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Prevalence and Characteristics of Indoor Tanning Use Among Men and Women in the United States

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Abstract

Objectives: To describe the prevalence and characteristics related to indoor tanning use among adults in the United States in the past year.

Design: Cross-sectional study.

Setting: Health Information National Trends Study, 2005.

Participants: The study included 2869 participants who were white and aged 18 to 64 years; a random subset of 821 participants were also asked questions about skin cancer prevention knowledge and attitudes.

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Author Contributions: Drs Choi and Lazovich had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Choi and Lazovich. *Acquisition of data:* Choi. *Analysis and interpretation of data:* Choi, Lazovich, Southwell, Forster, Rolnick, and Jackson. *Drafting of the manuscript:* Choi and Lazovich. *Critical revision of the manuscript for important intellectual content:* Choi, Lazovich, Southwell, Forster, Rolnick, and Jackson. *Statistical analysis:* Choi. *Obtained funding:* Lazovich, Southwell, Forster, and Rolnick. *Administrative, technical, and material support:* Choi. *Study supervision:* Lazovich.

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Main Outcome Measures: The study assessed the prevalence of self-reported use of indoor tanning in the past 12 months and its associations with demographic and lifestyle factors, knowledge, and attitudes.

Results: Overall, 18.1% of women and 6.3% of men reported tanning indoors in the past 12 months. Women who were older, were less educated, had lower income, and used sunscreen regularly were less likely to report the behavior, while women residing in the Midwest and the South and who used spray tanning products were more likely to report the behavior. Men who were less likely to report the behavior were older and obese but more likely to report the behavior if they lived in metropolitan areas and used spray tanning products. In an open-response format, only 13.3% of women and 4.2% of men suggested that avoidance of tanning bed use could reduce their risks of skin cancer. Greater skin cancer knowledge and higher perceived risk of skin cancer were inversely associated with the behavior in women.

Conclusions: Prevalence and some characteristics associated with indoor tanning use, such as sunscreen use, differed between women and men in the United States. Most adults did not volunteer avoidance of tanning bed use to prevent skin cancer. Clinician-patient communication on risks of indoor tanning may be helpful to reduce indoor tanning use.

SKIN CANCER IS THE MOST COMMON form of malignancy in the United States. The American Cancer Society estimated that 1 000 000 new cases of melanoma and nonmelanoma skin cancer were diagnosed in 2009; 8650 deaths were attributable to melanoma skin cancer.¹ In 2004, the estimated direct medical cost for treating skin cancer, primarily nonmelanoma skin cancer, was approximately \$1.7 billion, and the indirect cost attributable to lost productivity was approximately \$3.8 billion.² More alarmingly, the incidence of skin cancer is increasing among adults, particularly in women younger than 40 years,^{3,4} and this increase has been attributed by some scholars to the popularity of indoor tanning among this population. Despite a recent meta-analysis that supported a positive association between increased use of indoor tanning and both melanoma and nonmelanoma skin cancers,⁵ the indoor tanning industry is still growing rapidly, generating more than \$5 billion in annual revenues, and has attracted more than 30 million patrons,⁶ primarily women.⁷

Although several studies have examined the prevalence of and characteristics related to indoor tanning in adolescents,⁸⁻¹¹ similar studies are limited in adults and have generally been restricted to regional samples of adults and parents or legal guardians of teenagers.^{10,12-14} One study of a national adult sample found that females younger than 50 years were more likely to tan indoors in the past year than males of a similar age.¹⁵ Another study examined data from the Health Information National Trends Study (HINTS) and found that women were more likely than men to tan indoors in the past year.¹⁶ However, the purpose of that analysis was to examine indoor tanning use jointly with sunless tanning product use. Consequently, indoor tanners who did and did not use sunless tanning products were considered separately, and only a limited number of demographic characteristics were assessed.

Given the gender differences in the prevalence of indoor tanning among adults^{15,16} and adolescents^{10,12} as well as differences between women and men in sun protection practices⁸ and beliefs,¹⁷ we aimed to expand the previous analysis of the HINTS data to explore

characteristics related to indoor tanning separately for women and men. Furthermore, we explored the associations between indoor tanning and knowledge and attitudes toward skin cancer prevention. These analyses may yield insightful sex-specific findings to guide future interventions to reduce the prevalence of indoor tanning use.

METHODS

POPULATION

We used data from the National Cancer Institute's 2005 HINTS; detailed sampling methods and sample characteristics can be found elsewhere.¹⁸ In brief, households were selected by list-assisted random digit dialing of all US telephone exchanges and screened for eligibility, followed by an extended telephone interview with 1 adult per household among the eligible households. The overall response rate was 20.9% among all known residential numbers and 62.5% among all eligible households. Responses were weighted to produce nationally representative estimates for the noninstitutionalized adult population in the United States. The current investigation was restricted to participants who were white and aged 18 to 64 years (n=2869) owing to the low prevalence of indoor tanning in the non-white and subgroups 65 years or older in the population. Approximately 30% (n=821) of these participants were randomly selected to answer additional questions about skin cancer prevention knowledge and attitudes.

MEASURES

Demographic information, including age, sex, education level, annual income, and geographic region, was collected. The level of urbanization of participants' residential areas was measured according to the Rural-Urban Continuum 2003¹⁹ and dichotomized into metropolitan and nonmetropolitan areas. A personal history of skin cancer was measured according to whether participants were told by a physician that they had cancer and, if so, which types of cancer they had. Family history of skin cancer was assessed by similar questions concerning participants' family members.

Participants were asked how many times they had used indoor tanning devices, including sunlamps, sun beds, and tanning booths, in the past 12 months. Exposure to sunless tanning products was also assessed by a separate question with the same format. Use of indoor tanning or sunless tanning products was defined as at least 1 use in the past 12 months.

Regular use of sunscreen was assessed by asking participants how frequently they wore sunscreen when they were in the sun for more than an hour. Regular users included participants who reported always or often, and nonregular users included those who reported sometimes, rarely, or never. Participants who had smoked at least 100 cigarettes in their lifetime and were currently smoking at least some days were classified as current smokers; otherwise they were classified as former or never smokers. Body mass index was derived from participants' self-reported height and weight and categorized into nonoverweight, overweight, and obese.²⁰ Participants were also asked whether they had tried to lose weight during the past year. Physical activity levels of the participants were calculated by multiplying the reported number of days of moderately intense physical activities in a

typical week and the number of minutes that the participants exercised each day, and the answers were dichotomized into less than 150 minutes per week and 150 minutes or more per week.²¹

One-third of participants were randomly selected to answer additional questions related to skin cancer prevention. They were asked to suggest methods that people could use to reduce their chances of getting skin cancer. These open-ended responses were coded into 6 skin cancer prevention practices in the HINTS database: avoid tanning bed use, get tested for skin cancer, stay out of the sun, wear a hat, wear sunscreen, and have regular checkups. We considered these 6 practices to reflect participants' knowledge about skin cancer prevention. Their attitudes toward skin cancer prevention were measured by 2 closed-ended questions: how likely they thought they would develop skin cancer in the future, and whether they agreed that skin cancer was most often caused by personal behaviors or lifestyle.

STATISTICAL ANALYSIS

Analyses were stratified by sex. Logistic regression was used to obtain odds ratios and 95% confidence intervals on the association between indoor tanning use in the past 12 months and all correlates. Odds ratios for the relationship between indoor tanning use in the past 12 months and age, education level, annual income, region, and living in a metropolitan area were adjusted for each other, while other characteristics examined were adjusted for these demographic factors. The association between indoor tanning use in the past 12 months and skin cancer knowledge and attitudes was adjusted for age only because of a reduced sample size. Interactions between sex and other correlates on past-year indoor tanning use were also assessed. All analyses were performed with Stata/IC 10.1 (Stata Corp, College Station, Texas) and weighted to provide estimates for a noninstitutionalized US adult population. Variances of the estimates were calculated using the Taylor series linearization²² provided by svy options in Stata.

RESULTS

DEMOGRAPHIC CHARACTERISTICS

Of 2869 participants, 18.1% of women and 6.3% of men reported tanning indoors in the past 12 months. Among women, indoor tanning use was most common among 18- to 24-year-olds and declined steadily with age (Table 1; *P* for trend, <.001). Women who had less than a high school education or had an annual income of less than \$35 000 were significantly less likely to have tanned indoors in the past 12 months than women who had graduated from high school or had an annual income between \$50 000 to \$75 000, respectively (*P* < .05). Women in the Midwest were most likely to have tanned indoors in the past 12 months (*P* = .001). Although the prevalence of indoor tanning use was not as high as in the Midwest, women in the South were also significantly more likely to have tanned indoors in the past 12 months than women in the West (*P* = .03).

In men, use of indoor tanning also decreased with age (Table 1; *P* for trend, <.001). Men in the Midwest were also most likely to have tanned indoors in the past 12 months, although the confidence interval included the null value (*P* = .07). Unlike women, men living in

metropolitan areas were more likely to report tanning indoors in the past 12 months, and the difference between men and women was statistically significant (P for interaction, $<.05$).

SKIN CANCER HISTORY AND LIFESTYLE CHARACTERISTICS

Women who were regular sunscreen users were significantly less likely to report tanning indoors in the past 12 months (Table 2; $P < .001$), while no association between indoor tanning and sunscreen use was observed among men ($P = .78$). Both women and men who reported spray tanning product use in the past 12 months were more likely to have tanned indoors during the same period ($P < .005$), and men who used spray tanning products were significantly more likely to have tanned indoors in the past 12 months than women who used spray tanning products (P for interaction, $<.05$). While both women and men who were obese were less likely to report tanning indoors in the past 12 months, the result was statistically significant only among men (women, $P = .09$; men, $P = .02$). Attempting to lose weight in the past year, exercising 150 minutes or more per week, being a current smoker, and a personal and family history of skin cancer did not appear to be associated with indoor tanning use in either women or men in the past year ($P > .05$).

SKIN CANCER PREVENTION KNOWLEDGE AND ATTITUDES

In an open-ended response format to gauge knowledge of ways to reduce risk of skin cancer, the most commonly suggested method by women and men was wearing sunscreen, followed by avoiding the sun and wearing a hat (Table 3). Only 13.3% of women in the study suggested avoidance of tanning bed use, and only 5.8% of women reported that they should get tested for skin cancer. Women who indicated sunscreen use or avoidance of tanning bed use or who perceived themselves to be at high risk of developing skin cancer were more likely to have tanned indoors in the past 12 months ($P < .05$). In contrast, women who reported testing for skin cancer as a way to reduce their risk of skin cancer were less likely to have tanned indoors in that period ($P < .05$).

Using the same open-ended format, very few men suggested that they could reduce their risk of developing skin cancer by avoiding tanning bed use and getting tested for skin cancer (4.2% and 5.6%, respectively; Table 3). Among men who suggested testing for skin cancer or having regular checkups, none had tanned indoors in the past year. Like women, men who reported sunscreen use for reducing skin cancer risk were more likely to have tanned indoors in the past 12 months, although the association was not statistically significant ($P = .14$). Voluntary reports to stay out of the sun or to wear a hat were not associated with indoor tanning use in women or men ($P > .05$).

COMMENT

To our knowledge, this is the first study to examine characteristics related to adult indoor tanning use stratified by sex using a national sample. As expected, we found that indoor tanning use in the past year was more prevalent in women than in men, in agreement with previous studies in adolescents and adults.^{8,10,12,13,15,16}

We found that some characteristics pertaining to indoor tanning differed by sex. Men living in the metropolitan area, but not women, were more likely to report tanning indoors. This

finding contradicts a previous study with adolescents, which reported higher proportions of indoor tanning use among male and female adolescents in rural areas than in urban areas.⁹ Although we did not have sufficient information to investigate reasons for this finding, we speculate that differences in appearance motives between men living in metropolitan and nonmetropolitan areas could be one possibility. Alternatively, differences in marketing strategies used by the indoor tanning industry or in access to tanning salons between these areas could explain, in part, why men in metropolitan areas are more likely to tan indoors. Furthermore, we observed different regional patterns in women and men regarding use of indoor tanning. This finding agrees with a previous report on adolescent indoor tanning use.⁹ However, a previous study on adult indoor tanning use did not find significant regional differences when analyzing the National Health Interview Survey data,¹⁵ probably because men and women were pooled in the analysis. The regional differences may reflect greater availability of tanning salons, as the Midwest region has been shown to have the highest per capita indoor tanning facilities in the country.²³

Women who were regular sunscreen users were significantly less likely to report tanning indoors in the past 12 months; this association was not observed among men (women, $P < .001$; men, $P = .78$). Likely, women who regularly used sunscreen knew that they should also avoid indoor tanning to protect themselves from skin damage. In contrast, women who did not report regular use of sunscreen were more likely to tan indoors. It is concerning that women who did not use sunscreen regularly were also less likely to use other sun protection methods, such as staying in the shade or wearing protective clothes (data not shown). If true, this clustering of behaviors may place such women at a higher risk for skin cancer owing to insufficient protection from sunlight and the additional UV radiation received from tanning devices.

The association between spray tanning product use and indoor tanning use in the past 12 months was strong in women and men, significantly more so in men (P for interaction, $< .05$). Although an earlier study based on HINTS data examined indoor tanning and sunless tanning use, the outcome was defined by cross-classifying individuals according to indoor tanning and sunless tanning use.¹⁶ Therefore, the study was unable to examine the association between indoor tanning use and sunless tanning product use, as we have done. Our finding suggests that, instead of substitution, women and men used both means to obtain a tan-looking appearance. Our findings for the association between body mass index and indoor tanning suggest that possible discomfort with body image may lead to less participation in body-image enhancing activities such as indoor tanning, consistent with previous research showing that obesity is associated with higher body dissatisfaction and self-dissatisfaction.²⁴

It is concerning that only a small proportion of adults reported avoidance of indoor tanning bed use to prevent skin cancer. Perhaps people are confused by the messages from the indoor tanning industry on possible benefits of indoor tanning, eg, getting vitamin D from moderate exposure to artificial UV radiation. This possibility is also suggested by the fact that women and men who suggested sunscreen use as a method to reduce their skin cancer risk were more likely to have tanned indoors. Even though these individuals knew to protect themselves from the sun, they may have perceived indoor tanning to be safer. If knowledge

is the first step to prevent adults from tanning indoors, effective dissemination of the harms of indoor tanning use may reduce the prevalence of its use among adults. Interventions to reduce indoor tanning to date have focused on the appearance-damaging effect of indoor tanning, but such an approach may not change participants' perceived susceptibility to skin damage or cancer.^{25,26} Furthermore, these interventions have only been tested in young adults who were in college; their applicability to other adult populations is also uncertain. Other strategies such as clinician-patient communication on the risks of indoor tanning may be an alternative, since brief physician-patient communication is effective for other health behaviors, such as smoking cessation.²⁷ Media campaigns to disseminate information about reasons to avoid indoor tanning may also be useful.

One limitation of our study is the cross-sectional nature of the data. Consequently, we were unable to determine whether the association for knowledge and attitudes preceded or followed indoor tanning use. For example, individuals who tan indoors may be more aware of the possible negative consequences of the behavior. Future studies with longitudinal data would be able to provide more insights on the relationship between these characteristics. The low overall response rate may also raise concern about the external validity of the study. However, the demographic characteristics of those who responded to HINTS do not seem to be very different from those who responded to the 2005 National Health Interview Survey, which had a 69% response rate.¹⁵ Another limitation of this study was the low prevalence of indoor tanning among men, making estimates for men less stable.

In conclusion, some characteristics related to indoor tanning use are different and some are similar between women and men in the United States. Most women and men do not report avoidance of tanning beds to reduce their risk of skin cancer. Strategies such as clinician-patient communication and media campaigns that focus on strategically disseminating the harms of indoor tanning to the adult population may be needed to reduce the prevalence of indoor tanning among adults in the United States.

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The sponsor had no role in the design and conduct of the study; in the collection, analysis, and interpretation of data; or in the preparation, review, or approval of the manuscript.

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Association Between Demographic Characteristics and Indoor Tanning Use in 2869 Study Participants: Health Information National Trends Study, 2005

Table 1.

Variable	Women			Men		
	Tanned, No. (%)	AOR (95% CI) ^a	Tanned, No. (%)	AOR (95% CI) ^a	Tanned, No. (%)	AOR (95% CI) ^a
Age, y						
18-24	122 (35.8)	1 [Reference]	78 (12.2)	1 [Reference]		1 [Reference]
25-34	260 (24.8)	0.60 (0.33-1.12)	165 (9.3)	0.96 (0.29-3.10)		
35-44	437 (17.2)	0.34 (0.19-0.62)	219 (8.6)	0.64 (0.17-2.39)		
45-54	535 (14.0)	0.26 (0.14-0.46)	273 (1.8)	0.11 (0.03-0.44)		
55	502 (5.2)	0.10 (0.05-0.19)	268 (1.5)	0.12 (0.03-0.47)		
Educational level						
College graduate	719 (11.8)	0.54 (0.21-1.35)	414 (4.6)	0.40 (0.05-2.88)		
Some college	593 (25.6)	1.27 (0.80-1.99)	287 (7.2)	1.15 (0.46-2.86)		
High school graduate	457 (15.7)	1 [Reference]	243 (7.4)	1 [Reference]		
<High school	90 (13.8)	0.36 (0.24-0.54)	57 (3.4)	0.64 (0.26-1.61)		
Annual income, \$1000						
>75	492 (22.6)	1.27 (0.80-1.99)	308 (7.3)	0.98 (0.35-2.72)		
50-75	388 (19.2)	1 [Reference]	225 (7.0)	1 [Reference]		
35-50	238 (20.4)	0.92 (0.52-1.62)	115 (6.3)	0.72 (0.24-2.16)		
<35	415 (13.8)	0.54 (0.31-0.95)	211 (3.3)	0.39 (0.13-1.17)		
Region						
Northeast	331 (16.0)	1.75 (0.93-3.29)	206 (5.1)	0.73 (0.17-3.10)		
Midwest	554 (22.7)	2.51 (1.45-4.33)	290 (11.9)	2.87 (0.91-9.09)		
South	621 (19.5)	1.82 (1.05-3.15)	298 (2.3)	0.37 (0.10-1.40)		
West	360 (11.5)	1 [Reference]	209 (5.9)	1 [Reference]		
Level of urbanization ^b						
Metropolitan	1413 (17.4)	0.86 (0.57-1.31)	775 (7.3)	3.28 (1.16-9.27)		
Nonmetropolitan	543 (19.9)	1 [Reference]	228 (2.5)	1 [Reference]		

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval.

^aEstimates are adjusted for all variables in the table and are weighted.

^gEstimates are significantly different across sex ($P<.05$).

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Association Between Lifestyle Characteristics and Skin Cancer History and Indoor Tanning Use in 2869 Study Participants: Health Information National Trends Study, 2005

Table 2.

Variable	Women		Men	
	Tanned, No. (%)	AOR (95% CI) ^d	Tanned, No. (%)	AOR (95% CI) ^d
Use of sunscreen ^b				
Regular user	866 (11.5)	0.44 (0.30-0.65)	248 (6.5)	1.13 (0.48-2.69)
Nonregular user	968 (23.7)	1 [Reference]	746 (6.3)	1 [Reference]
Use spray tan ^b				
Yes	431 (30.9)	2.59 (1.74-3.87)	31 (34.5)	7.52 (2.25-25.08)
No	1434 (13.8)	1 [Reference]	971 (5.3)	1 [Reference]
BMI				
Obese	431 (12.5)	0.64 (0.38-1.08)	288 (2.2)	0.30 (0.11-0.85)
Overweight	523 (20.8)	1.24 (0.84-1.82)	411 (7.0)	0.84 (0.38-1.87)
Not overweight	857 (19.3)	1 [Reference]	300 (9.1)	1 [Reference]
Tried to lose weight				
Yes	1337 (19.3)	1.36 (0.90-2.05)	546 (5.0)	0.80 (0.37-1.71)
No	527 (14.9)	1 [Reference]	457 (7.6)	1 [Reference]
Amount of exercise, min/wk				
150	892 (18.2)	1.00 (0.71-1.40)	580 (7.5)	1.33 (0.64-2.77)
<150	965 (18.0)	1 [Reference]	417 (4.4)	1 [Reference]
Smoking status				
Current smoker	388 (22.1)	1.24 (0.82-1.88)	240 (6.6)	0.96 (0.43-2.13)
Former/never smoker	1477 (16.8)	1 [Reference]	761 (6.1)	1 [Reference]
Had skin cancer				
Yes	57 (8.9)	0.58 (0.17-1.95)	42 (0.0)	NA
No	1809 (18.2)	1 [Reference]	961 (6.5)	NA
Family has skin cancer				
Yes	328 (21.5)	1.27 (0.83-1.93)	151 (4.6)	0.71 (0.26-1.93)
No	1533 (17.2)	1 [Reference]	845 (6.6)	1 [Reference]

Abbreviations: AOR, adjusted odds ratio; BMI, body mass index; CI, confidence interval; NA, not available.

^qEstimates are adjusted for demographic variables and are weighted.
^pEstimates are significantly different across sexes ($P < .05$).

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Table 3. Association Between Knowledge and Attitudes Toward Skin Cancer Prevention and Indoor Tanning Use in 821 Study Participants: Health Information National Trends Study, 2005

Variable	Women		Men	
	Tanned, No. (%)	AOR (95% CI) ^b	Tanned, No. (%)	AOR (95% CI) ^b
Knowledge^a				
Avoid tanning bed use				
Yes	69 (38.2)	3.62 (1.71-7.66)	12 (11.1)	2.76 (0.30-25.60)
No	449 (14.6)	1 [Reference]	275 (4.3)	1 [Reference]
Get tested for skin cancer				
Yes	30 (2.6)	0.12 (0.02-0.88)	17 (0)	NA
No	488 (18.8)	1 [Reference]	286 (4.9)	NA
Have regular checkups				
Yes	29 (8.9)	0.43 (0.06-3.27)	10 (0)	NA
No	489 (18.5)	1 [Reference]	293 (4.8)	NA
Stay out of the sun				
Yes	408 (18.5)	1.14 (0.57-2.27)	200 (5.4)	1.77 (0.43-7.35)
No	110 (16.6)	1 [Reference]	103 (3.1)	1 [Reference]
Wear a hat				
Yes	321 (19.2)	1.25 (0.69-2.26)	184 (5.8)	1.82 (0.47-7.00)
No	197 (16.0)	1 [Reference]	119 (3.3)	1 [Reference]
Wear sunscreen				
Yes	456 (19.5)	4.67 (1.50-14.56)	246 (5.5)	5.70 (0.71-45.94)
No	62 (4.9)	1 [Reference]	57 (1.0)	1 [Reference]
Attitudes				
Perceived risk of skin cancer				
High	104 (26.9)	2.11 (1.01-4.39)	54 (3.4)	0.67 (0.16-2.88)
Moderate	203 (16.7)	1.15 (0.56-2.37)	104 (4.3)	0.86 (0.21-3.52)
Low	202 (14.8)	1 [Reference]	140 (5.0)	1 [Reference]
Behavior causes skin cancer				
Agree	382 (16.8)	0.67 (0.34-1.30)	224 (5.6)	2.57 (0.64-10.37)

Variable	Women		Men	
	Tanned, No. (%)	AOR (95% CI) ^b	Tanned, No. (%)	AOR (95% CI) ^b
Disagree	117 (23.2)	1 [Reference]	75 (2.3)	1 [Reference]

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; NA, not available.

^aBased on responses to an open-ended question: “What are some things that people can do to reduce their chances of getting skin cancer?”

^bEstimates are adjusted for age and are weighted.