Youth Access to Artificial UV Radiation Exposure

Practices of 3647 US Indoor Tanning Facilities

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Objective: To assess indoor tanning facility practices in a sample of facilities in 116 cities representing all 50 states.

Design: Cross-sectional study.

Setting: United States.

Participants: Employees of 3647 indoor tanning facilities were contacted by telephone. Data collectors (ie, confederates) posed as prospective, fair-skinned, 15-year-old female customers who had never tanned before.

Main Outcome Measures: Confederates asked respondents about their facility’s practices related to parental consent, parental accompaniment, and allowable tanning session frequency.

Results: Approximately 87% of the facilities required parental consent, 14% required parental accompaniment, 5% said they would not allow the confederate to tan owing to her age, and 71% would allow tanning every day the first week of indoor tanning. In Wisconsin, which bans indoor tanning among those younger than 16 years, 70% of facilities would not allow the confederate to tan. Multivariate analyses indicated that facilities in states with a youth access law were significantly more likely to require parental consent ($P < .001$) and parental accompaniment ($P < .001$) than those in states without a youth access law. Law was not significantly related to allowable tanning frequency ($P = .81$).

Conclusion: We recommend that additional states pass youth access legislation, preferably in the form of bans.

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EXPOSURE TO UV radiation (UVR) from indoor tanning lamps has been linked with both melanoma and squamous cell cancer, and first exposure before age 35 years may increase melanoma risk by as much as 75%.

See also pages 989, 1051, and 1059

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beyond those boundaries, we defined the city boundary as a 3-mile buffer zone surrounding the formal boundary. Using a multistep process with Geographic Information Systems data described in detail elsewhere, we created these boundaries and identified indoor tanning facilities within them. Our inclusion criteria for a facility were that it must offer indoor UVR tanning, be open to the public, and not require membership. With the term “tanning salons” as the key word, in March 2006 we identified all facilities within each city using ReferenceUSA.com as the primary source and Superpages.com as the secondary source. If an indoor tanning facility was shared by more than 1 city plus a 3-mile buffer area, we assigned the main city affiliation to the city whose center was closest to the facility.

ASSESSMENT OF OUTCOMES AND POTENTIAL CORRELATES

We hired and trained 5 young-sounding female college students (ie, confederates) to pose as 15-year-old potential clients, telephone the facilities, and follow a script for ascertaining facility practices. During the confederate interview process, we evaluated whether applicants sounded like teens by using blinded telephone screening, as well as Sona-Speech II voice software (version 2.7.0; KayPENTAX, Lincoln Park, New Jersey) to assess the fundamental voice frequency (ie, pitch). All 5 confederates’ voice frequencies fell within the acceptable ranges for a 15-year-old girl (179–310 Hz). Confederates telephoned all potentially eligible facilities in June through September of 2006; respondents were tanning facility staff who answered this telephone call. Up to 10 attempts were made to reach each tanning business. At the beginning of each 5-minute telephone contact, the confederate stated that she was planning to visit the facility that day and described herself as being 15 years old, having fair skin, and having never used indoor tanning. She then asked several scripted questions to assess the practices and characteristics of indoor tanning facilities and recorded all responses verbatim on a data collection form. In a previous study, we had found that data collected in person vs by telephone had acceptable concordance. The key questions were: (1) “Does my mom need to sign anything so I can tan?”, (2) “Does my mom need to be there while I tan?”, and (3) “How many times can I tan the first week?”. The practice of banning owing to the customer’s age was not asked about directly but was coded when the respondent replied that the confederate could not tan owing to age when asked question 1, and a separate variable for banning (yes/no) was then created.

We also measured potential correlates of practices, including facility type, number of tanning beds, respondent sex, whether the state had any tanning law, and whether the state had any law restricting youth access. Facility type, coded during the facility identification process, consisted of tanning salon (ie, sole or main service was indoor UV tanning), beauty salon or day spa (ie, provided UV tanning as a service), and “other” (ie, provided UV tanning but did not fit into the first 2 categories). Toward the end of the telephone call, the confederate asked “How many tanning beds or booths do you have?” (recorded and used in analyses as a continuous variable). Once data were collected, we recoded the various responses to confederates’ queries using a priori protocols. For law data, we systematically reviewed 2 legal databases and analyzed the content of existing indoor tanning laws. To assess interrater reliability, the confederates’ supervisors (L.C.P. and K.D.H.) listened to a random 20% of the calls on a second telephone line and recorded the respondent’s comments. All study procedures were approved by the San Diego State University institutional review board.

STATISTICAL ANALYSIS

Data were analyzed with SPSS (version 15.0 for Windows; SPSS Inc, Chicago, Illinois) and SAS (version 9.1.3; SAS Inc, Cary, North Carolina) statistical software. Facility was the unit of analysis. We examined the data using 2 perspectives: (1) practices of all facilities, irrespective of whether the state had an indoor tanning law, and (2) compliance of facilities under the jurisdiction of specific state laws (ie, a “report card”). Descriptive statistics were computed for each facility practice (ie, parental consent, parental accompaniment, banning for a 13-year-old, and frequency that an individual was allowed to tan); number of UV indoor tanning beds or booths; type of facility; and respondent sex. We tested the bivariate relationship between each facility practice and each potential correlate using generalized estimating equations (GEEs) that adjusted for city clustering. Potential correlates were number of beds, facility type, respondent sex, presence of any indoor tanning law, and presence of state youth access restriction law. Multivariate analyses using GEEs—1 for each practice—were conducted to test the relationship between each facility practice and multiple potential predictors simultaneously, adjusting for city clustering and confederate. The “any state law” variable was excluded, and “youth access law” was included as a predictor in the multivariate models because the latter was more relevant (and was nested within the former). Respondent sex also was excluded from multivariate tests because it was consistently unrelated to outcomes in the bivariate analyses. A significance level of \( P = .05 \) was used for all analyses.

For the report card, we assessed the percentage of facilities in (1) the 20 relevant states that complied with their parental consent laws, (2) the 2 relevant states that complied with their parental accompaniment laws, and (3) the 1 relevant state that complied with its ban for those younger than 16 years. Using \( \chi^2 \) tests, we compared these percentages with the percentages of facilities in states without these specific regulations. We evaluated interrater agreement on select variables for a subset of the data using the \( k \) value for the categorical variables and intraclass correlation coefficients (ICCs) for the continuous variables.

CHARACTERISTICS OF THE SAMPLE

A total of 4561 indoor tanning facilities were initially identified. For the current analysis, 79 facilities were excluded because the telephone number and business name resembled other businesses and our research team did not want to raise any suspicion when calling. An additional 835 facilities were excluded owing to disconnected telephone lines \( (n=408) \), no answer after 10 calling attempts \( (n=104) \), an answering machine picked up \( (n=27) \), the facility no longer provided UV tanning \( (n=180) \), the telephone number was wrong \( (n=67) \), and other reasons, including hang-up, the facility was out of business, and the number used turned out to be a fax number \( (n=40) \). This resulted in 3647 facilities with usable data. Approximately 80% of the tanning facilities were tanning salons \( (n=2895) \), 17% were beauty salons or day spas \( (n=616) \), and 3% were “other” \( (n=106) \); in analyses, the latter 2 categories were combined. Thirty of the facilities had missing data for facility type. The mean (SD) number of tanning beds was 9.94 (6.81) (range, 1–50 tan-
ning beds). The facility respondents were primarily female (84.3%).

**INTERRATER RELIABILITY**

The $k$ values for parental consent and parental accompaniment were 0.98 and 0.95, respectively. The ICCs for number of sessions allowed and number of tanning beds were 0.99 and 0.97, respectively.

**FACILITY PRACTICES**

As shown in Table 1, approximately 87% of facilities required our confederates to get parental consent, about 14% required parental accompaniment, and 5% did not allow tanning at all owing to the confederates' stated age. Only around 11% followed the FDA recommendations of 3 or fewer sessions the first week. The mean (SD) number of sessions allowed the first week was 6.02 (1.61). About 71% of respondents said they would allow a teen to tan 7 days a week.

In bivariate analyses (Table 2), there were no significant associations between the respondent's sex and any of the outcome variables. State law and youth access law each were significantly related to parental consent and parental accompaniment, and significantly less likely to follow the FDA tanning session frequency recommendations. Tanning facility type was significantly related only to tanning session frequency allowed, with tanning salons less likely to follow FDA frequency recommendations than other facility types. (See Table 2 for $P$ values.)

Multivariate analysis results indicated that for parental consent, youth access law, and number of beds were significant predictors (see Table 3 for odds ratios, 95% confidence intervals, and significance levels). Facilities in states without a youth access law had only around one-third the odds of requiring consent than facilities in states with a law. For each 5-bed increase, facilities were 14% more likely to follow parental consent. For parental accompaniment, the following variables were significant predictors: facility type, youth access law, and number of beds. Nonsalons were 53% more likely to require parental accompaniment than salons. Facilities in states without a youth access law were 58% less likely to require accompaniment than facilities in states with a law. Facilities were 19% more likely to require parental accompaniment with each 5-bed increase. For frequency that an individual was allowed to tan, number of beds was the only significant predictor; facilities were 29% less likely to follow the FDA frequency recommendations for each 5-bed increase. Similar to the bivariate results, none of the variables tested significantly predicted age-related banning.

**COMPLIANCE OF SELECT FACILITIES WITH SPECIFIC LAW CONTENT**

We also assessed compliance of select facilities with their specific state laws. Table 1 shows comparisons between fa-
ilities in states with vs those without specific laws on practices related to parental consent, parental accompaniment, and banning underage youth. As indicated, although compliance varied across the 3 practices, facilities in states with a specific law were significantly more likely to implement the practice compared with facilities in states without the specific law ($P < .001$). Of the 20 parental consent law states, facilities in 4 states (Louisiana, Maine, New Hampshire, South Carolina) had perfect compliance, and facilities in Georgia had the lowest level of compliance (72.5%). Using data we had collected previously on inspections conducted in states with tanning laws,\textsuperscript{19} we found that facilities in parental-consent states with annual (or more frequent) inspections were significantly more likely to require parental consent than those in parental-consent states with less-than-annual inspections (95% vs 91%; $\chi^2 = 12.19; P < .001$). Rates of requiring parental accompaniment in Indiana and Texas were 45.3% and 42.8%, respectively. Wisconsin was the only state with a ban on tanning for individuals younger than 16 years.

To our knowledge, this study is the largest study to date assessing indoor tanning facility practices regarding youth access. Our data on the proportion of facilities requiring parental consent—approximately 87% of all facilities—were encouraging. Two previous studies\textsuperscript{11,20} also found relatively high rates of facilities requiring parental consent. In both of those studies, as in ours, the confederates’ ages were explicitly provided at the beginning of the interaction. In contrast, studies\textsuperscript{9,10} using face-to-face methods have found more lenient parental consent practices. The different patterns in findings between these telephone vs in-person data collection methods may be due to facilities’ tendency to be stricter during the telephone call (when a “sale” is more abstract).

Results from our multivariate analysis suggested that being in a state with any type of youth access law made it significantly more likely that a facility would require written consent ($P < .001$). Also, the more tanning beds

### Table 2. Bivariate Associations Between Facility Practices and Predictors, Adjusted for City Clustering Using Generalized Estimating Equations

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Required Parental Consent (n=3463)</th>
<th>% Complying</th>
<th>$\chi^2$</th>
<th>Required Parental Accompaniment (n=3462)</th>
<th>% Complying</th>
<th>$\chi^2$</th>
<th>Confederates Not Allowed to Tan Owing to Age, 15 y (n=3645)</th>
<th>% Complying</th>
<th>$\chi^2$</th>
<th>Allowed Only 3 or Fewer Sessions (n=2962)</th>
<th>% Complying</th>
<th>$\chi^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility type</td>
<td></td>
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<tr>
<td>Tanning salons</td>
<td>87.8</td>
<td>3.65</td>
<td></td>
<td>14.2</td>
<td>3.17</td>
<td></td>
<td>4.9</td>
<td>0.03</td>
<td></td>
<td>9.7</td>
<td>20.07\textsuperscript{a}</td>
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<td>Other</td>
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<td>5.7</td>
<td>15.4</td>
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<tr>
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<td>86.9</td>
<td>14.1</td>
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<td>5.1</td>
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<td>4.4</td>
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<td>11.1</td>
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<td>No</td>
<td>79.7</td>
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<td>Youth access law</td>
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<tr>
<td>Yes</td>
<td>92.3</td>
<td>17.3</td>
<td></td>
<td>5.6</td>
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<td></td>
<td>9.7</td>
<td>0.72</td>
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<tr>
<td>No</td>
<td>78.0</td>
<td>9.4</td>
<td></td>
<td>4.1</td>
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<td></td>
<td></td>
<td></td>
<td>12.5</td>
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<tr>
<td>No. of tanning beds</td>
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<tr>
<td>12.60\textsuperscript{a}</td>
<td>10.69\textsuperscript{b}</td>
<td>32.83\textsuperscript{a}</td>
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</table>

\textsuperscript{a}P < .001.
\textsuperscript{b}P < .01.

### Table 3. Multivariate Analyses Between Facility Practices and Predictors, Adjusted for City Clustering Using Generalized Estimating Equations\textsuperscript{a}

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Parental Consent</th>
<th>Parental Accompaniment</th>
<th>Tanning Ban</th>
<th>Tanning Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>0.91 (0.67-1.22)</td>
<td>1.53 (1.20-1.95)\textsuperscript{b}</td>
<td>0.95 (0.65-1.39)</td>
<td>1.27 (0.95-1.70)</td>
</tr>
<tr>
<td>Youth access law</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>0.35 (0.25-0.49)\textsuperscript{b}</td>
<td>0.42 (0.28-0.63)\textsuperscript{b}</td>
<td>0.85 (0.36-2.01)</td>
<td>1.05 (0.71-1.54)</td>
</tr>
<tr>
<td>No. of tanning beds: per 5-bed increase</td>
<td>1.14 (1.05-1.24)\textsuperscript{c}</td>
<td>1.19 (1.11-1.27)\textsuperscript{b}</td>
<td>0.98 (0.80-1.11)</td>
<td>0.71 (0.63-0.81)\textsuperscript{b}</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; OR, odds ratio.
\textsuperscript{a}All models are adjusted for confederate.
\textsuperscript{b}P < .001.
\textsuperscript{c}P < .01.
a facility had, the more likely the facility was to require consent. This latter finding may be due to the association between facility type and number of beds, with sole-purpose tanning salons having more beds than other types of facilities. It is these salons that are most likely to be part of a well-organized tanning industry network, in which facility owners are encouraged to comply, at least on the surface, with existing laws.\textsuperscript{10,21}

Although banning a 15-year-old prospective customer was infrequent among all facilities in our sample, the Wisconsin facilities had a moderately high rate of compliance with this aspect of their law. Our rate of 70\% for banning a 15-year-old in Wisconsin was comparable with the 77\% rate in Wisconsin found by Hester et al.\textsuperscript{13} Moreover, Hester et al\textsuperscript{13} reported that for a prospective 12-year-old client, 89\% of Wisconsin facilities claimed they would implement a ban. Banning by facilities was substantially less common than requiring parental consent. Unlike a parental consent policy, which still provides the possibility of a sale as long as the parent agrees,\textsuperscript{23} imposing an absolute ban on adolescents, who may constitute a considerable proportion of a facility’s profits, would be “bad for business.”

Compliance with FDA-recommended session-per-first-week frequency was less than 11\% in the present study, with 71\% of facility staff allowing the confederate to tan every day, and these findings are similar to results from several previous studies.\textsuperscript{9,12,15,20} These data highlight the deficiencies in having recommendations vs results from several previous studies.\textsuperscript{8,12,13,20} These data highlight the deficiencies in having recommendations vs enforceable requirements. Not only do facilities allow frequent tanning, but they promote it using “unlimited tanning” discount price packages; these packages are ubiquitous in the US tanning industry.\textsuperscript{13} Unfortunately, frequent use of indoor tanning is likely to increase the risk for melanoma of individual customers by promoting greater cumulative UVR exposure.\textsuperscript{23,24}

Our study had several methodological limitations. First, we were not able to send confederates in person to assess practices. However, when we attempted to validate our telephone method against in-person visits in a pilot study, concordance was acceptable.\textsuperscript{12} A second limitation is that our confederates were older than 15 years, and even though their voices were relatively high-pitched and youthful sounding, they may have produced different reactions from facility staff than actual teens. Third, we conducted only 1 contact, with only 1 respondent, per facility. Therefore, it is possible that our data may not represent the “typical” practices of all personnel at a given facility. Fourth, our results may not generalize to facilities in smaller cities or rural areas. Fifth, there may be potential confounders (that we neglected to measure) of the associations we found in the analyses. Finally, the cross-sectional design precludes making definitive conclusions about causal relationships between correlates and the facilities’ practices. Methodological strengths of our study included a wide geographic area and large numbers of cities and facilities, assessment of several key practices that could influence exposure to artificial UVR by youth, inclusion of current legislative data as a potential correlate, and highly reliable data.

These data have important implications related to the safety of adolescent indoor tanners. Most facility personnel stated that a teen could tan every day the first week. This finding highlights the high level of UV exposure teens may be getting from indoor tanning. Nonregulated indoor tanning frequency schedules potentially could result in overexposure and burning. Therefore, regulation and enforcement of tanning schedules are warranted.

Are youth access laws, in general, and parental involvement laws, in particular, effective? Should more states pass these types of legislation? Our data indicated that having any youth access law was associated with significantly higher rates of requiring parental consent and parental accompaniment, and facilities in states with laws specific to these practices had considerably higher rates than facilities in states without comparable law content. Thus, at one level, if one defines success as facility compliance, our data could mean that the laws are having an impact. However, given the relatively high rates of indoor tanning by adolescent girls, as well as the potentially important gatekeeping function of parents,\textsuperscript{22,25} apparently many parents are allowing their teens to tan and are providing written consent or accompaniment.

Therefore, we encourage more states to adopt indoor tanning bans for minors. In fact, the World Health Organization has recommended banning those younger than 18 years from commercial indoor tanning.\textsuperscript{26} To date, 3 Australian states and France have banned those younger than 18 years.\textsuperscript{37-32} In the United States, as of June 2008, a law pending in Ohio would ban those younger than 18 years.\textsuperscript{33} Bans such as these may both reduce youth access in a direct way and more forcefully educate parents about the real dangers of indoor tanning.

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Author Contributions: Dr Mayer had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Mayer, Woodruff, Slymen, Belch, Forster, and Weinstock. Acquisition of data: Pichon, Hoerster, Woodruff, Clapp, and Hurd. Analysis and interpretation of data: Pichon, Mayer, Hoerster, and Slymen. Drafting of the manuscript: Pichon and Mayer. Critical revision of the manuscript for important intellectual content: Pichon, Mayer, Hoerster, Woodruff, Slymen, Belch, Clapp, Hurd, Forster, and Weinstock. Statistical analysis: Slymen. Obtained funding: Mayer. Administrative, technical, and material support: Pichon, Mayer, Hoerster, Woodruff, Slymen, Belch, Clapp, Hurd, Forster, and Weinstock. Study supervision: Pichon, Mayer, Hoerster, and Clapp.

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Additional Contributions: Our 5 confederates were Laurel Butcher, BA, Ashley Bickmore, MPH, Muriel Eclavea, BA, Erin Greene, BA, and Jennifer Nicol, MPH. James Sallis, PhD, John Weeks, PhD, and Todd Gilmer, PhD, helped design the study. Debra Rubio, BA, assisted with manuscript preparation.

REFERENCES


