



Short Communication

Prevalence and correlates of intentional outdoor and indoor tanning among adolescents in the United States: Findings from the FLASHE survey

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ABSTRACT

A body of research has focused on adolescents' indoor tanning behaviors but relatively little is known about the prevalence of adolescents' intentional outdoor tanning (time spent outdoors to get a tan). The present study used data from the National Cancer Institute's 2014 Family Life, Activity, Sun, Health and Eating (FLASHE) cross-sectional survey to examine the prevalence and correlates of intentional outdoor and indoor tanning among adolescents in the United States. Both unadjusted (bivariate) and adjusted (multi-variate) logistic regressions were performed to test the associations between demographic variables, time spent on media (e.g., using computers), emotional status and outdoor or indoor tanning. The overall prevalence of frequent outdoor tanning among adolescents in the U.S. was 15.6% (95% CI 13.8–17.4%) and the rate of indoor tanning in the past 12 months was 3% (95% CI 2.2–3.9). The adjusted odds of intentional outdoor tanning were significantly higher among girls (AOR 2.39, 95% CI 1.75–3.27), Non-Hispanic Whites (AOR 2.85, 95% CI 1.99–4.07), and those who spent more time on cell phones (AOR 1.40, 95% CI 1.25–1.57). The adjusted odds of indoor tanning were significantly higher among those who spent more time on computers (AOR 1.38, 95% CI 1.09–1.74) and cell phones (AOR 1.49, 95% CI 1.19–1.87). This study provides evidence for the relationship between media use and tanning behaviors among adolescents.

1. Introduction

Skin cancer is the most common cancer in the United States and incidence of melanoma, the most deadly type, has nearly doubled in the past 15 years (Gershenwald and Guy, 2016). Melanoma has become one of the most common cancers in young adult women (Siegel et al., 2016). The popularity of intentional ultraviolet (UV) tanning, both outdoors (e.g., sunbathing) and indoor tanning (i.e., tanning beds that emit artificial UV radiation) is thought to be a key contributor to growing skin cancer rates (Gershenwald and Guy, 2016). Tanning is most prevalent among young adults and adolescents, especially girls. Although there is some evidence that indoor tanning rates are decreasing, 7.3% of high school students reported indoor tanning in 2015 (Guy et al., 2017), little is known about the prevalence of outdoor tanning among adolescents.

The purpose of this study was to examine the prevalence and correlates of intentional outdoor and indoor tanning among adolescents in the United States. Study data were drawn from the cross-sectional Family Life, Activity, Sun, Health and Eating (FLASHE) study implemented by the National Cancer Institute (NCI). The primary correlates examined in this study include exposure to different media

channels and emotional status. Although aspects of media exposure and emotional states have been explored in a few tanning studies in young adults (Myrick et al., 2017; Stapleton et al., 2017), there is a dearth of studies examining their association with adolescent tanning. Adolescents spend nearly 9 h per day consuming media content (Media CS, 2015) and media exposure influences a variety of health-related behaviors through impacting psychosocial factors such as users' body image (Myrick et al., 2017). Studies have found evidence that media exposure affects attitudes toward tanning, UV exposure, and sun protection in young adult populations (Cafri et al., 2006). This study sought to examine the hypothesis that exposure to various types of media channels is associated with adolescents' tanning. Exposure to media has also been associated with low self-esteem, negative mood, and negative body image (Lopez-Guimera et al., 2010). Furthermore, risk behaviors like tanning have been associated with emotional status factors such as loneliness, depression, and negative body esteem (Gillen and Markey, 2012). This study will extend this work by examining the hypothesis that emotional status is associated with tanning in adolescents.

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2. Methods

2.1. Participants

Participants were adolescents from the NCI-administered FLASHE study, a survey study designed to explore cancer-related risk and protective behaviors among parent and adolescent dyads (Nebeling et al., 2017). Adolescent eligibility criteria included being between the ages of 12 to 17 years old and living with the parent respondent for > 50% of the time (Nebeling et al., 2017; Oh et al., 2017).

2.2. Recruitment and study procedures

The FLASHE cross-sectional study was active between April and October 2014 and the data were made publicly available in August 2017 (Nebeling et al., 2017). The participants were recruited through the Ipsos Consumer Opinion Panel and the sample was selected to be similar to the U.S. population on gender, Census division, household income and size, and race/ethnicity (Oh et al., 2017). The survey study was primarily designed to understand correlates of physical activity and diet. Skin cancer-related variables, including the frequency of outdoor tanning and indoor tanning and sun protection behaviors were also included as cancer risk factors. Invitations to enroll in the FLASHE study were sent to parents and adolescents via email which included the URL for the study website and a personalized identification number. Prior to study engagement, the website required parental consent both for themselves and their adolescent child (Oh et al., 2017). FLASHE study procedures were approved by the National Cancer Institute's Special Studies Institutional Review Board (IRB) and Westat's IRB (Nebeling et al., 2017; Oh et al., 2017). The current study was approved by the investigators' university IRB as a non-human subjects study.

2.3. Data collection

Each parent and child participant completed two online surveys. The response rate for the adolescent surveys was 31.6% and the final sample size for adolescents who completed both surveys was 1737. Participants received a \$5 cash incentive by mail for completing each survey. To encourage completion, the incentive increased to \$10 if the survey was completed during the week-long “bonus” period.

2.4. Measures

2.4.1. Demographics

The present study included demographic questions about age, sex, and race/ethnicity.

2.4.2. Emotional status

Emotional status was assessed with items measuring loneliness (Russell et al., 1978) which has been associated with depression, negative self-esteem, and media use (Cacioppo et al., 2006; Skues et al., 2012). Participants responded to two statements “I feel left out” and “I feel isolated from others” with response options ranging from 1 (*never*) to 5 (*always*).

2.4.3. Media use

Participants were asked about their typical day media consumption across three media categories: TV, computer, and phone/text. TV use was measured with a question asking how much time the respondents spend watching TV including watching movies or sports. Computer use included the use of social media, Internet, and gaming and was captured with a question asking about time spent on the computer (*How much time did you spend using computers? This includes time on Facebook as well as time spent surfing the internet, instant messaging, playing online video games, or computer games*). Cell phone use was measured by the phone/text question asking about “time spent talking or texting” and

directed respondents to report their time spent surfing the Internet or instant messaging as part of computer use. Response options for the media use questions ranged from 1 (e.g., *I didn't really watch TV at all*) to 5 (e.g., *I watched TV > 3 h per day*). Overall, 73% of the respondents watched TV > 1 h per day, 55% used computers > 1 h per day, and 48% used a cell phone > 1 h per day. Inter-item correlations between media use items were small (all *r*'s < 0.20).

2.4.4. Outdoor/indoor tanning

Outdoor tanning behavior was measured with a single item (*How often do you spend time in the sun in order to get a tan?*) with response options ranging from 1 (*never*) to 5 (*always*). Consistent with prior outdoor tanning research (Shoemaker et al., 2017), responses were recoded to create a dichotomous variable with response options *often* and *always* combined to represent participants who frequently engaged in outdoor tanning.

Indoor tanning behavior was measured with the question “*How many times in the past 12 months have you used a tanning bed or booth?*” Responses were recoded into a dichotomous variable representing no prior tanning or 1 or more prior 12 month tanning sessions, given only a small percentage of participants (3%) reported any indoor tanning.

2.5. Data analysis

Prevalence is reported as descriptive stats with 95% confidence intervals (CIs). Associations between the correlates and each tanning behavior were first examined with unadjusted (bivariable) logistic regression models testing the association of each variable with outdoor or indoor tanning. An additional adjusted (multivariable) model was conducted for each tanning outcome with all of the correlates included as independent variables. Data were analyzed using SAS 9.4.

3. Results

Of the respondents who completed standard demographic questions ($N = 1659$), 50.2% were female, 63.5% were non-Hispanic White, and the average age was 14.5 years ($SD = 1.6$). Data on the indoor tanning outcome was provided by 1544 participants and outdoor tanning was reported by 1539 individuals.

Table 1 provides prevalence estimates for outdoor and indoor tanning for the entire sample and by demographic variables. The overall prevalence of frequent outdoor tanning (i.e., often or always) was 15.6% (95% CI 13.8–17.4) and any past 12 month indoor tanning was reported by 3.0% (95% CI 2.2–3.9) of participants.

Table 2 shows the association of the correlates of outdoor and indoor tanning behavior. For outdoor tanning, unadjusted models revealed a non-significant association between outdoor tanning and age of adolescent ($p = 0.195$). Sex was significantly related to outdoor tanning ($p < 0.0001$) with the odds of outdoor tanning being 2.83 times higher among girls compared to males. Race/ethnicity was a significant predictor of outdoor tanning ($p < 0.0001$) as the odds of outdoor tanning were 2.52 times higher among non-Hispanic White adolescents compared to individuals from other races/ethnicities. Of the three media exposure variables, only cell phone use was significantly associated with outdoor tanning ($p < 0.0001$). Sex, race/ethnicity, and cell phone use remained significant predictors in the adjusted models.

Results showed that in the unadjusted model of indoor tanning of adolescents, age, emotional status, computers use, and cell phone use were significantly associated with indoor tanning ($p < 0.05$). Older adolescents were more likely to tan indoors (OR = 1.21, 95% CI: 1.00–1.46). Adolescents who felt left out and isolated from others more often were more likely to tan indoors (OR = 1.35, 95% CI: 1.03–1.75). Adolescents who spent more time on computers and cell phones were more likely to tan indoors than adolescents who spent less time on computers (OR = 1.47, 95% CI: 1.18–1.85) and cell phones

Table 1
Unweighted sample characteristics and weighted percentages of U.S. adolescents who intentionally tan outdoors and indoors, FLASHE 2014.

	Total sample unweighted N (%)	Outdoor tanning			Indoor tanning in the past 12 months	
		Non-tanners ^a (n = 660)	Non-frequent tanners ^b (n = 637)	Frequent tanners ^c (n = 240)	0 times (n = 1497)	≥ 1 time (n = 47)
		% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Total	1737	42.9 (40.5, 45.4)	42.2 (39.7, 44.6)	14.9 (13.1, 16.7)	97.0 (96.2, 97.9)	3.0 (2.1, 3.8)
Sex						
Male	835 (49.8)	52.4 (48.8, 55.9)	39.0 (35.5, 42.4)	8.6 (6.7, 10.6)	97.3 (96.2, 98.5)	2.7 (1.5, 3.8)
Female	778 (50.2)	33.4 (30.1, 36.7)	45.4 (41.9, 48.9)	21.2 (18.3, 24.1)	96.7 (95.5, 98.0)	3.3 (2.0, 4.5)
School type						
Public school	1417 (84.3)	42.1 (39.4, 44.8)	43.0 (40.3, 45.7)	14.9 (12.9, 16.8)	97.2 (96.3, 98.1)	2.8 (1.9, 3.7)
Private school	121 (7.2)	39.3 (30.1, 48.5)	42.0 (32.7, 51.3)	18.8 (11.4, 26.1)	96.3 (92.7, 99.8)	3.7 (0.2, 7.3)
Home-schooled/another kind of school	143 (8.5)	53.9 (45.4, 62.4)	33.9 (25.9, 42.0)	12.2 (6.6, 17.7)	95.9 (92.5, 99.3)	4.1 (0.7, 7.5)
Age (years)						
12–13	560 (33.3)	47.5 (43.1, 51.9)	39.4 (35.1, 43.7)	13.1 (10.1, 16.1)	97.4 (96.0, 98.8)	2.6 (1.2, 4.0)
14–15	585 (34.8)	41.0 (36.7, 45.3)	43.8 (39.5, 48.1)	15.2 (12.1, 18.3)	97.9 (96.7, 99.2)	2.1 (0.8, 3.3)
16–17	537 (31.9)	40.4 (36.2, 44.6)	43.3 (39.1, 47.5)	16.3 (13.2, 19.4)	95.9 (94.3, 97.6)	4.1 (2.4, 5.7)
Race/ethnicity						
Non-Hispanic White	1061 (63.7)	34.6 (31.4, 37.8)	46.4 (43.0, 49.7)	19.0 (16.4, 21.6)	96.8 (95.7, 98.0)	3.2 (2.0, 4.3)
Other	605 (36.3)	53.2 (49.5, 56.9)	37.0 (33.4, 40.6)	9.8 (7.6, 12.0)	97.3 (96.1, 98.5)	2.7 (1.4, 4.1)

Note. CI, confidence interval.

Variations in the sample size are due to missing data.

^a Respondents who reported “never”.

^b Respondents who reported “rarely” or “sometimes”.

^c Respondents who reported “often” or “always”.

(OR = 1.56, 95% CI: 1.27–1.93). However, in the adjusted model of indoor tanning, age and emotional status were not significantly associated with indoor tanning.

4. Discussion

Study objectives were to identify the prevalence and correlates of outdoor and indoor tanning among U.S. adolescents. Skin cancer

prevention experts have called for the need to expand the focus of skin cancer research to include surveillance of overlooked outdoor tanning behaviors especially among young people (Hay et al., 2017; U.S. Department of Health and Human Services, 2014). Frequent outdoor tanning was reported by 15.6% of adolescents, with higher rates among girls and non-Hispanic White individuals. This tanning rate is consistent with a recent study that found 14.1% of U.S. adults between 18 and 29 years of age were frequent outdoor tanners (Shoemaker et al., 2017).

Table 2
Unadjusted and adjusted odds ratios of U.S. adolescents who intentionally tan outdoors and indoors, FLASHE 2014.

	Outdoor tanning				Indoor tanning in the past 12 months	
	Non-frequent tanners compared to non-tanners		Frequent tanners compared to non-tanners		Unadjusted OR (95% CI)	Adjusted OR ^a (95% CI)
	Unadjusted OR (95% CI)	Adjusted OR ^a (95% CI)	Unadjusted OR (95% CI)	Adjusted OR ^a (95% CI)		
Age (years)	1.08 (1.01, 1.16)*	1.05 (0.98, 1.13)	1.11 (1.01, 1.21)*	1.04 (0.94, 1.16)	1.12 (0.93, 1.34)	1.00 (0.82, 1.21)
Sex						
Male	Ref	Ref	Ref	Ref	Ref	Ref
Female	1.83 (1.47, 2.28)***	1.74 (1.38, 2.18)***	3.84 (2.77, 5.31)***	3.25 (2.31, 4.58)***	1.23 (0.68, 2.23)	0.89 (0.48, 1.66)
Race/ethnicity						
Other	Ref	Ref	Ref	Ref	Ref	Ref
Non-Hispanic White	1.93 (1.55, 2.40)***	2.08 (1.65, 2.61)***	2.98 (2.16, 4.12)***	3.42 (2.42, 4.84)***	1.18 (0.65, 2.16)	1.33 (0.71, 2.51)
School type						
Public school	Ref	Ref	Ref	Ref	Ref	Ref
Private school	1.05 (0.68, 1.61)	1.05 (0.67, 1.65)	1.35 (0.78, 2.35)	1.41 (0.78, 2.54)	1.36 (0.48, 3.87)	1.49 (0.52, 4.33)
Home-schooled/another kind of school	0.62 (0.42, 0.91)	0.61 (0.40, 0.91)	0.64 (0.36, 1.13)	0.66 (0.36, 1.21)	1.50 (0.60, 3.77)	1.39 (0.52, 3.67)
Emotional status	1.06 (0.95, 1.19)	1.03 (0.92, 1.16)	1.19 (1.03, 1.38)*	1.01 (0.88, 1.16)	1.43 (1.09, 1.87)**	1.32 (1.00, 1.75)
Time spent watching TV	1.08 (0.99, 1.19)	1.07 (0.97, 1.18)	1.10 (0.97, 1.25)	1.08 (0.92, 1.27)	1.24 (0.96, 1.61)	1.03 (0.80, 1.34)
Time spent using computers	1.01 (0.93, 1.09)	0.99 (0.90, 1.08)	0.92 (0.82, 1.03)	0.89 (0.78, 1.01)	1.46 (1.16, 1.83)**	1.34 (1.06, 1.70)*
Time spent using a cell phone	1.20 (1.11, 1.30)***	1.17 (1.06, 1.28)***	1.51 (1.35, 1.69)***	1.47 (1.30, 1.66)***	1.59 (1.28, 1.97)***	1.56 (1.23, 1.96)***

Note. CI, confidence interval; OR, odds ratio.

^a Multivariable analysis included all displayed factors and was based on the weighted population of the study.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Past 12 month indoor tanning was reported by 3.0% of the adolescent sample. The rate increased to 6.3% among 17 year olds, consistent with studies that suggest many adolescents first try tanning near the end of high school (Guy et al., 2017). Indoor tanning rates reported by adolescents in this study are lower than other recent population-based studies of adolescent tanning (Coups et al., 2016) and adds to the evidence base that suggests there may be a national decline in adolescent tanning rates (Guy et al., 2017). Several factors may underlie this decrease, including increasing awareness of tanning's harms and the implementation of state laws and age restrictions on indoor tanning (Guy et al., 2017). Age, sex, and race/ethnicity were not significant predictors of indoor tanning in the current study, which is inconsistent with prior research (Guy et al., 2017). However, the lack of association in this study is likely due to the low frequency of indoor tanning.

Our findings suggested that exposure to different types of media had varying effects on tanning behaviors. Although mass media exposure has been found to be associated with tan appearance attitudes (Cafri et al., 2006), TV consumption was not a significant predictor of tanning. However, adolescents' computer-mediated communication including social media use and interpersonal communication including talking or texting on the cell phone, were significantly associated with their indoor tanning behaviors. These results are consistent with prior research of media use and indoor tanning intentions (Myrick et al., 2017) and suggests that adolescents who are more socially active with technology are more likely to indoor tan. The observed association between intentional outdoor tanning and interpersonal media use is a novel finding as correlates of intentional outdoor tanning among teens have been under-researched (Hay et al., 2017). The association between loneliness and indoor tanning observed in the univariate model supports and extends research linking emotional factors and tanning in young adults (Stapleton et al., 2017; Gillen and Markey, 2012).

Study limitations include the use of media exposure measures that were broad in scope (e.g., computer use included time spent on social media, surfing the Internet, instant messaging, and playing games), which limits the ability to examine the impact of specific types of media exposure. In addition, emotional status was only measured by the loneliness scale. Despite these limitations, study findings have important implications for future research. The high rate of frequent outdoor tanning supports the need for additional attention on outdoor tanning in skin cancer prevention research. Future research should consider tanning interventions to counteract negative media influences driving tanning and build on studies that support the use of social media interventions to produce positive effects on health behavior change (Yang, 2017).

Conflict of interest

The authors declare there is no conflict of interest.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect

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