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Teens, Tweets, and Tanning Beds: Rethinking the Use of Social Media for Skin Cancer Prevention



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The incidence of skin cancer is rising in the U.S., and melanoma, the deadliest form, is increasing disproportionately among young white women. Indoor tanning is a modifiable risk factor for all skin cancers and continues to be used at the highest rates in young white women. Adolescents and young adults report personal appearance-based reasons for using indoor tanning. Previous research has explored the influences on tanning bed use, including individual factors as well as relationships with peers, family, schools, media influences, legislation, and societal beauty norms. Adolescents and young adults also have high rates of social media usage, and research is emerging on how best to utilize these platforms for prevention. Social media has the potential to be a cost-effective way to reach large numbers of young people and target messages at characteristics of specific audiences. Recent prevention efforts have shown that comprehensive prevention campaigns that include technology and social media are promising in reducing rates of indoor tanning among young adults. This review examines the literature on psychosocial influences on indoor tanning among adolescents and young adults, and highlights ways in which technology and social media can be used for prevention efforts.

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INTRODUCTION

Technologic advances and the ubiquity of smartphones, social media, and Internet access have drastically shifted the social landscape. More than 70% of teens use social media, with Facebook (71%); Instagram (52%); Snapchat (41%); and Twitter (33%) being the most commonly used.¹ Visually oriented social media, including Instagram, Snapchat, and Pinterest, have a higher proportion of teenage female users compared with their male counterparts.² Young adults aged 18–29 years report even higher social media use on these platforms, including Facebook (82%); Instagram (55%); Pinterest (37%); and Twitter (32%).¹ On average, teens send and receive 30 text messages per day.¹ These new platforms with high engagement of young users provide a unique opportunity to reach this population with prevention efforts.

Research on the influence of social media use in health campaigns is in its early stages, but several studies suggest that social media use can be effective for promoting several different health behaviors. Nine of ten studies included in a review of public health campaigns using social media to target eating behaviors and physical

inactivity showed improvement in those aspects of health behaviors.³ For example, a study that provided a short message through social media to adolescents at high risk of sexually transmitted diseases found that those receiving the messages had fewer postings of health risk behaviors.⁴ However, the majority of studies involving social media in adolescent and young adult health have been observational and not focused on social media-based interventions.⁵

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This review focuses on skin cancer prevention, the role of indoor tanning in skin cancer prevention, and how social media may be leveraged to improve prevention efforts. First, the authors describe the scope of the problem of indoor tanning among adolescents and young adults and current efforts to reduce the rates of indoor tanning. Then, innovative ways to accelerate prevention efforts using mobile technology and social media are outlined in the context of psychosocial issues unique to adolescence and young adults. Throughout this review, the terms *adolescent* and *teenager* refer to studies with most participants who were either high school-aged or aged 11–18 years, whereas the term *young adult* refers to studies looking at either college-aged students or participants aged 18–30 years.

WHY SKIN CANCER?

Despite decades of ongoing skin cancer prevention efforts, the rates of both melanoma and non-melanoma skin cancer continue to increase in the U.S.^{6–8} and internationally,⁹ particularly among adolescents and young women. Melanoma, the deadliest form of skin cancer, is the second most frequently diagnosed cancer overall among individuals aged 15–29-years. In fact, melanoma makes up 8% of cancer diagnoses among people aged 15–19 years and is the most frequent cancer diagnosed among those aged 25–29 years at 18% of all cancers in this age group.¹⁰

Ultraviolet (UV) light exposure both from solar and artificial sources is a strong modifiable risk factor for all types of skin cancers.^{11,12} Indoor tanning specifically is associated with melanoma and non-melanoma skin cancer, and multiple studies demonstrate the strongest associations with first exposure before age 35 years, suggesting a susceptibility period in early life.^{13,14} Despite these known risks, both adolescents and young adults have high rates of several known risk factors. More than half of young adults aged 18–24 years report a sunburn in the past year. Among all surveyed adult age groups, individuals aged 18–24 years also report the lowest rate of sun protection usage, with 60% responding they used one or more types in the past year.^{15,16} Similarly among U.S. adolescents, only 13% of high school girls report wearing sunscreen regularly while in the sun and more than a third report a sunburn in the previous year.^{15,17}

A recent systematic review and meta-analysis showed that 55% of young adult university students and 19% of adolescents have used indoor tanning at some point in their lives, and 14% of young adult and 18% of adolescents have used indoor tanning the year prior.¹⁸ In the most recent 2015 National Health Interview Survey of U.S. adults, the highest rate of indoor tanning

was among non-Hispanic white women aged 18–24 years: 17.2% reported indoor tanning in the past year, whereas Hispanic young women reported a lower rate of 4.1%.¹⁹ In addition, approximately 3.6% of adult women reported using indoor tanning ten or more times per year.²⁰ The overall rate of indoor tanning decreased among U.S. young women by 4.5% between 2010 and 2013, and 7% among all U.S. high school students between 2010 and 2015.^{17,20} However, there were still approximately 10 million U.S. adults and 15% of white female U.S. high school students engaging in indoor tanning in 2013.^{17,20} Thus, prevention strategies are still needed, and more effective messaging has the potential to speed the decline of indoor tanning.

In 2014, the Surgeon General's Call to Action to Prevent Skin Cancer established strategic goals for multiple sectors of society including government, businesses, schools, community organizations, and individuals to enhance UV protection from the sun and artificial UV sources, such as indoor tanning.²¹ Since 2012, the U.S. Preventive Services Task Force has recommended that people aged 10–24 years with fair skin be counseled on the reduction of UV exposure to reduce the risk of skin cancer.²² According to the 2016 Skin Cancer Prevention Progress Report, recent progress in prevention strategies for adolescents and young adults includes state-specific legislation banning minors from indoor tanning, implementation of sun safety curriculum in schools, and a proposal for a U.S. Food and Drug Administration ban on indoor tanning for anyone aged <18 years.²³

WHAT WORKS IN SKIN CANCER PREVENTION?

Several innovative initiatives aimed at increasing awareness about the risks of indoor tanning have been implemented, including appearance-based messaging, school-based interventions, and community-wide comprehensive approaches.

A meta-analysis evaluating appearance-based interventions showed a significant reduction in indoor tanning behavior.²⁴ For example, one study found that when female university students were provided booklets with appearance-focused information, rates of indoor tanning decreased compared with controls at 6-month follow-up.²⁵ Interventions using UV photography to illustrate UV damage to the face also showed significant decreases in indoor tanning usage after participants viewed their photos that highlighted UV damage to facial skin.²⁶

Multicomponent community-wide interventions have demonstrated effectiveness at reducing UV exposures, including reducing indoor tanning. An example of one

community-wide program is the SunSmart City project launched in Montclair, New Jersey, which employed a variety of strategies, including mass media campaigns, policy changes, and sun protection education in schools to address the issue of sun protection comprehensively.¹⁶ A meta-analysis of seven community-based multi-pronged approaches including at least two components (e.g., educational, mass media, policy) in at least two different settings (e.g., school, recreation areas, entire community) showed a small decrease of 4% in indoor tanning use.²⁷ One intervention that combined traditional mass media intervention with social media found a reduction in indoor tanning use by >30% and a decrease in adolescents who started indoor tanning before age 15 years.²⁸ Furthermore, a recent Danish study on an adolescent school-based intervention to reduce indoor tanning used an e-magazine that included short films, advertisements, campaign materials, fiction, and social media and focused mainly on appearance-damaging effects of indoor tanning. The study found the odds of sunbed use were 40% lower at 6 months post-intervention.²⁹ The successful SunSafe program in Australia has also estimated that 100,000 skin cancers have been prevented over 15 years.³⁰ These comprehensive approaches show promise as long-term interventions.

Legislation

Although federal restrictions are lacking in the U.S., an increasing number of states have passed legislation banning indoor tanning for minors. As of March 2017, a total of 15 states and Washington, DC, have banned indoor tanning to all individuals aged <18 years, eight states have no age restrictions, and the remaining 29 states either ban some minors or require parent consent.³¹ Because most bans have been implemented within the past decade, studies of their impact are few. One study in Utah found a significant self-reported decrease in the prevalence of indoor tanning use from 12% to 7% among eighth- to 12th-grade students after restricting use for those aged <18 years unless accompanied by a parent or with a physician's note.³² However, 1 year after a ban of all minors aged <17 years was put into law in New Jersey, the rate of indoor tanning among female students did not change, and the rate increased in male students.³³ Compliance with these bans may also be an issue. In California, which bans all minors aged <18 years from indoor tanning, only 77% of >300 salons told a caller posing as a minor that she could not use their facilities, and many salons continued to make false claims about their services.³⁴ As part of the Affordable Care Act in 2010, a 10% federal tax on the use of indoor tanning devices was implemented.³⁵ In one study evaluating the legislation, 26% of surveyed tanning salons in Illinois

reported fewer customers after the tax.³⁶ Although 78% of salons reported that they perceived customers did not seem to care about the tax and younger clients were less likely to care about the tax than older clients.³⁶ In December 2015, the U.S. Food and Drug Administration proposed landmark legislation that included a ban on indoor tanning for minors aged <18 years and requires potential users to sign a risk acknowledgment before use.³⁷

SOCIAL MEDIA AND CANCER PREVENTION

It is hard to ignore the role and influence of social media on the lives of young adults. With >90% of teens and young adults going online daily and spending an average of almost 9 hours per day on social media, prevention campaigns have an opportunity to reach a large proportion of this population, including users of indoor tanning.³⁸ Among young adult indoor tanning users specifically, >80% report occasional to regular Facebook use, and >30% report occasional to regular Twitter, Instagram, and Pinterest use. Higher rates of indoor tanning are associated with regular Instagram and Twitter use. Respondents who report least occasional use of Instagram had double the odds of reporting indoor tanning in the past year.³⁹

Social media platforms are already used by commercial entities, including the indoor tanning industry, to advertise directly to adolescents and young adults.⁴⁰ A large proportion of social media pages from salons focus on popular culture references, a strategy thought to build relationships and engage with its targeted audience.⁴⁰ Although the influence of the indoor tanning industry on young adults through social media is concerning, social media and other online platforms also give public health advocates the opportunity to target health messages directly to those at highest risk and reach a large number of people at relatively low cost. The public health community needs to work together with technology companies to develop creative ways to use social media to reach those at highest risk of cancer-causing behaviors.

Although this field is rapidly developing, some parameters to consider include:

1. content of messages, given the growing evidence that appearance-based messages may be more effective for skin cancer prevention;
2. timing, given online searches for indoor tanning are most frequent between February and May⁴¹ suggesting online campaigns may be best implemented during this time frame for maximum exposure; and
3. type of platform used.

Female adolescents are higher users of visual-oriented social media² and prevention messages are more effective when they contain images,²⁴ suggesting image-based messages on Instagram and Snapchat could be an opportunity to place effective evidence-based message targeted at female adolescents.

Research is emerging on how individuals are using social media platforms in relation to health topics. Google search trends of tanning-related search terms showed seasonal trends with higher rates of searching in the U.S. annually in February–May with the peak in March.⁴¹ Over a 2-week period, >150,000 posts on Twitter, reaching >100 million users, mentioned indoor tanning, with <5% of the tweets mentioning risks.⁴²

Early studies on using technology interventions to reduce skin cancer risk show some promising results in promoting behavior change. A study of middle school students aged 11–14 years reported changes in sun protection after receiving 36 skin cancer prevention text messages over 12 weeks.⁴³ A study of adults aged 18–42 years who received 21 sun protection text messages over 12 months showed greater improvement in sun protection than the control group.⁴⁴ In an RCT of a web-based intervention where participants viewed a series of psychoeducational web pages and answer questions designed to restructure their beliefs about the ideal tan, the intervention group showed an increase in odds of abstaining from indoor tanning at the 6-week follow-up.⁴⁵ Another national RCT of a multimedia web-based intervention targeted at young adults at moderate or high risk of skin cancer showed increased sun protective behaviors.⁴⁶

TEENS, YOUNG ADULTS, AND INDOOR TANNING

Psychosocial and Environmental Factors Contributing to Indoor Tanning Behavior

Several factors influence an adolescent or young adult's tanning behavior, including those at the individual level (e.g., addiction, internalization of tan ideal, body image, psychiatric comorbidity); family level (e.g., interactions with parents, parent approval); peer level (e.g., peer use of indoor tanning, peer beauty ideals); and societal level (e.g., legislation, advertisements, beauty ideals).

Appearance is the main motivator for young adults who tan, with one study showing 90% of college students who frequently indoor tan reported the primary reason was to “look good.”⁴⁷ Those who perceive tanning makes them more attractive are more likely to use indoor tanning.⁴⁸ Weight is also a factor: Frequent indoor tanners were more likely to be concerned about their

weight, reported higher rates of dieting, and dieted to lose weight.⁴⁸

Studies have suggested that despite high levels of skin cancer risk knowledge, college students continued to tan to feel better and be more attractive.⁴⁹ Developmentally, adolescents and emerging adults show egocentrism marked by an exaggerated sense of invulnerability and sensation-seeking behavior, both of which contribute to risk-taking behaviors despite knowledge of risks.⁵⁰ Based on national survey responses, indoor tanning among high school students is associated with several other high-risk health behaviors such as attempting suicide, unhealthy weight control behaviors, binge drinking, and sexual intercourse with multiple partners.⁵¹ Similar findings were also observed among Colorado high school students with associations found between indoor tanning and alcohol use, cigarette smoking, marijuana use, and steroid abuse.⁵²

Indoor tanning can have an effect on an individual's mood and has been associated with qualities similar to other known substance use disorders. In surveys of indoor tanners for screening dependent behaviors, 30% met criteria for problematic behavior using a modified measurement used in identifying problematic behaviors related to alcohol and other substance use (CAGE or cut-annoyed-guilty-eye criteria).⁴⁷ Almost 40% of college students who use indoor tanning met DSM-IV diagnostic criteria for substance-related disorder modified for indoor tanning.^{47,53} Preliminary evidence suggests that these symptoms are driven by endogenous opioids induced by UV exposure, and physical withdrawal symptoms can be induced in frequent tanners with an opioid blockade to mimic discontinuation of indoor tanning.^{54,55} Those individuals who started tanning at a younger age were more likely to tan frequently later in life.^{47,56}

As with other health behaviors, peers and parents influence indoor tanning behavior among youth and young adults. Adolescents who report that more of their friends liked to be tan and tanned indoors are also more likely to use indoor tanning.^{48,57,58} University students who identify with the “popular” peer crowd are more likely to place importance on physical appearance and have more-favorable attitudes toward and increased use of indoor tanning than other peer groups.⁵⁹ Parents also influence adolescent health risk behaviors through modeling, health behavior attitudes, and monitoring their teen's behavior.^{57,60,61} In studies specific to indoor tanning, female caregivers are shown to have a powerful, multifaceted influence on their teenager's tanning behavior,⁶² and female parents were more likely than their teenage daughters to endorse that having a tan looks healthy and attractive.^{57,63} Youth who have primary

caregivers who used indoor tanning were much more likely to use it themselves.⁶⁴ Further, parents can act as “gatekeepers” to influence behavior: Adolescents who perceived that their parents would allow them to tan indoors are more likely to do so.⁶²

The media plays an important role in attitudes and expectations of indoor tanning.^{65–67} Frequent indoor tanning use in female adolescents is associated with the desire to look like women in movies, magazines, and TV.⁴⁸ TV and media often glamorize a tanned appearance,^{68,69} and viewing beauty-related reality TV is associated with more-positive attitudes that tan women are more attractive and increased use of indoor and outdoor tanning among college women.^{70,71}

Convenience is another factor associated with indoor tanning. Indoor tanning salons are widely available in urban areas across the U.S.⁷² In a national sample, just fewer than half of 125 top colleges were found to have indoor tanning facilities available to students on campus or in off-campus student housing, and these facilities are more common at colleges located in the Midwest and Northeast in addition to colleges with high enrollment.⁷³ Campus debit cards can be used to pay for indoor tanning at 14% of all surveyed colleges.⁷⁴ In addition, 41% of young women who report indoor tanning used facilities other than a tanning salon such as a gym, apartment complex, or beauty shop.⁷⁴

The tanning industry advertises heavily on social media platforms (e.g., Facebook, Twitter) known to have high rates of adolescent and young adult users to promote discounts and frequent use.⁴⁰ Tanning salons target teenage girls with promotions and provide inaccurate information regarding risk and recommended usage.⁷⁵

Opportunities for Social Media Use in Primary Care

Because many users of indoor tanning are generally healthy, the primary care setting provides a great opportunity to counsel about skin cancer prevention. Clinicians who treat adolescents are encouraged to perform a psychosocial risk assessment at visits taught with the acronym HEEADSSS (Home environment, Education and employment, Eating, peer-related Activities, Drugs, Sexuality, Suicide/depression, and Safety from injury and violence).⁷⁶ However, skin cancer risk behaviors are not included in this assessment, and fewer than half of a national sample of pediatricians surveyed report they counseled patients about avoidance of indoor tanning.⁷⁷ Most cite insufficient time as a barrier to skin cancer risk reduction counseling.⁷⁷ In 2012, the U.S. Preventive Services Task Force reaffirmed its recommendation that there was sufficient evidence to deliver behavioral counseling in the primary care setting to

fair-skinned patients aged 10–24 years to reduce UV exposure.⁷⁸ However, based on claims data, adolescents have infrequent primary care visits, with 70% of adolescents having one or fewer preventative care visits between the ages 13 and 17 years.⁷⁹ This creates another barrier to implementation of the U.S. Preventive Services Task Force recommendations. Social media is a potential tool to keep adolescents engaged with primary caregivers in this setting of fewer in-person interactions.

The Surgeon General’s Call to Action to Prevent Skin Cancer in 2014 emphasized the need for all sectors of society coming together to form a comprehensive skin cancer prevention strategy to help curb the increasing rates of skin cancer that would include governments, businesses, healthcare systems, schools, communities, families, and individuals.²¹ Strategies that go beyond education and address practical, environmental, and behavioral barriers to the reduction of indoor tanning have the highest likelihood of success (Table 1). Considering evidence of psychosocial issues that affect indoor tanning behavior among adolescents and young adults, the authors propose several action items involving stakeholders to help achieve the Surgeon General’s goal. Investing in the reduction of indoor tanning has the potential for returns in both money saved and healthier lives. A 2017 analysis of the financial implications found that direct medical care for patients with melanoma in the U.S. totals \$343 million annually, and a total economic loss of \$127 billion over their lifetime. It was projected that the comprehensive national skin cancer prevention intervention in Australia would lead to savings of 2.3 times the money spent on a comprehensive campaign and save >20,000 life-years in one state alone over 15 years.³⁰

FUTURE DIRECTIONS

The broader use of social media in skin cancer prevention campaigns will accelerate prevention efforts. As such, the authors propose:

1. that skin cancer prevention campaigns leverage social media to reach a broader audience;
2. developing and evaluating social media messages that shift norms about ideals of beauty and appearance;
3. increased use of social media to increase support, engagement, and advocacy for policies against indoor tanning for tanning bed policy efforts, including a national ban on indoor tanning on minors and a national tax on indoor tanning;
4. partnerships with technology companies to ensure public health advocates have access to the latest tools and platforms for dissemination of health messages;

Table 1. Proposed Solutions Based on Surgeon General Call to Action to Prevent Skin Cancer²²

| Partners in prevention based on Surgeon General's Call to Action ²² | Proposed future directions | Examples of action items |
|--|--|---|
| Federal, state, tribal, local, and territorial governments | Policy changes to discourage indoor tanning use Use social media to build widespread support for tanning bed policy efforts | (1) National ban on indoor tanning on minors (2) National tax on indoor tanning (3) Restriction of false advertising by tanning industry across all advertising mediums (4) Restriction of tanning industry advertising on social media |
| Businesses, employers, and labor representatives | Partnerships with technology companies to ensure public health advocates have access to latest tools, data, and platforms | (1) Prevention campaigns use data on social media usage to optimize target population (2) Researchers are given access to social media platforms to inform effective campaigns |
| Healthcare systems, insurers, and clinicians | Integration of social media prevention messages with health systems | (1) Pediatricians and general practitioners use social media to increase engagement with adolescents and provide skin cancer prevention education (2) Physicians use mobile technology such as text reminders to reinforce health messages (3) Health systems use social media pages to disseminate prevention messages |
| Early learning centers, schools, colleges, and universities | Further research on effective social media interventions to reduce indoor tanning | (1) University support of researchers investigating social media and prevention (2) Schools integrate social media into health education at all levels (3) Ban use of university-sponsored debit cards for purchasing indoor tanning (4) Restrict presence of indoor tanning facilities on university campuses and in university housing |
| Community, nonprofit, faith-based organizations | Integrate social media into ongoing skin cancer prevention campaigns | (1) Encourage all prevention campaigns to use evidence-based messaging (2) Increase social media presence for all skin cancer prevention campaigns |
| Individuals, families, and peers | Use social media to shift social norms about ideals of beauty | (1) Engage with social media influencers to discourage indoor tanning and devalue tan appearance (2) Use known social media influencers to spread health information (3) Use peer-to-peer social media activity to spread health messages |

5. a restriction of advertising by tanning industry on social media;
6. further research on the effectiveness of social media interventions to reduce indoor tanning; and
7. integration of social media prevention messages with health systems to ensure that patients and clinicians benefit from the latest tools in dissemination of personalized health messages.

CONCLUSIONS

Social media represents an underutilized and understudied opportunity for reduction of skin cancer risk factors, especially among adolescents and young adults, the most active users of social media. Public health advocates and researchers have yet to realize

the full potential of social media in cancer prevention, perhaps owing to a lack of rigorous studies testing these approaches. Research in this area will require a team science approach in which expertise in social media marketing, behavioral science, public health, health communications, and dermatology are needed. If social media interventions can be shown to shift high-risk cancer behaviors in a vulnerable group, using the example of tanning beds and skin cancer, then the implications are tremendous. Findings could be applied to tobacco cessation, obesity prevention, and beyond cancer prevention, to other health priorities where behaviors play a big role in the disease process. The authors hope to see growing collaboration between technology and social media companies and public health advocates to achieve these goals.

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