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Recent Changes in the Prevalence of and Factors Associated With Frequency of Indoor Tanning Among US Adults

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Reducing indoor tanning is a Healthy People 2020 objective and an important strategy for preventing skin cancer.[1] We examined changes in the prevalence and frequency of indoor tanning factors associated with frequency of indoor tanning among US adults.

Methods

We analyzed data collected from the 2010 and 2013 National Health Interview Survey, a nationally representative sample of the US civilian, noninstitutionalized population 18 years or older (N = 59 145). The data were collected from January 1st to December 31st for each survey year. The final response rates were 60.8% in 2010 and 61.2% in 2013.[2] Our analysis was exempted from Centers for Disease Control and Prevention Institutional Review Board approval. *Indoor tanning* was defined as using an indoor tanning device 1 or more times during the 12 months before each survey. We calculated the prevalence of indoor tanning in 2010 and 2013 and used log-linear regression to examine the factors associated with indoor tanning frequency among indoor tanners using pooled data from both years. Differences between categories within a variable were assessed with linear contrasts. Sample weights were applied to account for the complex study design and provide nationally representative estimates. $P < .05$ was considered statistically significant; all P values were 2-sided. Data were analyzed using SUDAAN, version 10.1 (RTI International).

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Study concept and design: All authors.
Acquisition, analysis, or interpretation of data: All authors.
Drafting of the manuscript: Guy.
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Study supervision: Guy, Berkowitz.

Results

We observed significant reductions in indoor tanning from 2010 to 2013: from 5.5% to 4.2% ($P < .001$) among all adults, from 8.6% to 6.5% ($P < .001$) among women, and from 2.2% to 1.7% ($P = .03$) among men (Table 1). A reduction was also observed among male and female infrequent (1–9 times per year) tanners (male, from 1.4% to 1.0%, $P < .05$; female, from 3.7% to 2.8%, $P < .01$) and female frequent (≥10 times per year) tanners (from 4.8% to 3.6%, $P < .001$).

In the adjusted analysis (Table 2), compared with their respective reference groups, indoor tanning frequency among female tanners was 28% lower among the oldest group ($P = .006$), 45% lower among college graduates ($P < .001$), 33% lower among women in fair or poor health ($P = .02$), and 23% lower among women meeting aerobic or strength physical activity criteria ($P = .01$). Compared with their respective reference groups, indoor tanning frequency among male tanners was 177% higher among men aged 40 to 49 years and 71% higher in men aged 50 years or older ($P < .001$) but 45% lower among cancer survivors ($P = .046$).

Discussion

Our findings indicate a temporal decrease in the prevalence of indoor tanning across several demographic groups. In our study in 2013, a total of 1.6 million fewer women and 0.4 million fewer men engaged in indoor tanning compared with 2010. Despite these reductions, our study found that an estimated 7.8 million women and 1.9 million men continue to engage in indoor tanning. Further research examining indoor tanning behavior among the estimated 0.8 million male indoor tanners 40 years or older is warranted given their increased frequency of indoor tanning and the lack of research or interventions focused on this demographic group.

The decrease in indoor tanning may be partly attributable to the increased awareness of its harms. Indoor tanning devices have been classified as carcinogenic to humans,[3] their use has consistently been shown to increase skin cancer risk,[4] and laws restricting access among minors may have changed public perceptions of their safety. In addition, a 10% excise tax on indoor tanning was implemented in 2010, which may have contributed to the decrease in indoor tanning.[5]

This study is subject to certain limitations. Results from the National Health Interview Survey are generalizable only to the noninstitutionalized civilian adult population. In addition, the use of cross-sectional data does not permit a causal inference between behaviors and the frequency of indoor tanning.

The Surgeon General has highlighted the importance of reducing the harms from indoor tanning and of continued public health efforts to identify and implement effective strategies to reduce indoor tanning.[5] Research regarding the motivations of indoor tanners could inform the development of new interventions. Physicians can also play a role through behavioral counseling, which is recommended for fair-skinned persons aged 10 to 24 years.[6]

Continued surveillance of indoor tanning will aid program planning and evaluation by measuring the effect of skin cancer prevention policies and monitoring progress.

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Table 1

Prevalence of Indoor Tanning Among Adults[a]

	% (95% CI)					
	Total		Women		Men	
Characteristic	2010 (n = 25 233)	2013 (n = 33 912)	2010 (n = 14 107)	2013 (n = 18 777)	2010 (n = 11 126)	2013 (n = 15 135)
Total	5.5 (5.1–6.0)	4.2 (3.9–4.5)[b]	8.6 (7.9–9.3)	6.5 (6.0–7.0)[b]	2.2 (1.9–2.6)	1.7 (1.5–2.0)[c]
Age, y						
18–29	11.3 (10.1–12.6)	8.6 (7.7–9.5)[b]	18.9 (16.9–21.1)	14.2 (12.7–15.9)[b]	3.9 (3.0–4.9)	2.9 (2.2–3.7)
30–39	5.9 (5.1–6.7)	5.5 (4.8–6.3)	9.2 (7.9–10.7)	8.5 (7.2–10.0)	2.5 (1.8–3.3)	2.2 (1.7–3.0)
40–49	5.9 (5.1–6.9)	4.3 (3.6–5.1)[d]	9.2 (7.8–10.8)	6.8 (5.6–8.1)[c]	2.6 (1.9–3.6)	1.8 (1.2–2.7)
≥50	2.1 (1.7–2.5)	1.5 (1.3–1.8)[c]	3.0 (2.4–3.6)	2.0 (1.6–2.4)[d]	1.0 (0.7–1.4)	0.9 (0.7–1.3)
Race/ethnicity						
Non-Hispanic white	7.4 (6.9–8.0)	5.7 (5.3–6.2)[b]	11.5 (10.5–12.5)	8.9 (8.2–9.7)[c]	3.1 (2.7–3.6)	2.3 (1.9–2.7)[c]
Nonwhite[e]	1.3 (1.0–1.6)	1.1 (0.9–1.3)	2.1 (1.6–2.8)	1.5 (1.2–1.9)	0.3 (0.2–0.5)[f]	0.6 (0.4–0.9)
Marital status						
Married or partnered	5.0 (4.5–5.6)	4.0 (3.6–4.3)[d]	8.3 (7.4–9.2)	6.4 (5.8–7.1)[d]	1.8 (1.5–2.3)	1.5 (1.2–1.9)
Not married or partnered	6.3 (5.7–6.9)	4.5 (4.1–5.0)[b]	9.0 (8.0–10.0)	6.5 (5.8–7.3)[b]	3.0 (2.4–3.7)	2.1 (1.7–2.6)[c]
Educational level						
College graduate	4.6 (3.9–5.3)	3.9 (3.4–4.5)	7.1 (6.1–8.3)	5.9 (5.0–6.9)	2.0 (1.5–2.5)	1.7 (1.3–2.3)
Some college	7.9 (7.1–8.9)	6.4 (5.7–7.1)[d]	11.9 (10.6–13.4)	9.5 (8.4–10.7)[d]	3.1 (2.4–4.0)	2.8 (2.2–3.5)
High school graduate or GED	5.4 (4.7–6.1)	3.4 (2.9–4.0)[b]	8.3 (7.1–9.6)	5.5 (4.7–6.5)[b]	2.4 (1.8–3.2)	1.3 (0.9–1.9)[c]

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Characteristic	% (95% CI)					
	Total		Women		Men	
	2010 (n = 25 233)	2013 (n = 33 912)	2010 (n = 14 107)	2013 (n = 18 777)	2010 (n = 11 126)	2013 (n = 15 135)
Some high school or less	2.6 (2.0–3.3)	1.4 (1.0–1.9)[d]	4.3 (3.2–5.7)	2.3 (1.6–3.3)[d]	0.9 (0.5–1.7)[f]	0.4 (0.2–1.0)
US Census region						
West	3.7 (3.0–4.6)	3.1 (2.6–3.7)	5.9 (4.7–7.3)	4.4 (3.5–5.4)	1.4 (0.9–2.0)	1.8 (1.2–2.5)
Northeast	4.1 (3.3–5.1)	3.7 (3.1–4.5)	6.6 (5.2–8.2)	6.1 (5.0–7.3)	1.5 (0.9–2.3)	1.2 (0.8–1.9)
Midwest	8.6 (7.6–9.7)	7.2 (6.5–8.1)	13.2 (11.5–15.1)	11.1 (9.8–12.7)[c]	3.6 (2.8–4.6)	3.3 (2.6–4.1)
South	5.4 (4.8–6.1)	3.2 (2.8–3.7)[b]	8.3 (7.2–9.5)	5.2 (4.5–6.0)[b]	2.3 (1.8–3.0)	0.9 (0.7–1.3)[b]
Frequency of indoor tanning						
Infrequent (1–9 times per year)	2.6 (2.3–2.9)	1.9 (1.7–2.1)[b]	3.7 (3.3–4.2)	2.8 (2.5–3.2)[d]	1.4 (1.1–1.7)	1.0 (0.8–1.2)[c]
Frequent (≥10 times per year)	2.9 (2.6–3.2)	2.2 (2.0–2.4)[b]	4.8 (4.3–5.3)	3.6 (3.2–4.0)[b]	0.9 (0.7–1.1)	0.8 (0.6–1.0)

Abbreviation: GED, General Educational Development certificate.

[a] *Indoor tanning* is defined as using an indoor tanning device (such as a sunlamp, sunbed, or tanning booth) 1 time or more during the 12 months before the survey. It does not include getting a spray-on tan. Estimates are based on weighted data. Sample sizes are unweighted and may not sum to the total owing to missing data. Percentages and 95% CIs are based on weighted population estimates. Odds ratios were computed to gauge the effect size of the reductions. The odds ratios and corresponding 95% CIs were 0.75 (0.67–0.84) overall, 0.75 (0.66–0.83) among women, and 0.77 (0.61–0.97) among men.

[b] $P < .01$ compared with 2010, assessed with general linear contrast.

[c] $P < .001$ compared with 2010, assessed with general linear contrast.

[d] $P < .05$ compared with 2010, assessed with general linear contrast.

[e] Nonwhite includes non-Hispanic black, Hispanic, and other race/ethnicity to avoid small numbers.

[f] Estimates based on fewer than 30 observations or with a relative standard error greater than 0.30 are considered unreliable by the standards of the National Center for Health Statistics.

Table 2

Factors Associated With Indoor Tanning Frequency Among Adults Engaging in Indoor Tanning[a]

	Women (n = 1899)		Men (n = 468)	
Characteristic	**IDR (95% CI)**	***P* Value[b]**	**IDR (95% CI)**	***P* Value[b]**
Year				
2010	1 [Reference]	.98	1 [Reference]	.48
2013	1.00 (0.86–1.17)		1.14 (0.80–1.62)	
Age, y				
18–29	1 [Reference]	.01	1 [Reference]	.001
30–39	0.83 (0.68–1.01)		1.33 (0.82–2.14)	
40–49	1.06 (0.80–1.40)		2.77 (1.63–4.73)[c]	
≥50	0.72 (0.57–0.91)[d]		1.71 (1.10–2.64)[c]	
Race/ethnicity				
Non-Hispanic white	1 [Reference]	.75	1 [Reference]	.78
Nonwhite[e]	0.91 (0.51–1.61)		1.12 (0.51–2.45)	
Marital status				
Married or partnered	1 [Reference]	.13	1 [Reference]	.19
Not married or partnered	1.17 (0.96–1.42)		1.31 (0.87–1.98)	
Educational level				
High school graduate or GED or less	1 [Reference]	<.001	1 [Reference]	.34
Some college	0.86 (0.69–1.06)		0.84 (0.54–1.31)	
College graduate	0.55 (0.44–0.69)[c]		0.72 (0.47–1.12)	
US Census region				
Midwest	1 [Reference]	.05	1 [Reference]	.26
Northeast	1.00 (0.73–1.38)		1.62 (0.83–3.17)	
South	1.09 (0.88–1.36)		1.08 (0.73–1.59)	
West	0.78 (0.58–1.04)		0.76 (0.45–1.30)	
Born in the United States				
No	1 [Reference]	.44	1 [Reference]	.11
Yes	1.18 (0.78–1.79)		2.15 (0.84–5.49)	
Visited a physician in the past year				
No	1 [Reference]	.50	1 [Reference]	.98
Yes	1.10 (0.83–1.47)		1.01 (0.62–1.65)	
Cancer survivor[f]				
No	1 [Reference]	.49	1 [Reference]	.046
Yes	0.89 (0.63–1.25)		0.55 (0.30–0.99)[g]	
Health status				
Excellent or very good	1 [Reference]	<.001	1 [Reference]	.41

Characteristic	Women (n = 1899)		Men (n = 468)	
	IDR (95% CI)	*P* Value[b]	IDR (95% CI)	*P* Value[b]
Good	1.34 (1.09–1.63)		1.14 (0.66–1.97)	
Fair or poor	0.67 (0.48–0.94)[g]		0.70 (0.34–1.44)	
Physical activity				
Meets neither criterion	1 [Reference]		1 [Reference]	
Meets strength only or aerobic criteria only	0.77 (0.63–0.94)[d]	.03	0.79 (0.46–1.33)	.67
Meets both aerobic and strength criteria	0.91 (0.72–1.15)		0.87 (0.54–1.39)	
Heavy drinker[h]				
No	1 [Reference]	.64	1 [Reference]	.41
Yes	1.07 (0.81–1.41)		1.26 (0.72–2.21)	
Overweight or obese				
No	1 [Reference]	.19	1 [Reference]	.36
Yes	0.89 (0.75–1.06)		0.83 (0.56–1.24)	
Smoking status				
Never smoker	1 [Reference]		1 [Reference]	
Former smoker	1.16 (0.86–1.57)	.58	1.09 (0.71–1.67)	.43
Current smoker[i]	1.02 (0.83–1.25)		0.77 (0.49–1.21)	

Abbreviations: GED, General Educational Development certificate; IDR, incidence density ratio.

[a] *Indoor tanning* is defined as using an indoor tanning device (such as a sunlamp, sunbed, or tanning booth) 1 time or more during the 12 months before the survey. It does not include getting a spray-on tan. Analysis was performed among a subset of the population reporting indoor tanning in the previous 12 months.

[b] *P* values represent overall *P* values.

[c] $P < .001$ vs the reference category and assessed with linear contrasts.

[d] $P \leq .01$ vs the reference category and assessed with linear contrasts.

[e] Nonwhite includes non-Hispanic black, Hispanic, and other race/ethnicity to avoid small numbers.

[f] Cancer survivors are identified from a question asking whether a physician or other health care professional had ever told them they had cancer or a malignancy of any kind.

[g] $P < .05$ vs the reference category and assessed with linear contrasts.

[h] *Heavy drinker* is defined as having 12 or more drinks in a lifetime, and more than 14 drinks per week in the past year among men or more than 7 drinks per week in the past year among women.

[i] Current smoker includes those who smoke some days and those who smoke every day.