



The urgent need to ban youth indoor tanning: evidence from college undergraduates

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Skin cancer is the most common malignancy in the USA, with over five million new diagnoses estimated in 2016 alone [1], and the incidence of melanoma, the deadliest form of skin cancer, doubled from 1982 to 2011 [2]. Of particular concern is the overwhelming increase in melanoma rates among adolescents and young adults [3]. A recent study analyzing Surveillance, Epidemiology, and End Results (SEER) data from 1973 to 2011 found that melanoma incidence among individuals in these age groups (0–14 and 15–39 years old) had increased by 253%, with young women at the greatest risk of developing melanoma [4].

Indoor tanning (IT) devices, common sources of ultraviolet (UV) radiation, appear to have played a significant role in the rising rates of melanoma and other skin cancers in recent decades, particularly among young women [5–7]. Previous research has conclusively determined that exposure to IT increases melanoma risk and the existence of a dose-response relationship between IT and increased risk [5]. Such risks have led to the classification of IT devices as “carcinogenic to humans,” by the World Health Organization’s International Agency for Research on Cancer [8, 9]. Additionally, in 2014, the U.S. Food and Drug Administration (FDA) reclassified IT devices as moderate- to high-risk medical devices (class II) and required all IT devices to display a black box warning stating they should not be used by individuals under 18 years of age [10]. However, despite the demonstrated dangers of this behavior, IT remains common in the USA and several other countries, particularly among teenage girls and young women. Much recent attention has focused on IT on or around college campuses, where rates exceed 40% according to data from a recent systematic review and meta-analysis [11].

We examined time of IT initiation (history and current use) in college students. We conducted a study of undergraduate students from three colleges in the USA (in Massachusetts and Alabama). A cross-sectional survey was administered in March–April 2014 using convenience sampling, a technique

Implications

Practice: Young age (e.g., high school) of indoor tanning initiation is associated with ongoing persistence and greater frequency of indoor tanning.

Policy: Policy is instrumental to discouraging and decreasing indoor tanning among youth; however, policymakers must consider potentially more stringent age restrictions and enforcement of such legislation for optimal success.

Research: Future research should explore barriers to adoption and enforcement of indoor tanning legislation, as well as observe its impact on indoor tanning initiation and persistence.

commonly employed in college tanning studies [12]. The institutional review boards of participating institutions granted the study exempt approval. Data obtained included demographics and tanning behaviors (including ever IT, currently IT, age of initiation, and frequency in past year) [15, 16].

Of 1014 surveys received, 971 met eligibility criteria (age 18 years or older and undergraduate enrollment at one of the participating institutions). Of these, 837 (86.1%) reported past IT practices (including none) and were included for analysis (80% female; 73% self-identified white; median age 20 years). Of the 837 respondents, 256 (30.6%) reported ever IT: 10.5% began before high school and 73.0% started during high school. Among these 256 who ever tanned, 135 (52.7%) reported IT in the past year; of these, 91% reported initiating IT in or before high school. Regarding frequency, individuals initiating IT before high school were 2.9 times (95% confidence interval [CI] [1.08–7.82]) more likely to have indoor tanned 10+ times in the past year compared with those starting in high school or college. Students at the two institutions in Alabama were significantly more likely to have engaged in IT than students at the university in Massachusetts (adjusted odds ratio [AOR] = 3.21, 95% CI [2.09–4.94] and AOR = 7.31, 95% CI [4.25–12.59], respectively).

Based on these findings from three universities, it is apparent that the majority of those who indoor tanned (among ever and current users) began *before* college (83.5 and 83.1%, respectively). Moreover, the earliest initiation of IT (before high school) was strongly related to more frequent IT many years later as college students. Study limitations include convenience sampling.

The 2014 U.S. Surgeon General's "Call to Action to Prevent Skin Cancer" highlighted the importance of IT prevention to achieve current goals for national skin cancer prevention [17]. Large-scale public awareness programs, public health policies, and legislation can play crucial roles in IT prevention, similar to the models set forth by tobacco control advocates. As of July 2016, 44 states had age restrictions in place, although the specifics of these limitations, with respect to minimum age and parental permission requirements, vary by state [10, 18, 19]. However, as of July 2016, 15 states currently have restricted IT access for minors under the age of 18: California, Delaware, Hawaii, Illinois, Louisiana, Massachusetts, Minnesota, Nevada, New Hampshire, North Carolina, Oregon, Texas, Vermont, Washington, and the District of Columbia [10, 19, 20]. Preliminary evidence indicates that states with more rigorous IT policies and restrictions have seen reduced prevalence of IT among adolescent and young adult (AYA) females [21, 22]. This underscores the current study's findings of early age of IT initiation and the need for prevention efforts that focus on the earliest onset of tanning, including prior to high school; cessation strategies should address persistent IT in college-aged populations.

In December 2015, the FDA proposed a federal restriction limiting the use of IT devices to individuals 18 years and older and requiring adult users to sign a risk acknowledgment statement before their first tanning session and again every 6 months thereafter [23]. Markov modeling of the potential effects of this legislation has estimated that it will prevent 61,839 melanoma cases and 6,735 melanoma deaths, as well as save US\$342.9 million in health care treatment costs over the lifetime of the 61.2 million youth in the USA 14 years old and younger [24]. This harmonization across all 50 states via a national ban on youth tanning would likely be more effective in reducing IT prevalence among AYAs and publicizing the harms of IT to all users, ultimately decreasing negative health outcomes linked to IT.

The findings presented by our study offer several implications for informing and expanding health policies. The present study demonstrates that the majority of indoor tanners initiate this behavior in adolescence, most frequently during high school. Previous research of adolescent tanning behaviors has determined high prevalence among teenagers, with IT rates as high as 73% [25–27]. Young age at IT initiation has been associated with persistent IT later in life as well as with difficulty in tanning cessation [25, 27]. However, existing studies have generally focused on establishing IT rates among either adolescent populations or

college populations. The current study is novel in its examination of age of initiation tracking indoor tanners from prior to high school to a number of years of college.

Therefore, it is laudable that the proposed FDA regulation aims to restrict those younger than 18 years old from using IT devices. However, future initiatives should consider extending the ban to those under age 19 to limit the influence that high school seniors might exert on their younger classmates. Of equal importance, IT use accelerates by age: while 20% of all high school girls engage in IT, rates are highest among 12th grade girls (27%) [28].

Harmonizing the current "patchwork quilt" of state-wide policies is essential in the drive to dramatically reduce youth indoor tanning. Currently, the 44 states with restrictions in place vary widely with respect to what age one must be to IT, provision of parent/guardian consent, and allowances for IT with a prescription from a physician, among other variations [10]. Compliance with these regulations has also demonstrated mixed results from state to state, with some demonstrating inadequate enforcement of facility compliance [29, 30]. Additionally, states requiring parental consent for IT among minors have shown sub-optimal rates of enforcement [29, 31–33].

In conclusion, the current study aligns with previous research, demonstrating that IT frequently begins *before* college and is common among younger adolescents [26, 27, 34–36]. However, the current study presents a novel view of IT initiation by examining age among a cross section of college students who have ever tanned. This has provided greater understanding about when IT behaviors begin, potential influences on this behavior, and insight into designing more targeted, effective prevention and cessation efforts. Similar to studies of early tobacco uptake and persistent later-life smoking, initiation of IT before high school was strongly related to more frequent IT rates many years later as college students. These findings, combined with studies that indicate that age of the first IT may play a role in later tanning behaviors, highlight the crucial factor of age at IT initiation [27]. These data show that individuals who start IT before high school are at the greatest risk of persistent tanning as well as the very high overall IT rates of individuals both prior to and during high school. These findings emphasize the importance of stemming these behaviors during high school or earlier—before they begin. Implementation of IT policy targeting use in adolescence is likely instrumental to achieving this goal. However, policymakers must consider essential factors including age restrictions and enforcement when formulating this legislation. Policy-level interventions to prevent the uptake of IT during the teenage years—both in high school and before high school—have the potential for a substantial impact on college tanning rates, and on rates of persistent tanning, in particular, and would catalyze a critical public health initiative towards addressing the increasing melanoma rates in the USA among young people.

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