
Skin Cancer Prevention Behaviors among Northeast Florida College Students

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ABSTRACT

Skin cancer is the most common cancer in the United States with over three million people diagnosed annually. Melanoma rates in the past 40 years have increased 800% in women and 400% in men under the age of 39. Ultraviolet radiation is directly linked with the development of skin cancer; moreover, young adults are the most active age group engaging in risky UV exposure. This study seeks to extend scientific understanding of skin cancer prevention behaviors among college students. A convenience sample of 747 college students were surveyed at a midsized Northeast Florida university using the National Cancer Institute core skin cancer prevention questionnaire. The majority of students did not regularly practice sun safety behaviors. Women were more likely to use sunscreen than men; however, women spent more time in the sun for tanning purposes ($p < .05$). Over half of the participants (53%) spent more than two hours outside during the previous summer, and 65% of participants reported having one or more sunburns in the previous year. Insufficient skin cancer prevention behaviors were apparent. Despite widespread educational efforts to reduce skin cancer, college students receive large amounts of intentional and unintentional exposure to UV radiation, either from the sun, or indoor tanning.

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BACKGROUND

Skin cancer is the most common form of cancer in the United States, with more than three million people diagnosed annually (American Cancer Society [ACS], 2012). Furthermore, one out of every five people in the United States will develop skin cancer during their lifetime (Robinson, 2005). The economic consequence of this cancer has resulted in a direct annual treatment cost of more than \$4 billion (National Cancer Institute [NCI], 2010). The three most common types of skin cancer include squamous cell carcinoma, basal cell carcinoma, and melanoma. Squamous and basal cell carcinomas are the most common forms of skin cancer and are rarely fatal (CDC, 2014). However, though not the most common form, melanoma is the most lethal skin cancer (Ahmedin, Siegel, Xu, & Ward, 2010). An estimated 12,190 deaths (9,180 from melanoma and 3,010 from other non-epithelial skin cancers) occurred in 2012 (ACS, 2012).

Melanoma is the most common form of cancer for people aged 25 to 29 years old and the second most common cancer for people aged 15 to 29 years old – an ever increasing trend affecting young people (Bleyer, O’Leary, Barr, & Ries, 2006). In fact, over the past 40 years, melanoma rates among those under the age of 40 have increased 800% in women and 400% in men

(Reed, Brewer, Lohse, Bringe, Pruit, & Gibson, 2012). This increase is not surprising given young adults ages 18 to 29 comprise the most active age group engaging in risky UV exposure (Choi, Lazovich, Southwell, Forster, Rolnick, & Jackson, 2010).

Exposure to UV light is the single most modifiable risk factor for skin cancers and is mostly preventable by avoiding the sun and indoor tanning machines (NCI, 2010). The American Cancer Society (2012) recommends avoiding the sun during peak hours (10am to 4pm), seeking shade when outdoors, wearing sun protective clothing, including sunglasses and a wide-brimmed hat, and frequently applying broadband sunscreen protection (SPF>15). Proper sunscreen use has been linked to a reduction in squamous cell and malignant melanoma skin cancer development by 40% and 50% respectively (Green, Williams, & Neale, 1999; Green, Williams, Logan, & Stratton, 2011).

Childhood, adolescent, and young adult UV exposure is damaging because it accumulates toward later skin cancer risk (Parkin, Mesher, & Sasieni, 2011). Furthermore, young adults, specifically college students, obtain a majority of their lifetime UV radiation exposure before and during this time of their life (Greene et al., 2010). Although college students

are spending significant time in the sun, only about 5% use sunscreen properly (Spradlin, Bass, Hyman, & Keathley, 2010). Further evidence of poor sun protection behavior was illustrated in a national telephone survey of young adults with 72% reported having at least one prior summer sunburn, 30% reported at least three sunburns and 12% reported more than five sunburns (Davis, Cokkinides, Weinstock, O'Connell, & Wingo, 2002). Sunburns are the short-term effect of excessive UV exposure and factors associated with increased odds of sunburn include greater sun sensitivity, lighter skin tones, younger ages, hours spent outdoors, sunbathing, and desirability of a tan (Davis et al., 2002).

Indoor tanning is a means of UV exposure, with an estimated 40% to 60% of college students having used indoor tanning machines (Hillhouse & Turrisi, 2005). Indoor tanning, also referred to as sunlamps, tanning booths/beds and artificial tanning, has been positively associated with skin cancer and has been classified as a carcinogen (Whitmore, Morison, Potten, & Chadwick, 2001; Karagas, 2002). Such machines can be uniquely tied to the rising rates in melanoma through epidemiological trend data and historical examination. Tanning beds were introduced in the United States in 1978 and became popular in the 1980s, coinciding with the increases of melanoma over the past 30 years. Indoor tanning is used to speed the skin tanning process regardless of climate. Tanning machines are particularly problematic given they expose people to even more concentrated doses of UVA and UVB radiation than the sun (Whitmore et al., 2001).

About 10% of the US population (30 million people) regularly use indoor tanning, with the highest rates among non-Hispanic white women living in the Midwest and South (Choi et al., 2010). Teenagers (13%) and young adults ages 18 to 29 (20.4%) comprise the largest block of indoor tanners (Choi et al., 2010). *Healthy People 2020* has identified two national objectives for reducing indoor tanning usage among adolescents in grades 9-12 and adults 18 years and older (U.S. Department of Health and Human Services, 2012). Young women are more active indoor tanners (18.1%) compared to 6.3% of men (Eaton et al., 2012). In summary, four out of five cases of skin cancer could be prevented by reducing UV exposure, avoiding indoor tanning, and practicing simple protective measures such as applying sunscreen.

Purpose

The purpose of this study was to examine the skin cancer prevention behaviors among college students in the southeastern United States.

METHODS

The data for this study came from a larger college health assessment survey, *Our Campus, Our Health* (OCOH), delivered at a large comprehensive university in Northeast Florida. The survey also included the core skin cancer prevention questionnaire developed by the National Cancer Institute workgroup (Glanz, Yaroch, Dancel, Saraiya, Crane, & Buller, 2008). All 16,343 undergraduate and graduate students at the institution were sent an email invitation to participate over a four-week period during the fall 2013 semester. The survey was delivered through Qualtrics Survey Software (Qualtrics, Provo, UT) by the Institutional Research office as directed by the IRB to protect participant privacy. Following completion of the survey, participants had the option of clicking on a hyperlink to enter their name and email address to enter a raffle to win a variety of incentives to increase survey participation. All responses were de-identified prior to being shared with the PI. The extensive 121-item survey yielded an 11% response rate with 1,774 participants. To be included in the study sample, participants were required to be between the ages of 18 to 25 and have responded to all demographic and skin cancer prevention variables, which reduced the sample size to 747 (4.5% overall response rate). Data was analyzed using SPSS (SPSS Inc, Chicago, IL) and included descriptive statistics and chi-square analysis.

RESULTS

The 747 students averaged 21 years of age ($M = 21.14$, $SD = 1.98$), were mostly women (73.6%), and white (74.8%), were in their third year of school (32.6%), insured (77.5%), and not working while in school (32.1%). Table 1 presents the demographic characteristics of the study sample. The sample was reflective of the overall population at the university with a largely female (56.5%) and white (70.9%) student body.

Overall sun protection behaviors were inadequate among respondents. The majority did not use sunscreen regularly (66.3%) with only 12.4% reporting always using sunscreen when outside on a warm sunny day. Sunscreen use did improve with age as Figure 1 shows. An overwhelming majority (97.1%) did not regularly protect their neck, ears, face and shoulders with a wide-brimmed hat, seek shade (82.5%), or use an umbrella (98.7%) when outside on a warm sunny day. Despite these poor sun protection behaviors, participants did not avoid the sun during peak hours (10am to 4pm) with 46.2% never attempting to avoid peak hours and less than 2% always avoiding peak hours. When asked how many hours they spent outside in the previous summer during peak hours, an alarming

majority (58%) reported more than two hours of daily sun exposure. Nearly 60% of respondents reported not regularly wearing a shirt that covered their shoulders while outside on a warm sunny day, yet 53.2% reported often or always wearing sunglasses. High-risk skin cancer behaviors were further confirmed by the reported sunburn rates with 71.8% of participants reporting at least one sunburn in the previous year and 10% of participants reporting more than five sunburns in the previous year – more than five lifetime sunburns is a risk factor that doubles the chance of developing melanoma. There were significant gender differences in sunscreen rates, sunglasses use, and wearing a shirt that covered the shoulders while outside. Women demonstrated better sunscreen χ^2 (4, N = 747) = 41.418, $p < .000$ and sunglasses use χ^2 (4, N = 747) = 10.538, $p < .001$, whereas men were more likely to wear a shirt covering their shoulders χ^2 (4, N = 747) = 31.355, $p < .000$.

Nearly half (48.8%) of the respondents reported “always” or “usually” spending time in the sun for the purpose of getting a tan and 44.6% reported using sunless tanning creams at home or spray tanning at a salon (12.6%). The majority of respondents reported never using a tanning bed (73.4%); however, women were more likely to indoor tan ($p < .000$). Of those who reported indoor tanning, the average age of the first tanning bed visit was age 17 ($M = 17.15$, $SD = 1.89$), with only 21% reporting using a tanning bed more than three times (less than three visits is considered experimental use), and the average usage at eight ($M = 8.10$, $SD = 30.65$) lifetime tanning bed visits. In the previous year, 8.6% of the respondents reported using a tanning bed more than three times, with average usage at two visits. There were significant gender and age differences in tanning behaviors, with women more likely to spend time in the sun for the purpose of tanning χ^2 (4, N = 747) = 15.390, $p < .005$, use tanning creams χ^2 (1, N = 747) = 43.445, $p < .000$ or sprays χ^2 (1, N = 747) = 18.717, $p < .000$, and tan indoors χ^2 (1, N = 747) = 25.229, $p < .000$. Table 2 depicts sun protection, sun exposure, and indoor tanning behaviors. Despite poor overall skin cancer prevention behaviors, 79.4% of the respondents have never had their skin checked for skin cancer from head to toe by a health professional.

DISCUSSION

Insufficient skin cancer prevention behaviors, including sun exposure, sun protection, and indoor tanning were apparent among the Northeast Florida college students in this study. Unfortunately, the

results are consistent with other studies of college students and help explain the rising melanoma rates among young people (Cottrell, McClamroch, & Bernard, 2005; Spradlin et al., 2010). One of the more interesting and promising findings from the study is the shift in sunscreen use around the age of 21 as depicted in Figure 1. There was a dramatic increase in sunscreen use that started at age 21 continued to increase through age 25. This is an important finding because most studies examining sunscreen use collectively examine the 18 to 25 age group, or study 20 to 29 year olds together (Heckman, Coups, & Manne, 2011), whereas this study teased out an important age-related shift in behavior. This finding highlights the need to target sun safety interventions at the freshman level.

Also, this study revealed important gender difference in skin cancer prevention risks that will aid in targeting behaviors salient to the respective genders (Cottrell et al., 2005; Spradlin et al., 2010). For instance, men engage in less sunscreen use than women, while women are more likely than men to sunbathe for the purposes of tanning and use tanning products. University health promotion centers could use this information to design interventions to promote better sunscreen use among fraternities, men dominated disciplines such as science, technology, and building construction. For women, the findings support previous studies that appearance motivations drive UV exposure so interventions directed toward young women would be different than programs for men (Leary & Jones, 1993; Hillhouse & Turrisi, 2002). A promising study promoted appearance improving alternatives to tanning such as the use of tanning creams, makeup with bronzers, and wearing clothing to flatter and enhance one’s natural skin tone (Hillhouse & Turrisi, 2002). Additionally, although the better sunscreen behaviors among women seemingly contradict their tan seeking and indoor tanning behaviors, there is an underlying logic. Women who are concerned about their appearance might use sunscreen to prevent wrinkles, sun spots, and skin aging, while incorrectly believing that indoor tanning is a safer alternative. Also, the short term perceived benefits of an attractive tan may outweigh long term costs such as cancer and skin damage. Sororities and disciplines with high female concentrations such as public relations, psychology, and sociology would be good environments to reinforce the message that any UV light causes skin damage, promote a “pale is pretty” message, and encourage appearance enhancement through other methods. Additionally,

Table 1. Demographic Characteristics of the Study Sample (N =747)

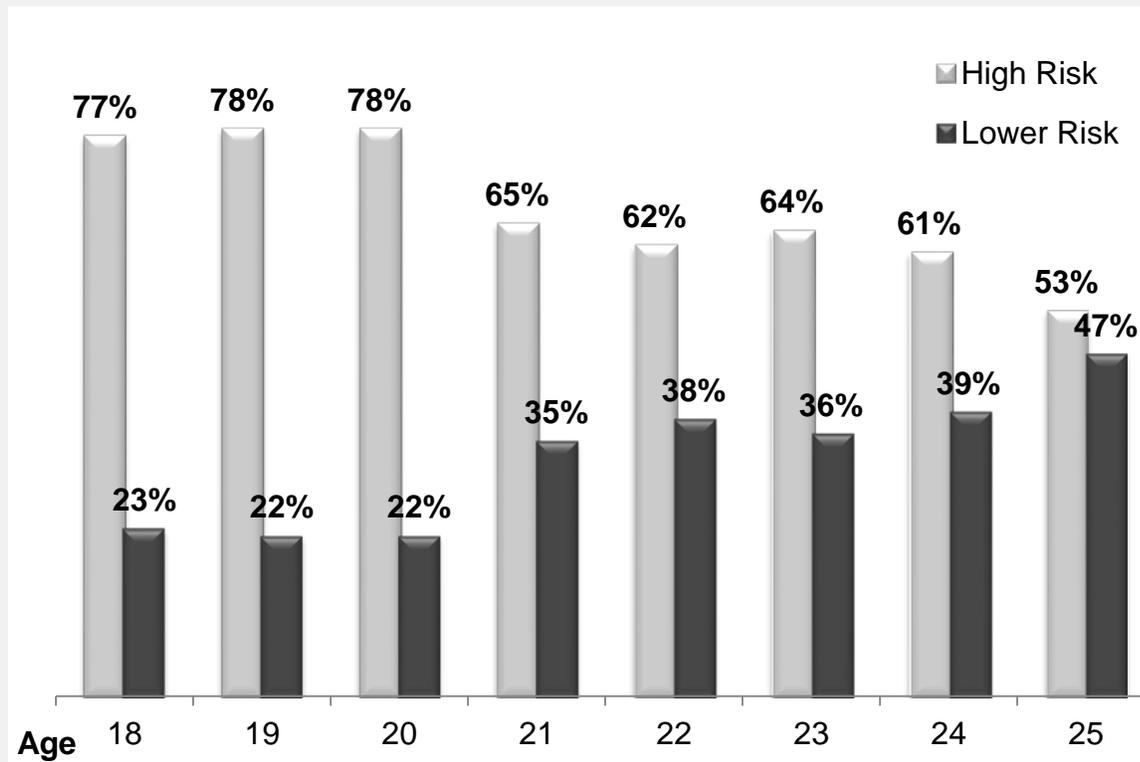
Characteristic	N	Percent
Sex		
Female	197	26.4
Male	550	73.6
Age		
18	74	9.9
19	103	13.8
20	123	16.5
21	140	18.7
22	110	14.7
23	88	11.8
24	66	8.8
25	43	5.8
Race/Ethnicity		
White	559	74.8
Hispanic	63	8.4
Black	48	6.4
Bi/Multi-race	26	3.5
Other races	51	6.8
Classification		
Freshman	131	17.6
Sophomore	114	15.3
Junior	244	32.6
Senior	195	26.1
Graduate	63	8.4
Insurance		
Insured	579	77.5
Uninsured	134	18.0
Unsure	34	4.4
Hours worked per week		
I do not work	238	31.9
1 – 10 hours	84	11.2
11 – 20 hours	152	20.4
21 – 30 hours	144	19.3
31 – 40 hours	98	13.1
Over 40 hours	31	4.2
Relationship status		
Single	269	36.0
In a committed relationship	418	56.0
Married	54	7.2
Divorced/widowed/separated	6	.8

Table 2. Sun Protection, Sun Exposure, and Indoor Tanning (N = 747).

	Women (N = 550)		Men (N = 197)		p value
	N	Percent	N	Percent	
Sun protection*					
Sunscreen use					.000
Always or often	210	38.19	42	21.32	
Sometimes, rarely, or never	340	61.81	155	78.68	
Wide-brimmed hat					.447
Always or often	16	4.00	8	4.06	
Sometimes, rarely, or never	528	96.00	189	95.94	
Seek shade					.802
Always or often	90	17.10	34	17.26	
Sometimes, rarely, or never	456	82.90	163	82.74	
Avoid peak hours (10am – 4pm)					.058
Always or often	51	10.30	28	14.72	
Sometimes, rarely, or never	491	89.27	168	85.28	
Wear a shirt that covers the shoulders					.000
Always or often	174	31.58	120	60.86	
Sometimes, rarely, or never	376	68.42	77	39.13	
Sunglasses					.001
Always or often	332	60.32	79	40.21	
Sometimes, rarely, or never	218	39.68	118	59.78	
Sun exposure					
Time spent in the sun to get a tan					.001
Always or often	332	53.99	70	35.52	
Sometimes, rarely, or never	112	46.01	127	64.48	
Hours spent per day outside in previous summer during peak hours					.640
Less than an hour	227	41.30	92	46.74	
1 – 2 hours	131	23.89	49	25.00	
3 – 4 hours	16033	29.15	49	25.00	
More than 5 hours	2	5.66	7	3.26	
Sunburn in the past year					.802
None	154	27.94	58	29.35	
1 – 2	285	51.82	94	47.83	
3 – 4	73	13.36	26	13.04	
More than five	38	6.88	19	9.78	
Indoor tanning					
Have ever used indoor tanning					.000
Yes	203	36.84	17	8.70	
No	347	63.16	180	91.30	
Lifetime indoor tanning usage					.000
2 or less visits	526	95.65	138	70.00	
More than 3 visits	24	4.35	59	30.00	

Notes: *The question asks when the participant is outside on a warm, sunny day and answers are on a 5-point Likert scale ranging from *Never* to *Always*. *Always* or *Often* is considered adequate use; *Sometimes*, *Rarely*, *Never* is considered inadequate use.

Figure 1. Sunscreen Use across the College Age Span



universities should seek to correct the misconception that indoor tanning is a safer alternative to natural sun exposure. This misconception has been promoted by the indoor tanning industry as tanning devices primarily emit UVB radiation associated with sunburn while the sun emits UVA and UVB. UVA is associated with more skin damage, yet both UVA and UVB rays are associated with skin cancer.

This study has a number of potential limitations that should be considered. Although the sample size is robust, the response rate was low (roughly 4.5% after applying the inclusion criteria) given the lengthy survey was sent to all 16,343 students enrolled at the university. Although the response rate is low, the sample is remarkably reflective of the overall demographics of the university as reported by the University Institutional Research Office. The convenience sampling methodology used limits generalizability although, as stated, the demographic

characteristics of the sample were remarkably representative of the overall university profile. Male participation (26.4%) was lower than university male enrollment (43.5%) and that is consistent with survey response research findings that males are less likely than females to respond to online surveys (Curtin, Presser, & Singer, 2002; Moore & Tarnai, 2002; Singer, van Hoewyk, & Maher, 2000). Also, studies using self-report surveys are subject to self-report, self-selection bias, and recall error (Olsen, 2008). Additionally, proper use of sun protective behaviors cannot adequately be assessed because there are nuances to sun protection, including amount of sunscreen used per application, frequency of reapplication, and environmental variables such as reflection from water when seeking shade. Also, the survey did not include questions about complexion, sun sensitivity, or family history of skin cancer – all of which contribute to skin cancer risk.

Conclusion

Despite widespread educational and mass media efforts to reduce skin cancer, college students continue to receive large amounts of intentional and unintentional exposure to UV radiation either from the sun or indoor tanning. Beyond the lack of skin cancer prevention behaviors revealed in this study, the most alarming finding was the majority of students (79.4%) have never had a full body skin check by a healthcare professional. This finding exposes an oversight in our healthcare system given that melanoma is the most common form of cancer among adults ages 25 to 29 and the second most common cancer among 15 to 29 year olds (Bleyer et al., 2006). Primary care providers and pediatricians have a tremendous opportunity to introduce skin health to their young patients by encouraging sun safety, assessing skin cancer risk by using the Fitzpatrick skin type test, taking family skin cancer history, and referring those at risk for skin cancer to a dermatologist for an annual skin cancer examination. In addition to skin cancer checks performed by a healthcare professional, all patients should be encouraged to conduct regular self-skin checks and keep a mole map such as the American Academy of Dermatology (2013) DETECT Skin Cancer: Body Mole Map that tracks mole size, shape, color, location, and border.

This study, along with the fact that melanoma rates continue to rise, supports the notion that traditional skin cancer prevention programs must evolve to include multiple delivery routes including primary care, mass media, and formal education programs.

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