



Short Communication

Choctaw Nation Youth Sun Exposure Survey

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ABSTRACT

The incidence of skin cancer is rising among American Indians (AI) but the prevalence of harmful ultraviolet light (UVL) exposures among AI youth is unknown. In 2013, UVL exposures, protective behaviors, and attitudes toward tanning were assessed among 129 AI and Non-Hispanic (NHW) students in grades 8–12 in Southeastern Oklahoma. Sunburn was reported by more than half the AI students and most of the NHW students. One-third of AI students reported never using sunscreen, compared to less than one-fifth of NHW students, but racial differences were mitigated by propensity to burn. Less than 10% of students never covered their shoulders when outside. Girls, regardless of race, wore hats much less often than boys. Regardless of race or sex, more than one-fourth of students never stayed in the shade, and more than one-tenth never wore sunglasses. The prevalence of outdoor tanning did not differ by race, but more than three-fourths of girls engaged in this activity compared to less than half the boys. Indoor tanning was reported by 45% of the girls, compared to 20% of girls nationwide, with no difference by race. Nearly 10% of boys tanned indoors. Among girls, 18% reported more than ten indoor tanning sessions. Over one-quarter of participants agreed that tanning makes people look more attractive, with no significant difference by race or sex. Investigations of UVL exposures should include AI youth, who have not been represented in previous studies but whose harmful UVL exposures, including indoor tanning, may place them at risk of skin cancer.

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1. Introduction

Skin cancer risk intensifies during adolescence when harmful exposures to ultraviolet light (UVL) frequently occur (Balk, 2011). Indoor tanning, which is a risk factor for melanoma (Boniol et al., 2012), is popular among youth (Guy et al., 2015a) and has been implicated in the rising incidence of skin cancers in the general US population (Boniol et al., 2012) as well as young adult women (Guy et al., 2015b). The incidence of skin cancer, including melanoma, is also increasing among American Indians (AI) (Simard et al., 2012). In Oklahoma, a state with a large population of AI, the proportion of AI diagnosed with advanced-stage melanoma

exceeds that of other racial groups (Campbell et al., 2014), and melanoma survival among AI is lower than that for Non-Hispanic Whites (NHW) (Baldwin et al., 2016). While studies suggest that members of racial minority groups do not perceive themselves as being at risk for skin cancer (Buster et al., 2012), and thus engage in skin protection less often than non-Hispanic Whites (NHW) (Mahler, 2014), none include AI youth.

The Choctaw Nation of Oklahoma Health Services Authority noted a rise in rates of melanoma among its service population. To investigate this rise, and to address the gap in knowledge regarding UVL exposures among AI youth, the Choctaw Nation Youth Sun Exposure Survey collected pilot data regarding sunburn, sunscreen use, outdoor tanning, indoor tanning, and attitudes toward tanning among youth in Southeastern Oklahoma.

2. Materials and methods

The Choctaw Nation of Oklahoma is a federally recognized tribe with a tribal jurisdictional statistical area of roughly ten counties in

Abbreviations: UVL, Ultraviolet Light; AI, American Indian; NHW, Non-Hispanic White.

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Southeastern Oklahoma, which include AI as well as non-AI residents. The Choctaw Nation of Oklahoma does not have a minimum blood quantum requirement as criteria for tribal enrollment. Tribal members must be able to document through state certified birth and death certificates their direct lineage to a Choctaw enrollee on the original tribal rolls.

Nearly all youth in this area attend public schools, with 5000 AI and 10,000 non-AI in middle and high school. Most school districts have a Youth Advisory Board (YAB), a volunteer community service organization and peer support program sponsored by the Choctaw Nation that is open to all students in grades 8–12 regardless of sex, race, or ethnicity. YABs consist of students interested in leadership development and participation in community service, and AI heritage is not required to participate. Of 17 total YABs, 9 met during the week of data collection in 2013 and were invited to participate. All 9 groups participated, comprising 134 attendees, all of whom partook in the study. The survey was brief (10 min), self-administered, and anonymous. Consistent with race categories on census and other nationwide assessments, students self-identified their race, either singly or in combination with other races. Other domains included UVL exposures, sun protection, propensity to burn or tan, and attitude items as adapted from existing surveys (see Box 1).

Unadjusted associations between demographic (race and sex) and exposure variables were assessed using chi-square tests for independence at $\alpha = 0.05$. Logistic regression was used to model binary outcome variables and to test for race by sex interactions. An interaction term between race (AI vs. NHW) and gender was retained only if statistically significant ($p < 0.05$). All statistical tests were two-sided. SAS v9.3 was used for all analyses.

The Choctaw Nation of Oklahoma Institutional Review Board (IRB) reviewed and approved data collection and manuscript. The University of Oklahoma Health Sciences Center IRB exempted the study from additional review. Printed instructions indicated the survey was voluntary and anonymous. Waiver of written informed consent was granted because the only record linking the survey respondent and the research would be the consent document.

3. Results

Analyses were limited to the 129 students who either self-identified as being AI, defined as having any AI ancestry, or Non-Hispanic White (NHW). Roughly half (52%) were AI. Most participants (85%) were in high school (grades 9–12): 13% in grade 9, 23% in grade 10, 25% in grade 11, and 24% in grade 12. Only 15% were in grade 8. Two-thirds (67%) were female.

As shown in Table 1, more than half the AI students and >80% of the NHW students reported any sunburn in the past year. Even among the 51 students who reported their only race was AI, 55% had sunburned in the past year (data not shown). Although girls reported any sunburn more often than did boys, the difference was not statistically significant.

Of five summertime outdoor protective behaviors (using sunscreen, wearing sleeves, wearing a hat, staying in the shade, wearing sunglasses), no difference by race was found except for sunscreen use. One-third of AI students reported never using sunscreen, compared to one-fifth of NHWs. A significant interaction between race and gender was found, with AI girls much less likely to use sunscreen than NHW girls (OR 0.24; 95% CI [0.08, 0.73]), but with no difference by race among boys. However, after adjustment for self-reported propensity to burn, no significant difference emerged between AI and NHW students in use of sunscreen ($p = 0.36$).

While girls less frequently reported never using sunscreen, never staying in the shade, or never wearing sunglasses, and more frequently reported never covering shoulders than did boys, the differences were not significant. However, girls much more frequently reported never wearing hats than did boys. No significant interactions between race and gender were found for these or any subsequent variables.

Self-reported propensity to burn after 1 h of unprotected exposure to sunlight (after not being in the sun for months) was reported by more

Box 1

Adapted UV exposure survey items.

In the summer, on average, how many hours are you outside per day between 10 AM and 4 PM on WEEKDAYS (Monday-Friday)? (Glanz et al., 2008)
(< 1 h; 1 to 2 h; > 2 h)

In the summer, on average, how many hours are you outside per day between 10 AM and 4 PM on WEEKEND Days (Saturday & Sunday)? (Glanz et al., 2008)
(< 1 h; 1 to 2 h; > 2 h)

In the past 12 months, how many times did you have a red OR painful sunburn that lasted a day or more? (Glanz et al., 2008)
(Please write in an estimated number.) _____ times

During the past 12 months, how many times did you use an indoor tanning device such as a sunlamp, sunbed, or tanning booth? (Do not count getting a spray-on tan.) (Centers for Disease Control and Prevention, 2011)
0 times; 1 to 9 times; 10 or more times

For the following questions, think about what you do when you are outside during the summer on a warm sunny day (Glanz et al., 2008).

How often do you wear sunscreen?
Never; Sometimes; Always

How often do you wear a shirt with sleeves that cover your shoulders?
Never; Sometimes; Always

How often do you wear a hat?
Never; Sometimes; Always

How often do you stay in the shade or under an umbrella?
Never; Sometimes; Always

How often do you wear sunglasses?
Never; Sometimes; Always

How often do you spend time in the sun in order to get a tan? (Glanz et al., 2008)
Never; Sometimes; Always

After several months of not being in the sun very much, if you went out in the sun FOR AN HOUR without sunscreen, a hat, or protective clothing, which one of these best describes what would happen to your skin? (Centers for Disease Control and Prevention and National Health Interview Survey, 2010)
Any burning was categorized as yes if participant indicated he/she would "Get a severe sunburn with blisters", "Have a moderate sunburn with peeling", or "Burn mildly with some or no darkening/tanning", and categorized as no if indicated would "Turn darker without sunburn", or "Nothing would happen to my skin".

Now consider after several months of not being in the sun very much, if you went out in the sun repeatedly, such as EVERY DAY FOR TWO WEEKS, without sunscreen, a hat, or protective clothing. Which one of these best describes what your skin would LOOK like? (Centers for Disease Control and Prevention and National Health Interview Survey, 2010)
Any tanning was categorized as yes if participant indicated he/she would become "Very dark or deeply tanned", "Dark/Moderately tanned" or "A little dark/mildly tanned", and no if indicated she/he would become "Freckled but still light skinned", or "Burned repeatedly with little or no darkening or tanning—still light skinned".

To what extent do you agree or disagree with the statement, "Tanning makes people look more attractive." (Cheng et al., 2010)
Strongly agree; Neither agree nor disagree; Strongly disagree

than half of the AI students compared to nearly 75% of the NHW students. No difference was found in propensity to burn by sex. Most (>80%) students reported a propensity to tan after two weeks in the sun with no difference by either race or sex.

Table 1

Prevalence of sunburn, sun protection, tanning, and attractiveness by race and sex in youth, Southeast Oklahoma, 2013.

	Total (n = 129)	Race		Sex	
		AI (n = 67)	NHW (n = 62)	Girls (n = 87)	Boys (n = 42)
Any sunburn, past 12 months, %	69.5	56.7	83.9**	73.6	61.0
Never use sunscreen, summer, %	25.6	32.8	17.7*	21.8	33.3
Never cover shoulders outside	6.2	6.0	6.5	8.1	2.4
Never wear a hat outside	58.9	59.7	58.1	74.7	26.2****
Never stay in shade outside	28.7	26.9	30.7	25.29	35.7
Never wear sunglasses outside	13.2	13.4	12.9	11.5	16.7
Would burn after 1 h in sun without protection ^a	62.7	53.9	72.1*	66.3	55.0
Would tan after two weeks in sun without protection ^a	86.5	89.2	83.6	84.5	90.5
Any time spent outdoors in order to tan, %	67.4	67.2	67.7	77.0	47.6**
Any indoor tanning, past 12 months, %	33.3	29.9	37.1	44.8	9.5****
Ten or more indoor tanning sessions, past 12 months, %	12.4	10.5	14.5	18.4	0***
Tanning makes people look more attractive, strongly agree, %	27.1	31.3	22.6	25.3	30.9

AI, American Indian; NHW, Non-Hispanic White.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, **** $p < 0.0001$ (Chi-square tests for differences in proportions by race or by sex).^a Number of missing = 1; number excluded due to not going outdoors = 2.

Intentional sun tanning was reported by two-thirds of the students with no statistically significant differences by race. Sun tanning, however, was much more prevalent among girls than boys (77.0% vs 47.6%, respectively). Similarly, about one-third of AI and NHW participants engaged in any indoor tanning, but girls reported indoor tanning much more often than boys (44.8% vs 9.5%, respectively). Nearly one-fifth of AI and NHW girls reported 10 or more indoor tanning sessions. One-quarter to one-third of respondents of both races and sex strongly agreed that tanning makes people look more attractive, but differences by race or sex were not statistically significant and no significant interaction terms were found.

4. Discussion

This is the first study to report UVL exposures, protective behaviors, and attitudes toward tanning among AI youth. Reports from several surveillance studies among youth have not included AI. As the prevalence of skin cancers is increasing among AI populations, greater inclusion of AI youth in nationwide studies of UVL exposures are needed.

Although propensity to burn among AI was reported less frequently than among NHW, mitigating the differences in use of skin protection by race, sunburn was reported by more than half the students with AI ancestry. This finding persisted even when limited to students who reported AI as their only race. Misunderstandings about UV risks may exist among people of AI ancestry who might believe themselves protected from harmful UV exposures even if they also share NHW ancestry. Such beliefs were not explored in this study and deserve further investigation. The high prevalence of sunburn nonetheless indicates the need for interventions to reduce harmful UVL exposures for both AI and NHW youth.

A particularly surprising and previously unexplored finding was the high prevalence of tanning, both indoor and outdoor, among many youth in this sample. The popularity of indoor tanning is particularly alarming, with both AI and non-AI girls engaging in this activity more than twice as often as high school girls in a 2013 nationwide study (45% vs. 20%) (Guy et al., 2015a), and was higher than the 31% reported for NHW girls (Guy et al., 2015a). Furthermore, 18% of girls engaged in ten or more indoor sessions, compared with 10% of high school girls nationwide (Guy et al., 2015a). The 10% prevalence of indoor tanning among boys in our study was also higher than the 5% reported by high school boys nationwide (5%) (Guy et al., 2015a), although such comparisons may be limited by sample size.

Reasons for the high prevalence of indoor tanning are not evident from this exploratory study and need further study. While AI participants felt that tanning makes people look more attractive more often than NHWs, the difference was not statistically significant. Cultural factors

that may affect tanning behavior have not been assessed for AI youth and deserve further exploration. Indoor tanning among rural teenage girls has also been shown to be higher than among urban populations (Quinn et al., 2015), and skin protection is less frequent among rural populations (Zahnd et al., 2010). Our largely rural study did not include an urban population for comparison.

Several evidence-based community level interventions have reduced indoor and/or outdoor UVL exposures among some youth (Holman et al., 2013; Olson et al., 2007; Watson et al., 2013), including among different racial and ethnic groups (Cheng et al., 2010), but none have been implemented among AI.

Some studies also suggest that regulatory and environmental interventions reduce indoor tanning (Guy et al., 2014; Watson et al., 2013), but the investigation of these or other influences on skin protection in AI communities is lacking. Several states with large AI populations, including Oklahoma, have no legal restrictions on indoor tanning (Pan and Geller, 2015), although the Food and Drug Administration requires age warnings be placed on indoor tanning devices (Watson et al., 2013).

4.1. Limitations

As an exploratory pilot study, survey responses were collected from a convenience sample of youth to identify exposures or behaviors that might contribute to the rise in skin cancer among AI. Another limitation is the inability to determine how well YAB students represent the underlying student population. Whether YAB youth have greater awareness of the risks of intentional tanning, and thus actually engage in less tanning behavior than their peers, is unknown. Conversely, it is not known if YAB participants feel pressure to tan in order to appear more attractive and/or more indigenous. However, the Choctaw Nation study staff had noted that AI youth in general were using indoor tanning frequently - an observation that also prompted the present study. Tanning was not felt by study staff to be substantially more prevalent among the YAB participants than the general student population, and as such, the high prevalence of tanning remains concerning, if not alarming.

Another limitation is that the small sample size limits the ability to detect moderate or small effects by age, race or gender. Larger, more inclusive surveillance studies of AI and rural populations are needed, as are spectrophotometric measures or other direct measurements of sun exposure.

4.2. Conclusions

AI as well as NHW youth in this rural sample frequently experienced UVL exposures that will likely increase their risk for skin cancer, including the high prevalence of indoor tanning. Although exploratory, these

findings are compelling and justify deeper investigations into legislative and behavioral interventions to reduce such exposures among AI youth, who have rarely, if ever, been included in surveillance studies or intervention trials.

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Conflict of interest

None.

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