunscreen and sunglasses. Also, rates of sunscreen and sunglasses use in non-Latino Whites were significantly higher than the other four groups. Similar results for sunscreen use were echoed in a Lewis and colleagues'(2006) study conducted one year later (i.e. sunscreen use at work is significantly associated with ethnicity and sunscreen use in non-Latino Whites postal workers was significantly higher than Asians and African Americans postal workers). Both the aforementioned studies also reported that non-Latino Whites are more likely than Whites to engage in hat use. Therefore, ethnicity predicts whether or not outdoor workers practice particular sun protection behavior.

Skin Type

Influence of skin type on sun protection behavior is investigated in many studies. Woolley, Buettner, and Lowe (2002) reported positive relationship between skin type and sun protective clothing use. An encouraging result emerged from this study was that outdoor

workers with more vulnerable skin type avoided sun between 10:00 AM to 2:00 PM. Pichon et al. (2005) and Lewis et al. (2006) showed increased sunscreen and hat use with greater sun sensitivity. On the contrary, there are studies that yielded no significant association between skin type and sun protection clothing use (Sales et al., 2005; McCool et al., 2009). However, Sales, Mayer, and Hoerster (2005) speculated that no relationship is because the use of sun protection clothing by outdoor workers is not to protect their skin but to protect themselves from occupational hazards such as handling pesticides or thorny branches. Additionally, in McCool et al.'s (2009) study, researchers examined only sunscreen use behavior, whereas, studies which showed association investigate more than one sun protection behavior. After taking all results and limitations of studies into consideration it can be concluded that sensitive skin type play a role in determining sun protection behavior in outdoor workers.

Education, Income, and Health Insurance

Two studies could be identified that examined the relationship between education and sun protection behavior, and the results were mixed. Rosenman et al. (1995) reported that increased education in farmers did not affect the likelihood of using sun protection. Moreover, findings from a more recent study indicated that outdoor workers with higher education were significantly more likely to use sunscreen than outdoor workers with lower education (McCool et al., 2009).

Only one study has documented the influence of income and health insurance (Rosenman et al., 1995). Results reported that increased income in female farmers increased the likelihood of using sun protection presumably because money is required for the purchase of sun protection modalities. Whereas, male farmers showed no increase in the likelihood of using sun protection with increased income. One unanticipated finding was that increased health insurance in both men and women did not increase the likelihood of sun protection use. The scarcity and

ambiguity of data on impact of education, income, and health insurance in outdoor workers makes it difficult to draw any conclusion.

Time (hours/years) spent at Work

The amount of time (hours/years) that outdoor workers spend at work has been found to be related to sun protection behavior. Lewis et al., (2006) showed the use of occupational sunscreen and hats in postal carriers was positively associated with hours worked outdoors. Also, Madgwick et al. (2011) reported that the more time construction workers spend outdoors, the more likely those construction workers will wear wide brimmed hats. In terms of years, Sales and colleagues (2005) noted that participants who used higher levels of sun protective clothing worked as farm workers a significantly longer period of time than the participants who reported lower levels of protection.

Personal History of Skin Cancer

The evidence of relationship between personal history of skin cancer and sun protection behaviors in outdoor workers can be clearly seen in the study of Woolley et al. (2002) in which solar protection (77.4% wore a wide-brimmed hats, 52% wore long sleeved shirts, and 50% wore sunscreen when out for significant amount of time) of male outdoor workers with previously removed NMSC was considerably higher than solar protection of outdoor workers in other studies. This reflects the finding of prior study (Rosenman et al., 1995) that documented personal history of skin cancer increased the likelihood of sun protective measures use in farmers and their spouses.

Family History of Skin Cancer

There is not sufficient evidence to support the influence of family history of skin cancer on sun protection behavior amongst outdoor workers. Participants of Rosenman et al.'s (1995)

study did not show increased use of sun protection measure against sun if they had a family member or friend with skin cancer history. Also, Stepanski and Mayer (1998) noted that UVR behavior score did not vary between participants with and without a family history of skin cancer. Lewis et al. (2006) reported having a family history of skin cancer as being significantly associated with engaging in sunscreen use, whereas, no association was reported with occupational hats use. Unfortunately, with only one study which partly supported the association between family history of skin cancer and outdoor workers sun protection behavior, any conclusion is speculative at best.

Knowledge

In the research to date on sun protection behavior, one factor assessed in several studies is knowledge related to skin cancer or melanoma. A large volume of studies reported that there appears to be a reasonable level of knowledge about the skin cancer. Wisconsin dairy farm workers reported average score of 70% correct on the knowledge questions about skin cancer (Marlenga, 1995). Also, 83% reported having knowledge that level of SPF in sun block or sunscreen should be 15 or higher (Parrott et al., 1996). In Australia, most of the outdoor construction workers reported high level of knowledge about skin cancer risk (94%) and use of sunglasses (85%) (Cioffi et al., 2002). Moreover, the researchers of these studies reported that this knowledge is not translated into sun protection behaviors; therefore, actual engagement in skin cancer prevention practices was poor. These findings further support the finding of Hammond, Reeder, Gray, and Bell (2008) who showed that sun protection practices is related to personal factors such as perceived susceptibility of developing skin cancer and perceived workplace support, but not to knowledge about skin cancer and prevention. However, there is an inconsistency in the literature with regard to association between knowledge and skin cancer

prevention. Studies yielded conflicting data, for example, Parrott and Lemieux (2003) found skin cancer knowledge of farmers positively associated with use of sunscreen, long sleeved shirts, and sun protective hats. Another example is of McCool et al.'s (2009) study; reported sunscreen use was strongly related with perceived knowledge about skin cancer.

Perceived Susceptibility

Of the research studies reviewed, only two studies examined the role of perceived susceptibility to skin cancer in determining sun protection behavior. Marlenga (1995) indicated that participants perceived their susceptibility to skin cancer; however, they did not use sun protection methods. In contrast, Hammond and coworkers (2008) reported that increased perceived susceptibility to skin cancer was one of the factors that increased the likelihood of using sun protection in outdoor workers. Based on contradictory findings, it is therefore not possible to suggest that sun protection behavior is associated with perceived susceptibility.

Perceived Workplace Support

In recent years, researchers have investigated the association between perceived workplace support and sun protection behavior in outdoor workers. This association has been strong and persistent. McCool et al. (2009) reported a positive association between perceived workplace support and sun protection practice. The findings of this study corroborate the results of a previous study (Hammond et al., 2008).

Perceived Barriers

A considerable amount of perceived barriers to sun protection were recognized in the studies. These include difficulty in remembering to use, amount of time required to use sunscreen, inconvenient or discomfort to use, lack of concern about sun exposure, perceived physical attractiveness related to tanned body (Cioffi et al., 2002; Hammond et al. 2008;

Marlenga, 1995; Parrott et al., 1996; Shoveller et al, 2000; Woolley et al., 2002). Furthermore, results of a study conducted by Marlenga (1995) revealed that, of all the addressed HBM variables (except self-efficacy), perceived barrier was the only important predictor of whether farmers protect their skin from sun exposure.

Summary of the Reviewed Studies

Marlenga (1995) targeted male Wisconsin dairy farmers to determine their health beliefs, level of skin cancer knowledge, current practices, and cues to prevent skin cancer. A questionnaire was developed for this study to address HBM variables on the basis of literature review, certain HBM variables, and researchers' personal experience. The survey was a 39-item questionnaire that was piloted and revised prior to full administration. Frequencies and percentages were used to summarize the answers to questionnaire. The average age of the 202 participating dairy farmers was 50.88 years old. Participants worked outdoors for an average of 4.15 hours/day. Seventy-four of the participants reported that they were more likely than others to get skin cancer due to their chosen job, 86% recognized that skin cancer is a severe disease, and 87% agreed that by engaging themselves in sun protective behavior might reduce their chances of developing skin cancer. Participants were asked about the perceived barriers for not using protective clothing and sunscreen and majority answered "was too hot to wear" and "I forgot to wear it" respectively. Most frequently used cues to actions to preventive skin cancer were farm magazines/newspapers (43%), health professionals (25%), and television (19%). The participants reported average score of 70% correct on the knowledge questions about skin cancer. Sixty percent of the participants were not aware that melanoma is most serious form of skin cancer. Additionally, the majority of the participants rarely or never; wore a wide brim hat (76%), used sunscreen (73%) and wore a long sleeved shirt (69%). Although dairy farmers were

knowledgeable about skin cancer, indicated perceived susceptibility and severity to skin cancer and perceived benefits of preventive actions against skin cancer, they did not practice sun protection. Among all the selected HBM variables, perceived barrier was the only predictor that explained why dairy farmers did not protect their skin from sun exposure. In conclusion, the utility of the HBM to assess and describe the sun protective behavior in dairy farm workers was questioned.

Rosenman et al. (1995) evaluated sun protection knowledge, attitude, and behavior of a random sample of farmers and their spouses. The inclusion criteria stipulated that participants must be 40 years of age or older. The survey instrument was pilot-tested on 57 farm men and 61 farm women before its implementation. Questionnaire items assessed skin cancer knowledge, frequency of sun protection behavior, source of information on health problems, frequency and source of health care sun exposures during work, and health care insurance. Of those that completed the questionnaire (n = 1,342), 43% of the men and 65.5% of the women were very likely to practice some type of sun protection. Most respondents (88.3%) knew that early diagnosis of skin cancer increase the chance of being treated. Moreover, almost 68% never had their skin checked for cancer. Although 89.4% of the farmers visited doctors for physical examination in the last three years, only 28.4% reported that they had skin examination for cancer. Multiple logistic regression analysis showed that increasing age and personal history of skin cancer influenced individuals to use protective measures against sun exposure. Furthermore, increased income in women increased the likelihood of using sun protection. In contrast, higher-income men were unlikely to use sun protection. In men and women, increased age, higher-income or -education demonstrated increased likelihood of having skin examined for

cancer. Finally, researchers stated that farmers and their spouses should adequately protect their bodies from solar radiation.

The project Georgia Harvesting Healthy Habits (GHHH) aimed to increasing skin cancer prevention and detection behavior in farmers of Georgia. Parrott et al. (1996) conducted formative evaluation based on Social Cognitive Theory (SCT) to identify environmental factors which might either facilitate or inhibit the impact of skin cancer prevention campaign for farmers (Bandura, 1986). Additionally, the purpose of evaluation was to determine the personal determinants of farmers skin cancer prevention and detection behavior. Pilot survey, field observation, and in-depth interview were performed to obtain data for formative evaluation. A total of 155 farmers responded to pilot surveys. All participants were White and their age was between 16 to 80 years. Forty-three percent noted that they did not wear wide-brimmed hats, 49% did not apply sunscreen, and 65% did not wear long-sleeved shirts during work in the sun. Most of the participants (56%) responded that they received information about skin cancer from their physicians. Survey's findings about social support showed that 53% participants reported that their friends recommended them to protect their skin during work in the sun. Barriers to sun protection indicated by farmers was amount of time needed to put on long sleeved shirt (30%), sunscreen (8%), and wide brimmed hats (1%). When asked about the knowledge of skin cancer: 90% were aware that melanoma is the most severe form of skin cancer. Pilot survey's findings of self-efficacy revealed that 73% of the farmers strongly believed that they can wear wide-brimmed hat, 63% were confident about their ability to apply sunscreen, and 48% are confident they can wear long sleeved shirt while working in the sun. One hundred and forty-four outdoor workers (49 farmers, 41 construction workers, 39 road workers, and 15 other outdoor workers) were observed while working in sunny summer weather. Results of field observation showed

that approximately 90% of the farmers were not wearing wide brimmed hats or caps with flaps, long sleeved shirt, and long pants. Results of in-depth interviews of nine farmers showed that all farmers, except farmers who had had melanoma, reported no use of sun protective measures when working outside in the sun. Formative evaluation concluded that there was a lacking of information, products, services, and social support for farmer workers to prevent and detect skin cancer.

Stepanski and Mayer (1998) evaluated solar protection behaviors among three different groups of outdoor workers: construction workers, California transportation workers (Caltrans), and US postal carriers in San Diego County, California. This cross-sectional research contained two distinct studies. Study 1 comprised of observations of workers (n = 312) while working at their respective jobs. To record the sun protection practices of outdoor workers, researchers used one page observation sheet modified from the solar protection behavior diary. In study 2 respondents (n = 240) completed questionnaires, which primarily addressed skin cancer risk factors, sun protection, and skin type. One-way ANOVA compared the three jobs on Ultra Violet Radiation (UVR) scores. To assess the association between UVR score and age, the spearman correlation test was used. Moreover, independent samples t-tests were conducted to determine if the UVR score varied either by family history of skin cancer or by gender. Association between adequate UVR protection and occupation was determined by using chi-square analysis. Results indicated that participants who had mean age of 39.44 years, were predominantly males (80.1%) and White (61.0%). Construction workers, Caltrans workers and mail carriers spent an average of 7.94, 6.95, and 5.11 hours working outdoors respectively. Furthermore, differences on solar protection scores mean across three groups of outdoor workers were significant (p<.05). There was no correlation between age and UVR score (r = .0172, p =

.79). Also, UVR score did not vary between participants with and without a family history of skin cancer (t (df = 226) = -0.99, p = .69) or between males and females (t (df = 234) = 1.09, p = .64). Face and lower arms were recorded as a least protected part of the body against UVR. Approximately one half (50.4%) of all subjects reported sufficient use of sun protection. Fifty-nine percent of the workers received skin cancer education and most of this education was received at workplace (51.7%). To assess an adequate level of protection against UVR, it is not only essential to observe the body as a whole, but also individual sites on the body.

Shoveller et al. (2000) conducted a telephone survey in Canada to determine outdoor worker's daily sun exposure and protective behavior during work. Additionally, they were asked about their most important sources of information and barriers to sun safety. Of the 4,023 participants who completed the surveys, 546 were outdoor workers. Eighty percent of outdoor workers were male and 95% were in the 25 to 64 years age range. Seventy percent received more than two hours of sun exposure during an average working day. Fifty eight percent showed hat use and 60% used sun protective clothing. Also, 23% of participants wore sunscreen on their face and 18% on their body at work. Furthermore, when outdoor workers were questioned about why they may not always use sun protective measures; 61% said they forgot, 54% reported sun protection was inconvenient, 38% liked tanned skin, and 34% answered that they were not worried about UVR exposure. Eighty-five percent of the outdoor workers identified television as a source of sun protection information, 66% received information from magazines, 63% from family or friend, and 21% from their employers. The results of this study indicated low levels of sun safety among outdoor workers. Moreover, outdoor workers need to increase their sun protection behaviors when working outside.

Cioffi et al. (2002) surveyed outdoor construction workers (n = 142) in Sydney, Australia on their knowledge of and attitude towards skin cancer and behavior regarding protection of their skin from sun. Survey questionnaires included information on skin cancer knowledge, sources of information about skin cancer, attitudes towards skin cancer, sun protection behavior, and use of sun protective measures. To analyze the data, frequencies were computed from the responses to the survey questions and converted to percentages. The great majority of the participants were male (97.8%) and most were between of 31 - 40 years. Results showed that wide brimmed hats (54% responded frequently/always) and sunglasses (61% responded frequently/always) were the most common sun protection practices among outdoor workers but these sun protection behaviors were low. Moreover, 65% of workers responded use of sunscreen never/occasionally and the reason for not wearing a sunscreen reported by workers was that its use was dangerous to health. Most of the workers reported high level of knowledge about skin cancer risk (94%) and use of sunglasses (85%). Nearly half of the participants (44%) answered that it was healthy to have a tanned body. Furthermore, 78% of the workers indicated that they receive most of the skin cancer information from television. Outdoor workers were aware that they were at risk of skin cancer; nevertheless, their use of sun protective measures was significantly less.

Woolley et al. (2002) conducted a cross-sectional study in Townsville, North Queensland, Australia to compare sun exposure and sun protection behaviors between outdoor male workers with a history of non-melanoma skin cancer (NMSC) and indoor workers. Only those male subjects were included in the sample who had one recorded NMSC and no record of melanoma between 1997 and 1999. Randomly selected participants (n = 300) completed a survey from October to December 1999 which consisted of questions about skin type, recent skin damage, recent sun behavior, and perceived barriers to sun protection. Retired or currently

unemployed were excluded and remaining participants were asked to categorize themselves as mainly indoor worker (n = 119), mainly outdoor worker (n = 72), or half indoor and half outdoor worker (n = 42). Chi-square tests, one-way analyses of variance, and nonparametric Kruskal-Wallis tests were used to assess association between variables. Multiple logistic regression analysis was used to assess whether changes in variables between indoor, half indoor and half outdoor, and outdoor workers could be related with the potential confounding effects of skin type. Mean age of respondents was 49 years (SD = 7.5). On average working day more than half of the mainly outdoor workers spent more than 6 hours outdoors. Overall, 36.8% of the currently outdoor working participants reported that their employers did not provide any workplace policy to use sun safety during work in the sun. A total of 43.6% of all participants answered that they wear long-sleeved shirts and 77.2% wear a wide-brimmed hat at work. The most frequently cited barrier to skin cancer prevention measures in this sample was that "did not get around to putting it on." No significant difference was found in the sun safety behavior between indoor workers and outdoor workers. Mainly indoor workers were more likely to wear sunscreen when going out in the sun for long time compared to other workers. Moreover, mainly outdoor workers spent more time in the sun while working and days off ($p < .0001$, for both) compared to mainly indoor workers. In summary, despite the fact that outdoor workers reported large sun exposure, their sun protective behavior was the same as other workers.

Parrott and Lemieux (2003) examined the effect of farm families' support on farmers' sun protection behavior. Randomly selected Georgia farmers (n = 448) were surveyed by means of telephone. Information collected included skin cancer knowledge, use of sun protection measures, familial expectations about sun protection practice, and familial information providing about skin cancer prevention and detection. Bivariate correlation coefficients were calculated to

access association between the variables being examined. Findings reported that all the participants were males, with the mean age of 50 years (*SD* = 12.66). Moreover, positive relationship was reported between farm families' information giving and perceived knowledge (r = .27, p < .001), wearing sun lotion (r = .27, p < .001), hats use (r = .16, p = .001), long sleeved shirts use (r = .11, p < .05), and skin examined by physician (r = .33, p < .001). Stepwise multiple regression analyses showed that farm families' expectations, knowledge, and information giving predicted farmers sunscreen use F (3, 444) = 46.65, p < .001, adjusted R^2 = .24. Furthermore, familial expectations and knowledge of farmers significantly predicted farmers use of long sleeved shirts F (2, 445) = 23.40, p < .001, adjusted R^2 =.10 and sun protective hats use F (3,444) = 44.43, p < .001, adjusted R^2= .17. Taking all the results into consideration, researchers inferred that involvement of the farm family members in skin cancer intervention program is highly effective approach in changing sun protection behavior and reducing skin cancer risk among farmers.

Pichon et al. (2005) compared sun-safety behaviors across ethnoracial groups employed as letters carriers at United States Postal Service (USPS). This study presented the results from the baseline survey conducted in summer 2001 as a part of Sunwise project, which included multi component intervention in Southern California. A total of 2,660 participants (non-Latino, Whites, Latino, Asian American, African American, and Pacific Islanders) were surveyed. Questionnaire addressed demographic characteristics, sun protection behaviors, and skin type. SAS, version 8.2 (SAS Institute, Cary NC, 2001) was used for data analyses. Three multivariate logistic regression analyses obtained from generalized estimating equations (GEE) were performed (one per behavior), with the outcome variable (sun protection behavior) and predicting variable (ethnicity, skin type, gender, number of years worked as a letter carrier, time

spent outdoors, and education). The results were based on data of 2,543 participants; their mean age was 43 years (*SD* = 8.54). Furthermore, participants were predominantly male (68%) and 53.63% were non-Latino whites. Letter carriers indicated that they spent an average of four hours per day outside. Logistic regression analyses investigated that ethnicity was significantly associated with the use of sunscreen and sunglasses ($p < .01$, for both). Rates of sunscreen and sunglasses use in non-Latino whites were significantly higher than other four groups. Hence, this study demonstrated that all the ethnoracial groups reported low rate of sufficient protection against sun.

Sales et al. (2005) conducted a study in California to assess farmworkers' knowledge, perceptions, and behaviors about solar protection. Three-hundred twenty six male Latino farmworkers participated in the study. Participants were interviewed by bicultural interviewer and while interviewing they observed farmers' use of sun protection. Also, subjects completed self-administered survey measuring: about skin sensitivity to sun, years as a farmworker, hours worked per day, previous education regarding skin cancer protection, history of skin cancer, and sun protective behaviors. Average age of the subjects was 32.79 years (*SD* = 13.14). Results showed that 19.3% of the participants knew the use of sunscreen and only nine participants reported any use of sunscreen during work. Almost all the farmworkers (98.7%) always used some form of hat when working outside in sun for more than 15 minutes; however, only few farmworkers (5.3%) indicated always wearing 2.5-inch wide brim hat which covered ears, nose, and possibly the face. More than 80% of the sample always wore shirt with long-sleeves or a collar. Ninety-five percent reported no use of any sun protective gear for eyes. Furthermore, 114 participants had no knowledge about skin cancer. Also, more than half of the respondents did not know that they were at risk of skin cancer in future. T- tests assessed that participants

who had higher levels of sun protective clothing use worked as farm workers significantly longer period of time than the participants who reported lower levels. Moreover, X^2 tests reported no significant association between skin type and the following variables during summer: frequency of wide-brim hat use X^2 (1, N = 325) = 0.13, p = .724, frequency of long sleeved shirt use X^2 (1, N = 325) = 0.505, p = .477, and perceived risk of skin cancer X^2 (1, N = 325) = 2.39, p = .122. Although the farmers used sun protective cloths adequately, their overall sun protective behavior was not consistent.

Targeting postal workers of United States Postal Service (USPS), Lewis et al. (2006) compared occupational and leisure-time sun protection rates and correlates. This study represents the data from the baseline survey collected during June-August, 2001 as a part of Sunwise project, which consisted of multi component intervention in Southern California. A total of 2,660 completed a self-administered questionnaire, which included questions about sun protection behavior during work and leisure time, provision of encouragement from family member or co-workers to protect skin, family history of skin cancer and information about skin cancer risk. Moreover, their wide brim hat use was monitored. Sun protection behavior rates between workdays and non-working days were compared using generalized linear mixed models and generalized estimating equations. Also, logistic regression analyses were used to determine the relationship between workdays and days off and use of sunscreen and wide brim hat while controlling predictor variables. Mean age of the study postal carriers was 43 years (SD = 8.5) and 69% were male. Results showed that respondents in this study spent an average of 3.9 hours (SD = 1.9) and 3.3 hours (SD = 2.1) outside on working and non-working day respectively. Twenty five percent of the participants always applied sunscreen during work whereas only 12% always used it during leisure time. Furthermore, 24% of postal carriers

always wore hat at work while only 4% wore hat on days off. Hat use increased with increased sun sensitivity and more time spent outside for both working and non-working days. In addition, level of sunscreen use at working and non-working days in females was higher than males. Participants who received encouragement from a family member were more likely to use sunscreen and wide brim hat on days off. Letter carriers experienced high levels of UVR exposure while work and days off; however, their use of sun protective measures were low.

In the survey questionnaire study aimed at three outdoor occupational groups in New Zealand: horticulture, roading, and building, Hammond et al. (2008) determined factors predicting sun protection use in the targeted population. Subjects selected for inclusion were required working outside between 10:00 AM to 4:00 PM and five days/week. Outdoor workers (n = 74) completed a self-administered questionnaire and reported their skin cancer knowledge, perceived skin cancer risk, attitude towards suntans, perceived workplace support and workplace policy. Also, participants were asked to record their sun protection practices in diary for five consecutive working days. One-way ANOVA with Scheffe's adjustment for multiple comparisons assessed relationships between occupational group and predicting factors of sun protection practices. Furthermore, regression analysis was used to determine the relationship of personal and workplaces factors with sun protection. Mean age of the participants was 35 years, with more than 80% male. Results showed that sun protection practices were predicted by perceived workplace ($p < .01$), attitude towards suntans ($p = .08$), and high perceived risk of skin cancer ($p = .09$). In contrast, knowledge was not found as a predicting factor of sun protection practices ($p = .68$). Thus, personal and workplaces of workers are the factors that increase the likelihood of using sun protection in outdoor worker.

Gies, Glanz, O'Riordan, Elliott, and Nehl (2009) assessed ultraviolet radiation (UVR) exposures and personal use of sun protection among lifeguards working at pool settings. A sample of lifeguards (n = 168) from four metropolitan regions of the US comprised the participants. To measure UVR exposure for 2 days, lifeguards were asked to wear a polysulfone (PS) badge. Also, data for this study were collected by questionnaire (baseline and follow-up survey) and 4-day diary in June and July, 2006. Information asked of the participants included the following: sun-protection habits, sunscreen use, skin cancer risk factors, history of sunburn, and UVR exposure. In addition, research staff observed participants for 2 days (on 1 weekday and 1 weekend day) to record their body coverage and if they wore PS badge. Participants had a mean age of 19.4 years (SD = 5.6), with 59.3% female, and 89.9% white. Participants spent an average of 4.29 hours a day in the sun. Results of one-way analysis of variances (ANOVAs) showed that sun protective practices varied by city. Lifeguards in Phoenix had highest level of sunglasses (90.4%) and sunscreen (76.4%) use, Austin reported highest level of hat (37%) and shade (31.2%) use, and Portland showed highest use of shirt (31.3%). Even though lifeguards in Omaha indicated highest median UVR exposures of 6.2 standard erythemal doses (SEDs), their overall level of sun protection was lowest. Across all locations, 74% of the lifeguards' PS badges indicated UVR exposure over recommended threshold limit values (TLV's) for occupational exposure. Thirty-nine percent of all the participants received more than four times the TLV and PS badges of 65% of participants received sufficient UVR to cause sunburn. Although lifeguards reported high level of UVR exposure, their use of appropriate sun protection was low and incidents of sunburn in each lifeguard were at least twice as in the previous year.

McCool et al. (2009) explained the associations of sunscreen use with sun safety attitudes and knowledge in outdoor workers of New Zealand. In addition, researchers determined the

association between perceived skin type and perceived risk of skin cancer. A sample consisted of 1,283 outdoor workers from nine occupational groups. A questionnaire was distributed to outdoor workers. They were queried about socio-demographic characteristics, the perceived skin cancer risk, skin cancer knowledge, and sunscreen use. ANOVA was performed to determine significant differences in gender, age, ethnicity and education across each of the independent measures (perceived skin type, perceived resilience, concern, perceived prioritization, attitudes towards sun tanning, workplace support and perceived knowledge). After controlling for socio-demographic variables and occupational groups, relation between each of the independent measures on the sunscreen use was determined by using multiple linear regression analysis. Older workers and workers with higher education were significantly more likely to use sunscreen than younger workers and workers with lower education respectively. Moreover, workers who had higher education were more likely to indicate higher level of workplace support than low educated workers. Results of multiple linear regression analysis showed that sunscreen use was strongly related with several independent variables; perceived prioritization of sun protection (p = .001), concern about effects of sun exposure on skin (p =.001), perceived workplace support ($p = .000^{*}$), and perceived knowledge ($p < .001$). Hence, intervention programs providing knowledge about risks associated with sun exposure and importance of sun protection practices likely to have a positive impact in terms of improving sun protection behavior

Madgwick et al. (2011) studied a convenience sample of construction workers (n = 360) in Britain to examine the association of socio-demographic and work characteristics with the use of sun protection measures. Pilot-tested questionnaire elicited information mainly on sun safety behaviors, provision of training on sun exposure by employers, personal/ family history of skin cancer, desire for sun tan and use of sunscreen on non-working days. In order to determine

associations between socio-demographic and occupation characteristics with regard to the use of sun protection measures, bivariate correlations were calculated. Moreover, logistic regression analysis was used to measure odd ratios (OR) and 95% confidence intervals (CIs) for those sun protection measures which are significantly associated ($p < .05$) with either one or more socio-demographic or occupational characteristics. Results noted that mean age of the respondents was 41.1 years (*SD* = 11.8), all of them were males, and spent an average of 6.6 hours/day outdoors (*SD* = 2.8). The most frequently used sun protection measures were; plentiful water intake (89%), use of sunscreen (60%), wearing long sleeved loose fitted tops and trousers (51%). Age was positively correlated with wearing of long sleeved loose fitting tops and trousers (*OR*, 1.03; 95% *CI*, 1.01-1.05). Furthermore, positive correlation was reported between recipient of sun protection training and wearing of long sleeved loose fitting tops, trousers (*OR*, 1.69; 95% *CI*, 1.02-2.80) and sunglasses (*OR*, 1.85; 95% *CI*, 1.10-3.13). To summarize, this study has demonstrated that intervention programs concentrating on demographic and occupational characteristics are likely to provide promising results in engaging workers in the use sun protection measure.

Table 2.1

A Summary of the Reviewed Studies

Author, Date	Objective, Population	Gender, Ethnicity, Sample Size (*n*), Mean age (*M*)	Results	Conclusions
Marlenga (1995)	Determine health beliefs, level of skin cancer knowledge, current practices and cues to prevent skin cancer, Wisconsin dairy farmers	100% male, n = 202, M = 50.88 years	Participants worked outdoors for an average of 4.15 hours/day The participants reported average score of 70% right on the knowledge questions about skin cancer 74% of the participants reported that they were susceptible to skin cancer 86% recognized that skin cancer is a severe disease 87% agreed that by engaging themselves in sun protective behavior might reduce their chances of developing skin cancer Perceived barriers for not using protective clothing and sunscreen were "was too hot to wear" and "I forgot to wear it" respectively Majority of the participants rarely or never; wore a wide brim hat (76%), used sunscreen (73%) and wore a long sleeved shirt (69%)	Among all the selected HBM variables, perceived barrier was the only predictor that explained why daily farmers did not protect their skin from sun exposure Utility of the HBM to assess and describe the sun protective behavior in dairy farm workers was questioned
Rosenman et al. (1995)	Evaluate sun protection knowledge, attitude, and behavior of a farmers and their spouses, Michigan, US	43% males & 65.5% females, n = 1,342, $\geq$ 40 years	43% of the men and 65.5% of the women were very likely to practice some type of sun protection Increasing age and personal history of skin cancer influenced individuals to use protective measures against sun exposure	Farmers and their spouses should adequately protect their bodies from solar radiation

Table 2.1 continued

A Summary of the Reviewed Studies

Author, Date	Objective, Population	Gender, Ethnicity, Sample Size (*n*), Mean age (*M*)	Results	Conclusions
			Increased income in women increased the likelihood of using sun protection, whereas, higher-income men were unlikely to use sun	
Parrott et al. (1996)	Identify environmental factors which might either facilitate or inhibit the impact of skin cancer prevention campaign for farmers in Georgia. Additionally, the purpose was to determine the personal determinants of farmers skin cancer prevention and detection behavior	Intercept survey: 155 farmers, all participants were white whose ages ranged from 16 to 80 years Fields observations: 49 farmers, 41construction workers, 39 road workers and 15 other outdoor workers In-depth interview: 9 farmers	Fields observations: 95% of the farmers were not wearing wide brimmed hats or caps with flaps and long sleeved shirt Pilot survey: 43% did not wear wide-brimmed hats, 49% did not apply sunscreen, and 65% did not wear long-sleeved shirts during work in the sun In-depth interview: older participants were more willing to engage into sun protection practices than younger participants Barriers to sun protection indicated by farmers was amount of time needed to put on long sleeved shirt (30%), sunscreen (8%), and wide brimmed hats (1%) 90% were aware that melanoma is the most severe form of skin cancer 73% of the farmers strongly believed that they can wear wide-brimmed hat, 63% were confident about their ability to apply sunscreen, and 48 % are confident they can wear long sleeved shirt while working in the sun	There was a lacking of: sources of information, products, services, and social support for farmer workers to prevent and detect skin cancer

Table 2.1 continued

A Summary of the Reviewed Studies

Author, Date	Objective, Population	Gender, Ethnicity, Sample Size (*n*), Mean age (*M*)	Results	Conclusions
Stepanski and Mayer (1998)	Evaluate solar protection behaviors among three different groups of outdoor workers: construction workers, California transportation workers (Caltrans), and US postal carriers in San Diego County, California	80.1% males (survey data), 61.0% White, Study 1: *n* = 312, Study 2: *n* = 240, *M* = 39.44 years	Construction workers, Caltrans workers and mail carriers spent an average of 7.94, 6.95, and 5.11 hours working outdoors respectively 50.4% subjects reported sufficient use of sun protection There was no correlation between age and UVR score UVR score did not vary between participants with and without a family history of skin cancer or between males and females	To assess an adequate level of protection against UVR, it is not only essential to observe the body as a whole, but also individual sites on the body.
Shoveller et al. (2000)	Determine the sun exposure and protective behavior of outdoor workers in Canada	80% male, *n* = 546, 95% between 25 - 64 years	70% received more than 2 hours of sun exposure during average workday 58% indicated hat use, 60% used sun protective clothing , and 23% wore sunscreen on their face and 18% on body at work Barriers to sun protection: 61% said they forgot, 54% reported sun protection was inconvenient, 38% liked tanned skin, and 34% answered that they were not worried about UVR exposure	Low levels of sun safety among outdoor workers
Cioffi et al. (2002)	Assess outdoor construction workers knowledge of and attitude towards skin cancer and behavior regarding protection of their skin from sun, Sydney, Australia	97.8% males, *n* = 142, majority were in range of 31 to 40 years	54% responded frequently/always use of a wide brimmed hats 50% responded frequently/always use of sunglasses	Outdoor workers were aware that they were at risk of skin cancer; nevertheless, their use of sun protective measures was significantly less

Table 2.1 continued

A Summary of the Reviewed Studies

Author, Date	Objective, Population	Gender, Ethnicity, Sample Size (*n*), Mean age (*M*)	Results	Conclusions
			94% reported high level of knowledge about skin cancer risk and 85% use of sunglasses	
Woolley et al. (2002)	Compare sun exposure and sun protection behaviors between outdoor male workers with a history of non-melanoma skin cancer (NMSC) and indoor workers in Queensland, Australia	100% males, *n* = 237, *M* = 49 years	On average working day more than half of the mainly outdoor workers spent more than 6 hours outdoors 43.6% answered that they wear long-sleeved shirts, 72% wore, and 77.2% wear a wide-brimmed hat at work The most frequently cited barrier to skin cancer prevention measures in this sample was that "did not get around to putting it on" No significant difference was found in the sun safety behavior between indoor workers and outdoor workers	Despite of the fact that outdoor workers reported large sun exposure, their sun protective behavior was the same as other workers
Parrott and Lemieux (2003)	Examine the effect of farm families' support on farmers' sun protection behavior, Georgia	100% males, *n* = 448, *M* = 50 years	Farm families' information giving was positively associated with perceived knowledge, wearing sun lotion, hats, and long sleeved shirts use Farm families expectations, knowledge, and information giving predicted farmers sunscreen use Familial expectations and knowledge of farmers significantly predicted farmers use of long sleeved shirts and sun protective hats	Involvement of the farm family members in skin cancer intervention program is highly effective approach in changing sun protection behavior and reducing skin cancer risk among farmers

Table 2.1 continued

A Summary of the Reviewed Studies

Author, Date	Objective, Population	Gender, Ethnicity, Sample Size (*n*), Mean age (*M*)	Results	Conclusions
Pichon et al. (2005)	Compare sun-safety behavior across ethnoracial groups employed as letters carriers at United States PostalService (USPS)	68% males, 53.63% non-Latino Whites, *n* = 2543 , *M* = 43 years	Letter carriers indicated that they spent an average of 4 hours per day outside Ethnicity was significantly associated with the use of sunscreen and sunglasses Rates of sunscreen and sunglasses use in non-Latino whites were significantly higher than other four groups	All the ethnoracial groups reported low rate of sufficient protection against sun
Salas et al. (2005)	Assess knowledge, perceptions, and behaviors regarding solar protection among farmworkers of California	100% males, 100% Latino, *n* = 326, *M* = 32.79 years	98.7% always used some form of hat when working outside in sun for more than 15 minutes 5.3% indicated always wearing 2.5-inch wide brim hat which covered ears, nose, and possibly the face +80% of the sample always wore shirt with long-sleeves or a collar 19.3% knew the use of sunscreen and only nine participants reported any use of sunscreen during work +90% reported no use of any sun protective gear for eyes Participants who had higher levels of sun protective clothing use worked as farm workers significantly longer period of time than the participants who reported lower levels	Although the farmers used sun protective cloths adequately, their overall sun protective behavior was not consistent

Table 2.1 continued

A Summary of the Reviewed Studies

Author, Date	Objective, Population	Gender, Ethnicity, Sample Size (*n*), Mean age (*M*)	Results	Conclusions
			No significant association between skin type and the following variables: frequency of wide-brim hat use, frequency of long sleeved shirt use, and perceived risk of skin cancer	
Lewis et al. (2006)	Compare occupational and leisure-time sun protection rates and correlates of postal workers in United States Postal Service (U.S.P.S.)	69 % males, 51.3% White (non-Hispanic), n = 2,600, M = 43 years	Respondents in this study spent an average of 3.9 hours and 3.3 hours outside on working and non-working day respectively 25 % always used sunscreen while working whereas only 12 % always used sunscreen during leisure time 24% always used hat at work while only 4% used hat at days off Hat use increased with increased sun sensitivity and more time spent outside for both working and non-working days Level of sunscreen use at working and non-working days in females was higher than males Participants with a family history of skin cancer were more likely to use sunscreen than participants who did not have family history of skin cancer Participants who received encouragement from a family member were more likely to use sunscreen and wide brim hat on days off	Letter carriers experienced high levels of UVR exposure while work and days off, however, their use of sun protective measures were low

Table 2.1 continued

A Summary of the Reviewed Studies

Author, Date	Objective, Population	Gender, Ethnicity, Sample Size (*n*), Mean age (*M*)	Results	Conclusions
Hammond et al. (2008)	Determine factors predicting sun protection use in the three outdoor occupational groups: horticulture, roading, and building in Central Otago, New Zealand	82% males, *n* = 74, *M* = 35 years	Sun protection practices were predicted by perceived workplace, attitude towards suntans, and high perceived risk of skin cancer Knowledge was not found as a predicting factor of sun protection practices	Personal and workplaces of workers are the factors that increase the likelihood of using sun protection in outdoor worker
Gies et al. (2009)	Assess ultraviolet radiation (UVR) exposures and personal use of sun protection among lifeguards working at pool settings in four metropolitan regions of the United States	59.3% females, *n* = 168, *M* = 19.4 years	Participants spent an average of 4.29 hours a day in the sun Lifeguards in Phoenix had highest level of sunglasses (90.4%) and sunscreen (76.4%) use, Austin reported highest level of hat (37%) and shade (31.2%) use, and Portland showed highest use of shirt (31.3%) Even though lifeguards in Omaha indicated highest median UVR exposures of 6.2 standard erythemal doses (SEDs), their overall level of sun protection was lowest Across all locations, 74% of the lifeguards' PS badges indicated UVR exposure over recommended threshold limit values (TLV's) for occupational exposure and PS badges of 65% of participants received sufficient UVR to cause sunburn	Although lifeguards reported high level of UVR exposure, their use of appropriate sun protection was low and incidents of sunburn in each lifeguard were at least twice as in the previous year
McCool et al. (2009)	Investigated the associations of sunscreen use with sun safety attitudes and knowledge in outdoor workers of New Zealand	*n* = 1,283, *M* = 37 years	Older workers and workers with higher education were significantly more likely to use sunscreen than younger workers and workers with lower education respectively	Intervention programs providing knowledge about risks associated with sun exposure and importance of sun protection practices are likely to have a positive impact in terms of

Table 2.1 continued

A summary of the Reviewed Studies

Author, Date	Objective, Population	Gender, Ethnicity, Sample Size (*n*), Mean age (*M*)	Results	Conclusions
			Sunscreen use was strongly related with perceived workplace support and perceived knowledge	improving sun protection behavior
Madgwick et al. (2011)	Examine the association of socio-demographic and work characteristics with the use of sun protection measures in construction workers, Britain	100% male, n = 360, M = 41.1 years	Respondents spent an average of 6.6 hours/day outdoors Most frequently used sun protection measures were; plentiful water intake (89%), use of sunscreen (60%), wearing long sleeved loose fitted tops and trousers (51%) Age was positively correlated with wearing of long sleeved, loose fitting tops and trousers	Intervention programs concentrating on demographic and occupational characteristics are likely to provide promising results in engaging workers in the use sun protection measures

Sun Exposure and Sun Protection Behaviors

Studies showed that outdoor workers spent a significant amount of hours outside per day. A Canadian National survey on sun exposure and protective behaviors reported that 70% of participants who worked outdoors experience more than two hours of sun exposure during an average working day (Shoveller et al., 2000). Sun exposure of construction workers in Britain was an estimated 6.6 hours per day (Madgwick et al., 2011). In the US, construction workers, transportation workers, and letter carriers spent an average of 7.94, 6.95, and 5.11 hours working outdoors respectively (Stepanski & Mayer, 1998). Moreover, surveys of larger samples of postal workers in Southern California reported receiving an average of 4 hours of sun exposure on workday (Pichon et al., 2005). Similarly, Wisconsin farmers reported being outdoors 4.15 hours daily (Marlenga, 1995). Lifeguards in Austin, Phoenix, Omaha, and Portland also spent an average of 4.29 hours a day in the sun. Additionally, UVR sensitive polysulfone (PS) badge readings found that across all locations, 74% of the lifeguards' UVR exposure was over recommended threshold limit values (TLV's) for occupational exposure and 65% received sufficient UVR to cause sunburn (Gies et al., 2009).

Moreover, the evidence from studies showed that outdoor workers get fairly consistent UV doses during their lifetimes. The farmers noted an average between 14 to 43 years of farming experience (Marlenga, 1995; Parrott & Lemieux, 2003; Salas et al., 2005). Postal workers indicated an average of 12 years of prolonged occupational sun exposure history (Pichon et al., 2005).

Most of the studies have examined at least the use of two of following sun protection measures in combination: wearing a hat, sunscreen application, wearing sunglasses, wearing protective clothing, and stay in the shade or limit exposure to sun during the midday hour. Field

observations of study conducted on transportation workers, construction workers, and postal workers revealed that 50.4% of the workers adequately protected their skin from sun (Stepanski & Mayer, 1998). Marlenga (1995) assessed current skin cancer protection practices of Wisconsin farmers. Results indicated that only 7% frequently/always wore long sleeved shirts, 13 percent frequently/always wore wide brimmed hats, and 8% frequently/always used sunscreen. A study on Californian farmworkers reported almost all the farmworkers (98.7%) always used some form of hat when working outside in sun for more than 15 minutes and more than 80% of the sample always wore shirt with long-sleeves or a collar but almost none wore wide brimmed hat (6% frequently/always), sunscreen (2% frequently/always), and sunglasses (3% frequently/always) (Salas et al., 2005). Moreover, Parrott et al. (1996) found in their formative research that farmers, road workers, construction workers and other outdoor workers in Georgia did not use adequate sun protection (86% wore long pants, 5% wore wide-brimmed hats or caps with flaps, 5% wore long-sleeved shirts, and 26% had no eye covering).

The sun protection behavior patterns of outdoor workers observed in US are similar in other countries. Canadian study showed inadequate sun safety practice among outdoor workers (58% wore hat, 60% wore protective clothing, 38% avoided sun, and 18% - 23% used sunscreen) (Shoveller et al., 2000). In Britain, Madgwick et al. (2011)documented most commonly used primary prevention strategies was sunscreen (60%), long sleeved loose fitted tops and trousers (51%), sunglasses (44%), but wide brimmed hats (23%) and use of shade or limiting exposure to sun (19% - 23%) was not commonly practiced. However, 78% participants in this study had undergone sun safety training. Likewise, construction workers in a study carried out in Australia responded frequently/always use of a wide brimmed hats (54%), sleeved shirt (11%), sunscreen (34%), sunglasses (61%), and shade device (5%) (Cioffi et al., 2002).

Furthermore, studies have identified UVR exposure pattern of outdoor workers during workdays and days off. Woolley et al.'s (2002) study on outdoor working men in Australia with prior history of skin cancer noted that half of the participants spent up to 6 hours in the sun on average working day and 76% spent at least two hours in the sun on the average weekend day. Moreover, it was reported that outdoor workers are likely to spend significant time in sun on a weekend or their day off because of deliberate lifestyle choices such as preference for outdoor recreational activities. The second major finding of this study was that outdoor workers sun protection behavior was similar to indoor workers; despite the fact outdoor workers reported significantly high exposure to sun than indoor workers, on the job and during leisure time, and their higher number of skin lesions excised. Lewis et al. (2006) reported that mail carriers are exposed to high levels of sun exposure on both working and non-working days, with little time in sun lower on non-working days (3.9 hours per working day versus 3.3 hours non-working day). Additionally, participants on work showed low level of sun protection and non-working day sun protection was considerably lower (25% always used sunscreen during work whereas only 12% always used sunscreen during non-working day and 24% always used hat at work while only 4% used hat at non-working day).

Theory-Driven Studies

Marlenga (1995) conducted a study based on Health Belief Model (HBM) (Rosenstock, 1974). It proposed that the sun protection behavior would be predicted by the HBM variables: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action. Perceived barrier was found as single predictor that explained why farmers did not engage in sun protection practice. Moreover, the author reported that utility of HBM with Wisconsin dairy farmers is questionable. One major criticism of this study lies in the fact

that researcher did not take into consideration the revised version of HBM which includes the construct self-efficacy (Rosenstock, Stretcher, & Becker, 1988). In addition, we were not offered any explanation of excluding self-efficacy or selecting the former version of HBM over the revised version. Also, it seems that Marlenga failed to conduct much of the historical research of HBM. This leads one question that needs to be asked: what would have been results if the author had included the construct self-efficacy in the study. Furthermore, the conclusion of the author would have been more convincing if he/she has stated "utility of selected constructs of HBM" rather than "utility of HBM."

A later study by Parrott et al. (1996) was designed using SCT. The purpose of the study was to use constructs of SCT (i.e., outcome expectations, self-efficacy, observational learning, and facilitation) to identify personal determinants of farmer's skin cancer and prevention behavior, and environmental influences that might either facilitate or inhibit the impact of skin cancer prevention campaign for farmers. A serious weakness with this study, however, is that the instrument used to gather data was pilot survey which means that reliability and validity of all the measures were not tested.

Overall Conclusions of Literature Review

Outdoor workers constitute an important target group, who are susceptible to developing of skin cancer, given considerable amount of hours they spend outdoors at workdays and days off. This intense UVR exposure is experienced by outdoor workers for prolonged periods throughout their lives, since they tend to spend several years in outdoor occupations. Although receiving high UV exposure on regular basis, overall data reported that the significant majority of outdoor workers did not adequately protect themselves from sun exposure.

The findings of this review suggest that there are several factors which facilitate engagement of outdoor workers in sun protection behavior, including: being female, older age, ethnicity, sensitive skin type, personal history of skin cancer, time (hours/years) spent at work, and perceived workplace support. On the other hand, factors responsible for lower levels of sun protection behavior are being male, younger age, and having perceived barriers.

With regard to sun protection behavior, findings were sparse and inconsistent regarding the relationship of factors such as perceived susceptibility, education, and income, health insurance. Therefore, considerably more research work is required to determine potential importance of these factors and before any conclusion is drawn regarding the relationship of these factors to engaging in sun protection practices.

Furthermore, findings of studies that investigated the relation of family history of skin cancer with sun protection behavior are important to consider for further research. In all the studies, family history of skin cancer was assessed by asking participants to indicate whether they had a family history of skin cancer or not. Researchers failed to provide an adequate definition of family history of skin cancer (i.e. skin cancer in 1 or more first-degree relatives (mother, father, brother, sister, child) to the participants in the studies which might have led inaccurate results (ACS, 2012). Therefore, it would be intriguing if the influence of family history of skin cancer on sun protection behavior is examined in future studies by using a thorough definition. If such information is forthcoming, this would enhance our understanding of the significance and role of provision of adequate information of the variables.

Knowledge of skin cancer has been widely studied for its relationship to sun protection behavior and has also yielded a mixed pattern of results. One of the possible reasons for inconsistent findings is differences in measures, methods, and analysis. However, in general,

outdoor workers are knowledgeable about skin cancer, but many outdoor workers do not protect their skin adequately. Therefore, knowledge alone is not enough to lead to sun protection behavior change. There may be some other cognitive factors that are likely to influence processes and lead to change in the outcomes. Little is known about psychological factors that explain why outdoor workers, despite high level of knowledge about skin cancer, choose not practice sun protection.

It is also noteworthy that not much data in literature is available regarding sun protection self-efficacy among outdoor workers. Furthermore, of all the studies reviewed, no study has investigated relationships between sun protection self-efficacy and sun protection behaviors among outdoor workers. Self-efficacy refers to conviction about one's ability to successfully perform a specific behavior needed to produce the desired outcome (Bandura, 1977). It will be beneficial to investigate if the self-efficacy is a significant target for promoting or changing sun protection behavior in outdoor workers.

There are likely to be challenges in generalizing results of the studies to the population of outdoor workers of different occupations. Despite the wide range of outdoor jobs targeted in the research, farmers, construction workers, and postal workers have been the subject of multiple studies and often sun protection behaviors are different among groups due to specific job types, proportion of males or females in occupations, and ethnicity. In addition, few studies have investigated samples comprised of outdoor workers of a variety of occupations and most of them did not focus on understanding the differences in sun protection behaviors between the subgroups of the samples. Assessing sun protection behaviors of subgroups in an outdoor workers population will be useful in designing or tailoring effective and specific group-focused

sun protection intervention which address the specific sun protection needs of each specific group.

This literature review provided data on a variety of psychological factors that induce or reduce the likelihood of outdoor workers adopting sun protection behaviors. Nonetheless, limited attention has been paid in designing a theoretically grounded study to identify psychological factors or to generate predictions for research. Moreover, studies that used theoretical framework were limited by serious methodological issues. It is also uncertain in the literature whether the existing health behavior theories are applicable or valuable to best predict sun protection behavior in outdoor workers. There is a need to conduct a study based on solid theoretical foundations that attempts to provide a potential and systematic explanation of relationships of factors in this domain. A deeper understanding of factors influencing sun protection practices could serve as a base for future studies and preventive interventions.

CHAPTER 3

METHODOLOGY

Study Design and Procedure

This cross-sectional study was conducted between May and October, 2012. After University of Mississippi Institutional Review Board (IRB) approval, the landscape service companies in North Mississippi were identified through an internet search and personal contacts (Appendix G). An initial phone call was made to the landscaping service companies. A brief summary of the study was given to companies and the timing and location of the survey administration was scheduled for those companies (Appendix B). To eliminate any chances of miscommunication with companies a Native American English speaker (Allison Ford-Wade, Ph.D.) conducted the initial phone calls. Reminders were sent to companies through phone or email, to ensure promptness of arrival time at administration sites. A brief explanation of the study was given to potential participants at the time of survey administration (Appendix C). The lead investigator hand delivered the information letter (Appendix D) and questionnaire (Appendix E) in a confidential envelope to participants during breaks. Brown envelopes were used for companies with sun protection policies and white envelops were used for companies with no sun protection policies. The survey took approximately ten minutes to complete. The second method used to obtain samples for this study included posting an information letter (Appendix D) and questionnaires (Appendix E) with a self-addressed prepaid postage envelope to the companies which decided to participate with this approach (Appendix B). Brown

envelopes and white envelopes were sent through United States Postal Services priority mail to companies with sun protection policies and companies without sun protection policies respectively. After ten days, the employers were contacted by telephone or emails to ensure that they received the packages and did not have any questions regarding study or survey administration. Participants voluntarily completed the questionnaire and sent them back to the lead investigator in the enclosed self-addressed prepaid postage envelope. Nearly three weeks after posting the envelops, a reminder phone call or email was sent to those who had not yet returned the completed questionnaires. Through the two different aforementioned methods to access and include participants, it was possible to maximize the response rate in the study that may have not been possible by using just one method.

Participants

According to the CDC, Standard Occupational Classification for landscape service workers includes the following workers: landscaping and groundskeeping workers, tree trimmers and pruners, grounds maintenance workers, first-line supervisors/managers of landscaping, lawn service, and grounds keeping workers. Moreover, it was documented that the following jobs are completed by landscape services workers: landscape and irrigation installation, lawn care, tree removal, general landscape maintenance and snow removal (CDC, 2012).

The survey was completed from May to October, 2012 by a convenience sample of participants who satisfy the above mentioned classification.

Measurement Instrument

The modified version of *Skin Cancer Survey* was used (Marlenga, 1995). See appendix F for permission to use the questionnaire. The questionnaire items were derived from previous studies (Hammond et al, 2008; Rosenman et al., 1995; Sales et al, 2005; Shoveller et al, 2000;

Von Ah, Ebert, Park, Ngamvitroj, & Kang, 2004; Von Ah, Ebert, Park, Ngamvitroj, & Kang, 2005). The self-reported questionnaire included 41-items on socio-demographic information, knowledge, HBM components, and sun protection behaviors. Moreover, the questionnaires used to design the instrument for this study were written in English. After approval of the validity, completed application was submitted for the IRB approval.

Measures

Participants indicated their age, sex (1 = Male, 2 = Female), ethnicity (1 = White, 2 = Black or African American, 3 = Hispanic or Latino, 4 = Native Hawaiian or Other Pacific Islander, 5 = Asian, 6 = American Indian or Alaska Native, and 7 = Other), education level (1 = 8^{th} grade or less, 2 = 9 – 12^{th} grade, 3 = Some college, and 4 = Bachelor's degree or higher), natural hair color (1 = Blonde, 2 = Red, 3 = Light brown, 4 = Medium brown, and 5 = Dark brown, and 6 = Black), eye color (1 = Brown, 2 = Green/Hazel, 3 = Blue, 4 = Grey, and 5 = Black), net income of household (1 = Less than $25,000, 2 = $25,000 - $50,000, and 3 = More than $50,000), workplace support (1 = Yes, 0 = No, and 2 = I don't know), hours and years spent at work. Moreover, participants were asked about sunburn history (1 = Yes, 0 = No, and 2 = I don't know), personal (1 = Yes, 0 = No, and 2 = I don't know) and family history of skin cancer (1 = Yes, 0 = No, and 2 = I don't know). Furthermore, skin sensitivity was determined by use of Fitzpatrick's scale of skin type (1 = Always burn, unable to tan, 2 = Usually burn, tans with difficulty, 3 = Sometimes mild burn, gradually tans to a light brown, 4 = Rarely burn, tan with ease to a moderate brown, 5 = Very rarely burns, tans very easily, and 6 = Never burns, tans very easily, deeply pigmented.

Sun Protection Behaviors

To determine current use of sun protection measures, participants were asked to indicate on a 5-point Likert-type scale (1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Frequently, and 5 = Always) how frequently they perform the following sun protection behavior when out in the sun for 15 minutes or more: wear wide-brimmed hat (like a straw hat), wear long-sleeved shirt, wear long pants, wear work gloves, wear sunscreen with a sun protection factor (SPF), and wear sunglasses. A total sun protection behavior score was obtained by summing all six items.

Moreover, after completing sun protection behavior questions, participants were asked to select any of the following reasons if they do not "Always" perform the sun protection behavior: "Sun protection takes too much time to put on," "Sun protection is inconvenient," "Sun protection is expensive," "Sun protection is too hot to wear" and "I forget to wear sun protection." All responses to reasons were measured using a Nominal scale (if checked: Yes = 1; if not checked: No = 0). Additionally, respondents were given an option if they wish to specify any other reasons for not "Always" practicing sun protection behavior.

Knowledge

The knowledge of participants regarding skin cancer was assessed via use of 10 items, and was evaluated based on a correct response. The Items were following: "Skin cancer is the most common form of cancer," "Melanoma is the least serious form of skin cancer," "Sun exposure causes most skin cancers," "The sun's rays are the strongest at mid-day," "Most skin cancers can be prevented," "When skin cancer is detected early, the cure rate is very high," "Sunburn causes lasting damage to the skin," "Experts suggest using sunscreen with a sun protection factor (SPF) of 15 or higher," "Skin cancer can cause death," and "A person with fair skin color needs the most protection from the sun." All the items required Nominal level responses (1 = True, 0 = False, and 2 = I don't know). For items 27-A and 27-C to 27-J,

responses “No” and “I don’t know” were considered incorrect. For item 27-B responses “Yes” and “I don’t know” were considered incorrect. A total knowledge score was obtained by adding all 10 items.

Health Belief Model (HBM) Constructs

The participants’ perceived susceptibility to skin cancer was measured by two items: “I am likely to get skin cancer sometime during my lifetime,” and “As a landscaper, I am more likely than the average person to get skin cancer.” These items were measured on five-point Likert-type scale anchored with 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly agree. A total perceived susceptibility score was obtained by adding all two items.

Two items assessed participants’ perceived severity of skin cancer: **“**I think skin cancer is a serious disease” and “If I get skin cancer, I will not be able to continue work as a landscaper.” The response metric was a five-point Likert-type scale ranging from Strongly agree (1) to Strongly disagree (5). A total perceived severity score was achieved by summing all two items.

Total scores from perceived susceptibility and perceived severity was multiplied to obtain the perceived threat score.

Perceived benefits of sun protection was measured by using seven Likert-type items with five-point responses (1 = Strongly disagree, 5 = Strongly agree): Examples of the items: “If I protect myself from the sun each day, I am less likely to get skin cancer” and “If I wear a wide-brimmed hat (like a straw hat), I am less likely to get skin cancer.”

One item was used to measure perceived barrier of sun protection. Participants were asked to report “Most people look better with a tan” on a 5-point Likert-type scale (1 = Strongly disagree, 5 = Strongly agree).

A variable perceived benefit outweighing perceived barrier was created by: (adding means of all items measuring perceived benefits ÷ 7) – (mean score of item measuring perceived barrier).

Cues to action was measured by asking participants from which of the following sources they have received sun protection information: radio, television, newspaper, internet, health information pamphlet, magazine articles or advertisements, American Cancer Society, your doctor or other health care worker, and friends or family. Nominal responses were required on a three-point scale, where 1 = Yes, 0 = No, and 2 = I don't know. For all nine items response "I don't know" was considered "No."

The participants' self-efficacy to engage in sun protection behaviors was assessed with the eight items. Examples of the items include: "Wear wide-brimmed hat (like a straw hat), when out in the sun for 15 minutes or more" and "Wear sunscreen with a sun protection factor (SPF), when out in the sun for 15 minutes or more." Responses to items on the self-efficacy were given on a scale ranged from Cannot Do at All (0) to Certain Can Do (10). A total self-efficacy score was achieved by summing all eight items.

Data Storage

The obtained completed questionnaires and electronic data files were stored in a locked file cabinet in the lead researcher's office at The University of Mississippi.

Data Entry

After creating a datasheet in Microsoft Excel spreadsheet, each questionnaire was assigned an identification number and then data were entered manually. To prevent data entry errors, a Health Promotion master's student at The University of Mississippi assisted the lead investigator of this study in performing data entry. During data entry, one person orally stated

the numerical codes while another entered them and monitored visually. Missing data were coded as period (.). The data entery was completed in five days. Each day approximately 25 questionnaires data were entered which took two to three hours. Once all data were entered, one of the co-investigators randomly selected 15 different segments to double-check the data, as well as, looked for any incorrectly entered data. Next, the data were transferred from Excel files to the Statistical Package for the Social Sciences (SPSS) version 21.

Instrument Validity and Reliability

The modified questionnaire was reviewed by a dermatologist (Philip R. Loria Jr, M.D.) for face and content validity. The Cronbach's alpha score for each scale are following: health beliefs $\alpha = .81$, cues to action $\alpha = .82$, self-efficacy $\alpha = .55$, and knowledge $\alpha = .83$.

Statistical Analysis

All data were analyzed using SPSS version 21 (Chicago, IL). Descriptive statistics (frequencies, percentages, means, and standard deviations) were computed to characterize the demographic characteristics and answer the research questions 1 – 8. Additionally, a Pearson correlation was performed to answer the research questions 10 – 11, as well as, to test the set of hypotheses. Scatter plots were created to screen outlying data and other unusual patterns. Alpha level of 0.05 was set up a priori.

CHAPTER 4

RESULTS

A total of 23 landscaping companies consisting of 140 employees were identified in North Mississippi. Only one company chose to have an investigator come to administer the survey, which yielded six completed questionnaires. The remaining 22 companies were accessed through mail-out surveys. Of 134 mailed questionnaires, 111 were returned to the primary researcher, generating an 83% response rate. Questionnaires received after the month of October were eliminated (n = 7). Also, one questionnaire was removed, since it was partially (< 50% items answered) completed including no responses to sun protection behavior questions; therefore, data from 109 landscapers were used for the analyses.

Description of Study Participants

As shown in Table 4.1, the sample (n = 109) ranges in age from 18 to 65 years (M = 37.06; SD = 12.18) and is composed of 94.5% of males and 5.5% of females. The race/ethnicity distribution of the sample was 77.1% White, 14.7% African American, 7.3% Hispanic, and 0.9% American Indian or Alaska Native. Over half (53.2%) of these respondents were educated beyond the high school level, and 47.7% reported an annual household income of less than $25,000.

The following breakdown of skin type emerged: About 50% had a high propensity to burn, low propensity to tan ("always burn, unable to tan," "usually burn, tans with difficulty," "sometimes mild burn, gradually tans to a light brown") and nearly 50% low propensity to burn,

high propensity to tan ("rarely burn, tan with ease to a moderate brown," "very rarely burns, tans very easily," "never burns, tans very easily, deeply pigmented"). Responding to the questions on personal and family history of skin cancer, 5.5% reported having had skin cancer and 25.7% indicated that an immediate family member had been diagnosed with skin cancer. Of the sample, 16.5% and 5.5% described their hair color as blonde and red respectively. Additionally, 28.4% of responders had green/hazel eyes and 24.8% had blue eyes. There were 53 participants who indicated being sunburned last year and 52 reported experiencing sunburns for this summer.

Table 4.1

Description of the Study Participants

Variable	*M*	*SD*	n (%)
Age (n = 107)	37.06	12.18	
Gender (n = 109)			
Male			103 (94.5%)
Female			6 (5.5%)
Ethnicity (n = 109)			
White			84 (77.1%)
African American			16 (14.7%)
Hispanic			8 (7.3%)
American Indian or Alaska Native			1 (0.9%)
Education (n = 108)			
8th grade or less			7 (6.4%)
9 – 12th grade			43(39.4%)
Some college			35 (32.1%)
Bachelor's degree or higher			23 (21.1%)

Table 4.1 continued

Description of the Study Participants

Variable	n (%)
Annual Household Income (n = 109)	
Less than $25,000	52 (47.7%)
$25,000 - $50,000	34 (31.2%)
More than $50,000	23 (21.1%)
Skin Type (n = 106)	
Always burn, unable to tan	8 (7.3%)
Usually burn, tans with difficulty	17 (15.6%)
Sometimes mild burn, gradually tans to a light brown	29 (26.6%)
Rarely burn, tan with ease to a moderate brown	25 (22.9%)
Very rarely burns, tans very easily	10 (9.2%)
Never burns, tans very easily, deeply pigmented	17 (15.6%)
Hair Color (n = 109)	
Blonde	18 (16.5%)
Red	6 (5.5%)
Light Brown	21 (19.3%)
Medium Brown	28 (25.7%)
Dark Brown	33 (30.3%)
Black	3 (2.8%)
Eye Color (n = 108)	
Brown	42 (38.5%)
Green/Hazel	31 (28.4%)
Blue	27 (24.8%)
Grey	2 (1.8%)

Table 4.1 continued

Description of the Study Participants

Variable	n (%)
Eye Color (n = 108) (continued)	
Black	6 (5.5%)
Personal History of Skin Cancer (n = 108)	6 (5.5%)
Family History of Skin Cancer (n = 109)	28 (25.7 %)
Sunburns (this summer) (n = 102)	52 (50.9%)
Sunburns (last summer) (n = 97)	53 (54.6%)

Responses to Research Questions # 1 – 8

Research Question # 1: What are Landscapers health beliefs (i.e. perceived susceptibility, perceived severity, perceived benefits, and perceived barriers) concerning skin cancer?

Perceived Susceptibility

Overall, 40.4% of the participants neither agreed nor disagreed that they are likely to contract skin cancer sometime during their lifetime. However, 69.7% agreed/strongly agreed to the statement "as a landscaper, I am more likely than the average person to get skin cancer".

Perceived Severity

A substantial number (87.2%) of study's participants perceived skin cancer to be a serious disease. Whereas, very few (13.8%) believed that if they get skin cancer, they will not be able to continue work as a landscaper.

Perceived Benefits

The respondents agreed/strongly agreed with the following statements: “if I protect myself from the sun each day, I am less likely to get skin cancer” (76.1%); “if I avoid outdoor work between 10 AM and 4 PM, I am less likely to get skin cancer” (44%); “if I wear a wide-brimmed hat (like a straw hat), I am less likely to get skin cancer” (60.5%); “if I wear a long sleeved shirt and long pants, I am less likely to get skin cancer” (69.7%); “if I wear a work gloves, I am less likely to get skin cancer” (40.4%); “if I wear sunscreen with a sun protection factor (SPF), I am less likely to get skin cancer” (69.7%). On the other hand, a minority (24.8%) believed that “if I wear sunglasses, I am less likely to get skin cancer”.

Perceived Barriers

Over 50% of the study sample agreed/strongly agreed that “most people look better with a tan.” Table 4.2 shows profile of skin cancer health beliefs.

Table 4.2

Frequencies and percentages for health beliefs

SD =Strongly Disagree; D = Disagree; N = Neutral; A = Agree; SA = Strongly Agree

Statements	SD n (%)	D n (%)	N n (%)	A n (%)	SA n (%)
I am likely to get skin cancer sometime during my lifetime (n = 109)	8 (7.3%)	8 (7.3%)	4 (40.4%)	36 (33%)	13 (11.9%)
As a landscaper, I am more likely than the average person to get skin cancer (n = 109)	4 (3.7%)	13 (11.9%)	16 (14.7%)	51 (46.8%)	25 (22.9%)
I think skin cancer is a serious disease (n = 109)	3 (2.8%)	7 (6.4%)	4 (3.7%)	27 (24.8%)	68 (62.4%)
If I get skin cancer, I will not be able to continue work as a landscaper (n = 109)	28 (25.7%)	35 (32.1%)	31 (28.4%)	9 (8.3%)	6 (5.5%)
If I protect myself from the sun each day, I am less likely to get skin cancer (n = 109)	4 (3.7%)	4 (3.7%)	18 (16.5%)	40 (36.7%)	43 (39.4%)
If I avoid outdoor work between 10 AM and 4 PM, I am less likely to get skin cancer (n = 109)	10 (9.2%)	16 (14.7%)	35 (32.1%)	25 (22.9%)	23 (21.1%)

Table 4.2 continued

Frequencies and percentages for health beliefs

SD =Strongly Disagree; D = Disagree; N = Neutral; A = Agree; SA = Strongly Agree

Statements	SD n (%)	D n (%)	N n (%)	A n (%)	SA n (%)
If I wear a wide-brimmed hat (like a straw hat), I am less likely to get skin cancer (n = 109)	7 (6.4%)	16 (14.7%)	20 (18.3%)	41 (37.6%)	25 (22.9%)
If I wear a long sleeved shirt and long pants, I am less likely to get skin cancer (n = 109)	8 (7.3%)	13 (11.9%)	12 (11%)	48 (44%)	28 (25.7%)
If I wear a work gloves, I am less likely to get skin cancer (n = 109)	7 (6.4%)	25 (22.9%)	33 (30.3%)	26 (23.9%)	18 (16.5%)
If I wear sunglasses, I am less likely to get skin cancer (n = 109)	12 (11%)	30 (27.5%)	40 (36.7%)	17 (15.6%)	10 (9.2%)
If I wear sunscreen with a sun protection factor (SPF), I am less likely to get skin cancer (n = 109)	5 (4.6%)	9 (8.3%)	19 (17.4%)	40 (36.7%)	36 (33%)
Most people look better with a tan (n = 109)	8 (7.3%)	11 (10.1%)	33 (30.3%)	35 (32.1%)	22 (20.2%)

Research Question # 2: How often do Landscapers engage in sun protection practices when out in the sun for 15 minutes or more?

Of the sample, just over half never/rarely wore a wide brimmed hat, gloves, and sunscreen. Nearly two-thirds of the landscapers indicated never/rarely wearing a long sleeved shirt. In contrast, almost three-quarters of respondents frequently/always used sunglasses. Additionally, more than half responded that they frequently or always wore long pants. The Table 4.3 summarizes the responses to the question on sun protection behavior.

Table 4.3

Frequencies and percentages for sun protection behaviors

Practice	Never n (%)	Rarely n (%)	Sometimes n (%)	Frequently n (%)	Always n (%)
Wear wide brimmed hat (n = 109)	26 (23.9%)	31 (28.4%)	36 (33%)	11 (10.1%)	5 (4.6%)
Wear long sleeved shirt (n = 109)	40 (36.7%)	26 (23.9%)	28 (25.7%)	6 (5.5%)	9 (8.3%)
Wear long pants (n = 109)	9 (8.3%)	8 (7.3%)	29 (26.6%)	19 (17.4%)	44 (40.5%)
Wear work gloves (n = 108)	26 (23.9%)	29 (26.6%)	36 (33%)	13 (11.9%)	4 (3.7%)
Wear sunglasses (n = 109)	5 (4.6%)	6 (5.5%)	13 (11.9%)	27 (24.8%)	58 (53.2%)
Wear sunscreen (n = 109)	39 (35.8%)	17 (15.6%)	22 (20.2%)	25 (22.9%)	6 (5.5%)

Research Question # 3: What reasons will be cited by Landscapers as barriers to engage in sun protection practices?

It can be seen from the data in Table 4.4 that the primary reason reported for not "Always" using a wide-brimmed hat, gloves, sunglasses, and sunscreen was "I forget to wear it". Moreover, when the participants were asked reasons about not "Always" wearing a long sleeved shirt and long pants, the majority noted that "it is too hot to wear".

List of barriers mentioned by Landscapers for not "Always" engaging themselves in sun protection behavior is illustrated in Table 4.5.

Table 4.4

Frequencies and percentages for barriers for not "Always" practicing sun protection behavior

Barrier	Wide brimmed hat n (%)	Long sleeved shirt n (%)	Long pants n (%)	Work gloves n (%)	Sunglasses n (%)	Sunscreen n (%)
Takes too much time	2 (1.8%)	1 (0.9%)	0 (0%)	4 (3.7%)	0 (0%)	23 (21.1%)
Inconvinient	46 (42.2%)	12 (11%)	6 (5.5%)	50 (45.9%)	12 (11%)	4 (3.7%)
Costs too much	1 (0.9%)	1 (0.9%)	0 (0%)	1 (0.9%)	0 (0%)	7 (6.4%)
Too hot to wear	28 (25.7%)	86 (78.9%)	60 (55%)	40 (36.7%)	3 (2.8%)	9 (8.3%)
Forget to wear	50 (45.9%)	11 (10.1%)	11 (10.1%)	52 (47.7%)	35 (32.1%)	70 (64.2%)

Table 4.5

Barriers listed by participants for not “Always” practicing sun protection behavior

Practice	Comments (n)
Wear wide brimmed hat	I wear a visior or a baseball cap (4); Don't like hats (4); Don’t have one for work (2); It's my choice to wear one; I don’t have one; Left it somewhere else; Hats can be uncomfortable; Not a part of our uniform; Not my style; Never thought about it; Just don’t; I like to wear it but most make me look goofy.
Wear long sleeved shirt	I wear long sleeves in the cold month (2); I don't like wearing them to work; It's my choice to; Uncomfortable (2); Shirts they provide are short sleeves; Not used to it, rolled the sleeves up; Don’t like sleeves; Like short sleeve shirts better; Just don’t.
Wear long pants	Fashionista; Uncomfortable; I like to wear shorts very so often; I hate pants; play time use sunscreen; I like to wear shorts.
Wear work gloves	Left it somewhere else; Don’t always need gloves; Depends upon what job we are doing; Cumbersome; Only when its cold, Only when needed; Do not need them; Just don’t like it, girls like rough hands.
Wear sunglasses	I can't see good with dark glasses; I can't see very well; Need to wear a wrap over and are not easy to wear; I wear priscription sunglasses; Wear regular glasses; I just wear sunglasses if I am weedeating; Don’t like the tan lines.
Wear sunscreen	Greasy & Smell (4); Just Don't (4); Don't sunburn; Sweats off of me; Don't stop reapply; Not used to do it; Uncomfortable; When I do just upon nose cheek area that burns the most on me; Don’t like sunscreen; It makes me sweat; Don’t like aearing it; I never took the time too; Never used this stuff; Messy and attracts dirt, if I wear it only on my face, ears and nose.

Research Question # 4: What sources of information will be identified by Landscapers as cues to action to protect from too much sun?

From the Table 4.6 we can see that friends or family (78%) was the most frequently listed source for sun protection information, followed by television (72.5%), their doctor or other health care worker (61.5%), magazine articles or advertisements (60.6%), and health information pamphlet (52.3%). Other sources of skin cancer information were: internet (40.4%), American Cancer Society (40.4%), radio (35.8%), and newspaper (30.3%).

Table 4.6

Frequencies and percentages for cues to action (descending order)

Sources	n (%)
Friends or family (n = 108)	85 (78%)
Television (n = 109)	79 (72.5%)
Your doctor or other health care worker (n = 107)	67 (61.5%)
Magazine articles or advertisements (n = 108)	66 (60.6%)
Health information pamphlet (n = 107)	57 (52.3%)
American Cancer Society (n = 106)	44 (40.4%)
Internet (n = 106)	44 (40.4%)
Radio (n = 107)	42 (35.8%)
Newspaper (n = 106)	33 (30.3%)

Research Question # 5: What is Landscaper's level of skin cancer knowledge?

Knowledge that "sun exposure causes most skin cancers" was indicated by a majority of participants (79.8%). Incorrectly, most of the participants (56%) reported "melanoma is the least serious form of skin cancer." Only 50.5% of the landscapers correctly demonstrated that "skin cancer is the most common form of cancer." Approximately two third of respondents correctly answered the questions: "sunburn causes lasting damage to the skin," "experts suggest using

sunscreen with a sun protection factor (SPF) of 15 or higher," and "a person with fair skin color needs the most protection from the sun." In addition, the correct response to "sun's rays are the strongest at mid-day" was given by 70.6% of the Landscapers. A total of 73.4% participants correctly identified that "skin cancer can cause death." In regard to respondent's knowledge of skin cancer prevention, 73.4% knew that "most skin cancers can be prevented" and 71.6% mentioned that "when skin cancer is detected early, the cure rate is very high." The table 4.7 presents the responses for skin cancer knowledge.

Table 4.7

Frequencies and percentages for correct responses for knowledge of skin cancer (descending order)

Statements	Correct responses n (%)
Sun exposure causes most skin cancers (n = 109)	87 (79.8%)
Most skin cancers can be prevented (n = 109)	80 (73.4%)
Skin cancer can cause death (n = 109)	80 (73.4%)
When skin cancer is detected early, the cure rate is very high (n = 109)	78 (71.6%)
The sun's rays are the strongest at mid-day (n = 109)	77 (70.6%)
A person with fair skin color needs the most protection from the sun (n = 108)	74 (67.9%)
Sunburn causes lasting damage to the skin (n = 109)	74 (67.9%)
Experts suggest using sunscreen with a sun protection factor (SPF) of 15 or higher (n = 109)	73 (67%)
Skin cancer is the most common form of cancer (n = 109)	55 (50.5%)
Melanoma is the least serious form of skin cancer (n = 108)	47 (43.1%)

Research Question # 6: What is Landscaper's level of self-efficacy to perform sun protection?

Of all participants, 42.2% chose "Cannot do at all (0)" in regards to the statement "limit sun exposure between 10 AM and 4 PM." About a one-quarter of the participants reported "Moderately certain can do (5)" regarding their confidence to wear wide-brimmed hat (like a straw hat) and work gloves when out in the sun for 15 minutes or more. Around one-fifth of Landscapers indicated confidence (10) to wear a long sleeved shirt and sunscreen with a sun protection factor (SPF) when out in the sun for 15 minutes or more. The majority (42.2%) of participants were confident (10) in their ability to wear long pant when out in the sun for 15 minutes or more. Over half (54.1%) were confident (10) about the following statement "wear sunglasses when out in the sun for 15 minutes or more." Table 4.8 illustrates frequencies and percentages for self-efficacy.

Table 4.8

Frequencies and percentages for self-efficacy

Statements	Cannot do at all 0 n (%)	1 n (%)	2 n (%)	3 n (%)	4 n (%)	Moderately centain can do it 5 n (%)	6 n (%)	7 n (%)	8 n (%)	9 n (%)	Certain can do 10 n (%)
Limit sun exposure between 10 AM and 4 PM (n = 109)	46 (42.2%)	18(16.5%)	12 (11%)	7 (6.4%)	3 (2.8%)	12 (11%)	2 (1.8%)	1 (0.9%)	2 (1.8%)	2 (1.8%)	4 (3.7%)
Wear a wide-brimmed hat (like a straw hat) when outin the sun for (n = 109)	5 (4.6%)	6 (5.5%)	4(3.7%)	10 (9.2%)	8 (7.3%)	28 (25.7%)	4 (3.7%)	7 (6.4%)	4 (3.7%)	6 (5.5%)	27 (24.8%)
Wear a long sleeved shirt when out in the sun for 15 minutes or more (n = 109)	14 (12.8%)	8 (7.3%)	13 (11.9%)	10 (9.2%)	8 (7.3%)	23 (21.1%)	4 (3.7%)	2 (1.8%)	4 (3.7%)	2 (1.8%)	21 (19.3%)
Wear long pants when out in the sun for 15 minutes or more (n = 109)	7 (6.4%)	5 (4.6%)	2 (1.8%)	7 (6.4%)	5 (4.6%)	10 (9.2%)	5 (4.6%)	7 (6.4%)	9 (8.3%)	6 (5.5%)	46 (42.2%)

Table 4.8 continued

Frequencies and percentages for self-efficacy

Statements	Cannot do at all 0 n (%)	1 n (%)	2 n (%)	3 n (%)	4 n (%)	Moderately centain can do it 5 n (%)	6 n (%)	7 n (%)	8 n (%)	9 n (%)	Certain can do 10 n (%)
Wear a work gloves when out in the sun for 15 minutes or more (n = 109)	15 (13.8%)	6 (5.5%)	4 (3.7%)	9 (8.3%)	6 (5.5%)	24 (22%)	11 (10.1%)	11 (10.1%)	8 (7.3%)	3 (2.8%)	12 (11%)
Wear a sunglasses when out in the sun for 15 minutes or more (n = 109)	3 (2.8%)	1(0.9%)	3 (2.8%)	1(0.9%)	2 (1.8%)	7 (6.4%)	7 (6.4%)	4 (3.7%)	10 (9.2%)	12 (11%)	59 (54.1%)
Wear a sunscreen with a sun protection (SPF) when out in the sun for 15 minutes or more (n = 109)	8 (7.3%)	5(4.6%)	6 (5.5%)	8 (7.3%)	6 (5.5%)	14 (12.8%)	7 (6.4%)	14 (12.8%)	10 (9.2%)	6 (5.5%)	25 (22.9%)

Research Question # 7: Do Landscaping companies in North Mississippi have a written policy to encourage their employees to protect themselves from the sun when they work outdoors? If yes, then do the company's workers know whether their respective companies have a workplace sun protection policy or not?

When initial phone calls were conducted, only three companies with a total of 41 landscapers responded having written sun protection policies. Interestingly, of 41 landscapers, six answered "No" and eight answered "I don't know" to the question regarding their companies having sun protection policy. Likewise, of the remaining 68 landscapers worked at companies which responded no sun protection policy, 11 checked "Yes" and 18 checked "I don't know" when asked about if their companies have sun protection policy. Table 4.9 (1 – 2) provides results of responses given by employers and employees about having workplace sun protection policy.

Table 4.9 – 1

Workplace Sun Protection Policy

Responses of Employers (n = 23)	n (%)
Yes	3 (13.1%)
No	20 (86.9%)

Table 4.9 – 2

Workplace Sun Protection Policy

Responses of Employees (n = 109)	n (%)
Yes	38 (34.9%)
No	45 (41.3%)
I don't Know	26 (23.9%)

Research Question # 8: What is Landscaper's long-term and daily UVR exposure?

When assessing time (years/hours) spent outdoors, it was found that average number of years spent as an outdoor worker was 11.04 (*SD* = 9) with a range of 0.33 to 40 years. Moreover, the range for daily hours spent outdoors between 10 AM and 4 PM was 2 to 6 hours (*M* = 5.36, *SD* = 1.02). See Table 4.10.

Table 4.10

UVR Exposures of Landscapers

Variable	*M* (*SD*)
Average years worked outdoors (n = 108)	11.04 (9.00)
Average hours worked outdoors (n = 108)	5.36 (1.02)

Responses to Research Questions # 9 – 11 and Hypothesis Testing # Ho1, Ho2, and Ho3

Research Question # 9: Is there a significant relationship between perceived threat (perceived susceptibility × perceived severity) and sun protection behaviors?

It was hypothesized (Ho1) that there is no significant relationship between perceived threat and sun protection behavior. Result of Pearson product-moment correlation coefficient revealed that there is no significant correlation between perceived threat and sun protection behavior at the 0.05 level of significance (r = .001, p = .993). The correlation remained insignificant after excluding the outliers (r = .032, p = .750). Therefore, based on the results of the analyzed data, we fail to reject Ho1. A scatter plot shows the data: Figure 4.3 and 4.4 (see appendix A).

Research Question # 10: Is there a significant relationship between perceived benefits minus perceived barriers and sun protection behaviors?

The null hypothesis (Ho2) was that there is no significant relationship between perceived benefits minus perceived barriers and sun protection behaviors. Pearson's correlation indicated significant correlation, at the 0.01 level of significance, between perceived benefits minus perceived barrier and sun protection behavior (r = 0.285, p = .003). The correlation remained significant after excluding the outliers (r = .293, p =.003). Therefore, based on the results of the analyzed data, Ho2 is rejected. A scatterplot shows the data: Figure 4.5 and 4.6 (see appendix A).

Research Question # 11: Is there a significant relationship between self-efficacy and sun protection behaviors?

It was also hypothesized (Ho3) that there is no significant relationship between self-efficacy and sun protection behaviors. Contrary to the hypothesis, correlational analyses showed moderate positive and significant correlation between self-efficacy and sun protection behaviors at the 0.01 level of significance (r = .538, p = .001). The correlation remained significant after excluding the outliers (r = .486, p =.001). Therefore, based on the results of the analyzed data, Ho2 is rejected. A scatter plot shows the data: Figure 4.7 and 4.8 (see appendix A).

CHAPTER 5

DISCUSSION

The purpose of this study was to determine skin cancer knowledge, health beliefs, self-efficacy, and sun protective behaviors in a sample of North Mississippi landscapers, an outdoor working group for which no previous data were available on preventive behaviors and health beliefs regarding skin cancer. Another purpose was to assess the relationships between selected HBM variables (i.e., perceived threat, perceived benefits minus perceived barriers, self-efficacy) and sun protection behaviors.

This study used a cross-sectional study design. Questionnaires were sent through USPS post mails to 22 landscaping companies, consisting of 134 employees. One company with six landscapers asked the researcher to administer the survey on-site. Of 140 North Mississippi landscapers, 117 completed and returned the questionnaires. The self-reported questionnaire included 41-items pertaining to socio-demographic characteristics, knowledge, HBM variables, and skin cancer preventive behaviors. Descriptive statistics (frequencies and percentages) and Pearson correlations were performed to analyze the survey data.

The results reported in this study are significant to public health professionals, since they can be utilized as baseline measures for designing behavioral interventions to prevent skin cancer among landscapers and perhaps other outdoor workers in North Mississippi.

In this study, landscapers reported substantial (M = 5.36 hours) sun exposure each day during the highest sun intensity hours (between 10:00 AM and 4:00 PM), which is higher than the amount of daily sun exposure reported by outdoor workers in the prior studies (Gies et al., 2009; Lewis et al., 2006; Pichon et al., 2005; Scerri et al., 2002; Shoveller et al., 2000). It is noteworthy that none of the aforementioned previous studies have noted outdoor workers' level of sun exposure during the peak sun hours. Furthermore, consistent with the Pichon et al.'s (2005) study on California farm workers, landscapers reported an average of 11.04 years of working outdoors, indicating long-term occupational exposure to sunlight. The present study's results of regular high levels and chronic solar exposures are alarming when considering that 77.1% of the landscapers were White, approximately 50% had a skin type with a high propensity to burn rather than tan, 53.2% having light colored eyes, and 22% revealed having light colored hair.

An interesting finding to emerge from the data comparisons was that family history of skin cancer in this study was higher than the rates revealed by Wisconsin dairy farmers (25.7 % vs. 15%), Southern California postal workers (25.7 % vs. 17.7%), and outdoor workers in San Diego County, California (25.7 % vs. 17.5%) (Lewis et al., 2006; Marlenga, 1995; Stepanski & Mayer, 1998). One possible reason for different rates is differences in the questions used in the studies to determine family history of the skin cancer. Compared with the abovementioned studies, this study provided a more thorough definition of a family history of skin cancer (i.e. skin cancer in first degree relative: mother, father, brother, sister, child); thereby, this finding supports the notion that it is crucial to take adequate definition of the variable into consideration while designing a question (Jewell, 2011).

The skin cancer history rate (5.5%) reported by landscapers of this study is reasonably similar to the rate noted in the previous study (7%) (Marlenga, 1995). However, this difference between the rates may be explained by the fact that mean age in the Marlenga's (1995) study was 50.88 years, with an average of 42.95 years of occupational sun exposure, while in the present study, the mean age was 37.06 years, with an average of 11.04 years of occupational sun exposure.

With regards to sunburns, results revealed that more than half (58%) of the landscapers experienced at least one or more episodes of sunburns within the year preceding the survey, this shows that sun exposure level was high enough to induce sunburn. This study did not identify the sunburned body sites. Nevertheless, another plausible explanation for high prevalence of sunburn is that the landscapers did not protect themselves as much as they could to reduce sun exposure.

Sun Protection Behaviors

Landscapers indicated more routinely (i.e., frequently/always) use of sunglasses (78%), in comparison with wearing sunscreen and sun protective clothing. A similar pattern was reported by Sydney construction site workers, Australia (Cioffi et al., 2002). The finding of the present study regarding sunglasses use is particularly surprising because it considerably exceeded the use of other sun protection strategies, as well as, it was higher than sunglasses use noted in the previous studies (Cioffi et al., 2002; Madgwick et al., 2008; Salas et al., 2005). This reflects that the relatively higher use of sunglasses among landscapers may not be deliberate sun protection practice and can be attributed to either: a) wearing sunglasses as protection against occupational hazards or b) social norms. Further studies are needed to extend our understanding of the salient reasons that underlie sunglasses use among landscapers.

The current sun protection behavior data were also compared with Marlenga's (1995) study conducted on Wisconsin dairy farmers. The landscapers' frequently/always use of long pants (57.9%) was lower than those found in Wisconsin dairy farmers (90%), whereas use of sunscreen (28.4%) and long sleeved shirt (13.8%) was higher than that reported by Wisconsin dairy farmers (8% and 7%, respectively). Furthermore, for the use of gloves (15.6%) and wide brimmed hat (14.7%), findings were in accordance with Marlenga (1995) (14% and 13%, respectively). Overall, however, landscapers' frequency to engage in sun protection behavior was not as high as would be optimal when working outdoors in summer between 10:00 AM and 4:00 PM. Hence, the present study confirms the previous recommendations that there is a strong need to increase skin cancer prevention practices among outdoor workers (Lewis et al., 2006; Marlenga, 1995; Pichon et al., 2005; Rosenmen et al., 1995; Stepanski & Mayer, 1998; Salas et al., 2005).

Barriers to Sun Protection Practices

Consistent with the Marlenga (1995) and Parrott et al. (1996), the most commonly expressed barrier to wear sun protective clothing was "it is too hot to wear." Regarding barriers to sunscreen and wide-brimmed hat use, the present findings corroborate Marlenga (1995) who noted that the most frequently named barrier for not always using sunscreen and wide-brimmed hat was "I forget to wear it." On the other hand, results revealed that the "too much cost" of sun protection measures was the least commonly mentioned barrier, which is in similar with previous studies and suggests that the affordability of sun protection is not a great concern among landscapers (Marlenga, 1995; Parrott et al., 1996; Woolley et al., 2002). The cost being the least frequently identified barrier could be due to 20 out of 23 companies which participated

provided sun protection measures to their employees, regardless of a workplace sun protection policy.

Skin Cancer Knowledge and Health Beliefs

Overall, landscapers presented a mean score of 67.1% correct on the knowledge questions regarding skin cancer. This finding was slightly lower than that of previous study (70%) (Marlenga, 1995). Furthermore, with regard to health beliefs, the current findings are somewhat in line with results of an earlier study (Marlenga, 1995). According to the HBM, an individual's perceived susceptibility, perceived severity, perceived benefits, and perceived barriers are partly dependent on his or her knowledge level (Glanz, Rimer, & Viswanath, 2008; Rosenstock, 1974). The knowledge that sun exposure causes most skin cancers had the highest (79.8%) correct responses, which means that landscapers knew that sun is a primary risk factor for skin cancer. However, 44.9% of the landscapers perceive that they were likely to get skin cancer sometime during their lifetime. On the contrary, 69.7% of landscapers perceived that they are more susceptible than the average person to get skin cancer. It is probable that a majority of landscapers perceived their likelihood to develop skin cancer higher than others, as they know that they are in sun more compared to others, but less than half perceiving their likelihood to develop skin cancer indicates that they might not know about genetic risk factors which are responsible of skin cancer. Another likely reason behind the minority of landscapers perceived susceptible to skin cancer could be explained by a low rate of personal and family skin cancer history. It is evident that individuals generally do not believe that they are at risk of disease until they come across themselves or their family member having a disease (Glanz, Rimer, & Viswanath, 2008). Future research should investigate landscapers' knowledge of other potential risk factors (i.e., genetic and personal) of skin cancer.

Likewise, results of the responses to perceived severity questions were mixed. Most landscapers (87.2%) agreed with the statement that "skin cancer is a serious disease," whereas, only a handful (13.8%) agreed with the statement that "if they get skin cancer, they will not be able to continue work as a landscaper." This may be explained by inconsistency in answers to the knowledge questions. On the one hand, 73.4% of landscapers correctly identified that "skin cancer can cause death." On the other hand, 56.9% could not correctly identify that "melanoma is the most serious form of skin cancer." More broadly, additional study is required to ascertain these speculations.

Nearly three-quarters (73.4%) of landscapers correctly reported that "most skin cancers can be prevented." This may have led a majority of the landscapers to believe that use of a wide-brimmed hat (60.5%), long sleeved shirt (69.7%), long pants, (69.7%), and sunscreen (69.7%) are beneficial. In addition to this, 76.1% reported that "if they protect themselves from the sun daily, they will be less likely to get skin cancer." Nevertheless, it was also found that 52.3% of the participants agreed or strongly agreed that tanned individuals look more attractive than individuals with no tan. Perhaps these landscapers' perceived attractiveness of a tanned look as one of the barriers for not using sun protection methods. It was documented that for many, the belief about physical attractiveness for tan skin contributes to unprotected exposure to sun for an extended time periods (Koblenzer, 1998; Pagoto et al., 2009). Given that landscapers receive significant amount of sun exposure at work, further researches should attempt to investigate both indoor and outdoor tanning behaviors, as well as, psychosocial factors associated with these behaviors of landscapers.

Relationship between HBM variables (i.e., perceived threat, perceived benefits minus perceived barriers, self-efficacy) and sun protection behavior

In support with the first null hypothesis, correlation analysis revealed no significant relationship between perceived threat and sun protection behaviors among this sample of landscapers ($r = 0.001$, $p = .993$). In contrast, Hammond et al. (2008) found that perceived risk to skin cancer led to increased sun protection practice, but in their study, perceived risk was assessed with a single item measure and a major weakness was that reliability and validity of the instrument was not tested. Hence, finding of our study may better capture the relationship of perceived threat with sun protection behavior.

Furthermore, contrary to the second null hypothesis, results from the current study showed a significant correlation between perceived benefits minus perceived barriers and sun protection behaviors ($r = 0.285$, $p = .003$). This means that if the landscapers' perceived benefits of sun protection are increased and perceived barriers to sun protection are decreased then their likelihood of sun protection behavior will be increased.

Finally, in contrast to the third hypothesis, correlation analysis showed a significant relationship between self-efficacy and sun protection behaviors ($r = 0.538$, $p = .001$), suggesting that the higher the self-efficacy to engage in sun protections, the higher the likelihood of sun protection practices.

Limitations of the Study

There were several limitations to this study that should be acknowledged. First, although this study had a respectable response rate (83.6%) and data were collected from multiple locations of Northern Mississippi, the sample was relatively small in size. Consequently, findings may not be generalizable to all landscapers of North Mississippi or the US.

Second, most of the landscapers who participated were White (77.1%) and male (94.5%), limiting generalizability of the results to females and other racial/ethnic populations. Third, because this study used convenience sampling, the possibility of self-selection bias cannot be ruled out.

This study was conducted during the summer to increase the validity of the self-reported sun protection behavior. However, the results are subject to recall bias, since the majority of the data were collected through US postal service and no information was obtained identifying the last time the participants had worked outside prior to completing the questionnaires. The sun protection behavior results may have been more convincing if methodologies such as observation and interview were also utilized to cross-check the data.

A further limitation is reliance on self-reporting of workplace sun protection policy. The responses of employees regarding sun protection policy were not consistent with those reported by employers. This suggests the influence of social desirability, as it could be possible that employers and employees were concerned that if they did not report in the manner that would be viewed acceptable by others; their employment would be at risk.

Another limitation of this study lies in the fact that internal consistency of self-efficacy to engage in sun protection behaviors was $\alpha = .55$, questioning the internal consistency reliability across self-efficacy items.

Furthermore, no attempt was made to control the influence of potential confounding variables. Therefore, caution must be applied when interpreting the results of relationships between HBM variables and practice of sun protection behavior. Also, the cross-sectional design of this study presents additional limitation that restricts causal relationships.

Conclusion

The HBM proposes that individual's likelihood to engage in protective behavior is based on perceived threat. This HBM proposition is not supported in the present study. However, the results indicate that perceived benefits outweighing the perceived barriers to sun protection is associated with sun protection behaviors. Furthermore, self-efficacy to engage in sun protection is associated with sun protection behaviors. The factors that account for absence of the relationship between perceived skin cancer threat and sun protection behaviors could be lack of skin cancer knowledge, low rate of personal or family skin cancer history, and several barriers to sun protection.

Future Implications for Research

In order to better represent all landscapers in North Mississippi, a randomized study that incorporates a larger sample of landscapers is recommended. Certainly, a prospective design should be considered for future studies in order to provide more definitive evidence of directionality or causality between HBM variables and sun protection behaviors. The analysis of this study was limited to relationships between selected HBM variables and likelihood of sun protection behavior change; therefore, it would be valuable to explore the role of variables such as modifying factors or cues to action in these relationships. While the study showed that self-efficacy significantly correlated with sun protection behaviors, future studies also need to identify strategies that can enhance self-efficacy of this particular population.

Implications for Health Promotion and Education Practice

Overall skin cancer knowledge among landscapers was low, with a mean score of 67.1%. Majority of the landscapers were knowledgeable that most skin cancers are attributed to sun exposure and it is highly preventable. But, landscapers lacked the knowledge that skin

cancer is the most common form of cancer and melanoma is the most serious form of skin cancer. Highlighting skin cancer incidence and melanoma mortality could be an important component of future skin cancer educational interventions focused on increasing sun protection practices in landscapers. A previous study provided evidence that educational programs could potentially increase skin cancer knowledge in outdoor workers (Mullan, Gardiner, Rosenman, Zhiwei, & Swanson, 1996).

In the present study, the most frequently identified source of sun protection information was friends or family (78%). Parrott and Lemieux (2003) reported that skin cancer prevention and detection information given by families contribute to the likelihood of farmers' sunscreen use. Therefore, future sun protection education intervention should target not only landscapers, but also their family members. However, the role of landscapers' families or friends in their sun protection activities should be explored in future research and provide a clearer picture of social support in the landscapers' sun protection behaviors.

The majority of the landscapers in this study also listed television (72.5%), magazine articles or advertisements (60.6%), and health information pamphlets (52.3%) as their common sources of information to protect from sun. Studies demonstrated that utilization of media channels to design an intervention can be an effective approach to increase the sun protection behaviors and reduce the risk of skin cancer among outdoor workers (Borland, Hocking, Godkin, Gibbs, & Hill, 1991; Mullan et al., 1996). An encouraging finding of our study was that 61.5% of the landscapers are receiving sun protection information from their doctor or other health care worker, indicating that landscapers are exposed to health care professionals. Based on the present study findings, it is suggested that partnerships between health care providers and media would be beneficial to disseminate sun protection information faster and maximize the reach to a

large population of landscapers. Moreover, nurses and general physicians should be encouraged to educate their patients who work outdoors about sun protection and regular full body screening for skin cancer. The sun protection related counseling by health care providers has been shown to be effective in increasing outdoor workers' skin cancer prevention practices and knowledge (Robinson et al., 2004).

In recognition of the landscapers' high-risk of skin cancer in this study, and considering the fact that skin cancer is highly preventable, the workplace educational interventions programs intended to promote regular sun protection of landscapers would be largely beneficial (Buller et al., 2005; Reinau, Weiss, Meier, Diepgen, & Surber, 2012). For example, Girgis, Sanson-Fisher and Watson (1994) conducted occupational skin screening sessions, as well as, education sessions. In the skin screening session a dermatologists performed the skin examination on each participant. During education session a 30-minute lecture was delivered to the participants. Lectures addressed skin cancer issues in Australia, the increased risk of skin cancer among outdoor workers, and protective measures to prevent skin cancer. Researchers inferred that improvement in solar protection behaviors and related knowledge of outdoor workers can be achieved by implementing sun protection workplace intervention programs.

In order to enhance sun protection, landscapers should be educated about benefits of sun protection measures. For example, *in comparison to visor and baseball cap, wide brimmed hat provides protection to not only your face but also to your ears, head and back of neck, long-sleeved shirts and long pants provide more protection than tank tops and shorts, sunscreen prevent skin damage, sunglasses can prevent soft skin damage around your eyes, trees and canopies shade can help in blocking much of the sun exposure* (CDC, 2013; Mahon, 2003). At the same time, intervention programs should attempt to reduce landscapers' personal barriers to

sun protection. Specifically, this study did not attempt to collect information about landscapers' clothing fabric and fitting; therefore, it is difficult to make any inferences regarding why landscapers cited sun protective clothing is too hot to wear. However, education of fabric characteristic and fitting should be considered when designing interventions focusing on barriers that may prevent landscapers engaging in sun protection. For example *loose-fitting, tightly woven, synthetic and darker color material may provide more protection against UVR* (CDC, 2013; Mahon, 2003). Development of intervention strategies should consider verbal or visual reminder strategies which may trigger sun protection behaviors among landscapers. Family members should be encouraged to remind landscapers to use sun protection behaviors. Another strategy could be placing stickers in landscapers' vehicles and on working instruments as a reminder for sun protection. One of the reasons listed by a majority of landscapers for not using sunscreen was it is greasy and smells bad. Health education professionals should ensure that landscapers know about the availability of sunscreen brands which are not oily and come in different fragrances.

One of the most important findings to emerge from the data analysis is that there is a significant relationship between self-efficacy and sun protection behaviors. Intervention programs that focus on increasing levels of sun protection should include strategies to increase self-efficacy to participate in sun protection behaviors. Future studies should apply Bandura's (1977) self-efficacy model (i.e., performance attainment, vicarious experiences, verbal persuasion, and physiological arousal) to identity the strategies.

Finally, this study lacked detailed information about workplace sun protection policy; therefore, drawing any conclusion about effectiveness or tailoring of the policy would be tentative at best. However, it is suggested that health promotion professionals should collaborate

with local and state health and safety legislators to obtain more accurate information, as well as, have a deeper understanding of current policies and responsibilities of landscapers. Further research regarding the use of policy and provision of sun protection measures is warranted for this population.

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APPENDICES

APPENDIX A

FIGURE 4.3 Scatter plot for Perceived Threat and Sun Protection Behaviors(Outliers Included)

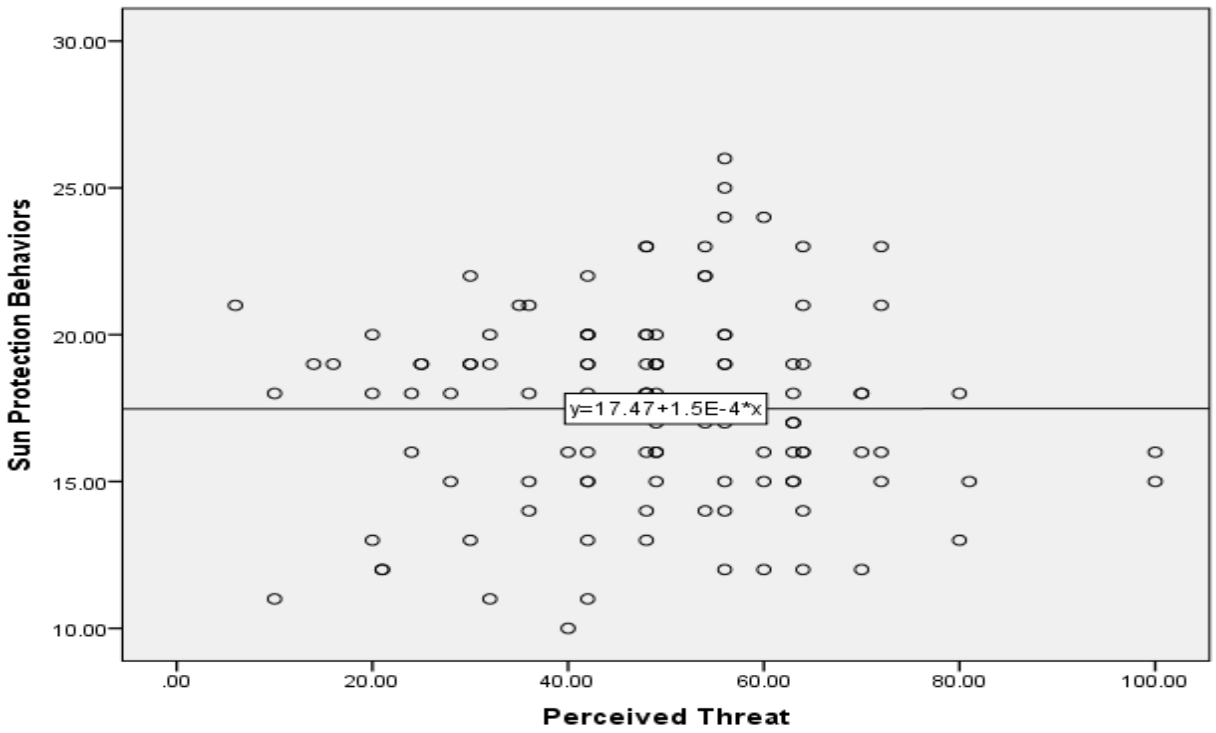


FIGURE 4.4 Scatter plot for Perceived Threat and Sun Protection Behaviors(Outliers Excluded)

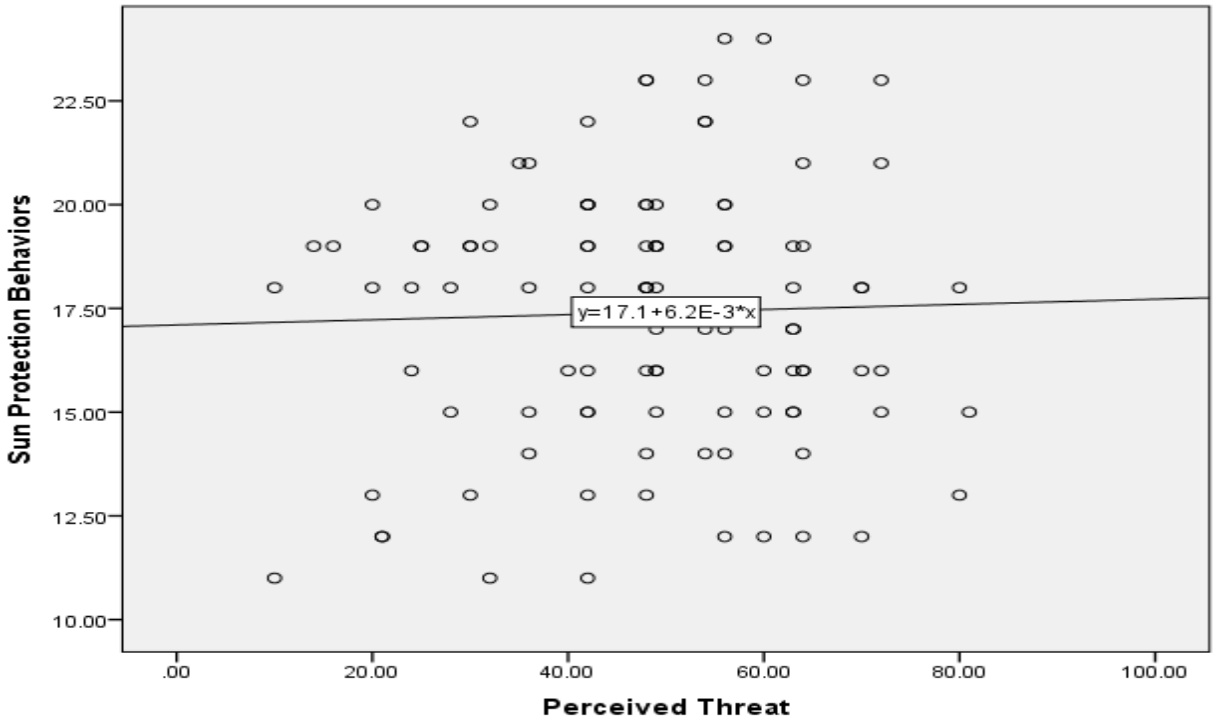


FIGURE 4.5 Scatter plot for Perceived Benefits minus Perceived Barriersand Sun Protection Behaviors (Outliers Included)

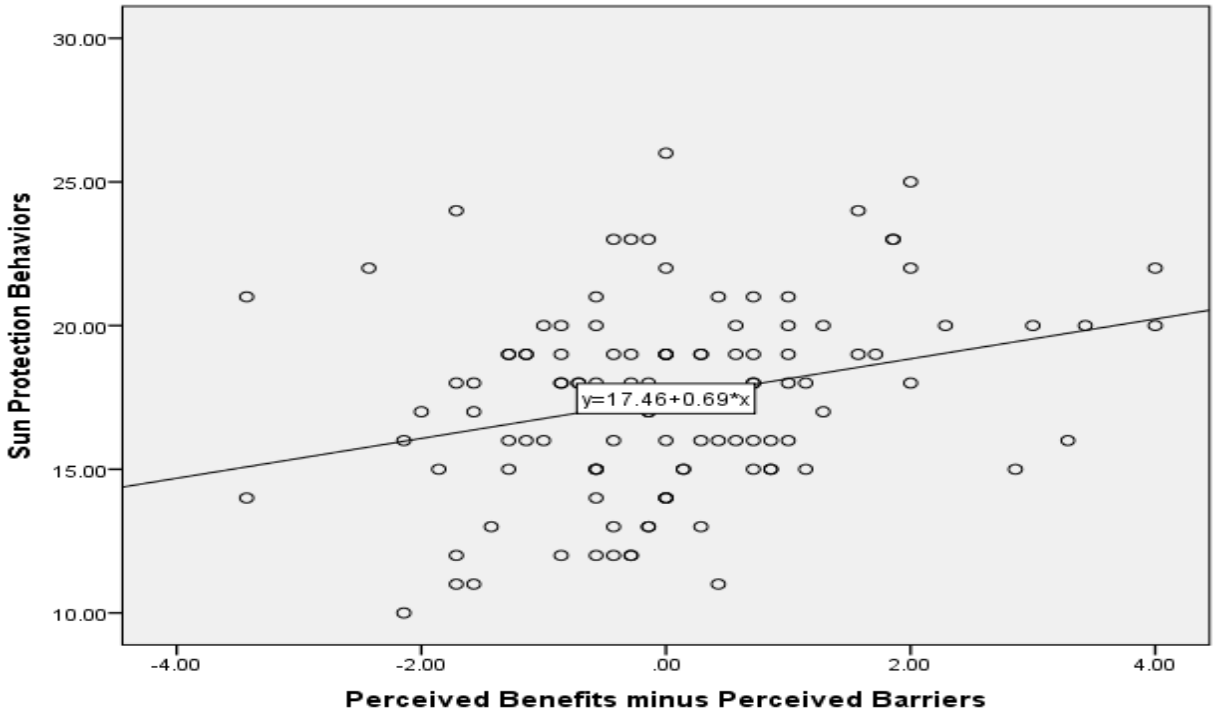


FIGURE 4.6 Scatter plot for Perceived Benefits minus Perceived Barriersand Sun Protection Behaviors(Outliers Excluded)

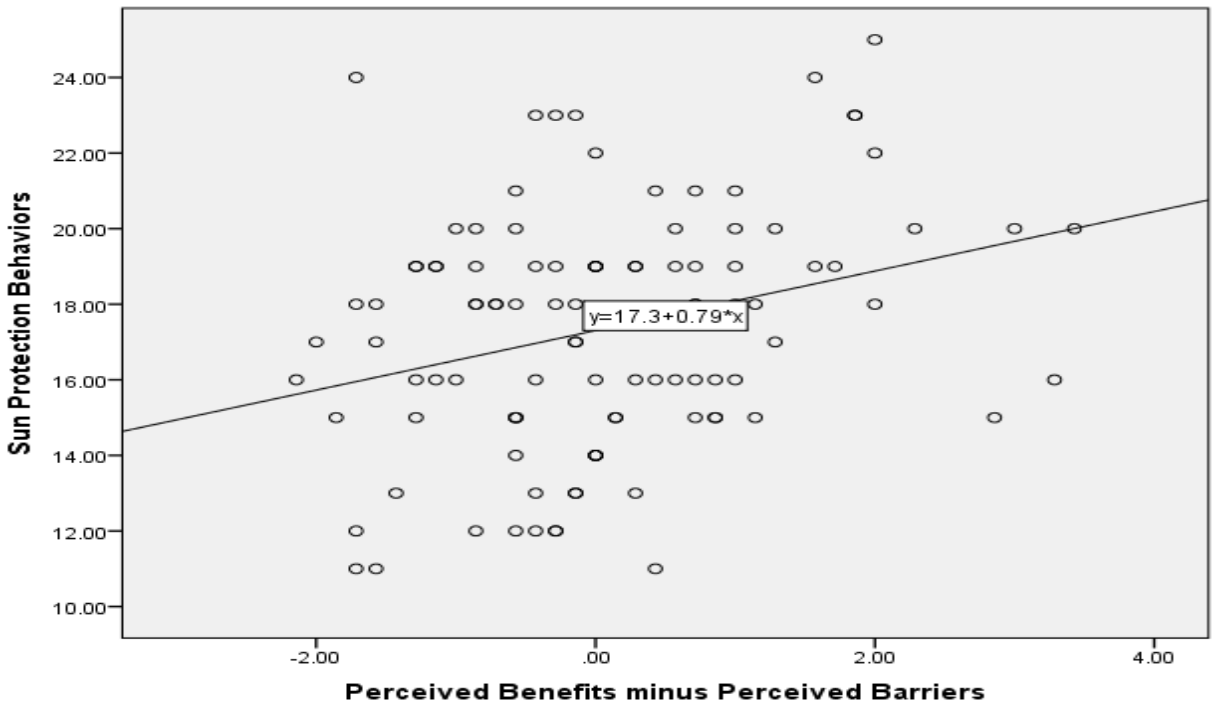


FIGURE 4.7 Scatter plot for Self-Efficacy and Sun Protection Behaviors (Outliers Included)

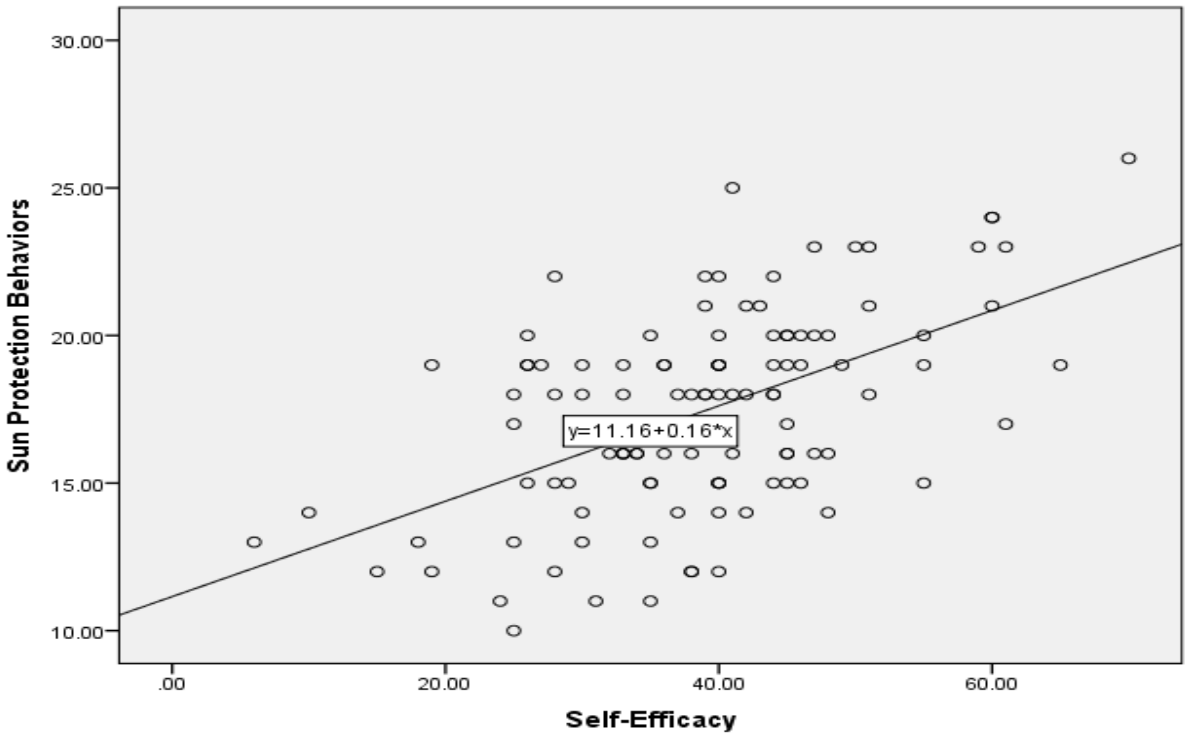
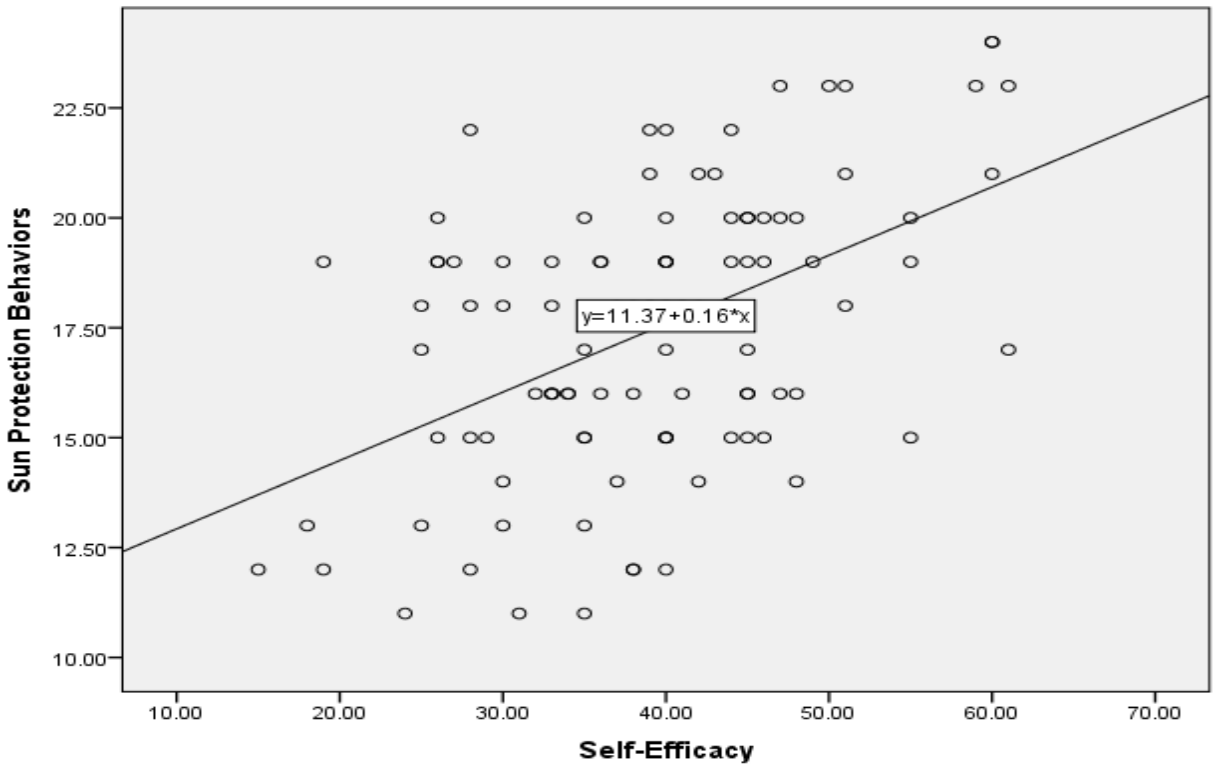


FIGURE 4.8 Scatter plot for Self Efficacy and Sun Protection Behaviors (Outliers Excluded)



APPENDIX B

Telephone Script to Conduct Survey

Investigator: My name is Dr. Allison Ford-Wade. We are conducting a study concerning sun protection behavior among landscapers in North Mississippi. Would you be interested in your employees participating in this study? It involves employees completing a 41-item questionnaire. The entire process will not exceed 30-minutes. Your company and all employees' names will remain confidential and all participants will have the opportunity to refuse participation entirely or to stop at any time while answering the questionnaire.

If Employer answers 'No'

Investigator: Thank you very much for your time

If Employer answers 'Yes'

Investigator: Does your company have any policies concerning the use of wide-brimmed hat, long sleeved shirt, long pants, work gloves, sunglasses and sunscreen with a sun protection factor (SPF).

_____Yes - 1

_____ No - 0

Investigator: When would be a good time for me to come and administer the survey?

OR

Investigator: Could you please provide us your mailing address to send the questionnaires to you in self-addressed postage stamped envelope?

Employer will provide the time, date and location.
OR
Employer will provide the address.

Investigator: Thank you very much.

APPENDIX C

Live Script for Questionnaire on Sun Exposure Distribution

Distributor: Have you completed a Questionnaire on Sun Exposure?
Participant: Yes or No
Distributor: If you would like to complete this questionnaire on sun exposure it is completely voluntary. Your name will be kept confidential, and any other identifying markers will be destroyed.

If you chose to complete the questionnaire - After you complete the questionnaire, please place it in the brown/white envelope and put it on the table.

If you refuse to participate entirely or If you want to stop while answering the questionnaire, please place it in the brown/white envelope and put it on the table.

If you have any questions, please do let me know.

Thank you for your time.

APPENDIX D

Information about the Questionnaire on Sun Exposure

Principal Investigator
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Co-investigators
Allison Ford-Wade,
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Description: We want to study the landscapers' health beliefs with regard to skin cancer, level of skin cancer knowledge, cues to sun protective actions, self-efficacy to engage in sun protection practices and current sun protection behavior. In order to answer our question, we are asking you to please take the time and fill out this questionnaire. The questionnaire has six parts. The first part will assess your health beliefs with regard to skin cancer. The second part will ask questions regarding current sun protection behavior. The third part will include cues to sun protective actions. The fourth part will assess self-efficacy to engage in sun protection practices. The fifth part will contain questions on knowledge about skin cancer. The last part will contain questions relating to your demographic information. If you are unsure about a question, please try to answer it to the best of your abilities.

Risks and Benefits: You may not know or understand particular questions regarding Skin Cancer- if so, please check the "I don't' know" option. We do not think there are any risks. You will be benefiting research in the topic of skin cancer knowledge and perceptions among landscapers.

Cost and Payment: The questionnaire will take about 10 minutes of your time to complete. There are no other costs in participating.

Confidentiality: Your name will be kept confidential, and any other identifying markers will be destroyed.

Appendix E

QUESTIONNAIRE ON SUN EXPOSURE

Your responses are important and will be kept confidential

For each statement below CIRCLE one response

1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

1. I am likely to get skin cancer sometime during my lifetime.	1	2	3	4	5
2. As a landscaper, I am more likely than the average person to get skin cancer.	1	2	3	4	5
3. I think skin cancer is a serious disease.	1	2	3	4	5
4. If I get skin cancer, I will not be able to continue work as a landscaper.	1	2	3	4	5
5. If I protect myself from the sun each day, I am less likely to get skin cancer.	1	2	3	4	5
6. If I avoid outdoor work between 10 AM and 4 PM, I am less likely to get skin cancer.	1	2	3	4	5
7. If I wear a wide-brimmed hat (like a straw hat), I am less likely to get skin cancer.	1	2	3	4	5
8. If I wear a long sleeved shirt and long pants, I am less likely to get skin cancer.	1	2	3	4	5
9. If I wear a work gloves, I am less likely to get skin cancer.	1	2	3	4	5
10. If I wear sunglasses, I am less likely to get skin cancer.	1	2	3	4	5
11. If I wear sunscreen with a sun protection factor (SPF), I am less likely to get skin cancer.	1	2	3	4	5
12. Most people look better with a tan.	1	2	3	4	5

13. When you are out in the sun for 15 minutes or more, do you wear a wide-brimmed hat (like a straw hat)? CIRCLE one response.

1	2	3	4	5
Never	Rarely	Sometimes	Frequently	Always

14. If you do not ALWAYS wear a wide-brimmed hat (like a straw hat), CHECK (×) the reason(s) why you do not:

( ) it takes too much time – 14 A
( ) it gets in the way of my work (inconvenient) – 14 B
( ) it costs too much – 14 C
( ) it is too hot to wear – 14 D
( ) I forgot to wear it – 14 E
( ) Other (explain) _____ - 14 F

15. When you are out in the sun for 15 minutes or more, do you wear a long sleeved shirt? CIRCLE one response.

1	2	3	4	5
Never	Rarely	Sometimes	Frequently	Always

16. If you do not ALWAYS wear a long sleeved shirt, CHECK (×) the reason(s) why you do not:

( ) it takes too much time – 16 A
( ) it gets in the way of my work (inconvenient) – 16 B
( ) it costs too much – 16 C
( ) it is too hot to wear – 16 D
( ) I forgot to wear it – 16 E
( ) Other (explain) _____ - 16 F

17. When you are out in the sun for 15 minutes or more, do you wear long pants? CIRCLE one response.

1	2	3	4	5
Never	Rarely	Sometimes	Frequently	Always

18. If you do not ALWAYS wear long pants, CHECK reason(s) why you do not:

( ) it takes too much time – 18 A

( ) it gets in the way of my work (inconvenient) – 18 B

( ) it costs too much – 18 C

( ) it is too hot to wear – 18 D

( ) I forgot to wear it – 18 E

( ) Other (explain) _____ - 18 F

19. When you are out in the sun for 15 minutes or more, do you wear work gloves? CIRCLE one response.

1	2	3	4	5
Never	Rarely	Sometimes	Frequently	Always

20. If you do not ALWAYS wear work gloves, CHECK reason(s) why you do not:

( ) it takes too much time – 20 A

( ) it gets in the way of my work (inconvenient) – 20 B

( ) it costs too much – 20 C

( ) it is too hot to wear – 20 D

( ) I forgot to wear it – 20 E

( ) Other (explain) _____ - 20 F

21. When you are out in the sun for 15 minutes or more, do you wear sunglasses?

CIRCLE one response.

1	2	3	4	5
Never	Rarely	Sometimes	Frequently	Always

22. If you do not ALWAYS wear sunglasses, CHECK reason(s) why you do not:

( ) it takes too much time – 22 A

( ) it gets in the way of my work (inconvenient) – 22 B

( ) it costs too much – 22 C

( ) it is too hot to wear – 22 D

( ) I forgot to wear it – 22 E

( ) Other (explain) _____ - 22 F

23. When you are out in the sun for 15 minutes or more, do you wear sunscreen with a sun protection factor (SPF)?

1	2	3	4	5
Never	Rarely	Sometimes	Frequently	Always

24. If you do not ALWAYS wear sunscreen with a sun protection factor (SPF), CHECK reason(s) why you do not:

( ) it takes too much time – 24 A

( ) it gets in the way of my work (inconvenient) – 24 B

( ) it costs too much – 24 C

( ) it is too hot to wear – 24 D

( ) I forgot to wear it – 24 E

( ) Other (explain) _____ - 24 F

25. From which of the following sources have you received information about protecting yourself from too much sun. CHECK (×) one response for each source.

	Yes 1	No 0	I don't know 2
Radio – 25 A	( )	( )	( )
Television - 25 B	( )	( )	( )
Newspaper – 25 C	( )	( )	( )
Internet – 25 D	( )	( )	( )
Health information pamphlet – 25 E	( )	( )	( )
Magazine articles or advertisements– 25 F	( )	( )	( )
American Cancer Society – 25 G	( )	( )	( )
Your doctor or other health care worker – 25 H	( )	( )	( )
Friends or family – 25 I	( )	( )	( )

26. Please rate your degree of confidence by recording in each of the blank spaces a number from 0 to 10 using the scale below.

0 Cannot do at all **1** **2** **3** **4** **5 Moderately certain can do** **6** **7** **8** **9** **10 Certain can do**

	Confidence (0-10)
Limit sun exposure between 10 AM and 4 PM – 26 A	( )
Wear a wide-brimmed hat (like a straw hat) whenout in the sun for 15 minutes or more – 26 B	( )
Wear a long sleeved shirt when out in the sun for 15 minutes or more – 26 C	( )
Wear long pants when out in the sun for 15 minutes or more – 26 D	( )

0	1	2	3	4	5	6	7	8	9	10
Cannot do at all					**Moderately certain can do**					**Certain can do**

	Confidence (0-10)
Wear a work gloves when out in the sun for 15 minutes or more – 26 E	( )
Wear a sunglasses when out in the sun for 15 minutes or more – 26 F	( )
Wear sunscreen with a sun protection factor (SPF) when out in the sun for 15 minutes or more – 26 G	( )

27. For each statement below, CHECK (×) one response:

	True	**False**	**I don't know**
	1	**0**	**2**
Skin cancer is the most common form of cancer – 27 A	( )	( )	( )
Melanoma is the least serious form of skin cancer – 27 B	( )	( )	( )
Sun exposure causes most skin cancers – 27 C	( )	( )	( )
The sun's rays are the strongest at mid-day – 27 D	( )	( )	( )
Most skin cancers can be prevented – 27 E	( )	( )	( )
When skin cancer is detected early, the cure rate is very high – 27 F	( )	( )	( )
Sunburn causes lasting damage to the skin – 27 G	( )	( )	( )
Experts suggest using sunscreen with a sun protection factor (SPF) of 15 or higher – 27 H	( )	( )	( )
Skin cancer can cause death – 27 I	( )	( )	( )
A person with fair skin color needs the most protection from the sun – 27 J	( )	( )	( )

For each of the questions below CHECK (×) your response:

28. What is your sex?

_____ Male - 1

_____ Female - 2

29. What is your ethnicity?

_____ White - 1

_____ Black or African American - 2

_____ Hispanic or Latino – 3

_____Native Hawaiian or Other Pacific Islander – 4

_____ Asian – 5

_____ American Indian or Alaska Native-6

_____ Other - 7

30. What is your current education level?

_____ 8^{th} grade or less - 1

_____ 9 – 12^{th} grade - 2

_____ Some college - 3

_____ Bachelor's degree or higher - 4

31. What is your net household income?

_____ Less than $25,000 - 1

_____ $25,000 - $50,000 - 2

_____ More than $50,000 - 3

32. Does your current workplace have a written policy to encourage workers to protect themselves from sun when they work outside?

_____Yes - 1

_____ No - 0

_____ I don't know - 2

33. Which of the following best describes your skin's usual reaction to your first exposure to summer sun, without sunscreen, for one-half hour at midday?

_____ Always burn, unable to tan - 1

_____ Usually burn, tans with difficulty- 2

_____ Sometimes mild burn, gradually tans to a light brown - 3

_____ Rarely burn, tan with ease to a moderate brown - 4

_____ Very rarely burns, tans very easily– 5

_____ Never burns, tans very easily, deeply pigmented – 6

34. What is your natural hair color?

_____ Blonde - 1

_____ Red - 2

_____ Light brown – 3

_____ Medium brown – 4

_____ Dark brown – 5

_____ Black – 6

35. What is your eye color?

_____ Brown - 1

_____ Green/Hazel - 2

_____ Blue – 3

_____ Grey – 4

_____ Black - 5

36. Have you ever had skin cancer?

_____Yes - 1

_____ No - 0 _____ I don't know - 2

37. Has your any first degree relative (mother, father, brother, sister, child) been diagnosed with skin cancer?

_____Yes - 1

_____ No – 0

_____ I don't know – 2

For each of the questions below, WRITE your response:

38. How long have you been working as an outdoor worker:

_____ Years _____ Months

39. What is the average number of hours you spend outdoors EACH day between 10 AM and 4 PM (May – October): _____

40. How many sunburns did you have so far this summer: _____

Last summer: _____

41. What is your age: _____

Your comments are welcome.

Thank you for your time. We appreciate your participation.

APPENDIX F

Permission to Use Skin Cancer Survey

On Wednesday 11/30/2011 at 3:45 pm, "Marlenga, Barbara L." wrote:

Good afternoon.....

I am happy to share my questionnaire with you. I do not have the word file any longer, but I scanned the questionnaire directly from my thesis for your use.

Good luck with your thesis research.

Best regards,
Barbara
Barbara Marlenga, PhD
Research Scientist
National Farm Medicine Center

-----Original Message-----
From: vknahar@olemiss.edu [mailto:vknahar@olemiss.edu]
Sent: Tuesday, November 29, 2011 5:54 PM
To: Marlenga, Barbara L.
Subject: Request of survey questionnaire

Date: November, 29, 2011

Ms. Barbara L. Marlenga,

I am in the process of preparing my Master's Thesis at the University of Mississippi. I read your article titled The health beliefs and skin cancer prevention practices of Wisconsin dairy farmers in which your questionnaire was used. I found the questionnaire to be an outstanding item to include in my research study on skin cancer in outdoor workers. Would you grant me permission to use your questionnaire? I will properly cite you in my thesis and any subsequent manuscript submissions. Obviously, both you and your questionnaire would be referenced in my Thesis. Would you please send me a copy of questionnaire. Thank you for any assistance you may be able to provide in my research.

Sincerely,
Vinayak Kumar Nahar
Graduate Student
The University of Mississippi
University, MS 38677

APPENDIX G

IRB Approval

Mr. Nahar:

This is to inform you that your application to conduct research with human participants, *Sun Protection Behaviors of Landscapers in North Mississippi* (Protocol 13X-023), has been approved as Exempt under 45 CFR 46.101(b)(2).

Please remember that all of The University of Mississippi's human participant research activities, regardless of whether the research is subject to federal regulations, must be guided by the ethical principles in *The Belmont Report: Ethical Principles and Guidelines for the Protection of Human Subjects of Research*.

- It is especially important for you to keep these points in mind:
- You must protect the rights and welfare of human research participants.
- Any changes to your approved protocol must be reviewed and approved before initiating those changes.
- You must report promptly to the IRB any injuries or other unanticipated problems involving risks to participants or others.

If you have any questions, please feel free to call me at (662) 915-7482.

Diane W. Lindley
Research Compliance Specialist, Division of Research Integrity and Compliance
Office of Research and Sponsored Programs
The University of Mississippi
100 Barr Hall, P.O. Box 907
University, MS 38677
Tel.: (662) 915-7482 Fax: (662)915-7577
dlindley@olemiss.edu

VITA

VINAYAK KUMAR NAHAR

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EDUCATION

M.S., Health Promotion, University of Mississippi, May 2013

M.D., Medicine, Vitebsk State Medical University, June 2008

TEACHING EXPERIENCE

HP 191 - Personal and Community Health

HONORS

Honored by Vitebsk State Medical University as bonafide, diligent and disciplined student throughout academic course

H. Leon Garrett Achievement Award in Health Promotion, 2011

First Prize in Graduate Student Council Poster Presentation, 2013

School of Applied Sciences Student of Month, April, 2013

PUBLICATIONS

Nahar, V. K. (2012). Health promotion across the world: Challenges and Future. *Indian Journal of Public Health Research and Development, 3*(4), 236–240.

Abe, T., Dabbs, N. C., **Nahar, V. K.,** Ford-Wade, M. A., Bass, M. A. & Loftin M. (2013). Relationship between dual-energy X-ray absorptiometry-derived appendicular lean tissue mass and total body skeletal muscle mass estimated by ultrasound. *International Journal of Clinical Medicine, 4*(3), 283-286. doi:10.4236/ijcm.2013.46049