

Sun protective behaviour and sunburn prevalence in primary and secondary schoolchildren in western Switzerland

Simone Ackermann^a, Anne Vuadens^a, Fabio Levi^b, Jean-Luc Bulliard^c

^a Faculty of Biology and Medicine, Lausanne University, Lausanne, Switzerland

^b Institute of Social and Preventive Medicine (IUMSP), Lausanne University Hospital, Switzerland

^c Division of Chronic Diseases, Institute of Social and Preventive Medicine (IUMSP), Lausanne University Hospital, Switzerland

Summary

AIMS OF THE STUDY: Although solar overexposure during childhood and adolescence increases the risk of melanoma, determinants of sunburn and sun protective behaviours of Swiss children have scarcely been explored. We investigated sunburn occurrence and sun protective behaviours of schoolchildren in western Switzerland, the region with the highest incidence of melanoma in Europe.

MATERIAL AND METHODS: Self-reported questionnaires were administered during regular classes to pupils in 5th (primary school, n = 431), 8th and 11th grades (secondary school, n = 837) in the 18 public schools of La Chaux-de-Fonds. Descriptive statistics and multivariate logistic regression analyses were performed to assess predictors of sunburns and of three sun protective behaviours (sunscreen, shade, wear of covering clothes).

RESULTS: Response rate was 91%. Sunburn prevalence over the preceding year was high (60% at least one sunburn, 30% at least two, 43% at least one severe sunburn). Younger age, fair skin, regular sunscreen use, higher sun-related knowledge and preference for a tanned skin were predictors of sunburn. Sunscreen was the most used protective measure (69%), followed by seeking shade (33%) and wearing long-sleeved shirts (32%). Decline in all protective measures was observed in older pupils and those with pro-tan attitudes. The wear of covering clothes was significantly associated with sunscreen use and seeking shade. Parental encouragement favoured sunscreen use and wearing of protective clothes.

CONCLUSIONS: Sunscreen use as a last protective barrier against ultraviolet radiation should be better emphasised in prevention campaigns targeting children and adolescents. Multi-faceted interventions, including role models, parents and peers should help to improve children's sun protective behaviours.

Key words: skin neoplasms; prevention; schools; child; ultraviolet; sun protection; sunburn; Switzerland

Introduction

Skin cancer is a growing public health and economic burden in fair-skinned populations [1]. In Europe, the incidence of cutaneous malignant melanoma (CMM), the most lethal type of skin cancer, has been steadily rising in recent decades [2–4].

Melanoma is potentially preventable since its main risk factor, intermittent intensive exposure to ultraviolet (UV) radiation, is modifiable [5]. Constitutional factors (e.g. skin phototype, eye and hair colour, number and size of nevus, freckles, familial history of CMM and genetic predisposition) also play an important role in the risk of CMM [6, 7]. Epidemiological evidence indicates that excessive sun exposure early in life, particularly during childhood and adolescence when target cells are still immature and the skin thinner, increases the risk of developing CMM later in life, and that the risk rises with the number of sunburns [5, 8].

Sun protection campaigns focussing on young children appear to be more effective, as preventive behaviours acquired during childhood are more likely to last than those acquired during adolescence [9, 10]. In Australia, where campaigns have been launched since the 1960s, declining CMM incidence rates in children and adolescents have been observed from the mid-1990s, especially for thin (≤ 1 mm) tumours [11]. Similar findings were reported about a decade later among US children [12]. Prior studies showed that the sun protection knowledge of children and teenagers increased with age, whereas sun protective attitudes and behaviours followed the opposite trend [9, 13]. The explanation is that behaviours of adolescents are mediated by attitudes, usually pro-tan, rather than by knowledge [10, 13–15]. Sun protective behaviours decline proportionally to the desire of getting tanned [10]. Poor sun protective behaviours seem mainly driven by the desire of tan for girls, whereas for boys tiresomeness plays an important role [16]. Being male, older and having a fair skin seems to be predictors of sunburn [14, 17, 18]. Whether sunscreen use contributes to sunburn occurrence remains unclear. Sunscreen use was found to reduce the risk of sunburn [19], to in-

crease it among routine users [20] or to have no influence on getting burnt [17, 18].

Switzerland has the highest CMM incidence rate in Europe and CMM is the second most frequent cancer in Swiss under the age of 40 [3, 21]. Within Switzerland, incidence rates are higher and the rise has been the largest in the western (French-speaking) part [22]. Although prevention campaigns have been conducted for about thirty years [23], knowledge of sun protective behaviour of Swiss children and their determinants remains limited [17]. Our study is the first investigation of sun protective behaviour and sunburn prevalence of children and adolescents in western Switzerland. We also aimed to identify determinants of sunburn and sun protection with a view to providing keys to improve current prevention messages and campaigns. The sun-related knowledge and attitudes of children and adolescents in western Switzerland, based on the same survey, have been reported separately [15].

Methods

Study population and questionnaire

The study population consisted of all 5th, 8th and 11th grade students ($n = 1268$) from the 18 public schools in La Chaux-de-Fonds, the third biggest city in western (French-speaking) Switzerland. This survey, based on anonymous self-reported questionnaires, was approved by the health promotion service of La Chaux-de-Fonds and by the cantonal ethics commission. Teachers and parents were separately informed by letter about the survey objectives. In May 2014, the questionnaires were completed during class hours under the supervision of teachers. Altogether, 1154 pupils (91%) participated in the study.

Because of the age span of students, separate versions of the questionnaire were addressed to primary schools (5th grade, average age: 9 years) and to secondary schools (8th and 11th grades, average ages: 12 and 15 years, respectively). The questionnaires are available in appendices 1 and 2, respectively. These questionnaires were adapted and validated in French from a previous study [17]. The questionnaires mostly consisted of multiple choices questions focusing on (1) the pupils' knowledge of the harmful effects of UV radiation and sun protective measures, (2) their attitude towards suntan, (3) their sun exposure and sunburn history, (4) their sun protective behaviour, and (5) parents' influence on their behaviour.

Definitions and classifications

Skin type was assessed from a table of six coloured photographs of faces representing each category of Fitzpatrick phototype with a corresponding description (skin, hair, eye colour and ability to tan). These images were selected by Swiss dermatologists and used in previous skin cancer prevention campaigns of the Swiss League against Cancer. For analysis, skin types were grouped into fair (phototypes I and II), intermediately pigmented (phototypes III and IV) and dark (phototypes V and VI).

The socioprofessional status (SPS) of each parent was retrieved from their occupation as reported by their children as free text in the questionnaires, and independently coded

by two trained investigators (FL and JLB). SPS categorisation was derived from the previously validated classification used by the Registrar General for England and Wales, and grouped in three levels (low, corresponding to the Registrar General's classes IV and V, medium, corresponding to class III, and high, corresponding to classes I and II) [24, 25]. The SPS of each child was defined as the highest SPS of either parent. Parental education was sought but deemed too unreliable to derive an educational status (over 40% of children did not know the highest qualification attained by their parents). Sunburn was defined as a reddening of the skin after sun exposure and considered as severe if it was reported as painful or involved blistering. We considered that one sunburn could occur accidentally without truly reflecting one's sun protection behaviour and that the occurrence of severe sunburn, while more likely to be accurately recalled, encompassed more subjectivity (pain, etc.). Therefore, we *a priori* selected the occurrence of at least two sunburns as the outcome of interest for analyses pertaining to sunburn and performed a sensitivity analysis on the definition of this outcome.

Sunscreen use was defined as "routine" when reported to be applied always, nearly always or often and as "sporadic" when used sometimes, rarely or never. Any means of sun protection (sunscreen, shade or clothes) actively encouraged to be used or directly applied by the parents was considered as parental encouragement. A child was classified as informed by his/her parents when they explained to him/her the dangers of UV or mentioned sun protection as a topic at home.

Statistical analyses

The power calculation was based on previously validated assumptions that between 30 and 70% of children will have the outcome(s) of interest (i.e. sunburn or use of any sun protection measure), and that subanalyses for gender and age (three grades) would be based on subgroups of similar sizes [17]. Under these assumptions and using a conventional alpha level of 5%, a sample size of around 1000 pupils has a 70–80% statistical power to detect an odds ratio of 1.5 or a power of 99% to detect an odds ratio of 2.

One questionnaire with no gender information was discarded from all analyses. Association between categorical variables were examined using the chi-square statistic. Differences between means were tested with the t-test for dichotomous variables and by an analysis of variance (ANOVA) when more than two means were compared. A multivariate logistic regression analysis was performed separately for each outcome. The outcomes considered were the prevalence of at least two sunburns in the preceding year and, for sun protection behaviours, the sporadic use of sunscreen, the intentional search for shade and wearing of a long-sleeved top. For predictors of sunburn, a sensitivity analysis using the occurrence of at least one severe sunburn as an alternative outcome was performed. Goodness-of-fit of models were assessed with standard summary measures [26]. All statistical analyses were carried out with Stata 12 (StataCorp LP, College Station, Texas, USA).

Results

Sunburn

The study population ($n = 1,153$) was evenly balanced across genders and school grades, and the distribution of skin type and SPS did not differ between genders (table 1). Overall, 60.2% of children reported at least one episode of sunburn, 30.1% at least two, 11.2% at least three and 43.2% at least one occurrence of severe sunburn over the preceding year (2013). Of those sunburnt, 66.3% described their worst sunburn as painful without blister, 6.9% as painful and blistered and 26.8% as painless. Activities related to sunburn occurrence were swimming or water sports (50.3%), other sports activities (23.8%) and nonphysical activities (25.9%). Fifty percent of children reported using sunscreen and 5% being in the shade when experiencing their worst sunburn, whereas 26% had no protection and 18% could not remember (data not shown).

The prevalence of at least two sunburns over the last year did not differ significantly by school grade (table 2). This prevalence was significantly higher for children with a fairer skin type, who routinely used sunscreen, preferred having a tanned skin and perceived they had sufficient sun protection. Most of these significant associations were also observed for each school grade. The highest sunburn prevalence was found in children of skin type I–II (42.8%), routine sunscreen users (33.6%) and those who preferred a tanned skin (38.3%).

The multivariate analysis (table 3) identified younger age (5th grade), fair skin, routine sunscreen use, preference for a tanned skin and a higher sun-related knowledge as predictors of sunburns. When the analysis was repeated with severe sunburn as the outcome (see appendix 3, supplementary table S1), significant effects of comparable magnitude were found for skin type, routine sunscreen use and tanning preference. However, the risk of severe sunburn increased with age, whereas it decreased with age for the occurrence of sunburn (table 3). Parental encouragement, i.e. any sun protection means actively encouraged or directly applied by the parents, was also a potential predictor of the occurrence of a severe episode of sunburn ($p = 0.07$, table S1).

Protective behaviours

Some 69.2% of children reported applying sunscreen routinely in summer and 39.5% also used it regularly in winter for sports; 32.8% of the pupils sought shade whenever possible and 31.5% of secondary school pupils deliberately wore long-sleeved shirts as a sun protective measure. Among routine sunscreen users, two thirds applied sunscreen several times during sun exposure and 55% reapplied it specifically after swimming. Nearly 9 out of 10 secondary school students used a sun protection factor (SPF) of 20 or higher; however, a third did not remember the SPF (data not shown).

As shown in table 4, the three protective behaviours studied (using sunscreen routinely, seeking shade, purposely wearing long sleeves) were most frequent at younger ages (5th grade), among those who preferred an untanned skin and among fair skinned children, except for seeking shade which was most common among those with skin type V or VI. In addition, users of one sun protective measure more frequently reported use of other sun protective behaviours, except for those seeking shade, which did not apply significantly more often sunscreen.

Sixty-one percent of the scholars were encouraged by their parents to protect against UV radiation and 55.6% of the secondary school students were informed by their parents about the dangers of the UV radiation (data not shown). Those encouraged by their parents reported protective behaviours more frequently (table 4). Some 61.5% felt that they protected themselves enough against the sun. The reasons mentioned for not protecting themselves better were forgetting (34.4%), preferring a tanned skin (25.3%), having a naturally dark skin (18%), finding sunscreen to be an unpleasant sensation on their skin (11%) or finding sun protection altogether to be too demanding (6.9%) (data not shown).

The multivariate analyses (tables 5, 6 and supplementary table S2) revealed that children who preferred a tanned skin and perceived that they were insufficiently protected from the sun were less likely to use any sun protection measure. Being younger was predictive of protective behaviours except for seeking shade. Fair skin was a predictor of routinely applying sunscreen and seeking shade. Parental encouragement was significantly associated with routine sunscreen use and possibly wearing long sleeves. In contrast, secondary pupils sensitised by their parents were less

Table 1: Sociodemographic characteristics of the sample by gender.

	Boys n (column %)	Girls n (column %)	Total n (column %)
Grade			
5th (8–10 years)	187 (33)	179 (31)	366 (32)
8th (11–13 years)	209 (36)	205 (35)	414 (36)
11th (14–16 years)	177 (31)	196 (34)	373 (32)
Skin type			
I–II	165 (29)	190 (33)	355 (31)
III–IV	314 (55)	290 (50)	604 (52)
V–VI	89 (16)	93 (16)	182 (16)
SPS			
High	130 (23)	132 (23)	262 (23)
Medium	294 (51)	309 (53)	603 (52)
Low	95 (17)	90 (16)	185 (16)

SPS = Socioprofessional status

likely to wear protective clothes deliberately. Wearing a long-sleeved shirt was also positively associated with use of other sun protective means (table S2, appendix 3). Children who did not seek shade or sporadically used sunscreen were more likely not to protect themselves with clothes. Gender showed no association with use of sun protection measures except for sunscreen, with males being 1.5 times less likely to apply it routinely. Furthermore, being of a low familial SPS and having a lower sun-related knowledge were predictors of sporadic sunscreen use.

Discussion

This first broad investigation of sun protective behaviours of children and adolescents in one of the European regions with the highest incidence of CMM showed a high annual prevalence of all types of sunburn. Younger age, fair skin (phototype I or II) and a high sun-related knowledge were

predictive of sunburn occurrence, whereas a desire for a tan and sunscreen use were the main potentially modifiable determinants of sunburn found. Along with the observed decline in behaviours and attitudes supportive of sun protection with increasing age, and the predominant reliance on sunscreen as a protective measure, our results largely but not entirely concurred with those reported from other countries with a high incidence of melanoma [9, 13, 14, 16–18]. The increased likelihood of getting sunburnt for routine sunscreen users disagreed with previous studies, including those from other Swiss populations [17–19]. This suggests inadequate sunscreen use, such as applying an insufficient quantity, insufficient renewal or applying it too late when going outdoors, or intentionally prolonged sun exposure [27–29], with sunscreen being used as a tanning aid. Our observation that sunscreen was used for 51.7% of the time when pupils got their worst sunburn supports the hypothesis of an inappropriate use. Moreover, the main reliance

Table 2: Prevalence (in %) of at least two sunburns by school grade.

	Total % (n)	5th grade (8–10 years) % (n)	8th grade (11–13 years) % (n)	11th grade (14–16 years) % (n)
	30.1 (1153)	29.8 (366)	31.9 (414)	28.4 (373)
Sociodemographic characteristics				
Gender				
Male	31.1 (573)	32.6 (187)	33 (209)	27.1 (177)
Female	29.1 (580)	26.8 (179)	30.7 (205)	29.6 (196)
Skin type				
I–II	42.8 (355)	40 (110)	50 (116)	38.8 (129)
III–IV	29.6 (604)	30.2 (182)	31.2 (231)	27.2 (191)
V–VI	6.6 (182)	11.6 (69)	1.6 (64)	6.1 (49)
SPS				
Low	27.6 (185)	21.6 (51)	23.8 (63)	35.2 (71)
Intermediate	30.4 (603)	32.3 (198)	33.5 (212)	24.9 (193)
High	28.2 (262)	24.7 (81)	30.9 (94)	28.7 (87)
Unknown	39	14	17	8
Protective behaviours				
Use sunscreen (summer)				
Routinely	33.6 (789)	31.1 (289)	35.7 (286)	34.1 (214)
Sporadically	22.7 (352)	25.7 (74)	24.4 (123)	20 (155)
Seek shade				
Yes	27.4 (372)	30.9 (136)	27 (137)	23.2 (99)
No	31.6 (761)	30 (220)	34.2 (272)	30.1 (269)
Wear long-sleeved t-shirt				
Yes	28.5 (246)	+NA	30 (160)	25.6 (86)
No	31.3 (534)	+NA	33.6 (250)	29.2 (284)
Attitudes				
Tanning preference				
No preference	27.9 (340)	23.7 (135)	29.8 (114)	31.9 (91)
Tanned skin	38.3 (540)	43 (107)	42 (212)	32.6 (221)
Untanned skin	34.3 (70)	41.7 (36)	40 (20)	7.1 (14)
Naturally dark skin	7.8 (154)	16.7 (42)	1.5 (65)	8.5 (47)
Perception of self-protection				
Sufficient	26 (697)	25.3 (261)	30 (257)	21.2 (179)
Not sufficient	37.2 (436)	43.6 (94)	35.8 (151)	35.1 (191)
Parental encouragement				
Yes	31.6 (708)	29.9 (278)	32.8 (232)	32.8 (198)
No	27.6 (445)	29.6 (88)	30.8 (182)	23.4 (175)
Parental sensitisation				
Yes	30.9 (641)	NA [†]	31.5 (321)	30.3 (320)
No	29.1 (512)	NA [†]	33.3 (93)	17 (53)

NA = not applicable; SPS = socioprofessional status; * p < 0.05; ** p ≤ 0.001; † 5th graders not asked

on sunscreen as means of sun protection could also result from misleading campaigns of the industry that advertised sunscreen as safe when used alone. A frequent and predominant use of sunscreen has also been reported in north-western Switzerland and in other countries with a high incidence of melanoma [9, 14, 16, 17]. In addition, in those same countries, other protective means such as clothes and shade were as sparsely used as reported in our survey.

The greater propensity of younger than older children to get sunburnt was at variance with several prior studies [14, 18, 19]. The lower risk of sunburn in older schoolchildren should be balanced with our finding that older age was associated with more severe sunburns. Getting sunburnt at a younger age can be considered to result from inadequate protection, possibly from insufficient parental assistance, whereas getting sunburnt at older age is more likely to reflect riskier behaviour and deliberately poor sun protection, for instance because of tanning preference, social norms and the influence of fashion [15, 30].

Overall, the absence of a gender difference in sunburn prevalence and of gender as a predictor of sunburn does not support the hypothesis that sun-related behaviours and attitudes are gender-specific. The only notable gender difference was the greater propensity of girls than boys to apply sunscreen. As neither the pro-tan attitude nor the type of activity related to the worst sunburn differed between girls and boys, this gender difference in sunscreen use did not appear to be of sufficient magnitude to impact sun exposure. Along with a few other studies [9, 17], our results support the conclusion that the observed gender difference in sunburn among adults may be less or even nonexistent among primary schoolchildren.

Our survey highlighted some encouraging facts about the impact of sun protection campaigns. The deliberate wearing of covering clothes was significantly associated with other protective means, suggesting that pupils start to use more than one protection measure, as recommended [31]. To our knowledge, determinants of covering clothes as a sun protection measure in children have not been reported before. The similarity in desire for a tan between Swiss boys and girls could suggest some improvement in pro-tan attitudes, as girls have usually had a more favourable pro-tan attitude. Furthermore, parental encouragement had a positive impact on children's protective behaviours as both routine sunscreen use and wearing of long-sleeved tops were associated with parental encouragement. Parents also seemed to be well aware of the different sun sensitivity

of skin phototypes, as fair-skinned children were more often encouraged to protect themselves from UV rays. The decline in parental encouragement with older children is probably due to the greater self-responsibility of older pupils, for whom parents might ease up on advice, and the lesser influence of parents as peer pressure becomes the major influential factor on the behaviour of teenagers [9, 30].

Our results confirmed that a pro-tan attitude remains one of the most consistent predictors of sunburns and of unhealthy sun-related behaviours among children and teenagers in countries such as Switzerland with a high incidence of melanoma [17]. Such an attitude is largely driven by fashion representing a suntan as healthy and attractive [30]. Pro-tan attitudes may probably also explain the association between fair skin and routine sunscreen use. Fair-skinned children are the most vulnerable to the pro-tan attitude since despite being found to be more likely than darker-skinned children to apply sunscreen routinely, they were about twice as likely to experience sunburns.

The high participation rate (91%), the inclusion of all public schools in a delineated region and the use of a previously validated questionnaire are among the main strengths of this study. Further, the study design did not permit any parental guidance or teacher influence on the children when filling in the questionnaire. The main limitations of this study were reliance on information self-reported by children and a potential social desirability bias. However, children and adolescents appear to be accurate in reporting their own health, including their sun protection practices [32, 33]. As questionnaires were distributed in May and most questions were about the previous summer, some recall bias cannot be excluded. Finally, our sensitivity analysis on the definition of the outcome (at least: one sunburn, two sunburns, a severe sunburn) indicated only minor variation across results from multivariate models.

Our survey assisted in identifying several ways to improve current sun protection messages. Sunscreen use as the last protective barrier against UV radiation when other means of protection cannot be applied (e.g. for water activities) or as an adjunct to other sun protection measures need to be better emphasised. Educational messages about sufficient application and frequency of reapplication of sunscreen (at least every 2 hours when perspiring or swimming) should help to limit the inappropriate use of sunscreen to intentionally extend sun exposure [34]. Multifaceted interventions appear to be more effective for changing behaviours and

Table 3: Multivariate logistic regression analysis for the occurrence of at least two sunburns.

Factor	Adjusted odds ratio*	95% confidence interval
8th vs 5th grade	0.80	0.56–1.14
11th vs 5th grade	0.51	0.33–0.78
Skin type (III–IV vs I–II)	0.56	0.42–0.75
Skin type (V–VI vs I–II)	0.15	0.07–0.30
SPS (low vs high)	1.11	0.70–1.76
SPS (intermediate vs high)	1.27	0.89–1.79
Sporadic sunscreen use (yes vs no)	0.64	0.46–0.90
Preference for a tanned skin (yes vs no)	1.64	1.21–2.24
Perceived self-protection (not enough vs enough)	2.16	1.60–2.91
Knowledge [†]	1.12	1.00–1.26

SPS = socioprofessional status; * Each variable was adjusted for all other factors in the model; [†] Per knowledge score point

attitudes toward sun exposure [35]. School environmental changes, e.g. provision of shaded outdoor areas, and reversing fashion norms, e.g. making covering clothes more attractive, are some examples. Sun protection campaigns targeting children and teenagers should involve role models such as athletes, artists or models, and include both parents and peers as peer pressure is paramount in the initiation of habits during adolescence [30]. Sun protection behaviours of young children largely depend on their parents, which stresses the importance of including parents in sun educational messages as early as possible in their child's life[36].

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Table 4: Prevalence (in %) of various sun protective behaviours.			
	Routine use of sunscreen (summer) % (n)	Seeking shade % (n)	Wearing long-sleeved t-shirt[†] % (n)
Sociodemographic characteristics			
Gender	*		
Male	65.0 (568)	32.4 (565)	33.1 (384)
Female	73.3 (573)	33.3 (568)	30.1 (396)
School grade	**	*	**
5th	79.6 (363)	38.2 (356)	NA [†]
8th	69.3 (409)	33.5 (409)	39.0 (410)
11th	58.0 (369)	26.9 (368)	23.2 (370)
Skin type	**	**	*
I–II	80.4 (352)	36.7 (349)	36.5 (244)
III–IV	69.6 (599)	27.8 (597)	30.2 (420)
V–VI	44.4 (180)	41.6 (178)	22.9 (109)
SPS	**		
Low	61.6 (185)	33.2 (184)	28.6 (133)
Intermediate	68.2 (597)	32.2 (593)	30.6 (402)
High	81.0 (258)	32.7 (257)	35.6 (180)
Unknown	59	36	21
Protective behaviours			
Use sunscreen (summer)			**
Routinely		34.3 (778)	38.2 (498)
Sporadically		29.2 (349)	20.0 (275)
Use sunscreen (winter)	**		*
Routinely	82.4 (442)	34.8 (440)	36.8 (337)
Sporadically	60.8 (676)	31.4 (672)	27.6 (432)
Seek shade			**
Yes	72.4 (369)		40.9 (235)
No	67.4 (758)		27.5 (538)
Wear long-sleeved t-shirts	**	**	
Yes	77.6 (245)	39.3 (244)	
No	58.3 (528)	26.3 (529)	
Attitudes			
Tanning preference	*	**	**
No preference	77.5 (338)	41.0 (334)	41.7 (204)
Tanned skin	69.2 (535)	22.4 (535)	27.8 (431)
Untanned skin	79.7 (69)	55.9 (68)	42.4 (33)
Naturally dark skin / unknown	72	64	26
Perception of self-protection	**	**	**
Sufficient	79.4 (693)	36.6 (689)	37.3 (434)
Not sufficient	53.5 (432)	27.2 (430)	24.1 (341)
Parental encouragement			
Yes	82.2 (703)	35.0 (698)	36.0 (428)
No	48.2 (438)	29.4 (435)	26.1 (352)
Parental sensitisation			
Yes	69.0 (636)	29.5 (637)	31.2 (638)
No	69.3 (505)	37.1 (496)	33.1 (142)

NA = not applicable; SPS = socioprofessional status; * p < 0.05; ** p ≤ 0.001; † 5th graders not asked

Correspondence: Jean-Luc Bulliard, PhD, PD MER, Division of Chronic Diseases, Institute of social and preventive medicine, Lausanne University Hospital, CH-1010 Lausanne, [jean-luc.bulliard\[at\]chuv.ch](mailto:jean-luc.bulliard[at]chuv.ch)

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Table 5: Multivariate logistic regression analysis for sporadic use of sunscreen.

Factor	Adjusted odds ratio*	95% confidence interval
Male vs female	1.49	1.10–2.01
8th vs 5th grade	1.43	0.95–2.16
11th vs 5th grade	2.81	1.78–4.44
Skin type (III–IV vs I–II)	1.67	1.17–2.40
Skin type (V–VI vs I–II)	3.64	2.11–6.27
SPS (low vs high)	1.75	1.07–2.85
SPS (intermediate vs high)	1.49	0.99–2.24
Preference for a tanned skin (yes vs no)	1.22	0.85–1.73
Perceived self-protection (not enough vs enough)	2.82	2.09–3.80
Parental encouragement (no vs yes)	3.61	2.67–4.88
Knowledge [†]	0.89	0.78–1.01

SPS = socioprofessional status; * Each variable was adjusted for all other factors in the model; [†] Per knowledge score point

Table 6: Multivariate logistic regression analysis for seeking shade.

Factor	Adjusted odds ratio*	95% confidence interval
Skin type (III–IV vs I–II)	0.73	0.55–0.98
Skin type (V–VI vs I–II)	1.10	0.69–1.75
Preference for a tanned skin (yes vs no)	0.41	0.31–0.55
Perceived self-protection (not enough vs enough)	0.66	0.50–0.87

* Each variable was adjusted for all other factors in the model.

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Appendix

Appendix 1: [Primary school questionnaire](#)

Appendix

Appendix 2: [Secondary school questionnaire](#)

Appendix

Appendix 3: Supplementary tables

Table S1: Multivariate logistic regression analysis for severe sunburns.		
Factor	Adjusted odds ratio*	95% confidence interval
8th vs 5th grade	2.18	1.56–3.04
11th vs 5th grade	2.34	1.65–3.32
Skin type (III–IV vs I–II)	0.53	0.40–0.71
Skin type (V–VI vs I–II)	0.22	0.13–0.39
Sporadic sunscreen use (yes vs no)	0.73	0.53–1.01
Preference for a tanned skin (yes vs no)	1.31	0.98–1.74
Perceived self-protection (not enough vs enough)	1.78	1.34–2.37
Parental encouragement (no vs yes)	0.77	0.57–1.02

* Each variable was adjusted for all other factors in the model.

Table S2: Multivariate logistic regression analysis for not wearing a long-sleeved shirt as a protection (only 8th and 11th graders asked).		
Factor	Adjusted odds ratio*	95% confidence interval
11th vs 8th grade	1.82	1.31–2.54
Sporadic sunscreen use (yes vs no)	1.87	1.26–2.76
Seeking shade (yes vs no)	0.68	0.48–0.97
Preference for a tanned skin (yes vs no)	1.55	1.08–2.22
Perceived self-protection (not enough vs enough)	1.41	1.00–1.99
Parental encouragement (no vs yes)	1.45	0.96–2.18
Parental sensitisation (no vs yes)	0.59	0.35–0.98

* Each variable was adjusted for all other factors in the model.