A Comparison of Skin Cancer Knowledge, Attitude, and Protective Behavior in African American Students in East and West Coasts

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Abstract

Purpose and Background: African Americans, in comparison to other ethnic groups, are often diagnosed with melanoma at advanced stages, resulting in low survival rates. One of the strongest risk factors for all types of skin cancer is exposure to UV radiation from the sun. UV ray intensity is associated with latitude; lower latitudes have stronger UV rays than higher latitudes. This study examines and compares the knowledge, attitude, and protective behavior toward skin cancer among United States African American college students who live in two different latitudes, Maryland and southern California. **Methods**: We surveyed 360 African American students from two major universities in southern California and Maryland. Students were asked to fill out questionnaires that assessed their knowledge, attitude, and protective behavior regarding sun exposure. **Results**: More African American students from Maryland knew the direct link between UV/sun radiation exposure and the occurrence of skin cancer (p = 0.02), while those from California were significantly more knowledgeable about skin cancer risk factors such as sunbathing without sunscreen ($p \leq 0.001$). Although students from Maryland were more concerned that exposure to the sun may give them skin cancer (p = 0.003) and more worried about the possibility of skin cancer ($p < 0.001$), they were less likely to engage in sun protection behaviors such as using sunscreen (p = 0.001). **Conclusion**: Based on this study, efforts to increase sun protective behaviors through education regarding skin cancer risk factors in Maryland are warranted.

Keywords: Skin cancer, African Americans, Melanoma, Knowledge, Attitude, Protective Behaviors

Introduction

Skin Cancer and African Americans – Health Disparities

African Americans perceive themselves to be at low risk of melanoma because they have high levels of melanin, a dark pigment that absorbs ultraviolet (UV) radiation (Pichon, Corral, Landrine, Mayer, & Adams-Simms, 2010; Halder & Bridgeman-Shah, 1995; Nadiminti, Rakkhit, & Washington, 2004). Although melanin is a major protective physiological barrier in skin damage due to UV radiation, it does not prevent skin cancer (Halder & Bridgeman-Shah, 1995). Research shows that every skin type, regardless of pigment, is susceptible to skin cancer (Beech, Harb, & Reed, 2004; Jackson, 2010). Even in people with darker skin, like African Americans, recent exposure to the sun increases epidermal melanin, which indicates UV damage to the skin (CDC, 2010a).

Unfortunately, skin cancer health disparities exist in the United States. Minority groups, particularly non-Hispanic black or African Americans, experience skin cancer disproportionately, especially with regards to prognosis (Coups, Manne, & Heckman, 2008; Hu, Parker, Thomas, & Kirsner, 2004; Shoo & Kashani-Sabet, 2009; Wich et al., 2010). Although Caucasians are more likely to be diagnosed with melanoma (27.3/100,000) than African Americans (1.1/100,000), African Americans are more likely to die from the disease (CDC, 2010b); Caucasians have 84.8% survival rate, compared to 58.8% among African Americans (Rouhani, Hu, & Kirsner, 2008). Furthermore, African Americans receive lower rates of routine skin cancer screening compared

to Caucasians (49% and 57%, respectively) (Health Reform, 2011). This discrepancy is thought to be the result of several factors: the lack of healthcare insurance; lack of primary care providers for regular check-ups; poor communication with primary care providers, which limits access to preventive care and increases the rates of re-hospitalization; low skin cancer awareness levels; and lack of access to sunscreen products in African American communities (Health Reform, 2011)

Skin Cancer in African American Skin

The symptoms and types of skin cancers that are often present in African Americans are different from the commonly identified skin cancers in other racial groups (Beech, Harb, & Reed, 2004; Dollemore, 2004; Shoo & Kashani-Sabet, 2009). In African Americans, skin cancer often occurs in less pigmented areas (Gloster & Neal, 2006), for instance, the palm of the hands, the skin beneath finger and toe nails, the soles of feet, the mucous membranes of the mouth, and the nasal passages (Beech, Harb, & Reed, 2004; Hutcheson, McGowan, Maize, & Cook, 2007). The annual skin cancer incidence rate in African Americans in the United States is 1/100,000 for melanoma (Gloster & Neal, 2006; Skin Cancer Foundation, 2010). Melanoma occurrence in African Americans is linked with sun exposure (Pichon, 2009; Shoo & Kashani-Sabet, 2009; Yamaguchi, Beer, & Hearing, 2007). About 65% of all melanoma cases are attributed to UV radiation from the sun (Skin Cancer Foundation, 2010).

Skin Cancer Rates in Two Regions with Variable Sun Intensities: California and Maryland

Geographic variability in sun intensity is a major contributing factor to the occurrence of skin cancer in different regions of the United States (Cicarma et al., 2009; Hu, Parker, Thomas, & Kirsner, 2004). Sun rays closest to the equator are more intense than sun rays in places further from the equator, and UV indices vary significantly between northern and southern states in the United States (Qureshi, Laden, Colditz, & Hunter, 2008). For example, California, especially southern California, is exposed to more intense sunlight and UV rays compared to Maryland (Qureshi, Laden, Colditz, & Hunter, 2008). California's latitude ranges from 32° 30' N to 42° 0' N; the latitudes of Los Angeles and San Francisco County are 34° 03' N and 37° 46' N, respectively (World Atlas, 2013). In comparison, Maryland's latitude ranges from 37° 53' N to 39° 43' N; the latitude of Baltimore city is 39° 17' N (World Atlas, 2013). The discrepancy in latitudes between these two states has a direct impact on the amount of UV rays dispersed in these regions. In 2012, Los Angeles, San Francisco, and Baltimore experienced 171, 139, and 127 days, respectively, that had "very high" and "extreme" UV indexes (The National Oceanic and Atmospheric Administration [NOAA], 2013). According to WHO, the annual average UV index for Los Angeles is 6.33, but New York (40° 43' N), which has similar latitude as Baltimore city, is only 4.92 (World Health Organization [WHO], 2013). Therefore, because of this difference in geographical latitude, it is safe to assume that southern Californians, in general, are more exposed to stronger UV rays compared to people living in Maryland.

The incidence rates for melanoma are surprisingly similar for Maryland and California. Both Maryland and California are in the same melanoma incidence rate interval of 19.2-21.5/100,000, and the same melanoma mortality rate interval of 2.6-2.8/100,000 (CDC, 2010c). Compared to the national melanoma incidence rates of 24/100,000 for men, California and Maryland incidence rates were 27.6/100,000 and 28.6/100,000, respectively. Similarly, for women, the national incidence rate was 15.1/100,000, compared to 16.1/100,000 and 16.6/100,000 in California and Maryland, respectively (CDC, 2010b).

Melanoma incidence rates among African Americans residing in California and Maryland are also similar. In 2007, California had an age-adjusted incidence rate for African Americans of 1.3/100,000 (CDC, 2010d). The age-adjusted melanoma incidence rate for African Americans was similar for Maryland (1.2/100,000 in 2007) (Maryland Department of Health and Mental Hygiene [MDHMH], 2010). Since our samples were taken from a university in southern

California, the closest estimate we have for melanoma rates are from Los Angeles County. According to National Cancer Institute (NCI) 2012 data, the incidence rate of melanoma among Blacks (including Hispanic blacks) is slightly lower in Los Angeles county (0.9/100,000, 95% confidence interval [0.6/100,000, 1.2/100,000]) than Maryland (1.0/100,000, 95% confidence interval [0.8/100,000, 1.3/100,000]) (National Cancer Institute, 2012). In sum, although Maryland receives much less intense UV radiation as compared to California, the melanoma incidence rates are similar to African Americans in California.

A review of the literature indicates there is a lack of research addressing sun protection behaviors among African Americans. To the best of our knowledge, no one has studied differences in attitudes, knowledge, and protective behaviors among African Americans who live in regions that receive different amounts of sun exposure. Therefore, the purpose of this study was to examine and compare the knowledge, attitude, and protective behavior toward skin cancer among United States African American college students living in areas with different sun intensities as measured by latitude. College age students were chosen for this study to control for education as a potential confounder. Furthermore, since skin cancer is directly linked to cumulative, lifetime sun exposure, a study of college age students, who, because of their young age, are still at low risk for skin cancer, maybe be an important group to target for future intervention studies.

Methods

Sample and Administration

The study sample was taken from African American college students who attended two large state universities in southern California and Maryland. Students were contacted through faculty who taught African American studies classes and through staff who advised African American campus student organizations. African American males and females, 18 years or older were eligible for the study. A cross-sectional study design was used to collect data from 180 students in each university. The questionnaires data was based on self-report and responses were anonymous. Eligibility requirements included being an African American of both sexes and a college student. One of the authors (C.M.) collected the data through visits to faculty/ staff approved classrooms, clubs, and service centers. The survey asked questions pertaining to knowledge of and attitudes towards skin cancer risk, in addition to practice of sun protection behaviors (Cheng et al., 2010; Cokkinides et al., 2001). All study protocols were reviewed and approved by Institutional Review Board at the academic institutions where data were collected.

Knowledge

Knowledge was assessed in these questions: “How important do you think the following are in increasing the risk of skin cancer?”, and the response options were 1 =sunbathing without sunscreen, 2 = sunbathing with sunscreen, 3 = fair skin with freckles that burns easily, 4 = getting sunburned as a child, 5 = getting sunburned as an adult, 6 = having a large number of moles, and 7 = using artificial sunlight (tanning beds). For these questions, the participants could rate them as “not important at all”, “somewhat important”, or “very important”. Knowledge was further assessed in this item: “What action should you take to reduce the risk of skin cancer?”, and the options were 1 = use sunscreen SPF below 15, 2 = use sunscreen 15+, 3 = stay in shade, 4 = cover exposed skin, and 5 = avoid sun during strongest reflection 10:00am – 3:00pm. Lastly, knowledge was measured in this item: “Exposure to sun/ultraviolet (UV) rays may cause skin cancer”, and the response options were on a Likert scale with 1 = strongly disagree to 5 = strongly agree.

Attitude

Attitude was measured with three items: “I am concerned that exposure to the sun/ultraviolet (UV) rays may give me skin cancer”, “The possibility of skin cancer worries me”, and “Getting skin cancer would severely affect my life”. The response options were on a Likert scale with 1 = strongly disagree to 5 = strongly agree.

Protective Behavior

Protective behavior was measured in three questions: "How often are you out in the sun?", and the response options were 1 = never, 2 = rarely, 3 = sometimes, 4 = often and 5 = always. The next question was "do you personally do anything to protect yourself from the sun?", and the response options were either "yes" or "no". The last item was: "What actions do you take to protect yourself from the sun?", and the actions listed were 1 = use sun screen, 2 = stay in the shade, 3 = cover up exposed skin, 4 = limit time in the sun and 5 = avoid midday sun (10:00am-3:00pm). The response options were "yes" or "no".

Statistical Analysis

The chi-square statistic was used to compare Southern California African American students with those from Maryland on the demographic variables and measures of knowledge, attitude, and protective sun behavior. Independent samples t-tests were used to compare the two student groups on means for composite variables on knowledge, attitude, and behavior. Binary logistic regression models were used to assess differences in sun protection behaviors for Maryland versus southern California while adjusting for known confounders. Data were analyzed using SPSS v.19. (SPSS Inc, Chicago, IL)

Results

Descriptive Analysis

A total of 360 African American students, 180 from a southern California university and 180 from a Maryland university, completed the surveys (Table 1). In general, more women participated in the survey compared to men (54.2%). There were slightly more female participants in California (59.4%) than Maryland (49.2%) (p = 0.057). These participants were almost equally distributed according to the skin types: 115 (32.4%) indicated having light dark skin that tans more than burns (31.1% in California and 32.8% in Maryland), 137 (38.6%) indicated a darker skin type which rarely burns but tans darkly (40.0% in California and 36.1% in Maryland), and 103 (29%) indicated having dark skin which never burns with dark even tans (28.3% in California and 28.9% in Maryland) (p = 0.81). Not all respondents answered every single question. The mean age of the participants was 23 years with a standard deviation of 4.7.

Table 1
Demographic Characteristics of the Sample, for California (CA) and Maryland (MD)

	CA	MD	Total and (%)	P-value
Sample (n)	180	180	360 (100%)	
Gender				
Male	73	90	163 (45.8%)	0.057
Female	106	87	193 (54.2%)	
Skin type				
Light dark, tans more than burns	56	59	115 (32.4%)	
Darker skin, rarely burns, tans darkly	72	65	137 (38.6%)	0.810
Dark skin, never burns, dark even tans	51	52	103 (29.0%)	

Location and Knowledge

There was a difference between locations on skin cancer knowledge. T-test on the composite knowledge variable showed that there was a statistically significant difference, assuming equal variance, between these two groups on knowledge on skin cancer ($p < 0.001$). African American students in southern California had significantly more procedural knowledge, such as risk factors of skin cancer and knowledge on protective behaviors, as compared to African American students in Maryland (Table 2). For example, students in California were more knowledgeable on risk factors for skin cancer, such as sunbathing without sunscreen ($p < 0.001$), fair skin with freckles ($p < 0.001$), and getting sunburned as an adult ($p < 0.001$); and they were more knowledgeable about protective behaviors that would reduce the risk of skin cancer, such as using sunscreen with SPF 15+ ($p < 0.001$), staying in the shade ($p < 0.001$), and avoiding sun's strongest reflection from 10am to 3pm ($p < 0.001$).

Table 2

Knowledge about Skin Cancer Risk Factors, by Geographic Region

		Sunbathing without sunscreen	Sunbathing with sunscreen	Fair skin with freckles	Getting sunburned as a child	Getting sunburned as an adult	Having a large number of moles	Using artificial sunlight
California *n* (%)	NI	27 (15.0)	39 (21.7)	30 (16.7)	36 (20.0)	25 (14.0)	45 (25.1)	33 (18.4)
	SI	34 (18.9)	91 (50.6)	50 (27.8)	58 (32.2)	64 (35.8)	58 (32.4)	34 (19.0)
	VI	119 (66.1)	50 (27.8)	100 (55.6)	86 (47.8)	90 (50.3)	76 (42.5)	112 (62.6)
Maryland *n* (%)	NI	83 (47.2)	39 (22.0)	53 (30.8)	51 (29.3)	34 (19.7)	43 (25.3)	44 (27.3)
	SI	39 (22.2)	109 (61.6)	59 (34.3)	52 (29.9)	87 (50.3)	71 (41.8)	37 (21.5)
	VI	54 (30.7)	29 (16.4)	60 (34.9)	71 (40.8)	52 (30.1)	56 (32.9)	88 (51.2)
	P-value	<0.001	0.03	<0.001	0.12	0.001	0.125	0.07

NI=not at all important, SI=somewhat important, VI=very important

Location and Attitude

There was a difference between locations on attitude toward skin cancer. A T-test on the composite attitude variable showed that there was a statistically significant difference, assuming equal variance, between these two student groups on attitude toward skin cancer ($p < 0.001$). In the questionnaire, two different types of attitudes toward skin cancer were probed. First, the questionnaire surveyed the attitude towards the possibility of being diagnosed with skin cancer. Maryland students were more concerned that exposure to the sun/UV may give them skin cancer as compared to California students ($p = 0.003$). In addition, Maryland students were more worried about the possibility of skin cancer as compared to California students ($p < 0.001$) (Table 3). Second, the questionnaire probed the attitude towards living with skin cancer. When asked whether getting skin cancer would severely affect their lives, California students were more concerned about the effects of skin cancer on their personal lives as compared to Maryland students ($p = 0.041$).

Table 3

Knowledge about UV rays, Attitude about Skin Cancer, and Frequency in the Sun, by Geographic Region

		Exposure to the sun (UV) rays may cause skin cancer	Concerned exposure to the sun/UV rays may give skin cancer	The possibility of skin cancer worries me	Getting skin cancer would severely affect my life	How often are you in the sun?	
California n(%)	D	33 (18.3)	64 (35.6)	87 (48.3)	20 (11.2)	NR	18 (10.1)
	N	12 (6.7)	37 (20.6)	34 (18.9)	12 (6.7)	S	70 (39.1)
	A	135 (75)	79 (43.9)	59 (32.8)	147 (82.1)	OA	91 (50.8)
Maryland n(%)	D	18 (10.2)	48 (27)	54 (30.3)	13 (7.5)	NR	65 (37.4)
	N	23 (13.1)	21 (11.8)	33 (18.5)	25 (14.4)	S	35 (20.1)
	A	135 (76.7)	109 (61.2)	91 (51.1)	136 (78.2)	OA	74 (42.5)
	P-value	0.02	0.003	0.001	0.041		0

D=disagree, N=neither agree nor disagree, A=agree, NR=never or rarely, S=sometimes, OA=often or always

Location and Protective Behavior

There was a difference between locations on protective behaviors practiced. Although the t-test on the composite behavior variable showed a lack of statistically significant difference between these two groups on sun protection behaviors (p = 0.40), there were differences between locations on specific protection behaviors between the groups (Table 4). When asked about specific actions, such as using sunscreens and covering up exposed skin, students in California were more likely to protect themselves from the sun as compared to Maryland students. For example, 49.2% of the students in California, as compared to 31.6% of the students in Maryland, used sunscreen to protect themselves from the sun (p < 0.001). In addition, 52% of the students in California covered up exposed skin as compared to 39.7% of the students in Maryland (p = 0.02). Conversely, 47.1% of the students in Maryland avoided midday sun between 10am to 3pm as compared to 31.8% of the students in California (p = 0.003). Interestingly, while students in California were more likely to use sunscreen and cover up exposed skin, Maryland students were more likely to associate themselves with having positive sun protection behaviors as compared to California students. When asked whether they personally do anything to protect themselves from the sun, 66.1% of the Maryland students surveyed responded "yes," whereas only 46.3% of the students in California said "yes" (p < 0.001).

Binary Logistic Regression Models of Sun Protection Outcome Behavior Variables

Sun protection outcome variables that were statistically significant in Table 4 were examined in four binary logistic regressions that adjusted for age, gender, and skin type (Table 5). Although California residents were less likely to say they personally did anything to protect themselves from the sun (OR= 0.51, 95% CI: 0.32 - 0.83), they were more than twice as likely to report using sunscreen and covering exposed skin (OR= 2.29, 95% CI: 1.39- 3.77 and OR= 2.31, 95% CI: 1.43 – 3.71, respectively) compared to Maryland residents. Interestingly, California residents were less likely to avoid the midday sun than Maryland residents, OR=0.52, 95% CI: 0.32 – 0.84.

Table 4

Actions Against Skin Cancer, by Geographic Region

Action – YES	CA *n* (%)	MD *n* (%)	p-value
Do you personally do anything to protect yourself from the sun?	82 (46.3)	111 (66.1)	< 0.001
What actions should you take to reduce the risk of skin cancer?			
Use sunscreen (SPF below 15)	83 (46.9)	47 (26.7)	<0.001
Use sunscreen (SPF 15+)	162 (90.5)	130 (73.0)	<0.001
Stay in the shade	139 (80.8)	86 (50.3)	<0.001
Cover up exposed skin	136 (76.0)	120 (68.6)	0.12
Avoid sun's strongest reflection 10:00am to 3:00pm	131 (74.0)	81 (46.3)	<0.001
What actions do you take to protect yourself from the sun?			
Use sunscreen	88 (49.2)	55 (31.6)	0.001
Stay in shade	125 (69.8)	136 (78.2)	0.075
Cover up exposed skin	93 (52)	69 (39.7)	0.020
Limit time in the sun	122 (68.2)	108 (62.1)	0.230
Avoid midday sun between 10:00am – 3:00pm	57 (31.8)	82 (47.1)	0.003

Table 5

Binary Logistic Regression Models of Sun Protection Outcome Behavior Variables between California and Maryland Students.

Sun protection outcome behavior variables	*CA vs.MD residents Odds Ratio (95% Confidence Interval)**	*p-value*
Do you personally do anything to protect yourself from the sun		
No	1.00	
Yes	0.51 (0.32, 0.83)	0.006
Use sunscreen		
No	1.00	
Yes	2.29 (1.39, 3.77)	0.001
Cover up exposed skin		
No	1.00	
Yes	2.31 (1.43, 3.71)	0.001
Avoid midday sun		
No	1.00	
Yes	0.52 (0.32, 0.84)	0.008

*Adjusted for age, gender and skin type (light dark, darker, dark skin)

DISCUSSION

Exposure to sunlight is the most important cause of skin cancers (National Cancer Institute [NCI], 2011) because sunlight contains UV radiations that mutate cellular DNA. Specifically, UVA and UVB radiation are known to directly and indirectly mutate tumor suppressor genes that protect the DNA (Waster & Ollinger, 2009). Therefore, reducing sunlight exposure is the most important preventive measure in avoiding skin cancer. Since the intensity of UV radiations depends on the geographical area, California receives stronger UV radiations as compared to Maryland. Therefore, southern California is expected to have higher incidences of all types of skin cancers as compared to Maryland based on the latitudinal and UV gradient (U.S. Department of Health and Human Services, 1983).

The results of this study suggest that California students are more likely to practice sun protection behaviors, such as using sunscreen and covering up exposed skin, as compared to Maryland students (Table 4 and 5). Although Maryland students were more likely to avoid the midday sun, because the region has high humidity, this practice could stem from efforts to avoid the heat from the sun during those peak hours rather than to protect themselves from the harmful effects of UV radiations. This is further supported by the fact that Maryland students were less likely to use sunscreen and cover up exposed skin as compared to California students.

This study suggests that procedural knowledge (e.g., skin cancer risk factors and sun protection methods) is more likely to be associated with sun protection behaviors than declarative knowledge (e.g., causes of skin cancer). Maryland students were significantly more knowledgeable about the cause of skin cancer; in contrast, California students were more knowledgeable about risk factors for skin cancer (e.g., sunbathing without sunscreen, fair skin with freckles, and getting sunburned as an adult) and more knowledgeable about sun protection behaviors (e.g., using sunscreen with SPF 15+, staying in the shade, and avoiding sun's strongest reflection).

In order to understand the knowledge discrepancy between these two groups of students, we compared the skin cancer information from the California Department of Public Health and the Maryland Department of Health and Mental Hygiene. These two agencies provided the same information on skin cancer including the risk factors and prevention behaviors. The difference in knowledge in the two groups of students, therefore, may not be based on the educational material provided by the state. Hence, the fact that African American students in California have more procedural knowledge than Maryland students could be related to knowledge indirectly from cancer educational efforts directed towards other populations with fair skin (e.g., Caucasians). For instance, California African American students knew that one of the risk factors for skin cancer is having fair skin with freckles, which is a more common physical feature among Caucasians. Accordingly, the ratio of African Americans to other races such as Caucasians is much higher in Maryland (1:2) than California (1:9) (U.S. Census, 2013). It is possible that stricter adherence to sun protection behaviors by the large Caucasian population in California, who are more predisposed to skin cancer, may help increase skin cancer awareness among the African American population as a form of procedural knowledge without necessarily impacting their declarative knowledge as to knowing why they engage in the behavior.

California residents may be engaging in more protective behaviors than Maryland residents due to climate or temperature differences and subsequent differences in frequency of participation in outdoor activities. In California, the climate is warmer and less humid throughout the year (Visit California, 2011) than in Maryland (Visit Maryland, 2011). Temperature affects the kind of activities people participate in because warmer temperatures will encourage more outdoor activities. In Maryland, where the winter and fall seasons limit the kinds of outdoor activities people participate in, people are less likely to be exposed to sunlight and practice sun

protection behaviors as compared to those who live in California. More favorable outdoor temperatures throughout the year will likely affect the sun protective behaviors of African Americans in California. For example, this might be one of the reasons why more California students did not avoid midday sun between 10am to 3pm as compared to Maryland students. In addition, since Californians spend more time outdoors, there may be a greater effort by the state public health agencies to get the skin cancer message out to the public.

Our findings are consistent with previous studies on risk perception and behavior in African Americans; African American participants showed some degree of concern about getting skin cancer, but failed to perceive the severity of the disease and their susceptibility (Garside, Pearson, & Moxham, 2010; Spradlin, Bass, Hyman, & Keathley, 2010). Kim *et al.* (2009) and Pichon, Corral, Landrine, Mayer, & Norman (2010) also found similar low risk perception, with no association to sunscreen use. Similar to our findings, they observed no difference between sex (male/female) and risk perception. The lack of differences by sex may be stemming from the recurrent notion that African Americans do not get skin cancer (Halder & Bridgeman-Shah, 1995). With such a belief, it is possible then that behavior change is low in spite of all the public health efforts in trying to promote protective behavior against skin cancer.

Aside from incorrect perception of risk, other barriers may be driving the low rate of sun protection in African Americans. Landrine and Corral (2009) reported a scarcity of drugstores, which can readily provide sunscreen products to the African American neighborhoods irrespective of the income levels. This can stifle any attempt to use sunscreen as a measure to protect against skin cancer. Also, the application of sunscreen to protect against the sun's UV is perceived as an inconvenience by many, including students, who spend time in the sun (Spradlin, Bass, Hyman, & Keathley, 2010). It may explain why there is no inclination towards sunscreen use or the usage of lower than recommended doses of sunscreen. Unfortunately, our study did not collect information on frequency of sunscreen use or sunscreen availability, so we cannot explore these hypotheses.

Implications

Based on this study, it would be appropriate to target sun protection education efforts to all African American students in both California and Maryland, but all the more in Maryland. Current efforts in Maryland have focused on the general public and educational materials have been made available on the program website with special focus on children and adolescents. Information is provided, which mentions that people of all races and ethnic groups are susceptible to skin cancer, including dark-skinned individuals (Center for a Healthy Maryland, 2013). However, this may not be sufficient enough to raise awareness and subsequently influence the behavior of African Americans.

There is, therefore, a need for educational information tailored for African Americans to influence knowledge, attitude, and sun protection behaviors towards skin cancer. Sun protection education should be culturally appropriate, so parents and young African Americans can relate to the issues of skin cancer and then, in turn, reinforce protective behavior in future generations. It is important for all states to assess the knowledge, attitude, and behavior of their African American population because, as shown by our study, differences exist at the state level. For example, in our study, California African American students seemed more concerned about the severity, but not much about the occurrence, and practiced more protective behavior than Maryland students who worried more about the occurrence of skin cancer, but did not practice as much positive behavior as California students.

Limitations

The limitations of the current study arise from the self-reported cross-sectional data without measuring changes over time. Also, this study was a convenience sample, so the results may not be representative of all African American students in Maryland and California. In addition, students who participated in the survey may be

more interested in public health issues than students who did not participate. Nevertheless, this study was significant because it highlighted important differences regarding skin cancer knowledge, attitudes, and behaviors among African American students between two states that receive different levels of UV radiations. More studies need to be conducted on African Americans across the United States with larger sample size, and not just on college students. Questions concerning access to health care, access to sunscreen products, education, economic status, and employment should be administered in future studies to understand other important factors that may influence engagement in skin cancer prevention behaviors.

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