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AN ANALYSIS OF THE RELATIONSHIP BETWEEN SOCIOECONOMIC STATUS AND SKIN CANCER USING THE HEALTH INFORMATION NATIONAL TRENDS SURVEY, 2005

by

ERIN NICOLE RUOFF

B.S., REINHARDT UNIVERSITY

A Thesis Submitted to the Graduate Faculty
of Georgia State University in Partial Fulfillment
of the Requirements for the Degree
MASTER OF PUBLIC HEALTH

ATLANTA, GEORGIA

APPROVAL PAGE

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ERIN NICOLE RUOFF

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DEDICATION PAGE

The following thesis is dedicated to my husband, family, and friends for their constant encouragement and support.

ACKNOWLEDGEMENTS

I would like to thank my thesis committee, Dr. Sheryl Strasser and Dr. Kymberle Sterling, for their guidance and encouragement. I would also like to thank the Institute of Public Health for giving me a chance to pursue my passions in this program.

I also want to thank everyone in The Department of Student Health Promotion. You all made me laugh to the point where I nearly cried! You fueled my passion for health even further. I will always remember my time there and the great things we did together for "the greater good."

Finally, I would like to acknowledge my friends for listening to me talk about this thesis for *many* hours. I would like to extend thanks my husband for his cheerful, motivational talks and all the trips he took to get me coffee to keep me going!

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AN ANALYSIS OF THE RELATIONSHIP BETWEEN SOCIOECONOMIC STATUS AND SKIN CANCER USING THE HEALTH INFORMATION NATIONAL TRENDS SURVEY, 2005:

STUDENT'S NAME:
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THESIS CHAIR:
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ABSTRACT

Background: Skin cancer is one of the most preventable forms of cancer yet for certain types of skin cancers, it can be fatal if it goes untreated. While ultraviolet radiation is the main cause of skin cancer, there are several other risk factors, including sunburn history, smoking, environmental pollutants, family history, personal history, and skin color. Practicing sun protection behaviors and receiving regular skin cancer screenings can prevent the cancer from ever developing. This study examines the demographic and socioeconomic status risk factors for skin cancer.

Methods: The Health Information National Trends Survey data was used from 2005. Using this secondary dataset, chi-square analysis was performed to determine the prevalence of skin cancer within the demographic categories of age and race/ethnicity as well as socioeconomic status indicators educational attainment, annual household income, employment status, and marital status. Univariate and multivariate analyses were performed to determine the correlations of the variables with skin cancer. A p-value of 0.05 and a 95% confidence interval were maintained throughout the analyses to determine any statistical significance.

Results: Of the 3,804 respondents who answered the question related to cancer diagnosis, 226 indicated they had a positive skin cancer diagnosis, which was 5.94% of the total sample. Skin cancer and increased age were consistently associated (χ_2 (2) = 171.5, $p<.001$). The skin cancer peak prevalence was for all those respondents aged 65 and older. Higher educational attainment and higher annual household income were associated with greater likelihood of skin cancer.

Conclusions: This study revealed that skin cancer is significantly associated with increased age, higher educational attainment, and higher annual household income. Implementing consistent screening practices and targeted behavioral interventions are important areas for health focus in the future.

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CHAPTER I
INTRODUCTION

1a. Background

The most common form of cancer in the United States (U.S.) is skin cancer (Centers for Disease Control [CDC], 2010), and it is also one of the most preventable forms of cancer. There are two main classifications of skin cancer: nonmelanoma and melanoma. Nonmelanoma skin cancers (NMSCs) are highly curable and typically develop in the basal or squamous cells of the skin. Melanoma develops in the melanocytes, which produce melanin, and can be curable if caught in the early stages of development. If melanoma skin cancer is not found early, it can be fatal. In 2010, it accounted for 8,700 skin cancer deaths in the U.S. (American Cancer Society, 2011).

Each year, about 193 people die from melanoma in Georgia. In 2009, it was estimated that 2,040 Georgians were diagnosed with melanoma. Among counties nationwide, White county, in north Georgia, has the second highest melanoma diagnosis (U.S. Environmental Protection Agency [U.S. EPA], 2011). It is these increasing rates of skin cancer diagnoses that are so concerning for the state of Georgia as well as the nation.

Ultraviolet radiation (UVR) is the main cause of skin cancer, although there are some other factors that can lead to the development of skin cancer (Diepgen & Mahler, 2002). Most importantly, sunburns are related to incidence of skin cancer. Close to 40% of White Georgians reported in 2004 that they had, had at least one sunburn in the past year, putting them

at a higher risk for developing skin cancer (U.S. EPA, 2011). Occupational exposures, certain chemicals, and environmental pollutants are also linked to skin cancer. Additional risk factors include skin color, as fair-skinned people tend to have greater risk, and smoking (Diepgen & Mahler, 2002).

It has been estimated that the U.S. spends close to 2 billion dollars in medical costs annually to treat skin cancer. Properly targeted public health interventions could greatly reduce these costs and contribute to a decrease in skin cancer. Over a 16 year period, using the EPA's SunWise intervention program could save the country nearly 30 million dollars in costs associated with skin cancer. It could also prevent nearly 11,000 new skin cancer cases (U.S. EPA, 2011). Other interventions could also contribute to a healthier nation. These interventions must incorporate the adoption of a variety of skin protective behaviors, such as sunscreen use, avoidance of sun exposure, and protective clothing, to be successful (Kasparian, McLoone, & Meiser, 2009).

1b. Purpose of Study

The purpose of this study is to examine the relationships of SES and skin cancer using data from the 2005 Health Information National Trends Survey (HINTS). This study will examine SES indicators such as annual household income, employment status, marital status, and education as well as reported skin cancer, age, and race/ethnicity to determine the most statistically significant predictors for skin cancer.

Using HINTS 2005 data, the prevalence of skin cancer will be examined among the surveyed group by age, race/ethnicity, and SES indicators. This study will also address the sun protection behaviors of those participants who have already been diagnosed with skin cancer.

This study is important because skin cancer can be fatal for some people and rates are increasing. The results of this study can provide valuable insights into personal risk and skin cancer associations. This study will also aid public health professionals in understanding how to tailor intervention strategies that closely match specific segments of the population that are at greater risk of developing skin cancer.

1c. Research Questions

Question #1: How is skin cancer in the HINTS 2005 sample different by age?

Question #2: How is skin cancer in the HINTS 2005 sample different by race/ethnicity?

Question #3: How is skin cancer in the HINTS 2005 sample different by education?

Question #4: How is skin cancer in the HINTS 2005 sample different by annual household income?

Question #5: How is skin cancer in the HINTS 2005 sample different by employment status?

Question #6: How is skin cancer in the HINTS 2005 sample different by marital status?

CHAPTER II
REVIEW OF THE LITERATURE

The literature review examines risk factors for skin cancer for both melanoma and nonmelanoma types. The following chapter presents scientific literature that supports the inclusion of variables of interest in this study.

2a. Biology of Skin Cancer

The p53 gene in the human body is where the development of skin cancer begins for most people. When the skin is exposed to too much sunlight, mutations begin in the p53 gene which initiates the skin cancer process. While the intense sun exposure will kill many skin cells because of the damage, some of the cells that survive can develop into skin cancer and/or tumors that can potentially be life-threatening (Kraemer, 1997).

The visible signs and symptoms of skin cancer may include changes in the color or size of moles on the body, appearance of oddly colored or shaped bumps or nodules on the body, or changes in the sensation of bumps, moles, or nodules. These changes in sensation could be oozing or bleeding as well as itching or tenderness on areas of the skin. While these signs may be simple to spot, especially with the help of a physician, skin cancer is easily preventable (American Cancer Society [ACS], 2011). According to the ACS (2011), there are many ways to prevent skin cancer from ever developing. These prevention tactics include wearing protective clothing and eyewear, wearing sunscreen, seeking shade on sunny days, and avoiding sun exposure between the hours of 10 a.m. and 4 p.m. Furthermore, people are advised to avoid

ultraviolet (UV) exposure from tanning beds as these still pose serious risk of damage to skin and can cause carcinogenesis (American Cancer Society, 2011).

Once diagnosed, skin cancer will either be melanoma or nonmelanoma. Nonmelanoma skin cancers include Basal Cell Carcinoma (BCC) and Squamous Cell Carcinoma (SCC). Skin cancers are named for the areas in the skin and body where the malignancies occur. BCC is most commonly found in people with light skin while the most common type of skin cancer for those with dark skin is SCC. With skin cancer, it is important to seek treatment early to avoid metastasis, or the spreading of the cancer to other healthy tissues in the body (National Cancer Institute, 2011).

2b. Risk Factors

Age.

While the newest reports link skin cancer to younger adults, it still greatly effects older generations. Of those people who live to the age of 65, nearly half will have nonmelanoma at least once (National Cancer Institute [NCI], 2010a). White men over the age of 50 constitute the majority of those diagnosed with melanoma (NCI, 2010b). It is also important to note that after the age of 40, men have the highest incidence of melanoma. For those younger than 40, women have the highest incidence of melanoma (Jemal et al., 2008).

Australia is of particular interest to the study of skin cancer as the incidence in this country is the highest in the world (Australian Institute of Health and Wellness [AIHW], 2004). In Victoria, Australia, researchers interviewed and examined numerous patients for aggressive melanomas. In the study, risk factors were established that potentially identified patients that may be at higher risk for serious melanoma tumors. Patients were interviewed for various demographic characteristics as well as their medical and family histories. They were also

examined by consulting dermatologists to locate any melanomas on their bodies. Older age and being male were significantly associated with the rapidly growing skin cancer tumors. Many of these cases tended to have previous melanoma histories, and they also were light-skinned with few freckles. Most of the participants over the age of 70 had developed melanoma on visible parts of the body, suggesting lack of sun protection behaviors at an earlier age could have played a role in the development of the skin cancer (Liu et al., 2006).

The elderly tend to have other health problems that can cause comorbidity issues. Sometimes these health conditions or treatments can contribute to the development of skin cancer. Lanoy and Engels (2010) noted in a study regarding immunosuppressive conditions that skin cancer risk is increased when these conditions are present. Because some of these health conditions may involve DNA alterations, this damage may initiate the skin cancer process. While the study did not make recommendations on how to treat this potential problem, it is clear that prevention efforts at a younger age may greatly decrease the comorbidity that could occur at an older age (Lanoy & Engels, 2010).

Hausauer et al. (2011) performed a study with a California population of Non-Hispanic White females aged 15 to 39 years. While this study was about the relationship of SES and skin cancer, it revealed information about the ages of those affected by skin cancer. Of those surveyed, adolescent girls and young women had an 80% higher rate of melanoma than those people in the lowest SES neighborhoods (Hausauer et al., 2011). If women are beginning to develop skin cancer at ages below 40 years, the skin cancer process is being initiated in the body very early. These trends must be monitored to ensure prevention efforts are implemented soon and to determine any geographical effects on skin cancer rates in the U.S.

Race/Ethnicity.

One of the risk factors for skin cancer is the race or ethnicity of a person. Those with darker skin tend to have lower rates of skin cancer compared to those people considered to be Caucasian or White. Biologically, dark skin has larger melanocytes, which allows the skin to filter up to twice as much Ultraviolet B (UVB) radiation as white skin (Halder & Bridgeman-Shah, 1995). This makes ethnic skin unique in its protection against sun exposure. However, those with darker skin do tend to have greater mortality and morbidity if they do develop skin cancer (Jackson, 2009). This may be due to delayed detection and diagnosis since skin cancer screenings are not performed as often for persons of color as they are for light-skinned individuals. In addition, those with darker skin tend to have more biologically aggressive cancers (Jackson, 2009). For those with ethnic skin, it has been noted that they tend to have false knowledge regarding skin protection from the sun. Because of this, interventions need to be designed specifically for persons of color. Furthermore, physicians need to consistently educate patients with darker skin, so they are aware of the damage that can be caused from sun exposure (Jackson, 2009).

In one study, people with ethnic skin were surveyed regarding their perceptions of skin cancer and their sun protection behaviors. Of the 100 people surveyed, 65 explained that they did not believe they were at any risk of skin cancer. Seven out of twenty-two participants with children younger than the age of twelve claimed they did not use any sunscreen on their children when their children participated in outdoor recreational activities (Kim et al., 2009). This demonstrates how the misconception that darker skin eliminates the risk of skin cancer continues from parent to child.

In 2009, researchers conducted an analysis of a health survey administered among African Americans to illustrate sun protection behaviors. Of the 2,187 people surveyed, only 31% participated in at least one sun protection behavior. Furthermore, applying sunscreen was the least practiced of all sun protection behaviors with 63% of participants reporting not using sunscreen. Those African Americans that were more sun-sensitive with lighter skin were the most likely to practice sun protective behaviors like wearing sunscreen, wearing sunglasses, and wearing a wide-brim hat. This evidence points to those with darker skin perceiving they have little to no risk of developing skin cancer (Pichon, Corral, Landrine, Mayer, & Norman, 2010).

Socioeconomic Status (SES).

Hausauer et al. (2011) performed a study with a population of Non-Hispanic White females aged 15 to 39 years to see if SES could be correlated with melanoma risk. The study used U.S. Census Bureau data as well as the California Cancer Registry to compare the national trend of increasing melanoma rates. After statistical analyses, the researchers found that the relationship between SES and melanoma risk was statistically significant for the upper two SES quintiles. Socioeconomic status was measured with the following variables: average educational attainment, median annual household income, percentage living 200% below the federal poverty level, percentage of blue-collar workers, percentage of workforce older than 16 years and unemployed, median monthly rent, and median house value. For some of the most affluent people, melanoma was a serious risk. There are several reasons why this could be true for more affluent groups of people. First, this group of people most likely has more disposable income for activities that warrant sun exposure. Activities could include vacations to beaches, recreational activities like boating, or artificial sun exposure through tanning beds (Hausauer et al., 2011). Women in this same age group are the most frequent indoor tanners (Heckman,

Coups, & Manne, 2008). Also, this group may have more access to tanning beds via the neighborhood in which they live. Finally, affluent groups tend to have more free time to participate in leisure activities like vacationing and using tanning beds (Hausauer et al., 2011).

While SES is commonly measured with income-related variables, many studies analyze SES using educational attainment. In a 1995/1996 study of a sample of AARP members, education and cancer risk were analyzed. Education was discussed as an indicator of SES, and the researchers wanted to find out if educational attainment was correlated with cancer risk. The researchers mailed out questionnaires, asking respondents about a variety of cancers, including melanomas of the skin. After analysis, a positive correlation between melanomas of the skin and higher educational attainment was noted. Therefore, participants in this study who had post graduate degrees were more likely to currently have or previously had melanoma than those participants who had less than a high school education. This same study highlighted that this relationship is not the same for all cancers. Only melanoma of the skin or cancers of the breast, prostate, and endometrium were positively associated with educational attainment (Mouw et al., 2008).

Similarly, Asgari et al. (2010) found a positive correlation between educational attainment and risk of cutaneous SCC in women who had completed some education beyond high school. This same result could not be substantiated for men. Within the same nested case-control study, researchers analyzed the relationship between marital status, another SES indicator, and cutaneous SCC risk. Women who were currently married or who had ever been married were at a higher risk for cutaneous SCC (Asgari, Efird, Warton, & Friedman, 2010).

In another study analyzing SES, using measures of employment, household income, education, and poverty percentages, researchers found that the survival from melanoma

is significantly associated with SES. Therefore, those living in low SES communities had poorer survival rates. Whites living in high SES areas had the greatest survival rates from 89.0 to 91.9 as income increased while Non-Whites had poorer survival rates from 77.6 to 90.1 as income increased (Reyes-Ortiz, Goodwin, Freeman, & Kuo, 2006). Since a recent study suggested higher SES neighborhoods experience higher rates of skin cancer in California, analyzing nationally representative surveillance data may determine if this statistically significant pattern is observed on a larger scale (Hausauer et al., 2011).

UV Exposure.

UV exposure, either natural or artificial, is one of the main causes of skin cancer. Researchers Gallagher, Spinelli, and Lee (2005) conducted a systematic review and meta-analysis of various studies to uncover any potential associations between sunbeds, sun lamps, and cutaneous melanoma. After reviewing ten published studies, a positive correlation was found between UV exposure via tanning beds and/or sun lamps and cutaneous melanoma with an overall odds ratio (OR) of 1.25 (95% CI, 1.05-1.49). This study also highlighted the change over time in the UV exposures from various tanning methods. For example, many modern tanning beds expose the user to Ultraviolet A emissions while sunbeds and sun lamps prior to the early 1980s primarily emitted UVB and Ultraviolet C. However, there is not a great deal of evidence indicating that one type of UV emission is any less harmful than the other (Gallagher, Spinelli, & Lee, 2005).

In another study regarding artificial UV exposure, researchers using 2005 National Health Interview Survey data discovered just over 20% of 18 – 29 year olds indoor tanned. The prevalence was 13.6% for those individuals 40 – 49 years of age. Some of the traits of those who indoor tanned included living in the Northeastern or Midwestern U.S., being

female, being Caucasian, having a higher level of education, visiting a physician in the past year, and having a higher perceived cancer risk. These correlates include race, gender, skin cancer perceptions, geographical location, and SES indicators. While indoor tanning was less common in this study among older adults, those respondents aged 50 – 64 years were more likely to have had serious sunburns in the past year as well as not engaging in sun protective behaviors, like sunscreen use, seeking shade, and wearing protective clothing. Indoor tanners were also more likely to visit a physician, so sun exposure education could be an important future implementation in this setting (Heckman et al., 2008).

Most UV exposure occurs from outdoor tanning and exposure to the sun. In the last year, over one-third of the U.S. population had at least one sunburn (CDC, 2011). When the skin burns and/or tans, the skin cells are reacting to being injured by producing additional pigment. This damage can sometimes initiate the development of skin cancer. Three sun protective behaviors are encouraged to prevent sunburns: wearing sunblock, wearing sun-protective clothing, and seeking shade from the sun and/or limiting outdoor activities during the most sun-intensive times of the day. However, most adults do not practice regular sun protective behaviors. The CDC estimates that only about 30% of adults use sunblock when preparing for sun exposure (CDC, 2011).

In a study of mountain guides from Austria, Germany, and Switzerland, researchers found a significant correlation between UV exposure and the prevalence of precancerous lesions and skin cancer. These mountain guides comprise a unique group of occupationally exposed people who are in great need of primary and secondary skin cancer prevention efforts. In the U.S., the same principle could be applied to workers who spend much of their days outdoors, like construction workers, highway workers, etc. For the European

mountain guides, BCCs occurred more often than for those in the control group of the study (7.1% compared with 0%). The only statistically significant risk factor for skin cancer produced by this study was the number of sunburns in a lifetime (Lichte et al., 2010).

Personal/Family History.

Personal/family history is another risk factor for skin cancer. Those with first-degree relatives that have had melanoma are considered at risk for skin cancer (Coups, Manne, & Heckman, 2008). Close to 10% of all those with melanoma have a family history of skin cancer. Similarly, if a person has had melanoma previously, they are more likely to develop melanoma again (Skin Cancer Foundation, 2011).

A meta-analysis, performed by Marcil and Stern in 2000, assessed 17 studies that identified the three year risk associated with a new NMSC for patients that had a NMSC previously. In this analysis, the three year risks ranged from 1% to 70%, a highly variable spectrum. Therefore, the authors separated results further into three year risks for BCC and SCC as well as those studies which did not specify the type of NMSC. The researchers found the risk of developing SCC after previously having SCC was less than 25%, and the mean risk of developing BCC after previously having BCC was 44%. The total risk for BCC ranged from 33% to 70% due to studies that contained a large number of patients who had previously had two or more BCCs, potentially making them at higher risk for developing BCC again. The mean risk of developing NMSC after having NMSC previously was 47%. Those people who previously had between 3 and 9 NMSCs had a 93% risk of developing another NMSC. This meta-analysis illustrated the risk of skin cancer associated with a personal history of skin cancer and how personal history can be a useful predictor (Marcil & Stern, 2000).

In addition to personal history, familial history of skin cancer is associated with risk of developing skin cancer. In a retrospective study, researchers examined familial risk of skin cancer amongst children and their mothers. The study, performed with information from 1989 to 1999, used respondent data from the Growing Up Today Study (GUTS). Those children included in the GUTS study each had a mother who had participated in the Nurses Health Study II. Of the 9943 children who participated, 783 participants' mothers reported a family history of skin cancer. Nearly five hundred participants' mothers reported having a skin cancer diagnosis themselves. This study noted that those offspring who had a family member with the disease were at a greater risk of developing the disease themselves. Additionally, this study examined the sun protection behaviors of these same groups and found that those families with a risk of skin cancer did not perform sun protection behaviors any more than families that reported no familial risk of skin cancer (Geller, Brooks, Colditz, Koh, & Frazier, 2006).

2c. Summary

Studies have indicated that age, race/ethnicity, SES, UV exposure, and personal/family history are associated with skin cancer risk. Research has shown that age and SES are negatively associated with skin cancer prevalence. This study will examine the associations between age, race/ethnicity, SES, UV exposure, and skin cancer to determine if skin cancer prevalence is associated with the following characteristics: younger people, White race/ethnicity, and higher SES.

2d. Hypotheses

Based upon the review of scientific literature surrounding skin cancer and sociodemographic risks, the following hypotheses were developed for this study.

Null Hypothesis #1: Skin cancer is not associated with increasing age in HINTS 2005 sample.

Alternate Hypothesis #1: Skin cancer is associated with increasing age in HINTS 2005 sample.

Null Hypothesis #2: Skin cancer is not associated with White race/ethnicity in HINTS 2005 sample.

Alternate Hypothesis #2: Skin cancer is associated with White race/ethnicity in HINTS 2005 sample.

Null Hypothesis #3: Skin cancer is not associated with more education in HINTS 2005 sample.

Alternate Hypothesis #3: Skin cancer is associated with more education in HINTS 2005 sample.

Null Hypothesis #4: Skin cancer is not associated with increased household income in HINTS 2005 sample.

Alternate Hypothesis #4: Skin cancer is associated with increased household income in HINTS 2005 sample.

Null Hypothesis #5: Skin cancer is not associated with working employment status in HINTS 2005 sample.

Alternate Hypothesis #5: Skin cancer is associated with working employment status in HINTS 2005 sample.

Null Hypothesis #6: Skin cancer is not associated with marital status in HINTS 2005 sample.

Alternate Hypothesis #6: Skin cancer is associated with marital status in HINTS 2005 sample.

Chapter 3 will focus on the methodology used to answer the study research questions and test the hypotheses.

Chapter III
METHODOLOGY

3a. Data Sources and Population

The 2005 Health Information National Trends Survey (HINTS) data was examined in this study. The NCI collects HINTS data every two years. The data is intended for the study of the American public's use of cancer related information. This survey also has special sections on cancer prevention and control. The 2005 data was gathered via telephone interviews, and the phone numbers were generated using a random-digit-dial (RDD) sample frame. A Computer Assisted Telephone Interview (CATI) format was used with the RDD sample frame to assist with skip patterns to generate a variety of household representatives. In addition to the RDD sample frame, the survey was list-assisted, meaning the list of numbers was generated from a group of U.S. telephone numbers in telephone exchanges. One residential number was selected from groupings of 100 telephone numbers until a nationally representative sample of 5,586 respondents was obtained. This survey is a unique surveillance tool because the comprehensive survey specifically covers health communication and information perceptions as well as key issues of health among American adults (NCI, n.d.).

Self-reported skin cancer status was determined by two questions asked during the phone interview. First, participants were asked *Have you ever been diagnosed as having cancer?* Second, the participants were asked to classify their type of cancer if they answered *Yes* to the first question. If the participant responded with melanoma or other type of skin cancer,

they were included in the study. The prevalence rate of self-reported skin cancer was determined in this study from the 3,804 respondents who answered the cancer diagnosis classification question.

3b. Study Measures

The study measures that were considered in this study included age, race/ethnicity, education, annual household income, employment status, and marital status. Any case that had missing data for the key variables in this study was excluded from analysis. The variables used in this study are illustrated in Table 1.

Table 1. Dependent and Independent Variables

Dependent Variable	Independent Variables
Skin Cancer	Age
	Race/Ethnicity
	Educational Attainment
	Annual Household Income
	Employment Status
	Marital Status

Age.

Age was reported as a whole number in years at the time of the phone interview. Age was then classified into three different categories based on the recommended 2010 Census reporting standards. The three categories included 18 – 44 years, 45 – 64 years, and 65 years and above (U.S. Census Bureau, 2010).

Race/Ethnicity.

Race/Ethnicity was categorized into three groups: Hispanic, Non-Hispanic White, and Non-Hispanic Black. Statistical results for the other Multiracial group are not discussed as there is wide variation within this group and it cannot be meaningfully interpreted. The other Multiracial group included Asian, American Indian, Alaskan Native, Native Hawaiian, Pacific Islander, and those who considered themselves Multiracial.

SES.

SES was assessed by educational attainment, annual household income, employment status, and marital status. Educational level was self-reported and was categorized into four groups: Less than high school, High School Graduate /GED or equivalent, Some College/ Vocational or Trade School/Associate Degree, and College Graduate or higher. These categories were based on the 2010 Census Bureau reporting standards (U.S. Census Bureau, 2010). Household income was categorized into the following groups: less than $25,000, $25,000 to <$35,000, $35,000 to <$50,000, $50,000 to <$75,000, and greater than or equal to $75,000. Employment status was categorized into five groups as collected by HINTS: Employed, Unemployed, Student, Retired, and Disabled. Marital status was broken into three categories: Married/In a Relationship, Previously Married, and Never Married. Married/In a Relationship included those who responded as married and those living with a partner. Previously Married included those who responded as Divorced, Widowed, or Separated.

3c. Statistical Analysis

The Statistical Package for the Social Sciences (SPSS)^{R} version 19.0 was used to recode, organize, and analyze the data from HINTS 2005 to make it suitable for the study. Frequency tables were created to determine the representation of the demographic variables such as age and race within the study population. Similarly, a frequency table was created for self-reported skin cancer status and the SES indicators identified in the study. Univariate and multivariate logistic regression analyses were performed to estimate the risk factors that were associated with skin cancer. Skin cancer (coded as 0 for normal and 1 for skin cancer) was the dependent variable in the models. The independent variables were age, race/ethnicity, educational attainment, annual household income, employment status, and marital status. Throughout all the analyses performed, a p-value of 0.05 and a confidence interval of 95% were used to determine any statistical significance.

Chapter IV
RESULTS

Each research question will be addressed in detail in this chapter.

4a. Sample Demographics

Of the 5,586 respondents who completed the HINTS survey, 3,804 met the eligibility criteria for this study. The demographic characteristics of the included respondents are presented in Table 2. Over 40% of participants were between the ages of 18 and 44. About 80% of participants identified themselves as Non-Hispanic White while only 9.1% of the participants identified themselves as Non-Hispanic Black. 32.7% of the participants had an educational attainment of a college degree or higher. Just over 26% of the sample made below $25,000, and the same percentage of the sample also made over $75,000 annually. Over half of the sample participants were employed (57%). Greater than half of the participants reported never being married while 26.9% of participants had been previously married.

Table 2. Demographic Characteristics of HINTS 2005 Skin Cancer Respondents Sample (n=3804)

Variables	N	%
Age		
18 – 44	1533	40.3
45 – 64	1416	37.2
65+	855	22.5
Race/Ethnicity		
Hispanic	401	10.5
Non-Hispanic White	3058	80.4
Non-Hispanic Black or African American	345	9.1
Education		
Less than High School	454	11.9
High School Graduate/ GED or equivalent	1012	26.6
Some College/Vocational or Trade School Graduate/Associate Degree	1095	28.8
College Graduate or Higher	1243	32.7
Household Income		
< $25K	1007	26.5
$25K to < $35K	466	12.3
$35K to < $50K	544	14.3
$50K to < $75K	783	20.6
> $75K	1004	26.4
Employment Status		
Unemployed	532	14.0
Disabled	221	5.8
Retired	786	20.7
Student	95	2.5
Employed	2170	57.0
Marital Status		
Never Been Married	2227	58.5
Previously Married	1024	26.9
Married/Living with a Partner	553	14.5

4b. Skin Cancer Prevention Behaviors

It is important to note the participants' skin cancer prevention behaviors and perceptions as these have bearing on the future health outcomes of the participants in regard to skin cancer. Table 3 illustrates participants' skin cancer prevention behaviors on sunny days. All respondents indicated have been diagnosed with skin cancer previously, so prevention behaviors should be an important priority for this group.

Table 3. Participant Skin Cancer Prevention Behaviors on Sunny Days for Those with Previous Skin Cancer Diagnosis (n=226)

Behavior	N	%
Wear Sunscreen		
Always	66	29.2
Often	45	19.9
Sometimes	40	17.7
Rarely	35	15.5
Never	30	13.3
Stay in the Shade*		
Always	33	15.3
Often	88	40.7
Sometimes	75	34.7
Rarely	14	6.5
Never	6	2.8
Wear a Hat*		
Always	42	19.4
Often	51	23.6
Sometimes	48	22.2
Rarely	20	9.3
Never	55	25.5
Wear Long-Sleeved Shirt*		
Always	22	10.2
Often	43	19.9
Sometimes	50	23.1
Rarely	51	23.6
Never	50	23.1
Wear Long Pants*		
Always	60	27.8
Often	54	25.0
Sometimes	54	25.0
Rarely	26	12.0
Never	22	10.2

*10 respondents did not answer the specified sun protection behavior questions.

29.2% of respondents always wore sunscreen on sunny days while only 15.3% of respondents always sought shade on sunny days. Less than 20% of participants always wore a hat on sunny days to cover their face, ears, and neck. Only 10.2% of respondents always wore long-sleeved shirts on sunny days, and a little over one quarter of those sampled always wore long pants on sunny days.

4c. Skin Cancer and Demographic Association

Skin cancer prevalence increased significantly with age (χ_2 (2) = 171.5, p<.001). Participants aged 65 and older experienced the highest skin cancer prevalence at 54.4%. Those participants aged 45 to 64 had the next highest skin cancer prevalence at 37.6%, leaving those aged 18 to 44 with only an 8% skin cancer prevalence. Skin cancer prevalence was significantly associated with Non-Hispanic White race/ethnicity (χ_2 (2) = 35.2, p<.001). Non-Hispanic Whites had the highest skin cancer prevalence at 95.6% while Hispanics and Non-Hispanic Blacks both had prevalence rates below 3%. Complete results are illustrated in Table 4.

Table 4. Skin Cancer Prevalence by Demographic Variables (n=226)

Variables	% with Skin Cancer	p-value
Age		
18 – 44	8.0	
45 – 64	37.6	<.001
65 and older	54.4	
Race/Ethnicity		
Hispanic	2.7	
Non-Hispanic White	95.6	<.001
Non-Hispanic Black	1.8	

4d. Skin Cancer and Socioeconomic Status Associations

Skin cancer prevalence significantly increased with educational attainment (χ_2 (3) = 7.94, p=.047). Those participants that had at least a Bachelor's degree or higher had the highest skin cancer prevalence at 36.3%. However, those that had some college had only slightly lower skin cancer prevalence at 32.3%. Skin cancer prevalence was highest among those respondents that made over $75,000 a year. The next highest skin cancer prevalence (26.1%) was within the group that made less than $25,000. The difference in annual household income groups was not statistically significant. Those respondents that stated they were retired had the highest skin cancer prevalence at 50.4%. Employment status was statistically significant (χ_2 (4) = 134.1,

p<.001). Finally, skin cancer prevalence was statistically significant for those respondents that had never been married (χ_2 (2) = 27.6, p<.001), and the prevalence decreased for those who had been previously married or who were currently married. Complete results are illustrated in Table 5.

Table 5. Skin Cancer Prevalence by SES (n=226)

Variables	% with Skin Cancer	p-value
Education		
Less than High School	6.6	
High School Graduate/ GED or equivalent	24.8	.047
Some College	32.3	
College Graduate or Higher	36.3	
Household Income		
< $25K	26.1	
$25K to < $35K	11.9	
$35K to < $50K	13.7	.996
$50K to < $75K	20.8	
> $75K	27.4	
Employment Status		
Unemployed	11.5	
Disabled	5.3	
Retired	50.4	<.001
Student	0.4	
Employed	32.3	
Marital Status		
Never Been Married	56.6	
Previously Married	38.5	<.001
Married	4.9	

The results of the univariate analysis of the association between each of the examined independent variables and skin cancer are shown in Table 6. An increase in age was associated with an increased odds of developing skin cancer. This association was also statistically significant. Only Non-Hispanic White under race/ethnicity demonstrated statistical significance with high odds of skin cancer at 6.479 with a 95% confidence interval (CI) of 2.395

– 17.531. Having more education indicated greater odds of skin cancer, and it was also statistically significant. Under employment status, being retired was the only factor with any statistical significance as a predictor. Marital status was statistically significant with being previously married indicating a higher odds for skin cancer. Overall, annual household income was the only variable that indicated no statistical significance. A multivariate logistic regression was performed to ensure the variables were independent of other covariates.

Table 6. Univariate Analyses of Sociodemographic Factors and Skin Cancer (n=3804)

Variables	OR	95% CI	p-value
Age			
18 – 44	.071	.043 – .117	<.001
45 – 64	.380	.284 – .508	<.001
65 and older	Referent		
Race/Ethnicity			
Hispanic	1.295	.362 – 4.627	.691
Non-Hispanic White	6.479	2.395 – 17.531	<.001
Non-Hispanic Black	Referent		
Education			
Less than High School	Referent		
High School Graduate/ GED or equivalent	1.714	.959 – 3.065	.069
Some College	2.090	1.186 – 3.685	.011
College Graduate or Higher	2.067	1.179 – 3.623	.011
Household Income			
< $25K	Referent		
$25K to < $35K	.946	.655 – 1.366	.766
$35K to < $50K	.934	.586 – 1.489	.776
$50K to < $75K	.918	.589 – 1.432	.706
> $75K	.970	.656 – 1.435	.880
Employment Status			
Unemployed	Referent		
Disabled	1.117	.553 – 2.256	.757
Retired	3.302	2.124 – 5.133	<.001
Student	.207	.028 – 1.544	.125
Employed	.677	.429 – 1.071	.096
Marital Status			
Never Been Married	Referent		
Previously Married	4.575	2.422 – 8.642	<.001
Married	3.005	1.612 – 5.602	.001

Table 7 illustrates the multivariate analyses, and only age exhibited overall significance for skin cancer controlling for the other five variables. However, Non-Hispanic White race/ethnicity, some college, college graduate or higher, greater than $75,000 annual household income, and being employed were statistically significant factors with P values below .05. Factors associated with higher odds of skin cancer included Non-Hispanic White race/ethnicity, higher educational attainment, higher annual household income, being retired, and being previously married. It was found that higher educational attainment, higher annual household income, and increased age were all associated with increased likelihood of skin cancer, controlling for race/ethnicity, employment status, and marital status.

Table 7. Multivariate Analyses of Sociodemographic Factors and Skin Cancer (n=3804)

Variables	OR	95% CI	p-value
Age			
18 – 44	.108	.059 – .199	<.001
45 – 64	.464	.313 – .687	<.001
65 and older	Referent		
Race/Ethnicity			
Hispanic	2.699	.720 – 9.671	.134
Non-Hispanic White	5.046	1.839 – 13.848	.002
Non-Hispanic Black	Referent		
Education			
Less than High School	Referent		
High School Graduate/ GED or equivalent	1.524	.827 – 2.810	.177
Some College	2.175	1.178 – 4.017	.013
College Graduate or Higher	2.126	1.124 – 4.020	.020
Household Income			
< $25K	Referent		
$25K to < $35K	.942	.569 – 1.557	.814
$35K to < $50K	1.052	.637 – 1.738	.843
$50K to < $75K	1.418	.873 – 2.303	.159
> $75K	1.755	1.049 – 2.937	.032
Employment Status			
Unemployed	Referent		
Disabled	1.387	.652 – 2.949	.395
Retired	1.407	.866 – 2.287	.168
Student	.585	.074 – 4.604	.611
Employed	.642	.394 – 1.047	.076
Marital Status			
Never Been Married	Referent		
Previously Married	1.497	.761 – 2.943	.242
Married	1.423	.733 – 2.763	.297

Chapter V
DISCUSSION AND CONCLUSION

5a. Discussion

With properly targeted interventions and education, skin cancer may easily be prevented. For example, Australia has taken action against skin cancer, launching numerous prevention campaigns since the 1980s. The country's most notable campaign was *Slip! Slop! Slap!* The media campaign used this catchy phrase as well as a jingle to encourage citizens to slip on sun protective clothing, slop on sunscreen, and slap on a hat wide enough to shield the face, neck and ears from the sun. The current campaign has been modified to include *Slip! Slop! Slap! Seek! and Slide* where seeking shade and sliding on protective eyewear have been added to the recommended sun protection behaviors (SunSmart, 2011).

There have been studies that look at various SES indicators and the relationship to the occurrence of skin cancer; however, most of these studies only examine one SES indicator rather than a compilation of variables. Studies examining SES and skin cancer tended to be older, conducted in the 80's, 90's, and early 2000's. New analyses are needed to document trends in our ever-changing society. Additionally, new information regarding the increased prevalence of skin cancer amongst young, high SES groups has surfaced, and this group is at a great risk.

The purpose of this study was to find the risk factors that may be associated with skin cancer using HINTS 2005 data. The Health Information National Trends Survey is a unique surveillance tool because the comprehensive survey tool specifically covers health

communication and information perceptions as well as key issues of health among American adults. This study used self-reported measures to determine skin cancer prevalence that were collected from the HINTS questionnaire. This dataset has special sections on cancer prevention and control, which makes it ideal for inclusion in this study.

The main research question of this study was if SES could be a good predictor for risk of developing skin cancer. Age consistently expressed itself as a variable strongly associated with skin cancer. As age increased, the association with skin cancer also increased. Therefore, the null hypothesis associated with age was rejected. The peak prevalence of skin cancer for this study was at 65 and older. This finding did not match the information presented by Hausauer et al. (2011), which indicated younger people developed skin cancer at higher rates. Since this study indicates older generations suffer from the greatest skin cancer burden, it stresses the importance of sun protection behaviors not only during youth but also well into the elder years. Engaging in at least one sun protection behavior could greatly reduce the risk of developing skin cancer.

In this study, Non-Hispanic Whites were associated with greater odds of having skin cancer as compared to Non-Hispanic Blacks and Hispanics. This finding is consistent with the research regarding the biological advantages of ethnic skin, noted by Halder, Bridgeman, & Shah (1995). For the univariate and the multivariate analyses, being Hispanic was a protective factor as compared with Non-Hispanic Whites. This was most likely due to the darker skin that most Hispanics possess, so Hispanic skin has larger melanocytes to better filter UVB radiation (Halder, Bridgeman, & Shah, 1995). The null hypothesis associated with race/ethnicity was rejected as Non-Hispanic White race/ethnicity is associated with skin cancer.

This study examined educational attainment, annual household income, employment status, and marital status as indicators of SES. This study detected a statistically significant association between skin cancer and educational attainment, leading to a rejection of the null hypothesis. This association is consistent with the work of Mouw et al. (2008). In the 2008 study, Mouw et al. (2008) also noted a positive correlation between melanoma and education.

For annual household income, this study found in the multivariate analysis that annual household income greater than $75,000 was statistically significantly associated with skin cancer, and this group also had the highest likelihood for having skin cancer. Therefore, the null hypothesis was rejected. Researchers indicated that higher income was associated with greater skin cancer risk in the study performed by Hausauer et al. (2011). It was suggested that those with higher income experience greater rates of skin cancer because this group has more disposable income and leisure time to participate in sun-intensive activities like boating, vacationing at the beach, and indoor tanning (Hausauer et al., 2011).

In the univariate analysis for employment status, being retired had the greatest OR (3.302; 95% CI = 2.124 to 5.133) and was also statistically significant. However, when the multivariate analysis was performed, being employed was the strongest predictor for skin cancer, controlling for age, race/ethnicity, education, annual household income, and marital status, yet the association was not significant. This led to support of the null hypothesis and rejection of the alternative hypothesis. Many elderly are included in the retired employment status group, and the aging tend to have high rates of skin cancer. This could explain the high odds in the univariate analysis. The multivariate analysis result is supported further by work of Hausauer et al. (2011),

linking high SES to risk of skin cancer. Since being employed is associated with income, those who are employed are most likely not in the lowest scale of earners.

The final SES indicator examined in this study was marital status. Being married previously was associated with a greater likelihood of skin cancer in the univariate analysis, but the same result was not reached after controlling for the other variables in this study. Therefore, the null hypothesis was supported, and the alternative hypothesis was rejected. This was not consistent with the findings of Asgari et al. (2010), which suggested that being previously married or currently married were associated with a statistically significant greater risk of skin cancer.

5b. Limitations of the Study

This study is limiting because this dataset is secondary data that is primarily based on self-reported information from participants. While the sample is large and representative, there is still a possibility that participants may be miscategorized based on their own omission or based on the part of the interviewer. Recall bias may be present in regards to categories of cancer diagnosis and sun protection behaviors. Recalling a diagnosis that occurred ten years ago or recalling a sun protection behavior that occurred six months ago could be an issue. Participants also could have simply given an incorrect response to the interviewer since these surveys were done via telephone. There is no way to know if all of the responses are entirely accurate. Furthermore, while the data seems overall nationally representative, when it was broken down into skin cancer-only diagnoses, the sample contained very few cases from minority races and ethnicities. This group is not expected to have overwhelming rates of skin cancer diagnosis, but the numbers represented here are very low, especially for meaningful analysis.

Finally, this study did not address smoking as a risk factor or any other potential chemical carcinogens. Family history and personal history were also not addressed statistically to see if these proved to be significant predictors for skin cancer in this study. The addition of other potential contributors to the burden of skin cancer could help develop additional insight into intervention and prevention strategies.

5c. Recommendations

Future research on the association of higher SES groups and skin cancer is needed using robust datasets. Since data is just now emerging on the prevalence of skin cancer within high SES groups, it is important to replicate these studies to determine the best ways to target interventions. Designing an intervention to target a high SES group could be challenging since this group has the means to be healthy yet chooses to disregard sun protection practices. Furthermore, studies should be established to pilot and evaluate interventions for high SES groups to prevent the development of skin cancer. This is important especially considering that those people in this study who had a cancer diagnosis *still* did not participate in sun protection behaviors. Health and wellness should not be a topic of desensitization or complacency.

Additionally, this study garners theoretical based follow up, particularly with regard to the Health Belief Model (HBM). The HBM is widely used to describe and predict health behaviors; however, skin cancer appears to be an anomaly with regard to the HBM. In this study, those who perceived a risk did not change their behaviors, especially for the sun protection behaviors of their children. This deserves further study and research, since the tenets of the HBM are met for the parent-child relationships for skin cancer (ETR Associates, 2009).

5d. Conclusion

This study is important because it suggests SES may be used to identify groups at risk for skin cancer, supporting other studies linking high SES to a higher burden of skin cancer development. Establishing successful interventions for this group poses a challenge to public health workers. This group has the money to invest in sun protection items like sunscreen and clothing, yet they choose to expose their bodies to harmful UV rays. Similarly, this group has the education and knowledge regarding healthy sun protection behaviors, and they are still developing skin cancer at higher rates. While behavior modification in regard to sun protection practices can be difficult, the consequences can be fatal. Unique interventions that cause behavior modification must be implemented and evaluated for success before the mortality rates also begin to climb. Furthermore, educating others on the warning signs is important. Providing visual illustrations of potentially problematic skin conditions could be helpful for people to know when to see a physician for screening. It is important that physicians and other skin care professionals utilize their time and skills to educate others about skin protection practices, stressing the importance of future consequences in relation to health.

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