

SHORT REPORT

French teenagers and artificial tanning

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Abstract

Background Exposure to solar and artificial ultraviolet (UV) radiations is a major risk factor for skin cancers. France has enacted one of the strictest laws that, notably, restrict tanning-bed access to adults ≥ 18 years old.

Objective We evaluated artificial tanning behaviours of French teenagers (11–17 years old): sunless-tanning products, sunlamps and artificial tanning beds.

Methods An anonymous questionnaire evaluating sunburn history, skin phototype, behaviours with sunless-tanning products and indoor tanning, and parents' behaviours was distributed to students enrolled in two middle and high schools in Antony, a typical city of the middle class French population, located in the Paris suburbs.

Results Among 713 teenagers (mean age: 13.5 years: male/female: 1.1) responding, more than half declared that it was important to be tanned during the summer, 1% reported having already used tanning pills, 9.9% tanning creams and 1.4% indoor tanning. Female teenagers significantly more frequently resorted to indoor tanning ($P = 0.02$), cited the importance of being tanned all year long ($P < 0.0001$), used tanning pills ($P < 0.0001$) or tanning creams ($P < 0.006$), and their parents relied on indoor tanning ($P < 0.0001$). Profiles of tanning-pill and -cream users were similar. Mean ages for the two groups were comparable.

Conclusion French regulations for indoor tanning seem quite effective. Our analyses revealed a typical teenager profile with sun-exposure risk behaviours, for example, indoor tanning, and use of tanning pills or creams. They could be a selective target for sun-protection information campaigns.

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Conflict of interest

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Introduction

Skin cancers in fair phenotype populations are considered a major public health priority in Western countries. Their incidence is increasing and exposure to solar or artificial ultraviolet (UV) radiation is the most important risk factor for developing these cancers.^{1–3} Exposure to UV radiation from indoor tanning increases the risk of developing melanoma and tanning-bed use before the age of 35 increases this risk to 75%.⁴ In 2009, the International Agency for Research on Cancer classified 'UV-emitting tanning devices' as 'carcinogenic to humans' (Group 1).⁵

Recreational indoor tanning with artificial light from tanning beds or sunlamps is particularly important in United States and northern European countries.^{6,7} In France, indoor tanning is becoming more-and-more prevalent, particularly among young females.⁸ France has enacted some of the strictest legislation that, notably, restrict tanning-bed access to adults aged ≥ 18 years old.⁹

Recently, it was reported that 10.8% of American adolescents used sunless-tanning products and that this practice was associated with risky UV-radiation exposure-related behaviours, including natural and artificial radiation.¹⁰ Sunless-tanning products are promoted as a way to achieve tanned skin without UV-radiation

exposure or to increase the sun's effect and are often regarded as safer alternatives to sun tanning or indoor tanning. Thus, we thought it is relevant to evaluate these two types of artificial tanning, that is, sunless-tanning products or tanning with artificial lighting, to better understand adolescents' behaviours. Our study aimed to evaluate artificial tanning behaviours among French teenagers.

This study was performed in Antony, a medium-sized (59 849 inhabitants) typical city of the middle class French population, located in the Paris suburbs. Investigators (AB, IV, EM) are involved in three sun-exposure prevention programmes in Antony (ECRAN project): 'Tête Brûlée',¹¹ an educational programme on sun-protection measures; Risc-UV project,¹² an evaluation of UV risk and behaviours of children in primary school; and SOLADO, reported herein.

Methods

An anonymous questionnaire comprising 12 items was used for the study. It includes (i) demographic data: gender, age; (ii) skin phototype (SP), defined according to Fitzpatrick's classification, and number of sunburns during the past year; (iii) artificial tanning behaviours of adolescents: use sunless-tanning products (creams and pills) and indoor tanning during the past year; (iv) and their parent's behaviours with indoor tanning and sunless-tanning products. To maximize response rates and their reliability, the items were multiple choice questions.

The questionnaire was distributed to the students of two middle and high schools located in the centre of Antony, in December 2011. These two schools were used to collaborate in the ECRAN

project and accepted to participate in SOLADO. Questionnaires were completed by all the teenagers (11–17 years old) during a biology class with the teacher's help and explanations.

Quantitative data are expressed as means \pm standard deviation (SD) and qualitative data as *n* (%). Means were compared with Student's *t*-test. Percentages were compared with the chi-squared test, using Yates' correction for small groups. Significance was defined as $P < 0.05$. Statistical analyses were computed with BiostaTGV software (<http://marne.u707.jussieu.fr/biostatgv/?module=tests>).

Results

Among the 722 questionnaires returned, 9 were excluded because the item 'age' was not completed for one and because eight teenagers were >18 years old, yielding 713 questionnaires for analysis.

Teenagers' characteristics

The 713 teenagers' mean age was 13.5 ± 1.9 (range: 11–17) years with a male/female gender ratio of 1.1 (Table 1, three missing data). More than half (55.9%), almost two-thirds of females ($P < 0.0001$) declared that it was 'important' or 'very important' to be tanned in summer, a fifth in spring and 15.4% all year long. Moreover, 60.5% of the adolescents declared having been sunburned during the past year: 91.5% SP I–II, 74% SP III–IV and 21% SP V–VI (data not shown; $P < 0.0001$). Furthermore, 12.3% reported that at least one of their parents had already resorted to sunless-tanning products, like tanning creams and 4.5% of the teenagers already used indoor tanning.

Table 1 Demographic characteristics of SOLADO-participating teenagers, their feelings about sun tanning and their parents' artificial tanning behaviours

Characteristic	Total	Male*	Female*	<i>P</i> †
Participants, <i>n</i> (%)	713	366 (51.5%)	344 (48.5%)	
Mean age \pm SD, years	13.5 ± 1.9	13.5 ± 1.9	13.5 ± 2.0	1.0
Phototype, <i>n</i> (%)				
I–II	59 (8.4)	34 (10.1)	25 (6.9)	0.2
III–IV	443 (63.0)	204 (60.6)	238 (65.6)	
V–VI	201 (28.6)	99 (29.4)	100 (27.6)	
Sunburn during the past year, <i>n</i> (%)	431 (60.5)	207 (60.3)	224 (61.2)	0.8
Teenagers considering it important to be tanned, <i>n</i> (%)‡				
In spring	157 (22.3)	70 (19.4)	86 (25.4)	0.06
In summer	397 (55.9)	175 (48.2)	220 (64.0)	<0.0001
All year long	110 (15.4)	52 (14.2)	57 (16.6)	0.4
Parents' behaviours, <i>n</i> (%)				
Use of sunless-tanning products	87 (12.3)	34 (9.4)	51 (14.8)	0.03
Mother	70	32	46	
Father	19	9	10	
Indoor tanning	32 (4.5)	16 (4.4)	16 (4.7)	0.9
Mother	30	15	15	
Father	7	4	3	

*Three missing data for sex. In addition, 1–9 values are missing per item.

†*P* value comparing male vs. female data.

‡Teenagers who considered it 'important' or 'very important' to be suntanned during these periods.

Teenagers' behaviours

Among female and male adolescents, respectively, 1.5% and 0.6% took tanning pills, 12.3% and 7.4% ($P = 0.03$) used tanning creams, and 2.7% and 0.3% ($P = 0.008$) had availed themselves of indoor tanning. Among those using indoor tanning, six declared that no one at the tanning centres had asked their age.

Among the 713 teenagers, the 7 (1%) who reported having already used tanning pills (Table 2), considered it highly significantly important to be tanned all year long, in summer and spring, and more frequently resorted to tanning creams or indoor tanning. Moreover, their parents significantly more frequently availed themselves of sunless-tanning products or indoor tanning.

Among the participants, 9.9% reported using tanning creams (Table 3) and accorded significant importance to be tanned all year long, in summer and spring, and significantly more frequently took tanning pills or had recourse to indoor tanning. Notably, their parents had significantly more frequently used sunless-tanning products.

Among respondents, 1.4% declared having used indoor tanning (Table 4) during the past year and accorded significantly higher importance to being tanned all year long, in summer and spring, and significantly more frequently took tanning pills and applied tanning creams. Their parents too had significantly more frequently resorted to indoor tanning.

Discussion

We identified a typical profile for French teenagers who probably carry a higher risk of developing sun-associated skin cancers. They are more frequently girls, whose parents availed themselves of artificial tanning, consider it important to be tanned and often use different kinds of artificial tanning. Although the declared frequency of tanning-bed use was very low, compared with the

United States and northern European countries, perhaps reflecting the strict French legislation (outlawing their use by people <18 years old), the law remains incompletely effective.

We cannot conclude that our study results are representative of adolescents' behaviours on a national scale. The main limit of our study came from its design, that is, a cross-sectional study, including only two schools from one suburban city. Although Antony can be considered representative of a middle class population, it is not representative of the entire French population. It should be noted that this study was the preliminary evaluation (feasibility, questionnaire validation) of a multicentre study, entitled SOLADO (SOLEil et ADOlescence/Sun and Adolescence), which will be conducted throughout France and aims to include 15 000 teenagers. It will be performed in two steps: inclusion of 5000 adolescents by 500 randomized French dermatologists, and evaluation of 10 000 adolescents from schools from the 'Hauts-de-Seines (92)' department in the Paris metropolitan region.

Although the World Health Organization recommends restricted use of indoor tanning by those <18 years old,^{4,5} only a few countries regulate indoor tanning by teenagers. Although France has enacted one of the strictest laws, establishing a legal minimum age for tanning (18 years), other European countries, such as Spain, Sweden, or Germany, only recommended limiting its use to subjects >18 years old.^{6,9} The teenage users of tanning centres declared that the French law on age restrictions was not strictly applied, perhaps because of lack of controls and sanctions. Few reports have been published on those regulations governing indoor tanning and compliance with them.^{13–16} The results of a recent French study showed that three-quarters of tanning centres did not comply with French indoor tanning advertising requirements, like not claiming any beneficial health effect of indoor tanning.¹⁶ The findings of

Table 2 Teenagers' tanning-pill behaviours and evaluation of the risk factors associated with their use

Characteristic	Use <i>n</i> = 7	No use <i>n</i> = 702	<i>P</i>
Mean age ± SD, years	13.7 ± 1.0	13.5 ± 2.0	1.0
Gender, M/F†, <i>n</i>	2/5	361/338	0.2
Skin phototype, <i>n</i> (%)			
I–II	1 (14.3)	58 (8.3)	0.5
III–IV	3 (42.9)	438 (62.4)	
V–VI	3 (42.9)	198 (28.2)	
Importance of being tanned†, <i>n</i> (%)			
In spring	5 (71.4)	50 (7.1)	<0.0001
In summer	6 (85.7)	389 (55.4)	0.006
All year long	4 (57.1)	105 (15.0)	<0.0001
Parents, <i>n</i> (%)			
Use of sunless-tanning products	5 (71.4)	82 (11.7)	<0.0001
Indoor tanning	3 (42.9)	29 (4.1)	<0.0001
Sunburn during the past year, yes (%)	6 (85.7)	422 (60.1)	1.0
Also used tanning creams, yes (%)	5 (71.4)	65 (9.3)	<0.0001
Also resorted to indoor tanning, yes (%)	4 (57.1)	6 (0.8)	<0.0001

*Three missing data for gender. In addition, 0–9 values are missing per item.

†Teenagers who considered it 'important' or 'very important' to be suntanned during these periods.

Table 3 Teenagers' tanning-cream behaviours and evaluation of the risk factors associated with their use

Characteristic	Use <i>n</i> = 70	No use <i>n</i> = 639	<i>P</i>
Mean age ± SD, years	13.6 ± 1.7	13.5 ± 2.0	1.0
Gender, M/F*, <i>n</i>	27/42	337/300	0.03
Skin phototype, <i>n</i> (%)			
I–II	3 (4.3)	56 (8.8)	0.5
III–IV	44 (62.9)	396 (62.0)	
V–VI	20 (28.6)	180 (28.2)	
Importance of being tanned†, <i>n</i> (%)			
In spring	31 (44.3)	125 (19.6)	<0.0001
In summer	54 (77.1)	340 (53.2)	<0.0001
All year long	24 (34.3)	85 (13.3)	<0.0001
Parents, <i>n</i> (%)			
Use of sunless-tanning products	25 (35.7)	62 (9.7)	<0.0001
Indoor tanning	6 (8.6)	26 (4.1)	0.08
Sunburn during past year, yes (%)	46 (65.7)	382 (59.8)	0.3
Also used tanning pills, yes (%)	5 (7.1)	2 (0.3)	<0.0001
Also resorted to indoor tanning, yes (%)	4 (5.7)	6 (0.9)	0.001

*Three missing data for gender. In addition, 1–9 values are missing per item.

†Teenagers who considered it 'important' or 'very important' to be suntanned during these periods.

Table 4 Teenagers' indoor tanning behaviours and evaluation of their risk factors for its use

Characteristic	Use <i>n</i> = 10	No use <i>n</i> = 694	<i>P</i>
Mean age ± SD, years	13.6 ± 1.8	13.5 ± 2.0	1.0
Gender, M/F*, <i>n</i>	1/9	362/329	0.02
Skin phototype, <i>n</i> (%)			
I–II	1 (10)	58 (8.4)	0.8
III–IV	5 (50)	433 (62.4)	
V–VI	4 (40)	193 (27.8)	
Importance of being tanned†, <i>n</i> (%)			
In spring	7 (70)	148 (21.3)	0.0002
In summer	9 (90)	382 (55.0)	0.0007
All year long	5 (50)	104 (15.0)	<0.0001
Parents, <i>n</i> (%)			
Use of sunless-tanning products	4 (40)	81 (11.7)	0.5
Indoor tanning	5 (50)	27 (3.9)	<0.0001
Sunburn during the past year, yes (%)	7 (70)	418 (60.2)	0.09
Also used tanning pills, yes (%)	4 (40)	2 (0.3)	<0.0001
Also used tanning creams, yes (%)	4 (40)	64 (9.2)	0.006

*Three missing data. In addition, 1–9 values are missing per item.

†Teenagers who considered it 'important' or 'very important' to be suntanned during these periods.

other studies also showed poor compliance with regulations for youth access to indoor tanning in other countries. For example, an American study evaluating compliance with youth-access regulations found that youth discounts were available and that, in Wisconsin, where indoor tanning is forbidden <16 years old, only 77% and 89% of facilities prohibited access of teenagers <15 and <12 years old respectively.¹³ The authors of an Australian study found that 55% of centres accorded underage teenagers tanning-bed access without written parental consent.¹⁴

In today's sociological culture, tanning is considered normative behaviour, particularly by young women. In two recent studies, based on nationally representative samples in Sweden and the United States, high adolescent rates of indoor tanning use, respectively, 30% and 24%, were also observed.^{6,17,18} Furthermore, recent studies in the United States showed that the frequency of self-reported use of sunless-tanning products among US adolescents was 10.8%, and that use was independently associated with sun-behaviour risks: higher frequencies of sunburn, no sunscreen

application and indoor tanning use.¹⁰ Two American studies evaluated the influence of parents on teenagers' indoor tanning practices, and their results showed potentially powerful parental impact on their teenage children's indoor tanning use.^{19,20} Analysis of our participants' responses, yielded a standard profile of teenagers with high risk sun-exposure behaviours, very similar to that found in the United States: female, according high importance to being tanned, using sunless-tanning products, and whose parents resorted to indoor tanning or using sunless-tanning products. These teenagers use or 'risk using' indoor tanning. It is important to target these teenagers in our sun-exposure information campaigns and to be more attentive to them. They can also be an important target for public health authorities to discourage their recourse to indoor tanning.

Given the prevalence of indoor UV tanning in France, especially by teenagers, despite its being forbidden by law, and its known risks, public health authorities must enforce compliance with the legislation and focus its prevention campaigns on at-risk teenagers.

References

- Gallagher RP, Spinelli JJ, Lee TK. Tanning beds, sunlamps, and risk of cutaneous malignant melanoma. *Cancer Epidemiol Biomarkers Prev* 2005; **14**: 562–566.
- El Ghissassi F, Baan R, Straif K *et al.* A review of human carcinogens – part D: radiation. *Lancet Oncol* 2009; **10**: 751–752.
- Autier P, Boyle P. Artificial ultraviolet sources and skin cancers: rationale for restricting access to sunbed use before 18 years of age. *Nat Clin Pract Oncol* 2008; **5**: 178–179.
- The International Agency for Research on Cancer Working Group on Artificial Ultraviolet 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**: 1116–1122.
- International Agency for Research on Cancer Working Group on risk of skin cancer and exposure to artificial ultraviolet light. *Appendix: European and international positions regarding artificial source of UV radiation*. Lyon, France. [WWW document] 2005. URL http://whqlibdoc.who.int/iarc/9283224418_eng.pdf (last accessed: 10 April 2012).
- Lazovich D, Forster J. Indoor tanning by adolescents: prevalence, practices and policies. *Eur J Cancer* 2005; **41**: 20–27.
- Buller DB, Cokkinides V, Hall HI *et al.* Prevalence of sunburn, sun protection, and indoor tanning behaviors among Americans: review from national surveys and case studies of 3 states. *J Am Acad Dermatol* 2011; **65**: S114–S123.
- Léon C, Benmarhnia T, Tordjman I, Gaillot-de Saintignon J, Beck F. L'exposition aux ultraviolets artificiels en France. *Bull Epidemiol Hebd* 2012; **19**: 205–209.
- Decret n° 97-617 du 30 mai 1997 relatif à la vente et à la mise à disposition du public de certains appareils de bronzage utilisant des rayonnements ultraviolets. [WWW document] URL <http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000567033&dateTexte=> (last accessed 3 March 2012).
- Cokkinides VE, Bandi P, Weinstock M *et al.* Use of sunless tanning products among US adolescents aged 11 to 18 years. *Arch Dermatol* 2010; **146**: 987–992.
- Mahé E, Beauchet A, Aegerter P *et al.* Neonatal blue-light phototherapy does not increase nevus count in 9-year old children. *Pediatrics* 2009; **123**: e896–e900.
- Mahé E, Beauchet A, de Paola Corrêa M *et al.* Outdoor sports and risk of UV radiation-related skin lesions in children: evaluation of risks, and prevention. *Br J Dermatol* 2011; **165**: 360–367.
- Hester EJ, Heilig LF, D'Ambrosia R *et al.* Compliance with youth access regulations for indoor UV tanning. *Arch Dermatol* 2005; **141**: 959–962.
- Dobbinson S, Wakefield M, Sambell N. Access to commercial indoor tanning facilities by adults with highly sensitive skin and by under-age youth: compliance tests at solarium centres in Melbourne, Australia. *Eur J Cancer Prev* 2006; **15**: 424–430.
- Pichon LC, Mayer JA, Hoerster KD *et al.* Youth access to artificial UV radiation exposure: practices of 3647 US indoor tanning facilities. *Arch Dermatol* 2009; **145**: 997–1002.
- De Maleissye MF, Fay-Chatelard F, Beauchet A *et al.* Compliance with indoor tanning advertising regulations in France. *Br J Dermatol* 2011; **164**: 880–882.
- Demko C, Borawski EA, Debanne SM *et al.* Use of indoor tanning facilities by white adolescents in the United States. *Arch Pediatr* 2003; **157**: 854–860.
- Boldeman C, Branstrom R, Dal H *et al.* Tannings habits and sunburn in a Swedish population age 13–50 years. *Eur J Cancer* 2001; **37**: 2441–2448.
- Stryker JOE, Lazovich D, Forster JL *et al.* Maternal/female caregiver influences on adolescent indoor tanning. *J Adolesc Health* 2004; **35**: 528.
- Hoerster KD, Mayer JA, Woodruff SI *et al.* The influence of parents and peers on adolescent indoor tanning behavior: findings from a multi-city sample. *J Am Acad Dermatol* 2007; **57**: 990–997.