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Sun Exposure, Tanning Behaviors, and Sunburn: Examining Activities Associated With Harmful Ultraviolet Radiation Exposures in College Students

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Abstract

Understanding the behaviors that lead to sunburn is an important objective toward developing intervention strategies to reduce risk for skin cancers. Our cross-sectional study surveyed 400 college students aged 18 and older at a public state university in the northeastern US in 2018 to assess tanning behaviors, outdoor activities, sun protection, and sunburn over the past year. Sunburn was exceedingly common; over half reported one or more sunburns in the past 12 months. Outdoor intentional and unintentional tanning were also common. Male sex, White race, sun sensitive skin type, and outdoor intentional and unintentional tanning were independently associated with increased odds of sunburn. Water and non-water sports, sunbathing, and vacations were also associated with sunburn. These results indicate that tanning and outdoor activities such as sports are important behaviors on which to focus for sunburn prevention among college students. Understanding the behaviors that are associated with sunburn provides useful opportunities to prevent skin cancer among young people.

Keywords

Skin cancer; Primary prevention; College students; Sunburn; Tanning

Introduction

Skin cancers are the most common malignancies in the United States, with approximately 5.4 million cases treated per year (ACS, 2019). While melanoma is not the most common, it

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Declarations

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the Stony Brook University IRB and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

is the most serious form of skin cancer (ACS, 2019) and constitutes the third most common cancer in the United States among men and women ages 20–49 (Ward et al., 2019). Among males aged 30–39 and females aged 20–29, melanoma constitutes the second most common cancer (Noone et al., 2017; Ward et al., 2019). Melanoma was projected to kill over 7,000 Americans in 2019 (ACS, 2019), and in contrast to other cancer types, the incidence of melanoma is rising (ACS, 2019; Thrift & Gudenkauf, 2019; Ward et al., 2019). Ultraviolet radiation (UVR) exposure, delivered through outdoor sun exposure or via artificial sources such as tanning beds, is the predominant risk factor for all types of skin cancer and is largely modifiable (WHO, 2018).

Sunburn is strongly related to skin cancer risk. Sunburn is manifested as skin inflammation and redness, with corresponding blistering and peeling that result from damage to skin cell DNA as a result of UVR exposure (D’Orazio et al., 2013). There is a clear dose–response between number of sunburns and melanoma risk (Dennis et al., 2008; Pfahlberg et al., 2001). Over one-third of adults report experiencing at least one sunburn in the past year (Holman et al., 2019a, 2019b). Rates are even higher in young people; about 50% of young adults age 18–24 report having a sunburn in the past year (Tribby et al., 2019). Accordingly, understanding the behaviors that lead to sunburn is important to developing effective intervention strategies to reduce sunburn and the corresponding risk for the development of skin cancers.

Many young people seek UVR exposure in the form of tanning. As with a sunburn, a tan is also a marker for DNA damage that increases skin cancer risk (FDA, 2018; Brenner & Hearing, 2008; Sheehan et al., 2002). People with a range of phenotypes (i.e., skin types) can experience tanned skin when exposed to UVR (Sheehan et al., 2002). Tanning is very common among young adults, including college students; however, much of what is known about tanning behavior in college students has focused specifically on indoor tanning (Gambla et al., 2017), which is waning in the United States and now fairly uncommon (Guy et al., 2017a, 2017b). In contrast, rates of outdoor tanning, defined as intentional UVR exposure to acquire a tan, are higher, ranging from 34 to 65% among college students (Daniel et al., 2018; Fogel & Krausz, 2013; Heckman et al., 2012). Outdoor tanning is more common in female than male college students (Daniel et al., 2018), and psychosocial factors, including desiring an improved appearance, are strongly associated with the practice (Cafri et al., 2009).

Little is known about the broad range and patterns of activities that may result in sunburning and tanning among young people. College students spend extended time outdoors, socializing between classes, biking or walking to get to classes, and engaging in recreational, work, or sports activities outdoors, activities that may also result in a tan and sunburn even if students are not intentionally seeking a tan. A range of outdoor activities, including the active pursuit of a tan, may be related to increased incidence of sunburn and corresponding skin cancer risk (Holman et al., 2019b). One study documented that most (88%) college students spend three or more hours outside on summer days, of whom only a minority (17%) always wear sunscreen during this time (Basch et al., 2012). In fact, the use of sun protection in young people has been diminishing (Basch et al., 2014; Jones et al., 2012), and sunburn is typically unintended (McLeod et al., 2017). A better understanding

of the frequency and patterns of both intentional and unintentional tanning, the duration and type of outdoor activities, and how these activities relate to sunburn, can inform the development of tailored skin cancer prevention interventions in young men and women (Hay et al., 2017).

Our study, which sought to address gaps in understanding diverse forms of tanning, outdoor activities, and sunburn in college students, has the following aims. In Aim 1, we examine the frequency of recent (past year) sunburn, as well as the frequencies of recent outdoor intentional, outdoor unintentional, and indoor tanning, sun protection, sun exposure, and the prevalence of participating in various activities pursued outdoors. In Aim 2, we assess the univariate relationships of recent sunburn to each of these variables (listed in Aim 1) related to tanning, sun protection, sun exposure, and outdoor activity. Finally, for Aim 3, we assess multivariate relationships of recent sunburn to tanning, sun protection, and sun exposure, as well as demographic covariates (sex, race, and skin type).

Methods

Participants and Procedure

Students aged 18 and older at a public state university completed a survey between January and April 2018 using a secure online research software tool. We recruited participants from the Psychology Department subject pool for course credit; the subject pool consisted of students in various programs of major study enrolled in psychology courses, a plurality of whom were freshman. Participants were provided with one-time access to the study website directly from the department's subject pool platform where they had the ability to sign up and request the link to participate in the survey. The study landing page included an informed consent form. We invited 418 participants to take the survey over the course of two recruitment posts on the subject pool platform, ending recruitment after 400 surveys were submitted (final sample $N = 400$). The study was approved by Stony Brook University's Institutional Review Board. We administered measures in the order described below.

Measures

Sunburn.—We assessed the number of recent sunburns with the question, “In the past 12 months how many times did you have a red or painful sunburn that lasted a day or more?” with six ordinal response options ranging from “0 sunburns” to “5 or more sunburns” (Shoveller et al., 2003).

Recent tanning.—We asked participants how often they had tanned in the past 12 months. Three types of tanning behaviors were assessed for the past 12 months: unintentional outdoor tanning (“when spending time outside, how often have you ended up with a tan, even if you didn't try to get one?”); intentional outdoor tanning (“how often have you spent time in the sun in order to get a tan?”; Glanz et al., 2008); and indoor tanning (“how often have you used a tanning bed or booth with tanning lamps?”; Lazovich et al., 2008), resulting in three separate scores. Intentional tanning items have been used widely with college student populations, whereas the unintentional tanning item was developed for this

study using parallel wording. Response options for each item ranged from 1 = “Never” to 5 = “Always.”

Sun protection.—The International Agency for Research on Cancer (IARC) defines adequate sun protection as the use of sunscreen in conjunction with other sun protection strategies such as seeking shade, wearing protective clothing that covers arms and legs, and wearing a hat, a combined strategy that is also endorsed by the United States Surgeon General (USDHHS, 2014). We assessed the *frequency of use* of five individual sun protection strategies (i.e., sunscreen, protective clothing, hats, shade seeking, and sunglasses; response options 1 = Never to 5 = Always; Glanz et al., 2008) and also examined *adequate sun protection* in the binary (yes = often or always used sunscreen and at least one other form of sun protection).

Sun exposure time.—Two items measured average time typically spent outdoors in the summer for weekends (Saturday and Sunday) and weekdays (Monday through Friday) using response options ranging from “30 min or less” to “6 h” using one-hour intervals (Glanz et al., 2008).

Outdoor activities.—We assessed one’s typical participation in seven daytime outdoor activities during the hours of 10AM-4PM using a checklist, including swimming or water sports, non-water sports/recreation, sunbathing or sitting in the sun, working outside, socializing, vacationing, and transportation (in “select all that apply” format) with items adapted from prior research (Davis et al., 2002).

Participant characteristics and demographics.—Phenotypic variables were assessed with five questions regarding hair color, eye color, freckling, skin’s typical reaction to the first sun exposure of the summer (typical burning response), and skin’s typical reaction to repeated sun exposure (i.e., typical tanning response in the summer; Fitzpatrick, 1988). Scores for sensitive skin (1) or non-sensitive skin (0) were totaled across the five items, for a 0–5 possible range of scores. Participant age, sex, race, and ethnicity were also assessed.

Statistical Analyses

We used descriptive statistics for Aim 1 to determine the frequency of (a) recent sunburn (in the past 12 months); (b) recent tanning behaviors (unintentional outdoor, intentional outdoor, and indoor, as well as aggregate tanning); (c) use of sun protection; (d) weekly summer sun exposure time; and (e) typical outdoor activities. For Aim 2, we used univariate binary logistic regression analyses to determine the potential relationship between recent sunburn and (a) demographics (sex, race, and skin type); (b) tanning; (c) sun protection; (d) sun exposure; and (e) outdoor activity variables. For Aim 3, we used multivariate logistic regression to determine the independent association of tanning measures, sun protection measures, and measures of sun exposure time with recent sunburn, as well as demographics (sex, race, and skin type). The multivariate model excluded outdoor activity variables due to multicollinearity (Hosmer et al., 2013).

Results

Demographics

Demographic and phenotypic characteristics for the study sample ($N = 400$) appear in Table 1. Sixty-three percent were female (among valid responses; 47 respondents provided missing data for sex due to a technical error). Seven percent identified as Black, 11% identified as another race or mixed race, 40% as White, and 42% as Asian; in addition, 14% identified as being of Latino or Hispanic ethnicity. Sex was approximately proportionate across each racial category (considering valid, non-missing responses). Over two-thirds (69%) reported a skin type that typically tans in the summer (one of five skin type items; see Table 1 for all). Those reporting more sun sensitive skin type were most likely to identify as White, followed by Asian.

Aim 1: Behavior Frequencies

Approximately half (55%) of the sample reported one or more sunburns in the past 12 months: 26% reported experiencing one sunburn, 15% two, 9% three, 3% four, and 2% five or more. Tanning in the last 12 months was common: 72% reported that they had tanned outdoors unintentionally (sometimes, often, or always) and 32% reported that they had tanned outdoors intentionally (sometimes, often, or always). Nearly half of the sample (44%) reported unintentional outdoor tanning only. One-quarter (25%) reported both unintentional and intentional outdoor tanning, and a similar proportion (24%) reported no recent tanning at all. Of those few reporting any recent indoor tanning (8%, $n = 30$), more than half ($n = 17$) reported they had done this “rarely,” 9 reported “sometimes,” and 4 reported “often.” All of the indoor tanners also reported that they tanned outdoors.

The most commonly reported type of sun protection among five methods assessed (multiple selections permitted) was wearing a shirt with sleeves that covered the shoulders (49% reported wearing this often or always while in the sun). The next most common was seeking shade (45%), followed by using sunscreen (41%), wearing sunglasses (38%), and wearing a hat (17%). Over one-third (36%) reported sunscreen use along with at least one other method of sun protection. Nearly half (49%) reported 3 h or more per day outdoors during summer weekdays; 2 h per day outdoors was the modal (24%) response. For weekend days, 68% reported sun exposure time of three hours or more and the mode was four hours per day (21%). Outdoors between 10 am and 4 pm, the most commonly endorsed activities were socializing (81%), transportation (56%), vacation (54%), and non-water sports (52%).

Aim 2: Univariate Correlates of Sunburn

Univariate logistic regression results are reported in Table 2. Those who reported White race and more sun sensitive skin type (continuously measured) were more likely to report sunburn; there were no differences by sex. Several types of tanning (i.e., intentional outdoor tanning; indoor tanning) and greater sun exposure (i.e., weekday outdoor exposure greater than 30 min; more than 3 h of weekend outdoor exposure), were associated with sunburn. Participating in both water- and non-water sports, sunbathing, and outdoor vacations during the hours of 10 am–4 pm were associated with sunburn, but outdoor transportation was

related to lower likelihood of having sunburn (see Fig. 1). Sun protection frequency was not related to increased odds of sunburn.

Aim 3: Multivariate Correlates of Sunburn

Both intentional ($OR = 3.35$, $p < 0.001$) and unintentional outdoor tanning ($OR = 1.37$, $p < 0.05$) were associated with increased odds of sunburn (see Table 3). In this model, race and skin type also remained significantly associated with sunburn, and male sex was related to a higher likelihood of reporting sunburn ($p < 0.05$). Indoor tanning, sun protection, and sun exposure time were not independently associated with sunburn in the multivariate model. The Cox-Snell $R^2 = 0.37$.

Post Hoc Analyses

Since likelihood of reporting a sunburn was significantly related to skin type and not to sun protection, we wanted to test if sun protection varied by skin type. We conducted an exploratory sub-group analysis, finding no interaction between sun protection and skin type. We also were interested in examining a possible interaction between sex and intentional tanning, but did not find any.

Discussion

We examined sunburns and associated behaviors in a diverse convenience sample of college students. Recent sunburn was somewhat common, and equivalently frequent in men and women. Sunburn was more common among students who reported outdoor tanning, sunbathing (defined as sitting in the sun), tanning indoors, participating in sports (both water and non-water), vacationing, or having greater sun exposure time. Only intentional and unintentional outdoor tanning were independently associated with sunburn after accounting for students' demographics and other behaviors. Demographics, particularly White race and more sensitive skin type, were strong independent determinants of self-reported sunburn. Male sex was also a significant factor when other variables, such as tanning, were accounted for, reflecting our better understanding of sunburn in young women than men, despite the fact that sunburn was equally reported across sex. Previous research has found that college men use less sun protection than college women (Yockey et al., 2017).

The frequency of sunburn reported in this sample is consistent with recent data from the National Health Interview Survey which found that 50% of young adults age 18–24 experienced sunburn in the past year (Tribby et al., 2019). Among those who reported sunburns in this study, the majority reported only one, but the number of burns ranged to five or more. Recent tanning was also a commonly reported behavior. Unintentional tanning was very common, reported by nearly three-quarters of the sample, whereas intentional outdoor tanning was reported by only one-third. The least common type of tanning was indoor, reported by only 17 participants; this pattern was expected given the recent decline in indoor tanning prevalence among young people (Guy et al., 2017a, 2017b). Importantly, all indoor tanners also reported some form of outdoor tanning, either unintentional or intentional. These findings indicate that college students understand the difference between unintentional and intentional outdoor tanning; they report unintentional tanning nearly

ubiquitously, across sex and race, indicating that this prevalent type of tanning warrants particular focus.

Recent tanning was an important correlate of recent sunburn; however, not all forms of tanning were associated equally with sunburn. Indoor tanning was not related to sunburn with covariates accounted for, while unintentional tanning had a small but significant relation to sunburn in our multivariate model. Intentional outdoor tanning had a strong, positive association with sunburn, both as a univariate predictor, and independent of skin type, sex, and race. Thus, it appears that outdoor tanning, both intended and unintended, is an important determinant of sunburn. Sunburn and unintentional tanning are similarly common among college students and occur unintentionally (McLeod et al., 2017). However, intentionally getting a tan as well as sunbathing are associated with even greater odds of reporting recent sunburn. The distinctions between intentional and unintentional tanning should be further explored in order to identify the specific decisions and risky behaviors that may be associated with sunburn.

Several typical everyday activities are associated with higher odds for sunburn. Participating in both non-water and water sports and vacationing, as well as sunbathing, significantly related to sunburn for both men and women. Recent data from the National Health Interview Survey found that about half of young adults experienced past-year sunburn, but that spending time walking outdoors was not generally associated with sunburn among older adults (Tribby et al., 2019). The young age of our college student sample may translate to more time outdoors and higher risk for sunburn while performing outdoor activities. Other recent research found that among adults of all ages reporting a recent sunburn, water sports or swimming and being on vacation were primary determinants of self-reported sunburn (Holman, et al., 2019b); however, notably, in the sample of older adults reported in the above study, attempting to get a tan was only reported among 5% as the activity being performed during sunburn. These studies provide important context for the occurrence of sunburn. Taken together, they indicate that among adults as well as college students, outdoor activities such as swimming may be risky for sunburn, and among college students in particular, outdoor tanning is an important behavior on which to focus sunburn prevention strategies.

Sun protection, defined in our study according to the Surgeon General's recommendation (USDHHS, 2014) of using sunscreen as well as at least one additional method (either often or always), was not significantly related to sunburn. Rather, skin type and race accounted for variation in sunburn. People with sun-sensitive skin who typically experience severe or frequent sunburn may also be the most likely to use sunscreen and other sun protection methods, with imperfect results; however, a subgroup analysis that we conducted ex post facto revealed no differences in the association of sun protection with sunburn across skin type. Research indicates that many people do not use sunscreen effectively; for example, they forget to reapply it and experience sunburn as a result (O'Hara et al., 2019). This problem may contribute to the lack of association we found between sun protection and sunburn.

This study has a variety of implications for skin cancer risk behavior intervention development among college students. First, it indicates the need for such interventions

among college students, approximately half of whom experience sunburns, with many reporting recent tanning, both of which are highly risky for the development of skin cancer. Further, specific behaviors and activities appear to be common among those who report sunburn, including outdoor sports and vacationing. The context about how sun damage occurs, as suggested by this study's findings, will be valuable for designing targeted interventions for those who are most at risk, such as swimmers, or students departing for spring break and other college vacation periods. While many existing interventions target women, our study indicates that similar proportions of men and women report the experience of sunburn, and suggests a greater likelihood of sunburn among men when other explanatory variables are accounted for. Therefore, college men should be targeted as well as women in interventions, as well as in research designed to better understand factors that may be specific to men experiencing sunburn.

This study has several limitations. We examined a diverse range of skin cancer risk behaviors, including unintentional tanning, which was widely reported in our study sample, but is not well-understood in the literature. Although our student sample was racially diverse, we recognize that our results may not be generalizable to adults of the same age who are not in college, or to young adults in other parts of the country that have climates that differ from that of the northeast (Gambla et al., 2017). However, the frequency of reported sunburn in the present study is consistent with recent nationally representative data for young adults (Tribby et al., 2019). Results from this study are based on self-report, which may introduce bias. However, self-report surveys of tanning have been found to be relatively accurate when compared with objective measures (Cust et al., 2018; Glanz et al., 2010) and the findings are comparable with those of previous research that examine rates of tanning in college students (Gambla et al., 2017) and sunburn among young adults (Holman et al., 2019a, 2019b). In addition, although we acknowledge the limitations of self-reported skin type, this is a common measure (e.g., Daniel et al., 2018). Questions about activities did not directly ask about sunburn while performing the activities; however, without diary methods, participants may have difficulty answering with certainty what they were doing exactly when they were sunburned (in addition, sunburn often takes several hours to appear on the skin). We conducted the survey throughout the spring semester, when, at times, it is not warm and sunny in the northeast; recall error may have occurred as participants attempted to report their behaviors over the past year. Finally, about 12% of participants' data on sex was missing; this was determined to be from an error with the questionnaire software and was not associated with other study variables. However, the prevalence of missingness may necessitate results by sex to be interpreted with caution.

Sunburn and especially tanning, both of which increase skin cancer risk, are common among college women and men. Sunburn was commonly associated with tanning, increased time in the sun, and sports and vacationing. Interventions that reduce outdoor tanning may be particularly effective for reducing sunburn among college students, as suggested by the strong relationship between intentional outdoor tanning and sunburn, independent of student sex, race, and skin type. For college students, who may spend extended time outdoors, behavioral health messaging about avoiding sunburn should target athletes as well as students leaving for spring and summer breaks. Health promotion messages and interventions aimed at reducing outdoor tanning are essential and may also reduce sunburns.

Young adulthood is a period in which lifelong patterns of many health behaviors are established. Given the serious health consequences of skin cancer, evidence-based efforts to modify risky behaviors in college students are vital for this population.

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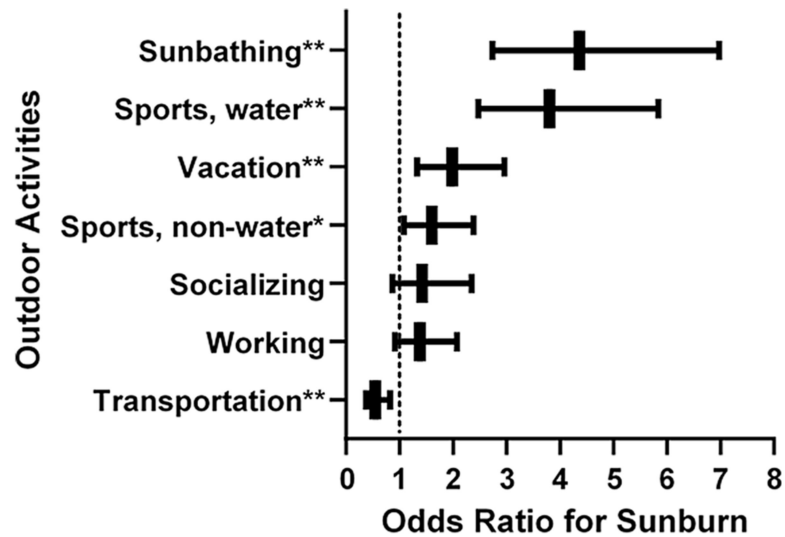


Fig. 1. Univariate Relationships Between Self-Reported Incidence of Past-Year Sunburn and Typically Performed Daytime Outdoor Activities. *Note.* Error bars indicate 95% confidence intervals for odds ratios. * $p < .05$. ** $p < .01$. Figure shows that sunbathing and outdoor water sports yielded the highest odds of reporting a sunburn over the past year. Vacations and non-water sports were also found to significantly increase the odds of reporting a sunburn, while transportation was found to significantly decrease the odds of reporting a sunburn

Table 1Sample Demographic and Behavioral Characteristics ($N = 400$)

Variables	<i>n</i> (%)
<i>Demographics</i>	
Age (years) <i>M</i> (<i>SD</i>)	19.8 (1.8)
Median (range)	20 (18–34)
Sex	
Female	223 (55.8)
Male	128 (32.0)
Other	2 (0.5)
Missing ^a	47 (11.8)
Race	
White	158 (39.5)
Asian	169 (42.3)
Black	28 (7.0)
Other	44 (11.3)
Ethnicity Hispanic/Latino/a	56 (14.0)
<i>Phenotypic Variables</i>	
Hair	
Red, fair, or blonde	45 (11.3)
Brown or black	355 (88.7)
Eyes	
Blue, green, hazel	89 (22.3)
Brown or black	311 (77.7)
Freckling	
None, very few, few	378 (94.4)
Some, many, very many	22 (5.6)
Skin burns with first summer sun exposure	
Yes	68 (17.1)
No	332 (83.1)
Skin tans by end of summer	
Yes	275 (68.8)
No	125 (31.2)
<i>Recent Tanning Frequency</i>	
Unintentional Outdoor Tanning	
Never	28 (7.0)
Rarely	85 (21.3)
Sometimes	143 (35.8)
Often	108 (27.0)
Always	36 (9.0)
Intentional Outdoor Tanning	

Variables	<i>n</i> (%)
Never	159 (39.8)
Rarely	113 (28.2)
Sometimes	81 (20.3)
Often	42 (10.5)
Always	5 (1.3)
Indoor Tanning	
Never	370 (92.5)
Rarely	17 (4.3)
Sometimes	9 (2.3)
Often	4 (1.0)
Always	0 (0.0)
<i>Sun protection</i>	
Sunscreen	
Never	41 (10.3)
Rarely	86 (21.5)
Sometimes	108 (27.0)
Often	120 (30.0)
Always	45 (11.3)
Stay in the shade	
Never	13 (3.3)
Rarely	51 (12.8)
Sometimes	158 (39.5)
Often	157 (39.3)
Always	21 (5.3)
Shirt with sleeves	
Never	38 (9.5)
Rarely	75 (18.8)
Sometimes	92 (23.0)
Often	128 (32.0)
Always	67 (16.8)
Hat	
Never	93 (23.3)
Rarely	124 (31.0)
Sometimes	114 (28.5)
Often	60 (15.0)
Always	9 (2.3)
Sunglasses	
Never	76 (19.0)
Rarely	87 (21.8)
Sometimes	85 (21.3)
Often	99 (24.8)
Always	52 (13.0)

Variables	<i>n</i> (%)
<i>Time spent in the sun in summer</i>	
Weekdays	
30 min or less	24 (6.0)
31 min to 1 h	83 (20.8)
2 h	96 (24.0)
3 h	65 (16.3)
4 h	66 (16.5)
5 h	35 (8.8)
6 h	31 (7.8)
Weekends	
30 min or less	18 (4.5)
31 min to 1 h	47 (11.8)
2 h	64 (16.0)
3 h	68 (17.0)
4 h	85 (21.3)
5 h	61 (15.3)
6 h	57 (14.2)
<i>Outdoor Activities</i>	
Sports, non-water	208 (52.0)
Sports, water	166 (41.5)
Sunbathing	134 (33.5)
Working	155 (38.8)
Socializing	322 (80.5)
Vacation	217 (54.3)
Transportation	223 (55.8)

^aThese missing cases were determined to be from an error with the questionnaire software and missing at random

Table 2Univariate Binary Logistic Regression Results for 1 or More Recent Sunburns ($N = 400$)

Variable	Past-year Sunburn (%)	Odds Ratio	95% CI	<i>p</i>
<i>Sex</i>				
Male	53.9%	REF		
Female	52.9%	.96	.62, 1.49	.86
<i>Race</i>				
White	82.3%	REF		
Asian	37.3%	.13	.08, .21	< .001
Black	14.3%	.04	.01, .11	< .001
Other	47.7%	.21	.10, .42	< .001
Skin Type ^a		2.09	1.64, 2.66	< .001
Unintentional Outdoor Tanning ^b		1.18	.97, 1.42	.09
Intentional Outdoor Tanning ^b		3.07	2.37, 3.98	< .001
Indoor Tanning ^b		2.14	1.18, 3.89	.01
Sunscreen + 1	61.1%	1.52	1.01, 2.31	.05
Less Protection	50.8%	REF		
<i>Weekday Sun Exposure</i>				
30 min or less	25.0%	REF		
31 min to 1 h	56.6%	3.92	1.41, 10.87	.01
2 h	57.3%	4.02	1.47, 11.03	.01
3 h	55.4%	3.72	1.31, 10.59	.01
4 h	53.0%	3.39	1.19, 9.61	.02
5 h	60.0%	4.50	1.43, 14.14	.01
6 h	58.1%	4.15	1.29, 13.35	.02
<i>Weekend Sun Exposure</i>				
30 min or less	27.8%	REF		
31 min to 1 h	42.6%	1.93	.59, 6.28	.28
2 h	45.3%	2.15	.69, 6.76	.19
3 h	57.4%	3.50	1.12, 10.91	.03
4 h	58.8%	3.71	1.21, 11.36	.02
5 h	63.9%	4.61	1.45, 14.65	.01
6 h	63.2%	4.46	1.39, 14.27	.01
<i>Sports, non-water</i>				
No	48.4%	REF		
Sports, water	72.9%	3.80	2.47, 5.84	< .001
No	41.5%	REF		
<i>Sunbathing</i>				
No	43.2%	REF		
Working	59.4%	1.38	.92, 2.07	.12
No	51.4%	REF		

Variable	Past-year Sunburn (%)	Odds Ratio	95% CI	<i>p</i>
Socializing	56.2%	1.42	.87, 2.34	.16
No	47.4%	REF		
Vacation	62.2%	1.98	1.33, 2.96	.001
No	45.4%	REF		
Transportation	48.0%	.55	.37, .82	.003
No	62.7%	REF		

^aOdds ratios represent a per unit increase on a 6-point scale

^bOdds ratios represent a per unit increase on a 5-point scale

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Table 3

Multivariate Binary Logistic Regression Results for Tanning, Sun Protection, and Time Spent Outdoors as Predictors of 1 or More Recent Sunburn ($N=400$)

Variable	Odds Ratio	95% CI	<i>p</i>
<i>Sex</i>			
Male	REF		
Female	.52	.28, .95	.03
<i>Race</i>			
Asian	.38	.19, .75	.005
Black	.09	.02, .34	< .001
Other	.34	.13, .89	.03
Skin Type ^a	1.96	1.36, 2.81	< .001
Unintentional Outdoor Tanning ^b	1.37	1.01, 1.86	.04
Intentional Outdoor Tanning ^b	3.35	2.31, 4.84	< .001
Indoor Tanning ^b	.83	.36, 1.94	.67
Sunscreen + 1	1.10	.60, 2.02	.77
<i>Weekday Sun Exposure</i>			
31 min to 1 h	3.11	.76, 12.83	.12
2 h	2.15	.51, 9.01	.30
3 h	1.06	.23, 4.89	.94
4 h	1.26	.26, 6.11	.77
5 h	2.02	.39, 10.57	.41
6 h	1.23	.20, 7.60	.83
<i>Weekend Sun Exposure</i>			
31 min to 1 h	1.17	.23, 5.88	.85
2 h	1.61	.32, 8.09	.56
3 h	1.41	.28, 7.06	.68
4 h	2.45	.49, 12.31	.28
5 h	4.26	.75, 24.11	.10
6 h	1.54	.25, 9.35	.64

^aOdds ratios represent a per unit increase on a 6-point scale

^bOdds ratios represent a per unit increase on a 5-point scale