Practices of Unregulated Tanning Facilities in Missouri: Implications for Statewide Legislation

AUTHORS: Brundha Balaraman, MD,^a Lauren K. Biesbroeck, MD,^b Stephanie H. Lickerman, APRN, ANP-BC,^c Lynn A. Cornelius, MD,^{a,d} and Donna B. Jeffe, PhD^{d,e}

^aDivision of Dermatology, Department of Medicine, and ^cDivision of Health Behavior Research, Washington University School of Medicine, St Louis, Missouri; ^bDivision of Dermatology, Department of Medicine, University of Washington School of Medicine, Seattle, Washington; ^dDepartment of Dermatology, Saint Louis University School of Medicine, St Louis, Missouri; and ^eAlvin J. Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine, St Louis, Missouri

KEY WORDS

skin cancer, indoor tanning, UV radiation, melanoma, health policy

ABBREVIATIONS

FDA—US Food and Drug Administration

UVR—UV radiation

Dr Balaraman conceptualized and designed the study, conducted the study, collected data, performed data analysis, drafted the initial manuscript, critically reviewed and revised the manuscript, and approved the final manuscript as submitted; Dr Biesbroeck conceptualized and designed the study, conducted the study, collected data, reviewed and revised the manuscript, and approved the final manuscript as submitted; Mrs Lickerman conceptualized and designed the study, reviewed and revised the manuscript, and approved the final manuscript as submitted; Dr Cornelius conceptualized and designed the study, critically reviewed and revised the manuscript, approved the final manuscript as submitted, and served as coprincipal investigator; and Dr Jeffe conceptualized and designed the study, contributed to data analysis, critically reviewed and revised the manuscript, approved the final manuscript as submitted, and served as coprincipal investigator.

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Address correspondence to Brundha Balaraman, MD, Division of Dermatology, Washington University School of Medicine, Campus Box 8123, 660 South Euclid Ave, St Louis, MO 63110. E-mail: bbalaram@dom.wustl.edu

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WHAT'S KNOWN ON THIS SUBJECT: UV radiation exposure in tanning beds is associated with an increased risk of skin cancer. Because of the rising rate of melanoma, the World Health Organization recommends that persons <18 years of age not use tanning devices.

WHAT THIS STUDY ADDS: Despite scientific evidence to the contrary, tanning facilities in Missouri, a state without indoor-tanning regulations, often misinformed consumers regarding the risk of skin cancer and would allow children as young as 10 years old to use tanning devices.

abstract

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BACKGROUND: The incidence of skin cancer has increased in the United States, concomitant with increased UV radiation (UVR) exposure among young adults. We examined whether tanning facilities in Missouri, a state without indoor-tanning regulations, acted in accordance with the Food and Drug Administration's recommendations and consistently imparted information to potential clients about the known risks of UVR.

METHODS: We conducted a statewide telephone survey of randomly selected tanning facilities in Missouri. Each tanning facility was surveyed twice, in the morning (7 AM–3 PM) and evening (3–10 PM), on different days, to determine intrasalon consistency of information provided to potential clients at different times.

RESULTS: On average, 65% of 243 tanning-facility operators would allow children as young as 10 or 12 years old to use indoor-tanning devices, 80% claimed that indoor tanning would prevent future sunburns, and 43% claimed that there were no risks associated with indoor tanning. Intrasalon inconsistencies involved allowable age of use, and UVR exposure type and duration. Morning tanning-facility employees were more likely to allow consumers to start with maximum exposure times and UV-A-emitting devices ($P < .001$), whereas evening employees were more likely to allow 10- or 12-year-old children to use indoor-tanning devices ($P = .008$).

CONCLUSIONS: Despite increasing evidence that UVR exposure in indoor-tanning devices is associated with skin cancer, ocular damage, and premature photoaging, tanning facilities in Missouri often misinformed consumers regarding these risks and lack of health benefits and inconsistently provided information about the Food and Drug Administration's guidelines for tanning devices. *Pediatrics* 2013;131:415–422

Approximately 3.5 million cases of nonmelanoma skin cancers (eg, basal and squamous cell carcinomas) are diagnosed in the United States annually,¹ making it the most common cancer.² An estimated 1 in 5 Americans will develop skin cancer in their lifetime.³ The incidence of nonmelanoma skin cancers has doubled among young adults in the United States⁴ concomitant with increased UV radiation (UVR) exposure to natural sunlight and artificial tanning devices.^{5,6} There is evidence for a dose-response relationship between use of tanning beds and risk of basal-cell carcinoma, in particular, with a stronger association for younger age of exposure.⁷

Indoor tanning is an expanding \$5-billion industry, serving >30 million clients annually, including 2.3 million adolescents.^{8–11} Tanning-bed use has been associated with a 1.5-fold increased risk of basal cell carcinoma, a 2.5-fold increased risk of squamous cell carcinoma,¹² and up to a threefold increased risk of melanoma, particularly with use before 30 years of age.^{13–15} Based on Surveillance Epidemiology and End Results data, there has been an increase in the incidence of cutaneous melanoma over the past 2 decades in the United States.¹⁶ The American Cancer Society estimated that 76 250 new melanoma cases in the United States would be diagnosed in 2012.¹⁷ Melanoma was the third most common cancer diagnosed among adolescents and young adults aged 15 to 39 years, and women had a 69% higher risk of melanoma compared with men.¹⁸ This greater melanoma risk among women coincided with increased tanning-bed use among female adolescents, who consistently reported more frequent indoor tanning than male adolescents.⁵

According to the US Department of Health and Human Services and the International Agency for Research on

Cancer, UVR is carcinogenic to humans, equivalent to arsenic and asbestos.^{15,19} However, tanning devices are considered to be Class I medical devices, the same designation given to bandages and tongue depressors, which allows manufacturers an exemption from mandatory performance standards.²⁰ Overexposure or frequent exposure to UV-A and UV-B radiation is associated with premature photoaging, skin cancer, and ocular damage.²¹ Many tanning facilities market “nonburning” devices equipped with bulbs that primarily emit UV-A radiation (380–420 nm)²² that causes potentially mutagenic oxidative damage to DNA.²³ To increase exposure over shorter time intervals, high-pressure tanning devices use bulbs that emit UV-A radiation 10 to 15 times that of noontime sunlight.²⁴ Furthermore, UV-A–induced “tanning” is due to the redistribution of preexisting melanin that affords minimal UVR photoprotection.^{25–27} However, many individuals assume that these devices provide photoprotection before ambient UVR exposure.

Because of the rising rate of melanoma in younger individuals,^{28–30} and the role of UVR in pathogenesis, the World Health Organization stated that persons aged <18 should not use tanning devices.³¹ The US Preventive Services Task Force recommends that persons 10 to 24 years of age should reduce UVR exposure by engaging in sun-protective behaviors including the use of broad-spectrum sunscreen and avoidance of indoor tanning.³² The US Food and Drug Administration (FDA) endorses eye protection, visible warning signs, informed consent, skin assessments before tanning-bed use, and compliance with manufacturer operational instructions. As of March 2012, only 33 states had regulatory laws enforcing some or all of these guidelines,³³ many of which lack adequate restrictions for minors. In 2012, California became the

first state to ban use of tanning devices among all minors <18 years. In the remaining 17 states, including Missouri, any individual or entity may market tanning beds without regulatory oversight to enforce the safety standards just described.

Few studies have evaluated the practices of indoor-tanning facilities in states lacking regulations. In those studies published, tanning-facility operators were found to be inadequately trained in the use of tanning equipment,³⁴ to misinform consumers about the potential hazards of UVR,³⁵ and to be lenient with FDA guidelines.³⁶

We sought to evaluate the practices of tanning facilities in Missouri, a state without indoor-tanning regulations. We examined whether these businesses acted in accordance with FDA recommendations and consistently imparted information to potential clients about the known risks of UVR.

METHODS

In July 2007, we identified cities within each of the 115 Missouri counties by using the National Association of Counties Web site.³⁷ The city of St Louis is considered to be a county equivalent (ie, 1 of the 115 counties). We used 2 Internet search engines^{38,39} to identify tanning facilities in each city by using the search word “tanning.” In this way, we identified 831 unique indoor-tanning facilities in Missouri in July 2007; 21 counties had no tanning facilities listed, and facilities with duplicate telephone numbers or addresses were included only once. We planned to survey a random sample of half the total number of tanning facilities identified. The number of facilities selected from each county was proportional to the county’s population in 2006 as determined by the US Census Bureau.⁴⁰ After compiling a list of salons for each county, the desired number of facilities for each county was

selected randomly with a random-number generator. If a county had fewer tanning salons than desired, all available facilities in that county were included. Therefore, our final sample included 375 tanning facilities in 94 counties.

To describe differences in counties that were included and excluded in the sample, all Missouri counties were classified as metropolitan or nonmetropolitan by using the US Department of Agriculture's 2003 Rural-Urban Continuum Codes.⁴¹ We also geocoded the street addresses of each tanning facility to be able to describe population characteristics of the census tracts in which these facilities conducted business.

After approval by the Institutional Review Board at Washington University, each tanning facility was interviewed twice by phone, on different days and times, by 2 trained medical students who posed as potential customers. A standard script was created to sound like an adolescent conversation; the script was slightly modified (Table 1) for each interviewer to avoid raising suspicion among employees who might have responded to both calls. Data were collected anonymously, and

responses were recorded into a spreadsheet.

Interviewer A conducted the survey from 7 AM to 3 PM, and Interviewer B performed the survey from 3 PM to 10 PM. The first call to any facility could have taken place either in the morning or evening. Interviews were conducted from July through September 2007, with a maximum of 5 attempts made to contact each salon by each interviewer.

We coded the content of information given to the interviewers regarding the risks associated with artificial UVR devices and about specific practices that were allowed (eg, duration of exposure to UVR-emitting devices, age restrictions, requirements or recommendations for protective eye-wear or sunscreen). A numerical code was created (Table 2) that grouped responses into broader categories. In this way, it was possible to assign multiple codes to any given response. For example, a response such as, "UVR may cause sunburns, premature wrinkling, or skin cancer" would be coded as 3 (UVR damage, which included sunburns and premature wrinkling) and 4 (skin cancer). We used these codes to determine whether the same information was provided to the

callers at both times. Each interviewer independently coded both sets of data. Code-assigning discrepancies occurred 6 times among 3270 assigned codes, for a 99.8% agreement in coding between raters. Discrepant responses were reevaluated and discussed, and a consensus on coding was reached between the interviewers. Only the agreed-on set of codes was analyzed.

Facilities that completed both interviews were included in analysis (Table 3). Data were analyzed by using SPSS 18.0.3 (SPSS, Inc, Chicago, IL). Descriptive statistics, including frequencies or means, were computed for each response as appropriate. We used the McNemar or McNemar-Bowker test to examine the concordance between responses provided during the 2 interviews. The McNemar-Bowker test⁴² is an extension of the McNemar test⁴³; both are used to test the null hypothesis that responses in 2 related variables (eg, 2 interviews of the same tanning salon at different times) do not differ significantly. Two-tailed $P < .05$ was considered significant.

We examined selection bias for inclusion and for the number of interviews that salons completed (ie, completed 0, 1, or 2 interviews) by their location in either metropolitan or nonmetropolitan counties by using χ^2 tests. We created a 5-item, census-tract-level poverty index by using principal components analysis and report the reliability of this scale by using Cronbach's α . We also examined whether census-tract-level poverty differed by the number of completed interviews by using analysis of variance.

RESULTS

Of 375 indoor-tanning facilities selected for inclusion, 243 (65%) in 81 counties completed both interviews and were included in the analysis (Table 3). Of these 243 facilities, 177 (73%) were

TABLE 1 Telephone Script Used to Interview Tanning Facilities

Interviewer A (7 AM–3 PM)	Interviewer B (3 PM–10 PM)
"Hi, I'm going on vacation in a few weeks and would like to get a tan." How old do I have to be to tan?	"Hi, I'm going on vacation in a few weeks and would like to get a tan." How old do I have to be to tan?
"I am 16 and have never tanned before. My 10-year-old sister really wants to tan too." Can she come?	"I am 16 and have never tanned before. My 12-year-old cousin is staying with us. Can I bring her with me?"
"I have pretty fair skin and light brown hair but I want to get a tan fast." How many times can I tan in 1 day? How long can I tan each time?	"I have pretty fair skin and light brown hair but I want to get a tan fast." How many times can I tan in 1 day? How long can I tan each time?
What are the dangers with indoor tanning?	What are the dangers with indoor tanning?
"I heard that if I tan before my vacation, it will protect me from getting sunburned." Is that true?	"I heard that if I tan before my vacation, it will protect me from getting sunburned." Is that true?
"My friend said that I should bring eye goggles but I don't have any." Can I still tan without goggles? If no: "I really don't want raccoon eyes." Can I choose not to wear them? If no: Do you sell them? How much do they cost?	"My friend said that I should bring eye goggles but I don't have any." Can I still tan without goggles? If no: Do you sell them? How much do they cost?
Do you offer unlimited tanning packages?	Do you offer unlimited tanning packages?
Does my mom need to sign anything? If yes: What? Can I take it home for her to sign?	Does my mom need to sign anything? If yes: What? Can I take it home for her to sign?

TABLE 2 Interview Questions and Descriptions of Coded Responses

Numerical Code	Code Description	Examples
How long can I tan?		
1	Cannot determine	Includes “I don’t know” or “I need to ask the owner”
2	Start low and work up	≤10 min if no other information was provided
3	Start with maximum exposure	>10 min if no other information was provided
4	Assessment	Includes “depends on skin type,” or “need to see you in person”; excludes “depends on bed”
5	Start with high or bronzer bed	Includes “bed without burning rays,” “only UV-A rays”
What are the dangers of tanning?		
1	Risks not stated	Includes “same as the sun,” or referred to another source (eg, doctor, Web site, books)
2	No risks if customer takes precautions	Includes goggles, short-term exposure, sunscreen, lotions, or sanitize bed. “If you do not abuse it, overexpose, or burn”
3	UVR damage	Includes sunburn, eye damage, skin problems (drying, aging, wrinkling), “get sick,” “cook organs”
4	Skin cancer	Skin cancer
5	Contraindications	Includes pregnancy, medications, nevi, or personal history of skin cancer
Is it true that tanning before my vacation will protect me from the sun?		
1	Safer than the sun	Includes “controlled exposure,” “different rays than the sun,” “you do not burn”
2	Doctor recommended	Includes “many people tan because doctors recommend it”
3	Health benefits	Includes “prevents cancer,” “makes vitamin D,” “protects against the sun”
Requirements to consent 10-y-old sister (or 12-y-old cousin)		
1	Onsite parent/guardian consent	Includes “first time,” “every time,” or timing unspecified
2	Offsite parent/guardian consent	Includes “take home,” “note from home,” or “phone call”
3	No adult (≥18 y old) necessary	Includes “you can sign for her”
4	Any adult (≥18 y old)	Includes “anyone over 18 can sign for her”
5	Doctor’s note	A doctor’s note was not requested by any operator surveyed in this study
6	Cannot determine	Includes “I do not know” or “I have to ask the owner”

TABLE 3 Response Rates of Tanning Facilities

Survey Status	7 AM–3 PM (Morning)	3 PM–10 PM (Evening)
Complete	271 (72.3%)	248 (66.1%)
Incomplete (includes facilities that recognized the survey or declined to answer all the questions)	2 (0.5%)	17 (4.5%)
Phone disconnected	97 (25.9%)	104 (27.7%)
No answer	5 (1.3%)	6 (1.6%)
Total	375	375

located in metropolitan areas, and 66 (27%) were in nonmetropolitan areas. Of the 132 facilities excluded from analysis because they did not complete both interviews, 98 (74%) were in metropolitan areas, and 34 (26%) were in nonmetropolitan areas. The proportion of metropolitan- and nonmetropolitan-area tanning salons that completed 0, 1, or both interviews did not differ significantly ($P = .759$). Neither did the census-tract-level poverty index differ significantly by number of interviews completed ($P = .086$). Census-tract-level poverty was a composite score of 5 variables: % African

American, % female-headed households, % civilian labor force unemployed, % persons living below poverty, and % households with no vehicle ($\alpha = 0.82$).

We next evaluated whether the information given by each facility was consistent across both interviews (Table 4).

Risks of Exposure

On average, 40% of tanning facilities specifically mentioned the risk of skin cancer, whereas 20% claimed that there was “no risk if the customer takes

precautions,” and 31% did not provide any comments on the risks associated with indoor tanning. On average, 43% of facilities claimed that there were no risks associated with indoor tanning. Unsolicited benefits (eg, “it is safer than the sun,” “it is doctor recommended,” and “there are added health benefits”) were also volunteered by a few employees, whether they mentioned any risks.

Duration and Exposure Type

On average, only 22% of employees informed the interviewers that a skin assessment was necessary to determine the duration of UVR exposure, nearly 20% would allow customers to start with maximum duration of UVR exposure, and 7% recommended high UV-A intensity bronzing devices. Overall, 65% of employees recommended starting with low UV exposure, but no one inquired about potential

TABLE 4 Frequencies of Responses Provided to Each Interviewer

Tanning-Facility Responses	7 AM–3 PM	3 PM–10 PM	Mean %	P Value
1. Are there any risks with tanning?	<i>n</i> = 243	<i>n</i> = 243		<.001 ^a
Yes	154 (63.4%)	106 (43.6%)	53.5	
No	78 (32.1%)	131 (53.9%)	43.0	
Uncertain	11 (4.5%)	6 (2.5%)	3.7	
2. What are the dangers of indoor tanning? (If answered yes to question 1)	<i>n</i> = 154	<i>n</i> = 106		NC ^b
Not stated	46 (29.9%)	34 (32.1%)	30.8	
No risks if customer takes precaution	34 (22.1%)	18 (17.0%)	20.0	
UVR damage	73 (47.4%)	54 (50.9%)	48.8	
Skin cancer	59 (38.3%)	44 (41.5%)	39.6	
Contraindications	6 (3.9%)	0 (0.0%)	2.3	
3. Unsolicited comments in response to question 1	<i>n</i> = 243	<i>n</i> = 243		NC ^b
Safer than the sun	37 (15.2%)	23 (9.5%)	12.4	
Doctor recommended	0 (0%)	4 (1.6%)	0.8	
Health benefits	5 (2.1%)	7 (2.9%)	2.5	
4. How long can I tan?	<i>n</i> = 243	<i>n</i> = 243		<.001 ^a
Cannot determine	2 (0.8%)	9 (3.7%)	2.2	
Start low and work up	135 (55.6%)	183 (75.3%)	65.4	
Start with maximum exposure	76 (31.3%)	20 (8.2%)	19.8	
Assessment	55 (22.6%)	50 (20.6%)	21.6	
Start with high or bronzer bed	29 (11.9%)	6 (2.5%)	7.2	
5. Can my 10-y-old sister or 12-y-old cousin tan?	<i>n</i> = 243	<i>n</i> = 243		.008 ^a
Yes	149 (61.3%)	168 (69.1%)	65.2	
No	86 (35.4%)	61 (25.1%)	30.2	
Uncertain	8 (3.3%)	14 (5.8%)	4.5	
6. Consent required for 10-y-old or 12-y-old (If answered yes to question 5)	<i>n</i> = 149	<i>n</i> = 163		NC ^b
On-site	115 (77.2%)	76 (46.6%)	61.2	
Off-site	24 (16.1%)	42 (25.8%)	21.2	
No adult	8 (5.4%)	27 (16.6%)	11.2	
Any adult	2 (1.3%)	5 (3.1%)	2.2	
Doctor's note	0 (0%)	0 (0%)	0	
Cannot determine	0 (0%)	18 (11%)	5.7	
7. Can I tan without goggles?	<i>n</i> = 243	<i>n</i> = 243		<.001 ^c
Yes	54 (22.2%)	20 (8.2%)	15.2	
No	189 (77.8%)	222 (91.4%)	84.6	
Uncertain	0 (0%)	1 (0.4%)	0.2	
8. Will tanning prevent sunburns?	<i>n</i> = 243	<i>n</i> = 243		.024 ^c
Yes	183 (75.3%)	206 (84.8%)	80.0	
No	54 (22.2%)	37 (15.2%)	18.7	
Uncertain	6 (2.5%)	0 (0%)	1.2	

Column percentages do not necessarily total 100% because some responses were assigned multiple codes. Weighted means were calculated when appropriate.

^a McNemar-Bowker test of symmetry.

^b NC, not calculated; data shown for descriptive purposes only because of unequal *ns* and/or not everyone provided explanations for their response to the first question.

^c McNemar 2 × 2 tests of significance, excluding “uncertain” responses due to missing data for 1 set of measurements.

contraindications to tanning, such as photosensitizing medications, medical conditions, or a personal history of skin cancer or requested or required a physician's note.

Allowable Age

On average, 65% of salon operators claimed that they would allow children as young as 10 or 12 years old to use their tanning devices. Seventy-seven percent of morning employees re-

quired on-site parental consent, but only 47% of evening operators requested on-site consent. Twenty-six percent of evening operators would allow off-site parental consent, and 17% stated that “an adult was not necessary” for a 10- or 12-year-old to use indoor-tanning devices.

Requirements for Eye Protection

On average, 85% of salons reported that eye protection was required while

tanning. However, after Interviewer A raised concerns regarding “raccoon eyes,” 94 of 214 salons reversed their answer; ultimately 151 of 271 (56%) would have permitted her to tan without eye protection (Table 5).

Sunburn

Overall, 80% of tanning facilities claimed that indoor tanning would prevent future sunburns, but only 19% advocated for preventative measures, such as applying sunscreen.

Consistency of Information Provided to Clients

Inconsistencies in responses were observed for the risks associated with indoor tanning ($P < .001$), whether 10- or 12-year-olds would be allowed to use tanning beds ($P = .008$), requirements for eye protection ($P < .001$), recommendations regarding duration of UVR exposure ($P < .001$), and whether tanning beds prevent sunburns ($P = .024$). Evening employees were more likely than morning employees to report allowing 10- or 12-year-old children to use indoor-tanning devices. Morning employees were more likely to report allowing consumers to initiate with maximum exposure times and bronzer devices, while evening employees were more likely to recommend starting lower.

DISCUSSION

Our results indicate that tanning-facility operators do not consistently provide information regarding known risks of indoor UVR exposure when communicating with customers and suggest that employees are inadequately educated about the operation of tanning devices. Despite the scientific evidence linking UVR to the development of skin cancer,^{44,45} 43% of tanning salons in our study claimed that there were no risks associated with indoor tanning, and 78% did not require skin assessments

TABLE 5 Change in Stated Requirement for Eye Protection Upon Further Questioning by Interviewer A

Response	First: "Can I tan without goggles?"	Probe: "I really don't want raccoon eyes. Can I choose not to wear them?"
Yes	57 (21.0%)	151 (55.7%)
No	214 (79.0%)	120 (44.3%)
Total	271	271

This probing question was asked only by Interviewer A, therefore all completed surveys for Interviewer A ($n = 271$) were included in this table. Total numbers of responses to each question are provided; McNemar 2×2 test, $P < .001$.

before the recommendation of tanning schedules (eg, type and duration of UVR exposure). Contrary to World Health Organization recommendations,³¹ 65% of employees surveyed would have allowed children as young as 10 or 12 years old to use indoor-tanning devices, some without on-site parental consent. Several employees changed their minds about requiring eye protection upon additional questioning about the necessity of using goggles, indicating either a lack of knowledge about or disregard for associated ocular risks. Furthermore, no one inquired about contraindications to tanning, including photosensitizing medications (eg, isotretinoin) or history of skin cancer or other pertinent medical conditions (eg, lupus). Interestingly, in our study, tanning services were offered at unusual venues such as fitness centers, floral shops, video rental stores, travel agencies, and laundromats, where employees would not be expected to specialize in tanning-bed operation.

In 2010, the Federal Trade Commission charged the Indoor Tanning Association with propagating deceptive safety and health claims regarding indoor tanning.⁴⁶ The Federal Trade Commission subsequently issued a consumer alert stating that tanning devices can lead to skin cancer and are more dangerous than the sun, discounting purported health benefits advertised by the tanning industry.⁴⁷ There is growing evidence that melanoma risk is associated with tanning bed use. A recent population-based, case-control study found a 74% increased likelihood of

melanoma with 1-time use of tanning beds compared with never-users, and risk increased with repeated use and high-intensity tanning devices.⁴⁴ Similar increases in melanoma risk with repeated use and younger age at initiation were also reported in western Europe.⁴⁸

To our knowledge, this study is the largest single-state survey of tanning facilities conducted in a state without regulatory laws for indoor-tanning facilities. A small survey of 20 facilities in New York City in the late 1980s showed that up to 80% of operators informed customers that artificial tanning would not cause sunburns or skin cancer,⁴⁹ similar to our results nearly 30 years later, despite scientific evidence to the contrary. Inspection of Arkansas tanning salons revealed poor eye protection and inadequate limits on exposure time; consumers with Fitzpatrick skin type II were also promised a "safe" UV-A tan that would protect against sunburns.⁵⁰ In another study, >70% of tanning-facility operators had never received training for their positions and were often unaware of contraindications to tanning.³⁴ Other studies have reported that salons exceed the number of sessions allowed per week⁵¹ and that only 5% of facilities were in compliance with recommended manufacturer tanning schedules, whereas 100% offered "unlimited" tanning packages.¹⁰ Although other studies have reported what tanning-facility employees say to their patrons, ours is unique in reporting the intrasalon consistency of information provided to potential clients in a

statewide, random sample of tanning salons.

This study had some limitations. Because data were collected anonymously, we did not know whether we interviewed the same person both times, so the unit of analysis was the tanning salon and not the individual employee. In addition, the survey elicited responses to open-ended questions. We did not ask each employee whether he or she gives specific types of information to potential customers (eg, we did not ask each employee if he or she told a customer that skin cancer is a risk of indoor tanning). Employees spontaneously mentioned the responses we report here. Furthermore, because this was a descriptive study and was conducted in only 1 state without tanning-salon legislation, we cannot generalize our results to other states or to states that have passed tanning-salon legislation. In-person surveillance may be pursued in future studies to measure actual practice. Our data were collected in 2007; however, we believe that our results reflect the status quo of tanning-facility operation in Missouri, which, to this day, lacks indoor-tanning legislation. In 2007, we could not locate any governmental registry of tanning facilities in Missouri to verify the total number of facilities in operation. It is unknown whether additional facilities were unlisted online, but we found no evidence of selection bias by location of facilities in metropolitan and nonmetropolitan counties or in census tracts with varying levels of poverty.

We propose that for some individuals, without limiting access, there may be little incentive to change behaviors. Indeed, the enactment of smoke-free laws, for example, succeeded in promoting smoking cessation within local communities.⁵² In 2008, we began an aggressive campaign to establish statewide legislation to promote

awareness and safety among tanning-bed users in Missouri, which is still underway and proving to be a slow process. Essential components of our proposed legislation include (1) enforcement of FDA recommendations for tanning-bed operators (eg, warning signs, mandatory eye protection, manufacturer compliance), (2) enforcement of age restrictions prohibiting children aged <18 years from using tanning devices, and (3) providing the same information to all consumers before tanning-bed use. Although the Health Care Reform Act enacted in 2010 included a 10% tax on tanning services, such an intervention may not be suffi-

cient to restrict use of tanning services because it has had a minimal effect on decreasing the frequency of indoor tanning.⁵³ We also believe that tanning devices should be elevated to either a Class II or III category for medical devices, which would at least require regulatory oversight of manufacturers. Furthermore, because the majority of adolescents who use tanning beds are older (16 to 18 years old),⁵ there is a need for higher age restrictions in states with existent laws. As physicians and patient advocates, we should be at the forefront of educating parents, implementing community programs, and supporting legislation that pro-

tections children and adults from the harmful effects of UVR-emitting devices. Consumer and patient education regarding the dangers of indoor tanning are paramount in skin cancer prevention.

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REFERENCES

1. Rogers HW, Weinstock MA, Harris AR, et al. Incidence estimate of nonmelanoma skin cancer in the United States, 2006. *Arch Dermatol*. 2010;146(3):283–287
2. American Cancer Society. *Cancer Facts & Figures 2009*. Atlanta, GA: American Cancer Society; 2009
3. Robinson JK. Sun exposure, sun protection, and vitamin D. *JAMA*. 2005;294(12):1541–1543
4. Christenson LJ, Borrowman TA, Vachon CM, et al. Incidence of basal cell and squamous cell carcinomas in a population younger than 40 years. *JAMA*. 2005;294(6):681–690
5. Demko CA, Borawski EA, Debanne SM, Cooper KD, Stange KC. Use of indoor tanning facilities by white adolescents in the United States. *Arch Pediatr Adolesc Med*. 2003;157(9):854–860
6. Geller AC, Colditz G, Oliveria S, et al. Use of sunscreen, sunburning rates, and tanning bed use among more than 10 000 US children and adolescents. *Pediatrics*. 2002; 109(6):1009–1014
7. Zhang M, Qureshi AA, Geller AC, Frazier L, Hunter DJ, Han J. Use of tanning beds and incidence of skin cancer. *J Clin Oncol*. 2012; 30(14):1588–1593
8. Dellavalle RP, Parker ER, Cersonsky N, et al. Youth access laws: in the dark at the tanning parlor? *Arch Dermatol*. 2003;139(4): 443–448
9. Demierre MF. Time for the national legislation of indoor tanning to protect minors. *Arch Dermatol*. 2003;139(4):520–524
10. Kwon HT, Mayer JA, Walker KK, Yu H, Lewis EC, Belch GE. Promotion of frequent tanning sessions by indoor tanning facilities: two studies. *J Am Acad Dermatol*. 2002;46(5): 700–705
11. Levine JA, Sorace M, Spencer J, Siegel DM. The indoor UV tanning industry: a review of skin cancer risk, health benefit claims, and regulation. *J Am Acad Dermatol*. 2005;53(6): 1038–1044
12. Karagas MR, Stannard VA, Mott LA, Slattery MJ, Spencer SK, Weinstock MA. Use of tanning devices and risk of basal cell and squamous cell skin cancers. *J Natl Cancer Inst*. 2002;94(3):224–226
13. Chen YT, Dubrow R, Zheng T, Barnhill RL, Fine J, Berwick M. Sunlamp use and the risk of cutaneous malignant melanoma: a population-based case-control study in Connecticut, USA. *Int J Epidemiol*. 1998;27 (5):758–765
14. Gallagher RP, Spinelli JJ, Lee TK. Tanning beds, sunlamps, and risk of cutaneous malignant melanoma. *Cancer Epidemiol Biomarkers Prev*. 2005;14(3):562–566
15. International Agency for Research on Cancer Working Group on artificial ultraviolet (UV) light and skin cancer. The association of use of sunbeds with cutaneous malignant melanoma and other skin cancers: a systematic review. *Int J Cancer*. 2007;120 (5):1116–1122
16. Purdue MP, Freeman LE, Anderson WF, Tucker MA. Recent trends in incidence of cutaneous melanoma among US Caucasian young adults. *J Invest Dermatol*. 2008;128 (12):2905–2908
17. American Cancer Society. Cancer facts & figures 2012. Available at: www.cancer.org/acs/groups/content/@epidemiologysurveillance/documents/document/acspc-031941.pdf. Accessed April 1, 2012
18. Weir HK, Marrett LD, Cokkinides V, et al. Melanoma in adolescents and young adults (ages 15–39 years): United States, 1999–2006. *J Am Acad Dermatol*. 2011;65(5 suppl 1):S38–S49
19. Department of Health and Human Services, National Toxicology Program. *Report on Carcinogens*. 12th ed. 2011. Available at: <http://ntp.niehs.nih.gov/ntp/roc/twelfth/roc12.pdf>. Accessed March 1, 2012
20. US Food and Drug Administration. Learn if a medical device has been cleared by FDA for marketing. Available at: www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/Overview/ClassifyYourDevice/default.htm. Accessed July 29, 2012
21. Wang SQ, Setlow R, Berwick M, et al. Ultraviolet A and melanoma: a review. *J Am Acad Dermatol*. 2001;44(5):837–846
22. Briggs D. *Looking Fit: Tanning Fact Book, A Guide for Today's Successful Salon Owners 2006–2006*. Phoenix, AZ: Virgo Publishing; 2005:1–272
23. Gilchrest BA, Eller MS, Geller AC, Yaar M. The pathogenesis of melanoma induced by ultraviolet radiation. *N Engl J Med*. 1999;340 (17):1341–1348
24. Gerber B, Mathys P, Moser M, Bressoud D, Braun-Fahrlander C. Ultraviolet emission

- spectra of sunbeds. *Photochem Photobiol*. 2002;76(6):664–668
25. Miller SA, Hamilton SL, Wester UG, Cyr WH. An analysis of UVA emissions from sunlamps and the potential importance for melanoma. *Photochem Photobiol*. 1998;68(1):63–70
26. Miyamura Y, Coelho SG, Schlenz K, et al. The deceptive nature of UVA tanning versus the modest protective effects of UVB tanning on human skin. *Pigment Cell Melanoma Res*. 2011;24(1):136–147
27. Wolber R, Schlenz K, Wakamatsu K, et al. Pigmentation effects of solar-simulated radiation as compared with UVA and UVB radiation. *Pigment Cell Melanoma Res*. 2008;21(4):487–491
28. Lange JR, Balch CM. Melanoma in children: heightened awareness of an uncommon but often curable malignancy. *Pediatrics*. 2005;115(3):802–803
29. Hamre MR, Chuba P, Bakhshi S, Thomas R, Severson RK. Cutaneous melanoma in childhood and adolescence. *Pediatr Hematol Oncol*. 2002;19(5):309–317
30. Karlsson P, Boeryd B, Sander B, Westermarck P, Rosdahl I. Increasing incidence of cutaneous malignant melanoma in children and adolescents 12–19 years of age in Sweden 1973–92. *Acta Derm Venereol*. 1998;78(4):289–292
31. The World Health Organization. Sunbeds, tanning and UV exposure. Available at: www.who.int/mediacentre/factsheets/fs287/en/. Accessed July 29, 2012
32. Behavioral Counseling to Prevent Skin Cancer. Clinical Summary of US Preventative Services Task Force Recommendation. Available at: www.uspreventiveservicestaskforce.org/uspstf11/skincancouns/skincancounsum.pdf. Accessed July 29, 2012
33. Tanning Restrictions for Minors. A state-by-state comparison. Available at: www.ncsl.org/issues-research/health/tanning-restrictions-for-minors.aspx. Accessed March 1, 2012
34. Fleischer AB Jr, Fleischer AB. North Carolina tanning operators: hazard on the horizon? *J Am Acad Dermatol*. 1992;27(2 pt 1):199–203
35. Heilig LF, D'Ambrosia R, Drake AL, Dellavalle RP, Hester EJ. A case for informed consent? Indoor UV tanning facility operator's provision of health risks information (United States). *Cancer Causes Control*. 2005;16(5):557–560
36. Hester EJ, Heilig LF, D'Ambrosia R, Drake AL, Schilling LM, Dellavalle RP. Compliance with youth access regulations for indoor UV tanning. *Arch Dermatol*. 2005;141(8):959–962
37. National Association of Counties. Available at: www.naco.org/Template.cfm?Section=Find_a_County&Template=/cfiles/counties/state.cfm&statecode=MO. Accessed July 26, 2009
38. Superpages. Available at: <http://yellowpages.superpages.com>. Accessed March 1, 2012
39. Yellow Pages AOL. Available at: <http://yellowpages.aol.com>. Accessed March 1, 2012
40. U.S. Census Bureau. American FactFinder. Missouri by county: GCT-T1-R. Population estimates. Available at: http://factfinder.census.gov/servlet/GCTTable?_bm=y&-geo_id=04000US29&-box_head_nbr=GCT-T1-R&-ds_name=PEP_2009_EST&-format=ST-2S. Accessed March 1, 2012
41. United States Department of Agriculture. Economic Research Service. Rural-urban continuum codes. Available at: <http://ers.usda.gov/data-products/rural-urban-continuum-codes.aspx>. Accessed July 31, 2012
42. Bowker AH. A test for symmetry in contingency tables. *J Am Stat Assoc*. 1948;43(244):572–574
43. McNEMAR Q. Note on the sampling error of the difference between correlated proportions or percentages. *Psychometrika*. 1947;12(2):153–157
44. Lazovich D, Vogel RI, Berwick M, Weinstock MA, Anderson KE, Warshaw EM. Indoor tanning and risk of melanoma: a case-control study in a highly exposed population. *Cancer Epidemiol Biomarkers Prev*. 2010;19(6):1557–1568
45. Veierød MB, Weiderpass E, Thörn M, et al. A prospective study of pigmentation, sun exposure, and risk of cutaneous malignant melanoma in women. *J Natl Cancer Inst*. 2003;95(20):1530–1538
46. Indoor Tanning Association settles FTC charges that it deceived consumers about skin cancer risks from tanning. Available at: www.ftc.gov/opa/2010/01/tanning.shtm. Accessed March 1, 2012
47. Consumer Alert FTC. Indoor tanning. Available at: www.ftc.gov/bcp/edu/pubs/consumer/alerts/alt174.pdf. Accessed March 1, 2012
48. Boniol M, Autier P, Boyle P, Gandini S. Cutaneous melanoma attributable to sunbed use: systematic review and meta-analysis. *BMJ*. 2012;345:e4757
49. Fairchild AL, Gemson DH. Safety information provided to customers of New York City suntanning salons. *Am J Prev Med*. 1992;8(6):381–383
50. Bruyneel-Rapp F, Dorsey SB, Guin JD. The tanning salon: an area survey of equipment, procedures, and practices. *J Am Acad Dermatol*. 1988;18(5 pt 1):1030–1038
51. Hurd AL, Mayer JA, Woodruff SI, Belch GE, Patel MR. Comparing two methods of measuring legislation compliance among indoor tanning facilities. *J Am Acad Dermatol*. 2006;54(3):433–439
52. Hahn EJ, Rayens MK, Langley RE, Darville A, Dignan M. Time since smoke-free law and smoking cessation behaviors. *Nicotine Tob Res*. 2009;11(8):1011–1015
53. Jain N, Rademaker A, Robinson JK. Implementation of the federal excise tax on indoor tanning services in Illinois. *Arch Dermatol*. 2012;148(1):122–124