School sun-protection policies—does being SunSmart make a difference?

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Abstract

Evaluate the comprehensiveness of primary school sun-protection policies in tropical North Queensland, Australia. Pre-determined criteria were used to assess publicly available sun-protection policies from primary schools in Townsville (latitude 19.3⁰S; n = 43), Cairns (16.9⁰S; n = 46) and the Atherton Tablelands (17.3⁰S; n = 23) during 2009–2012. Total scores determined policy comprehensiveness. The relationship between policy score, SunSmart status and demographic characteristics was explored. At least 96.6% of primary schools sampled had a sun-protection policy. Although policies of Cancer Council accredited ‘SunSmart’ schools addressed more environmental, curriculum and review-related criteria than those of ‘non-SunSmart’ schools, the overall median score for both groups was low at 2 from a possible 12 (48.5% of SunSmart schools [SSSs]: interquartile range [IQR = 2.0–9.0] versus 65.9% of non-SSSs: [IQR = 2.0–3.0], P = 0.008). Most policies addressed hat wearing, while criteria related to shade provision at outdoor events, regular policy review and using the policy to plan outdoor events were poorly addressed. Although most primary schools in skin cancer-prone North Queensland have written sun-protection policies, the comprehensiveness of these policies could be vastly improved. These schools may require further support and advice to improve the comprehensive of their policies and incentives to continually implement them to achieve and maintain exemplary sun-protection compliance.

Introduction

Skin cancer is Australia’s most common and expensive cancer [1, 2]. It is estimated that two-thirds of Australians will acquire a non-melanoma skin cancer during their life with the annual cost of these cancers to the health system being >$260 million [1–3]. Furthermore, the incidence rate of cutaneous melanoma in Australia is 13 times higher than that in other countries [4].

A leading cause of skin cancer is sun exposure [4–6]. Sun protection during the first 10 years of life is extremely important given that time spent outdoors and latitude of residence during this period may be linked to future cutaneous melanoma development [7]. Sun exposure during the childhood years, particularly if it results in sunburn, damages the skin and increases the proliferation of melanocytic nevi [8–11]. Children raised in geographical regions with high ambient ultraviolet radiation (UVR), such as Queensland, Australia, develop more melanocytic nevi than those raised elsewhere [9, 11–13]. An increased number of melanocytic nevi are a phenotypic risk factor for cutaneous melanoma development, increasing the risk ratio of developing this disease up to 20-fold [6, 8–11, 14].

In 1988, 8 years after the internationally recognized ‘Slip! Slop! Slap!’ population-based campaign began in Australia, the Cancer Council
(formerly known as the Anti-Cancer Council of
Victoria) developed the SunSmart program to en-
courage sun-protective behaviors of children and
adolescents [15–17]. The ‘SunSmart Schools’
(SSSs) accreditation program was rolled out in
Victorian primary schools in 1994, Queensland
schools in 1999 and has since been introduced in
other Australian states and settings including early
childhood services [18].

Australian primary schools seeking SunSmart
accreditation must: formulate and implement a
comprehensive sun-protection policy; encourage
students and staff to wear wide-brim, bucket or le-
gionnaire-style hats and are expected to work toward
scheduling outdoor assembly, class and recreational
periods outside peak UVR exposure times to reduce
the UVR exposure levels of students and staff [18]
(Table I outlines the criteria for SunSmart accredit-
ation). A SSS is encouraged to provide students and
staff with personal sun-protection such as sunscreen
and to strive to improve shade availability [18]. The
SunSmart program is now internationally recog-
nized and some schools in America, England, New
Zealand, Scotland and South Africa have adopted
the values it promotes [19–24]. As the SSSs program
expands globally, it is especially pertinent to ensure
that the program is effective at promoting and
achieving sun-safe behavior.

Government primary schools in Queensland are
required by the Department of Education, Training
and Employment to develop and implement
sun-safety policies in the school community that in-
corporate education programs and skin cancer pre-
vention strategies [18, 25]. These policies must
stipulate: that an effort is being made to reduce the
duration of peak UVR exposure received by stu-
dents and staff, that students must wear protective
clothing such as hats when outdoors, that schools
should provide SPF 30+ sunscreen for student use
and that adult role modeling of good sun-protective
behaviors in the school environment is valued [25].
Consequently, a sun-protection policy should be in
place at all Queensland schools regardless of
SunSmart status.

This study describes the adequacy of sun-protec-
tion policies at primary schools in North and Far
North Queensland, Australia, and explores whether
the comprehensiveness of these policies varies ac-
cording to SunSmart status. To our knowledge, this
is the first study to independently evaluate primary
school sun-protection policies using pre-determined
criteria in Australia.

**Methods**

**Location**

Townsville (latitude 19.25°S, longitude 146.77°E),
Cairns (latitude 16.87°S, longitude 145.75°E) and
the Atherton Tablelands (Atherton: latitude
17.26°S, longitude 145.48°E), Queensland,
Australia, are associated with a tropical climate,
with hot humid summers, dry winters and high
levels of UVR year round [26, 27]. Townsville
and Cairns are regional cities located on the east
cost of North Queensland, adjacent to the ‘Great
Barrier Reef’, while the local government area of
the ‘Atherton Tablelands’ includes numerous ele-
vated dairy farming towns (average 700 m above
sea level) in the ‘Great Dividing Range’ south-
west of Cairns.

**Ethics**

Approval to conduct a study of sun-protection in
primary schools in these areas was obtained from
James Cook University (approval number H3365)
and the Department of Education and Training (Ref.
11/54273), although ethics approval is not formally
required for evaluation of publicly available docu-
ments such as these which can be obtained from
school websites.

**Data collection**

School lists for primary schools in the local govern-
ment areas of Townsville, Cairns and the Tablelands
were obtained from the Education Queensland
school directory [28]. The Education Queensland
school directory also provided further assignment
of schools to the education zones (localities) of ‘pro-
vincial city (urban)’, ‘rural’ or ‘remote’ [28]. The
SunSmart status of each school was verified by the
### Table 1. Sun protection criteria used to assess the sun protection policies of 112 primary schools in Townsville, Cairns and the Atherton Tablelands in Queensland, Australia

<table>
<thead>
<tr>
<th>Sun-protection policy criteria&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Minimum inclusions for specified criterion to be considered 'present'</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Behavior: five points</strong></td>
<td></td>
</tr>
<tr>
<td>Behavior 1 (Hats): All staff and students at the school wear a broad brimmed, legionnaire or a bucket style hat (with a deep crown and brim width of at least 6 cm) whenever they are outdoors.</td>
<td>‘No hat, no play’; or hat wearing is specifically mentioned and a description of a GSH&lt;sup&gt;b&lt;/sup&gt; is provided in uniform guidelines; or there is a stated expectation that students will wear a hat when outside.</td>
</tr>
<tr>
<td>Behavior 2 (Clothing): Clothing that covers as much skin as possible is provided as part of the school uniform/dress code: for example, midriff and singlet tops are not appropriate.</td>
<td>Uniform&lt;sup&gt;c&lt;/sup&gt; is described as ‘SunSmart’; or uniform is specified or shown in photos to include a sleeved dress&lt;sup&gt;d&lt;/sup&gt; or polo-shirt/shirt/t-shirt/blouse,&lt;sup&gt;e&lt;/sup&gt; shorts/skirt/skort/culotte,&lt;sup&gt;e&lt;/sup&gt; socks and enclosed footwear.</td>
</tr>
<tr>
<td>Behavior 3 (Shade use): Children are encouraged to use available areas of shade for outdoor activities.</td>
<td>Mentions students are encouraged to use shade (not limited to those students without hats staying in the shade).</td>
</tr>
<tr>
<td>Behavior 4 (Role models): Staff are requested and parents are encouraged to act as role models by following sun protection measures.</td>
<td>Wearing of hats and/or sun safe clothing by staff, parents and/or adult role models is mentioned; or mentions parents/carers/guardians are expected to support the SunSmart/sun safety policy.</td>
</tr>
<tr>
<td>Behavior 5 (Sunscreen): The use of SPF 30+ broad-spectrum, water-resistant sunscreen is encouraged with time for application allowed.</td>
<td>Mentions that SPF 30+ sunscreen is provided, encouraged, used or applied to students.</td>
</tr>
<tr>
<td><strong>Environment: two points</strong></td>
<td></td>
</tr>
<tr>
<td>Environment 1 (Adequate shade): The school has enough shade or is trying to increase the number of trees and shade structures to provide shady areas in the school grounds.</td>
<td>Mentions presence of shade structures; notes that the school is trying to improve shade availability.</td>
</tr>
<tr>
<td>Environment 2 (Shade at events): Shade is considered when organizing outdoor activities, such as physical education (PE) and sports carnivals.</td>
<td>Mentions shade is considered when planning outdoor events.</td>
</tr>
<tr>
<td><strong>Curriculum: four points</strong></td>
<td></td>
</tr>
<tr>
<td>Curriculum 1 (Rescheduling): Outdoor activities are rescheduled to minimize sun exposure during peak UV times.</td>
<td>Mentions that an effort is made to minimize time spent outdoors given that school hours coincide with peak UVR exposure times.</td>
</tr>
<tr>
<td>Curriculum 2 (Promote sun-safety): SunSmart behavior is regularly reinforced and promoted to the whole school community, for example by newsletters or assemblies.</td>
<td>Use of newsletters or assemblies is mentioned as a way of promoting sun safety.</td>
</tr>
<tr>
<td>Curriculum 3 (Sun-safety education): Curriculum information and activities about sun protection are included in at least 3-year levels.</td>
<td>Policy states sun safety, sun-protection and/or SunSmart information is included in the curriculum or mentions a commitment to educating students about sun safety.</td>
</tr>
<tr>
<td>Curriculum 4 (Policy use): The sun protection policy is used when planning all outdoor events: for example, camps, fairs, excursions and sporting events.</td>
<td>Mention of sun-protection policy being used when planning outdoor events.</td>
</tr>
<tr>
<td><strong>Review: one point</strong></td>
<td></td>
</tr>
<tr>
<td>Evaluation (Review regularly): The school is responsible for regularly reviewing its sun protection policy. This will focus on how well the policy works in influencing student and staff behavior, shade provision and curriculum materials. The school will participate in The Cancer Council’s regular review process.</td>
<td>Policy states that sun-protection policies are reviewed and/or updated; or there is evidence of previous review, e.g. Policy dated 2008, reviewed 2010, next review 2012.</td>
</tr>
</tbody>
</table>

<sup>a</sup>Taken from the Cancer Council’s guide to being Sun Smart [32].  
<sup>b</sup>GSH—gold standard hat: includes broad brim, legionnaire and bucket style hats.  
<sup>c</sup>Regulation day uniforms were assessed rather than winter or formal uniform options (where present). The type of school uniform options described reflects the tropical climate of the sample area.  
<sup>d</sup>A sleeve that covered the shoulders and finished at least half way to the elbow was required to be described or shown in photographs for a point to be awarded.  
<sup>e</sup>A pant length that was described as being at least mid-thigh was required to meet the criteria.
Cancer Council, Queensland, while demographic information (e.g. government/non-government school, location and student enrolments) was obtained from Education Queensland [29] and the ‘index of community socio-educational advantage’ (ICSEA) values were retrieved from the Australian ‘My School’ website [30]. ICSEA is a scale that represents educational advantage and is calculated using student family background data to represent the levels of educational advantage students bring to their studies [31]. Values range from 500 (schools with students from extremely educationally disadvantaged backgrounds) to 1300 (schools with students from highly educated families) and the average ICSEA value is set at 1000 [31].

Sun-protection policy collection and evaluation

Search functions and links provided on school websites were used to locate sun-protection policies during 2009–2012. Sun-protection policies were found in school handbooks, prospectus and/or policy links on school websites; these were subsequently downloaded. When no information about a sun-protection policy was discovered, the school was contacted to request an enrolment package. The Cancer Council’s guide to being SunSmart [18, 32] was used to assess all sun-protection policies. One assessor evaluated all sun-protection policies to ensure continuity of data collection. The assessor also trained another research assistant to evaluate policies in the same way for a related study and a high level of agreement was achieved when the same policies were reviewed by both assessors (concordance coefficient = 0.963, 95% CI 0.877, 0.989). In doing so, numerous policies were read and the ‘minimum inclusions’ (i.e. key words and phrases) listed in Table I were defined. While the wording in the policies varied, the key words/ phrases used by schools were similar, perhaps because an example sun-protection policy is publicly available on the Cancer Council’s SunSmart website [18]. Each sun-protection policy criterion was recorded as ‘present’. A maximum score of 12 was possible with five being allocated for the behavioral, two for the environmental and four for the curriculum sub-categories while one point was awarded if a review process was mentioned. Similar methods have been documented previously [23, 33, 34].

Statistical analysis

IBM SPSS Statistics version 19 (IBM SPSS, Inc., Chicago, IL, USA) was used for data analysis. As data were not normally distributed, non-parametric Mann–Whitney, Kruskal–Wallis and chi-squared tests were used to assess differences in scores according to school characteristics. An alpha level of 0.05 was used to determine statistical significance.

Results

Sample

Sun-protection policies were obtained for 112 of the 116 (96.6%) primary schools in the sampling area (unavailable to public or did not exist for three schools in the Atherton Tablelands and one in Townsville). Most of the 112 primary schools from the local government areas of Townsville, Cairns and the Atherton Tablelands with written sun-protection policies were government owned (66.1%), situated in urban areas (64.3%), enlisted in the SSS program (60.7%) and had an ICSEA score below 1000. A greater proportion of Cancer Council-endorsed SSS were large schools (>800 students) compared with non-SSSs (NSSS) (17.6% versus 4.5%; \( P = 0.039 \); Table II).

Most schools (55.4%) addressed 2 criteria of the 12 specified, while only 6 (5.4%) schools addressed all 12. Of the schools with a perfect score, five were SSS. Approximately 5% of all schools obtained a total score of 1 or less (Table III).

The sun-protection policies of SSS were more likely than those of NSSS to mention promoting sun-safety messages within the school community \( (P = 0.001) \); shade provision at outdoor school events/carnivals \( (P = 0.002) \); regularly reviewing their policies \( (P = 0.006) \) and rescheduling outdoor
activities to minimize peak UVR exposure \( (P = 0.007) \); as well as encouraging students to utilize both shade \( (P = 0.005) \) and SPF 30+ sunscreen \( (P = 0.018) \), expecting adults to model good sun-protection behaviors \( (P = 0.017) \); including sun-protection education in the curriculum \( (P = 0.012) \) and ensuring the school grounds are adequately shaded \( (P = 0.037) \) (Table IV). Fewer differences were found between the sun-protection policies of non-government and government run

### Table II. SunSmart and NSSS characteristics of 112 primary schools in Townsville, Cairns and the Tablelands in Queensland, Australia

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>All schools ((n = 112))</th>
<th>SunSmart ((n = 44))</th>
<th>Non-SunSmart ((n = 68))</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td>74 (66.1)</td>
<td>25 (36.8)</td>
<td>13 (29.5)</td>
<td>0.433</td>
</tr>
<tr>
<td>Non-government</td>
<td>38 (33.9)</td>
<td>43 (63.2)</td>
<td>31 (70.5)</td>
<td></td>
</tr>
<tr>
<td>School size(^a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small ((\leq 399 \text{ students}))</td>
<td>55 (49.1)</td>
<td>29 (42.6)</td>
<td>26 (59.1)</td>
<td>0.039</td>
</tr>
<tr>
<td>Medium ((400–799 \text{ students}))</td>
<td>43 (38.4)</td>
<td>27 (39.7)</td>
<td>16 (36.4)</td>
<td></td>
</tr>
<tr>
<td>Large ((\geq 800 \text{ students}))</td>
<td>14 (12.5)</td>
<td>12 (17.6)</td>
<td>2 (4.5)</td>
<td></td>
</tr>
<tr>
<td>ICSEA(^b) status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \leq \text{mean} (\leq 1000))</td>
<td>81 (72.3)</td>
<td>47 (69.1)</td>
<td>34 (77.3)</td>
<td>0.348</td>
</tr>
<tr>
<td>Above mean ((\geq 1001))</td>
<td>31 (27.7)</td>
<td>21 (30.9)</td>
<td>10 (22.7)</td>
<td></td>
</tr>
<tr>
<td>Locality(^c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>72 (64.3)</td>
<td>47 (69.1)</td>
<td>25 (56.8)</td>
<td>0.186</td>
</tr>
<tr>
<td>Rural</td>
<td>36 (32.1)</td>
<td>19 (27.9)</td>
<td>17 (38.6)</td>
<td></td>
</tr>
<tr>
<td>Remote</td>
<td>4 (3.6)</td>
<td>2 (2.9)</td>
<td>2 (4.5)</td>
<td></td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Townsville ((\text{latitude } 19.25^\circ \text{S, longitude } 146.77^\circ \text{E}))</td>
<td>43 (38.4)</td>
<td>29 (42.6)</td>
<td>14 (31.8)</td>
<td>0.208</td>
</tr>
<tr>
<td>Cairns ((\text{latitude } 16.87^\circ \text{S, longitude } 145.75^\circ \text{E}))</td>
<td>46 (41.1)</td>
<td>27 (39.7)</td>
<td>19 (43.2)</td>
<td></td>
</tr>
<tr>
<td>The Atherton Tablelands ((\text{latitude } 17.26^\circ \text{S, longitude } 145.48^\circ \text{E}))</td>
<td>23 (20.5)</td>
<td>12 (17.6)</td>
<td>11 (25.0)</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\)Using 2008 enrolment data obtained from Education Queensland [29]. \(^b\)ICSEA—index of community socio-educational advantage. The mean value is set to 1000 [31]. \(^c\)Locality refers to the education zone assigned to a school by Education Queensland [28].
schools. Non-government schools did however place greater emphasis on role modeling of sun-protective behaviors by adults (P = 0.002), sunscreen use (P = 0.024), periodic review of policies (P = 0.023) and inclusion of sun-protection education in the curriculum (P = 0.031) than government school policies. Inclusion of behavioral, environmental, curriculum-based and review criteria in a school’s sun-protection policy did not appear to be influenced by the school’s ICSEA score, other than for the sun-protective uniform criterion (Table IV).

SSS tended to address more criteria in the environmental (P = 0.013), curriculum (P = 0.032) and review (P = 0.006) categories than NSSS (Table V). Non-government schools addressed more behavioral (P = 0.049) and review criteria (P = 0.023) than government schools (Table V). Total sun-protection policy scores did not vary with school size, geographical location in Northern Queensland (Townsville, Cairns or the Atherton Tablelands) or locality (urban, rural or remote).

The median total score obtained for all schools was 2.0 [inter-quartile range (IQR) = 2.0–6.8] from 12.0 while scores for SSS and NSSSS were 2.0 [IQR = 2.0–9.0] and 2.0 [IQR = 2.0–3.0], respectively (P = 0.008). Non-government schools achieved a higher median total score compared with government schools (3.0 [IQR = 2.0–8.3] versus 2.0 [IQR = 2.0–3.3]; P = 0.020).

Discussion

A major finding of this study was that only 5.4% of North and Far North Queensland primary schools scored the possible 12/12 for their sun-protection policies, while the median total policy score was 2 from a possible 12. However, even though many were not very comprehensive, almost all of these schools had some form of written sun-protection policy. A comprehensive written sun-protection policy could be the first step toward promoting and improving sun-protective behaviors at schools, especially if school staff, parents and care-givers actively encourage such behavior and become sun-safety role models. However, data supporting the link between sun-protection policies and observations of sun-protective behavior at primary schools are lacking. Research involving independent assessment of policies and direct unannounced observations of behavior to better represent usual sun-protective practices (rather than self-reported data) would be particularly beneficial.
Sun-protection policies of SSS addressed more individual criteria and consequently scored higher total scores than NSSS. SSS and NSSS characteristics were similar therefore it is possible that other factors, such as motivation to develop a sun-protection policy for SunSmart accreditation, influenced the comprehensiveness of such policies. SSS did not consistently address the 12 criteria better than NSSS which could suggest that greater guidance may be required to ensure that all criteria are understood and subsequently addressed. Non-government schools were found to have more comprehensive sun-protection policies than government schools and a school ICSEA value above the mean was not associated with a better sun-protection policy. A relationship between sun-protection policy scores and socio-economic status, school size, school locality or region was not found.

Most schools sampled achieved overall scores that were considerably lower than those awarded to the majority of New Zealand primary schools [23, 33] and only slightly higher than those attained by American primary schools [24]. Overall, SSS sun-protection policies were more comprehensive than those of NSSS, suggesting that schools participating in the SunSmart program demonstrate more interest in policy development and/or have better access to resources to help develop their policies.

Almost all sun-protection policies addressed student hat wearing while outdoors which is commendable. School hats were described as being ‘SunSmart’ or broad brim, bucket or legionnaire style which are considered to be ‘gold standard hats’ since they provide better protection to the face, head and neck regions than cap/visor styles [35, 36]. Most policies stated a ‘no hat, no play’ rule for students and specified students without hats were to play in shaded areas.

SSS sun-protection policies were more likely to encourage all students to use shade when

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### Table V. Behavior, environment, curriculum and review scores attained by 112 primary schools in Townsville, Cairns and the Atherton Tablelands, North Queensland, Australia: stratified by school SunSmart status, ownership and ICSEA score

<table>
<thead>
<tr>
<th>Sub-criteria: All schools</th>
<th>SunSmart school</th>
<th>School ownership</th>
<th>ICSEA score</th>
</tr>
</thead>
<tbody>
<tr>
<td>score attained&lt;sup&gt;a&lt;/sup&gt;</td>
<td>n = 112 (%)</td>
<td>Yes n = 68 (%)</td>
<td>No n = 44 (%)</td>
</tr>
<tr>
<td>Behavior</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1.8</td>
<td>1.5</td>
<td>2.3</td>
</tr>
<tr>
<td>1</td>
<td>4.5</td>
<td>2.9</td>
<td>6.8</td>
</tr>
<tr>
<td>2</td>
<td>58.9</td>
<td>52.9</td>
<td>68.2</td>
</tr>
<tr>
<td>3</td>
<td>7.1</td>
<td>5.9</td>
<td>9.1</td>
</tr>
<tr>
<td>4</td>
<td>7.1</td>
<td>7.4</td>
<td>6.8</td>
</tr>
<tr>
<td>5</td>
<td>20.5</td>
<td>29.4</td>
<td>6.8</td>
</tr>
<tr>
<td>Environment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>72.3</td>
<td>64.7</td>
<td>84.1</td>
</tr>
<tr>
<td>1</td>
<td>13.4</td>
<td>13.2</td>
<td>13.6</td>
</tr>
<tr>
<td>2</td>
<td>14.3</td>
<td>22.1</td>
<td>2.3</td>
</tr>
<tr>
<td>Curriculum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>70.5</td>
<td>60.3</td>
<td>86.4</td>
</tr>
<tr>
<td>1</td>
<td>4.5</td>
<td>5.9</td>
<td>2.3</td>
</tr>
<tr>
<td>2</td>
<td>7.1</td>
<td>7.4</td>
<td>6.8</td>
</tr>
<tr>
<td>3</td>
<td>9.8</td>
<td>14.7</td>
<td>2.3</td>
</tr>
<tr>
<td>4</td>
<td>8.0</td>
<td>11.8</td>
<td>2.3</td>
</tr>
<tr>
<td>Review</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>80.4</td>
<td>72.1</td>
<td>93.2</td>
</tr>
<tr>
<td>1</td>
<td>19.6</td>
<td>27.9</td>
<td>6.8</td>
</tr>
</tbody>
</table>

<sup>a</sup>Refer to Table 1 for detailed criteria explanation.
outside; however, this criterion was addressed by less than a quarter of school policies overall. While we found that students might be encouraged to use shade if they did not have a hat, shade use should be encouraged at all times, regardless of hat wearing. Combining multiple methods of personal sun protection as recommended by the Cancer Council’s slip (on sun-protective clothing), slop (on SPF30+ sunscreen), slap (on a hat), seek (shade) and slide (on sunglasses) message is the optimal way to reduce sun damage [37].

The importance of adult role modeling of sun-protective behaviors was more likely to be mentioned in SunSmart and non-government schools policies but was poorly addressed overall. The value of adult role models for encouraging and reinforcing sun safe behaviors has been demonstrated [38, 39] thus the importance of this criterion in sun-protection policies should not be understated. Schools may have placed less emphasis on adult role modeling in their policies because they assume that school staff and parents/care-givers act as role models without being asked to do so. However, our research suggests that <20% of adults accompanying students to and from school grounds wear a hat, suggesting it is necessary to address adult role modeling in school policies [40]. Similarly, sunscreen use should be included in sun-protection policies since when it is applied properly and used in conjunction with other personal sun-protection items, such as hats, it can be a valuable form of sun-protection since regular application may reduce skin cancer development [37, 41–43]. While SSS were more likely to mention that sunscreen was provided to students than NSSS, the criterion was addressed poorly overall.

Overall, shade provision was poorly addressed, with few schools considering shade when planning their outdoor events. Policies of SSS were more likely than those of NSSS to mention the availability of adequate shade in the school grounds or to consider shade when planning outdoor events.

Perhaps shade availability was poorly addressed overall because providing built shade structures and portable shade structures at outdoor events can be costly. Principals consider shade to be an important component of sun protection for students; however, the construction of new shade structures can be limited by school budgets and lack of funding [23].

Although principals generally consider shade provision to be important for their students, constructing new fixed shade structures and purchasing portable shade for outdoor events (e.g. athletics carnivals) are costly, and therefore may be limited by school budgets and lack of funding [23]. Alternative forms of shade, such as native trees, can be planted by school students, and offer an affordable alternative to built shade; however, it can take many years for trees to reach maturity and provide considerable shade [44]. Shade utilization should be promoted by schools in conjunction with sun-protective clothing and sunscreen. Furthermore, shade adequacy should be considered when planning outdoor events (e.g. swimming carnivals), since such events may take place during peak UVR exposure periods.

Rescheduling outdoor activities such as physical education classes and designated meal break/play times would be beneficial since they usually coincide with peak UVR exposure periods. Most policies made no mention of attempts to reschedule outdoor activities or using the policy to plan outdoor activities such as school excursions and sports carnivals. Less than one-quarter of school policies mentioned that sun-safety information was regularly included in school newsletters and/or assemblies. Nor did the majority of schools state that sun-safety education was incorporated into the school curriculum. Given that the incidence of cutaneous melanoma in Australia is among the highest in the world [4], sun-safety education in Australian primary schools should be improved to establish good sun-protection habits early in life. Sun-safety education is included in the curriculum of > 60% of primary schools in England, suggesting that there is room for improvement in Australian schools [44]. It was not possible to evaluate the comprehensiveness of the sun-protection education included in the curriculum using publicly available information alone. As it is possible that the quality of such information could vary at the school, state or national level, it is important to ensure that only evidence-based material is included in such curricula.
Unlike previous studies, we did not find that school size (as determined by number of enrolments) influenced the comprehensiveness of sun-protection policies [23, 45]. Nor did we find an association between school location (urban, rural or remote) and adequacy of policies. The educational advantage of students attending schools, as represented by school ICSEA score, was not associated with better sun-protection policies.

Our research is strengthened by the use of independently assessed sun-protection policy evaluation criteria in contrast to the self-reported data commonly used in other studies [23, 33, 44–47]. The use of a single policy assessor could be considered a study limitation; however, we believe that it improved the consistency of data collection. Likewise, publicly available school sun-protection policies may not always include the most recent information, but do reflect the information this is most readily available to parents/care-givers. Furthermore, a causal relationship between SunSmart status and comprehensiveness of sun-protection policies cannot be implied due to the cross-sectional study design used. Future research that explores school staff perspectives toward sun-safety policies and practice would be beneficial.

In conclusion, only 5% of schools received a perfect score and the majority of school policies only scored 2 from a possible 12. While SSS and non-government schools were found to address more criteria than NSSS and government schools there is room for improvement at almost all schools. Although policy is not necessarily indicative of practice, a comprehensive sun-protection policy is an essential part of establishing a good attitude to sun safety in school communities. The importance of sun-protection policies in the school environment should be emphasized. When developing their policies, schools should be directed to the support available such as the resources available from the Cancer Council Australia. Our team is currently funded by Queensland Health to pilot a program that monitors sun-protection compliance in schools; rewards schools that consistently practice sun-safe behaviors and provides incentives to encourage schools to achieve and continue to maintain high levels of sun protection. These data will serve as a valuable baseline from which the impact of future interventions aimed at improving sun-protection policies and practices in schools can be measured.

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