



Sun protection practices in New Zealand secondary schools: a 2014 baseline study

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ARTICLE INFO

Article history:

Received 7 September 2015

Received in revised form 2 February 2016

Accepted 7 March 2016

Available online 10 March 2016

Keywords:

Sun protection

Secondary schools

Survey questionnaire

Skin cancer prevention

ABSTRACT

Objective. Guided by the established primary school SunSmart programme, a survey of secondary schools' sun protection policies, planning, behavioural expectations, curriculum content and environment was undertaken in order to establish a baseline to inform advocacy and secondary level programme development.

Methods. All 448 principals of state or state integrated public secondary schools identified from the Ministry of Education database were mailed a hard copy questionnaire. School sun protection practices were assessed and a summative, non-weighted, 11-item Total Sun Protection Score (TSPS) was created. Associations between TSPS and socio-demographic factors, as well as school sun protection policy, were investigated using unadjusted and multiple linear regressions.

Results. Usable responses received from 211 of the 448 schools (47% participation) indicated reasonable representativeness of eligible schools, but under-representation of low socioeconomic decile institutions ($p = 0.003$) and those with the smallest roll size ($p = 0.004$). Only 50% of schools reported having a sun protection policy. The least attained TSPS components were outdoor event planning (17.1%), student breaks (16.6%), sun-protective clothing (8.5%) and shade provision (6.2%). The mean (SD) TSPS was 4.58 (2.06). In multivariable analysis, TSPS was statistically significantly positively associated with having a sun protection policy ($p < 0.001$) and the presence of primary level classes ($p < 0.001$) – the latter suggesting a possible influence of programme continuity, but negatively associated with integrated school status ($p = 0.036$).

Conclusion. A standard SunSmart programme could be promoted to all schools, irrespective of socioeconomic decile, overall roll size, gender status or regional population density. Low attainment of some TSPS components indicates targeting priorities.

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1. Introduction

New Zealand (NZ) schools are required to fulfil National Administrative Guidelines (NAGs) which include the need to “ensure that the school's buildings and facilities provide a safe, healthy learning environment” (NAG 4) and “provide a safe physical and emotional environment” (NAG 5) for students. (Ministry of Education) Although not specifically identified, these guidelines should be taken to include the provision of shade and appropriate sun protection practices for avoiding erythema and assisting skin cancer primary prevention.

In high solar ultraviolet radiation (UVR) environments, as NZ is seasonally, more than 90% of skin cancers are attributed to excessive UVR exposure, (Armstrong, 2004) so most cases are potentially preventable. The link between UVR exposure during childhood and adolescence, and subsequent cutaneous malignant melanoma (melanoma) incidence has

been specifically identified. (Levine et al., 2013; Whiteman et al., 2001) Given that students attend school during the hours of highest UVR (10am–4pm), spend at least part of that period outdoors and can receive a substantial fraction of their total UVR exposure while at school, (Moise et al., 1999) there is good justification to implement comprehensive school programmes that follow World Health Organization guidelines and address sun protection policy, practice, curriculum content and environment. (World Health Organization, 2003) This should be a priority in NZ which ‘leads’ the world with the highest overall (males and females combined) age standardised melanoma incidence rate, (International Agency for Research on Cancer, 2013) and where deaths from skin cancers exceed those from motor vehicle traffic crashes (513 vs 284 deaths in 2011). (Ministry of Health, 2011).

Having a written sun protection policy is associated with more comprehensive practice in primary schools, and policy comprehensiveness is associated with practice comprehensiveness. (Dono et al., 2014) With the exception of shade adequacy, the inclusion of specific aspects of sun protection in written policy is linked significantly to corresponding practice. (Jones et al., 2008) Higher sun protection policy scores are associated with higher sun protection practice scores among early

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childhood services. (Ettridge et al., 2011) Comparable studies of policy implementation in secondary schools have not been reported, although educational interventions can be associated with positive changes in students' knowledge, attitudes and behavioural intentions. (Geller et al., 2002) Systematic review evidence regarding behaviour change, however, was considered insufficient, (U.S. Centers for Disease Control and Prevention) with little additional evidence emerging since. (Haiducu & McLean, 2013).

At secondary schools sun protection tends not to be an identified priority and, as we observed in an earlier exploratory study, (Jopson & Reeder, 2004) secondary students are at an age when they are expressing their independence, challenge authority, and often have little thought for the possible long-term consequences of their actions. Sun. protection is difficult to encourage in these conditions. Nevertheless, schools have opportunities to educate about the issues and to provide environments which both protect and encourage sun protection."(p. 23).

In NZ, a comprehensive SunSmart Schools Accreditation Programme (SSAP) for Term 1 (January–April, southern hemisphere summer/autumn) and Term 4 (October–December, spring/summer) has been successfully implemented at primary and intermediate level since 2005. (Reeder et al., 2012) There is no comparable secondary level programme, but the SSAP provides a template with potential for extension to secondary levels. Baseline information is required to: 1). describe the existing situation, 2). inform advocacy, and 3). help assess the impact of any secondary school intervention implemented. Guided by the SSAP and exploratory secondary school site visits, (Jopson & Reeder, 2004) the national survey results reported here are intended to help meet these goals.

2. Methods

2.1. Participants

The most recent available Ministry of Education schools database was obtained and all non-private, state or state-integrated (formerly private and 'special character' – often church affiliated) schools with secondary age students (Year 9–modal age 13 years, and above) were selected (August 2014) and 448 schools were identified as eligible for inclusion. Special schools for teenage mothers and those with disabilities were excluded because they offer specialist services for young people with high needs who may also be enrolled at their local mainstream school, have the curriculum adapted for them, receive support from specialist staff, additional teaching time and teacher's aide support.

2.2. Procedures

An invitation to participate in the survey was mailed to school principals or statutory managers, with the option of delegating survey completion to the most appropriate person. The mailing included a letter of support from the Cancer Society, an Information Sheet, the survey instrument and a postage paid, pre-addressed envelope for returning the completed questionnaire. One email reminder was provided if no survey response was received after three weeks, followed by a telephone reminder after at least a further two weeks. The final cut-off for inclusion was 3 March 2015. As an incentive to participate, there was a prize draw for a sunscreen dispenser (value NZ\$25) for five randomly selected participating schools. Departmental ethical approval was obtained following University of Otago procedures, and the project was reviewed and approved by the Human Ethics Committee (D14/336).

2.3. Survey instrument

The survey instrument, which takes approximately 10 min to complete, was developed from the primary school SSAP questionnaire. Feedback was sought and obtained from Cancer Society national and regional health promotion staff. The questionnaire (*Supplementary File 1*)

contained items on the respondent's role at school, whether the school had a written sun protection policy or procedure (and policy location and accessibility), and sun protection practices (10am–4pm Terms 1 and 4). Sun protection practices surveyed included how sun protection messages were communicated, lunch break sun exposure, provision and assessment of shade, uniform and dress codes, hat wearing, sun-screen use, guidelines for outdoor events and assemblies, curriculum content and staff role modelling.

2.4. Measures

The Total Sun Protection Score (TSPS) is a summative, non-weighted score reflecting sun protection planning and behavioural expectations at school and school events, curriculum content and environmental provision. It comprises 11 components each contributing one point if the school meets the specified criterion (Table 1).

Other measures obtained from the Ministry of Education database included: school integration status (state, state integrated, special character), socioeconomic decile (with 1 being the lowest 10% of schools with highest proportions of students enrolled from low socioeconomic communities), type (year range either years 7–15, 9–15, or composite/area schools 1–15), overall roll size, gender status (co-educational/single sex), geographic region (six Cancer Society divisions used for health promotion programme dissemination and useful for monitoring advocacy efforts and institutional change) and Ministry of Education population density categories, (rural, minor urban, secondary urban, main urban).

2.5. Analysis

The chi-square goodness of fit test was used to assess the representativeness of participating schools in terms of socio-demographic characteristics. The frequency distributions of the TSPS and its eleven component items were evaluated. In order to assist the prioritisation of targeting, school sun protective practices were categorised into four groups: those which were attained by 75% or more of participating schools, those attained by less than 75% but at least 50%, those attained by less than 50% but more than 25% and those by less than 25%. Associations between TSPS and school sun protection policy, as well as socio-demographic factors were investigated using unadjusted and multiple linear regressions. The residuals of the multiple linear regression model were assessed for heteroscedasticity and non-normality, and variance inflation factors were investigated for collinearity. Stata software version 13.1 was used for all statistical analyses. The two-sided significance level $\alpha = 0.05$ was specified for all statistical tests.

3. Results

Usable responses were received from 211 of 448 schools surveyed (47% participation). Responding schools were somewhat under-representative of low socioeconomic decile schools ($p = 0.003$) and those with the smallest roll size ($p = 0.004$), but otherwise reasonably representative of all eligible schools (Table 2). Survey respondents were mainly principals and/or held senior management positions (141; 67.14%), followed by teachers (47; 22.38%). The remainder (22, 10.48%) held roles primarily with health responsibilities, such as school nurses, first aid officers and counsellors.

Only 50.24% of schools reported having a sun protection policy. A single school reported meeting the criteria for all 11 TSPS components (Table 3). Although 19 schools (9%) scored 8 or more and most (74.9%) scored between 3 and 7, 34 (16.1%) scored 2 or less, and the mean (SD) TSPS was only 4.58 (2.06). When ranked by the percentage of schools meeting the criteria for each TSPS item (Table 1), almost all schools (96%) met the "assemblies" criterion, since assemblies were mostly held indoors, and more than 75% met the sunglasses criterion. Sunscreen and information provision criteria were met by more than

Table 1
Requirements for meeting sun protection practices guideline criteria, ranked by percentage of schools attaining.^a

Abbreviation	Criteria	Minimum requirement(s) to meet ^a	Met by %
1. Assemblies	Assemblies are scheduled, whenever possible, to minimise time outdoors between 10am and 4pm.	School assemblies are held either indoors, under shade or before 10am.	95.73
2. Sunglasses	Students are permitted to wear sunglasses during outdoor activities.	The wearing of sunglasses during outdoor activities at school is permitted.	75.83
3. Sunscreen	The use of at least SPF30+ broad spectrum sunscreen when outdoors is encouraged.	Students are encouraged to wear at least SPF30+ broad spectrum sunscreen when outdoors at school.	62.56
4. Information provision	Information about the sun protection policy (SPP) and related practices is provided to staff and students.	At least 3 of the following are used to disseminate general sun protection messages at school: a. assemblies; b. newsletters; c. in class; d. staff meetings; e. posters; f. f. UVI display board.	51.18
5. Role modelling	Staffs are expected to be role models by practising and promoting SunSmart behaviours.	School staffs are encouraged to wear a sun protective hat (broad-brimmed, bucket or legionnaire) during school outdoor activities.	43.60
6. Hat wearing	All students wear a sun protective hat for outdoor activities.	The following are true: a. Hat wearing for outdoor activities is encouraged; b. only broad-brimmed (min. 7.5 cm brim), bucket (min. 6 cm brim, deep crown) or legionnaire hats are worn.	43.60
7. Curriculum	SunSmart education programmes are included in the curriculum at all levels every year.	An extended session on sun protection is taught at all levels every year in either the Health/Wellbeing or Science curriculum.	36.97
8. Event planning	The SPP is reflected in the planning of all outdoor events (e.g. camps, excursions, sporting events).	The following are true: a. SPF30+ broad spectrum sunscreen is made available for students at all outdoor events; b. outdoor events are scheduled early/late in the day, where possible.	17.06
9. Breaks	Sun protection is reflected in policies for breaks and lunch.	The following are true: a. students are encouraged to take breaks and eat lunch in shaded areas or indoors; b. students are permitted to stay indoors for breaks on fine days.	16.59
10. Clothing	The use of appropriate sun protective clothing is expected for outdoor school use.	One of the following is true: a. Students are encouraged to wear shirts with collars and long sleeves; b. Sun protective options are provided in the PE and school uniform/dress codes.	8.53
11. Shade	The school either has sufficient shade or is working towards increasing it so that it is adequate in school grounds.	One of the following is true: a. substantial shade is available in school grounds for both active and passive pursuits; b. there are specific plans to increase shade in the next 12 months.	6.16

^a Schools to meet each item listed, as described.

50% of schools, followed by staff role modelling, hat wearing and curriculum content, met by more than 25%. The criteria for outdoor event planning, student breaks, clothing and shade provision were met by the fewest participating schools, well below 25%. Few met the shade (6.2%), sun protective clothing (8.5%), student breaks (16.6%) and outdoor event planning (17.1%) criteria – TSPS distribution (Table 3) indicates that 34 schools (16.1%) scored 2 or less, 158 (74.9%) scored between 3 and 7, and 19 (9%) scored 8 or more. The mean (SD) TSPS was 4.58 (2.06).

When school socio-demographic factors (Table 1) and sun protection policy status (Y/N) were entered into univariate regression models as potential predictors of TSPS, school type, overall roll size, population density of region and sun protection policy status were statistically significant (Table 4). However, in the multiple regression model (fully adjusted for all variables in Table 1 and sun protection policy status) only the associations with school type and sun protection policy status remained significant: schools with a sun protection policy had a higher TSPS than those without and institutions catering for secondary students, alone, had a lower TSPS than those which included both secondary and primary students. Additionally, in the adjusted model, state-integrated schools had a significantly lower TSPS than state schools. Although the overall group Wald test was not statistically significant for region ($p = 0.08$), of the 15 possible post hoc individual pairwise comparisons, three

were statistically significant, and all three suggested a lower TSPS for Canterbury/West Coast region schools.

4. Discussion

Although approximately half of the responding schools reported having a sun protection policy, a single school reported meeting the criteria for all 11 TSPS components (Table 3), and the mean (SD) TSPS was only 4.58 (2.06). Some TSPS components were reported with particularly low frequencies that would justify giving them prioritised attention.

4.1. Shade

The environmental shade provision TSPS criteria were the least likely to be met (6.2%). In earlier surveys, we found that shade also presented a challenge for primary schools, often because of its cost. It seemed promising that, in 2013 correspondence with the SunSmart Schools National Coordinator, the Minister of Education acknowledged that “shaded outdoor learning spaces form part of the Ministry’s Modern Learning Environment criteria” and that officials “expect some type of shade protection to be provided in major redevelopments and new builds of schools”. Shade sails were not supported because of “their high replacement cycles, and the potential damage they can cause to school

Table 2
Distribution of school characteristics by response status.

School characteristic	All eligible schools (n = 448)		Responding schools (n = 211)	
	n	%	n	%
Integration status				
State	349	77.9	171	81.0
State-integrated	99	22.1	40	19.0
Socioeconomic decile				
1–3 (low)	151	33.7	49	23.2
4–7 (medium)	188	42.0	97	46.0
8–10 (high)	109	24.3	65	30.8
Type (uncategorised)				
Composite (year 1–10)	4	0.9	2	0.9
Composite (year 1–15)	118	26.3	36	17.1
Restricted composite (year 7–10)	3	0.7	–	–
Secondary (year 11–15)	2	0.4	–	–
Secondary (year 7–10)	2	0.4	1	0.5
Secondary (year 7–15)	98	21.9	54	25.6
Secondary (year 9–15)	221	49.3	118	55.9
Type (dichotomised)				
Primary and secondary	225	50.2	93	44.1
Secondary	223	49.8	118	55.9
Overall roll size				
Less than 200	101	22.5	28	13.3
200–799	209	46.7	101	47.9
800–1399	88	19.6	47	22.3
1,400–1,999	36	8.0	27	12.8
More than 2000	14	3.1	8	3.8
Gender status				
Single sex (girls)	53	11.8	27	12.8
Single sex (boys)	43	9.6	23	10.9
Co-educational	351	78.3	160	75.8
Primary co-ed, secondary (girls)	1	0.2	1	0.5
Geographic region (N to S) ^a				
Northland/Auckland	120	26.8	53	25.1
Waikato/Bay of Plenty	84	18.8	28	13.3
Central Districts	83	18.5	36	17.1
Wellington/Tasman	60	13.4	32	15.2
Canterbury/West Coast	60	13.4	37	17.5
Otago/Southland	41	9.2	25	11.8
Population density status ^b				
Rural (<1,000)	62	13.8	25	11.8
Minor urban (1,000–9,999)	92	20.5	44	20.9
Secondary urban (10,000–30,000)	38	8.5	24	11.4
Main urban (>30,000)	256	57.1	118	55.9

^a Cancer Society Divisions.

^b Ministry of Education categories.

buildings”, but staffs were “investigating the cost of planting established trees on school sites that have limited shaded areas.” However, these statements were made in the context of the primary school programme and the need for rebuilding following the Christchurch earthquakes.

Table 3
Total Sun Protection (TSP) score distribution.

Number of TSP score items	Schools reporting (n = 211)	
	n	%
0	1	0.47
1	5	2.37
2	28	13.27
3	45	21.33
4	32	15.17
5	27	12.80
6	32	15.17
7	22	10.43
8	12	5.69
9	6	2.84
10	0	0.00
11	1	0.47

Shade provision for existing schools is not currently routinely funded by the Ministry, and we are currently unable to evaluate how much change has actually occurred. It will be important to seek Ministry commitment to ensuring that environmental shade is also available for secondary school students. With respect to staffs, this issue could potentially be addressed in the context of workplace health and safety, (*Occupational Safety and Health Service, 1997*) and in association with policy expectations regarding clothing and sunscreen.

4.2. Sun protective clothing

In earlier NZ surveys, the meeting of sun protective clothing and hat wearing criteria also proved to be a challenge for primary schools, (*Reeder et al., 2012*) and 71% of randomly selected secondary schools, visited on site in summer 2002–3, had summer uniforms that were not sun protective. (*Jopson & Reeder, 2004*) As we recommended then, schools should review their existing uniform policy with sun protection in mind, so students have summer uniform options that are both comfortable and sun protective, preferably with a loose fit and made from fabrics with tight weave or knit, including longer skirts/trousers and tops with sleeves and collars providing protection for the arms and neck. At that time it was observed, informally, that in schools without prescribed uniforms, students were more likely to be wearing sun protective clothing, such as longer trousers or skirts, and more likely to wear hats, although sleeve length did not stand out as different from uniformed schools. This may have reflected what was fashionable at that time. In the present survey, very few schools (8.5%) met the minimum clothing requirements, so this is an area where investigation of barriers to uptake is required. There remains a need to work with the designers and providers of youth clothing and school uniforms in order to ensure that suitable sun protective options are available for schools to choose and remain attractive to students – a point noted by other researchers. (*Horsley et al., 2000*) These considerations also need to apply to school sports uniforms. Although the separate hat wearing criterion was reportedly met by 43.6% of schools, it should be noted that to meet this criterion schools only had to “encourage”, rather than require, sun protective hat wearing for outdoor activities. Outside of school contexts, some sports codes now require participants to wear certain forms of sun protection, so there are precedents for this and a potential for extension to school sports participation.

4.3. Student breaks and outdoor event planning

The percentages of schools meeting the student breaks (16.6%) and event planning (17.1%) criteria were low and, clearly, they also present challenges. Given that the rescheduling of outdoor events to either early or late in the day, and shade provision for event participants tend to be difficult for schools to accommodate, there is a need to, at least, ensure that broad spectrum sunscreen is provided and its appropriate use encouraged. Another strategy would be to ensure that adequate shade is available at venues for use by those not participating in a given event, as well as staffs and spectators. Temporary shade structures may provide a partial solution. Permitting students to access indoor spaces for breaks on fine days may raise challenges for supervision, but these should be surmountable provided that the desirability of this option as a sun protection strategy is acknowledged, given that equivalent shelter is usually available on rainy days.

4.4. Curriculum content

Curriculum content was another item for which compliance was quite low (37%), as we also found when surveying primary schools, but the potential for it to influence behaviour may be significant. There are opportunities to achieve curriculum integration in several fields, not only health and science, but also social science, history and other disciplines. However, resources need to be developed by

Table 4
Unadjusted and adjusted values for potential school predictors of Total Sun Protection Score, with 95% confidence intervals (CI) and *p*-values.

School characteristic (Reference category)	Unadjusted			Adjusted		
	Estimate	95% CI	<i>p</i> -Value ^a	Estimate	95% CI	<i>p</i> -Value ^a
Sun protection policy						
Yes	1.55	1.03, 2.07	<0.001	1.28	0.75, 1.80	<0.001
Integration status (state)						
State-integrated	−0.00	−0.72, 0.71	0.991	−0.93	−1.79, −0.06	0.036
Socioeconomic decile (1–3: Low)			0.489			0.543
4–7 (Medium)	−0.00	−0.72, 0.71		0.39	−0.37, 1.14	
8–10 (High)	−0.37	−1.14, 0.40		0.17	−0.72, 1.07	
Type (primary and secondary)						
Secondary	−1.33	−1.87, −0.80	<0.001	−1.29	−1.96, −0.62	<0.001
Overall roll size (≤100–400: small)			0.007			0.897
Medium (401–800)	−0.96	−1.66, −0.26		−0.25	−1.01, 0.51	
Large (801–1500)	−0.83	−1.55, −0.10		−0.35	−1.31, 0.62	
Very large (>1500)	−1.36	−2.26, −0.47		−0.39	−1.61, 0.84	
Gender status (co-educational)			0.690			0.151
Single sex (girls)	0.16	−0.68, 0.99		0.86	−0.02, 1.74	
Single sex (boys)	−0.33	−1.24, 0.58		0.11	−0.80, 1.03	
Geographic region (Northland/Auckland)			0.516			0.082
Waikato/Bay of Plenty	0.22	−0.74, 1.17		−0.13	−1.02, 0.77	
Central Districts	0.03	−0.85, 0.90		−0.30	−1.16, 0.55	
Wellington/Tasman	0.23	−0.68, 1.14		−0.15	−1.06, 0.77	
Canterbury/West Coast	−0.64	−1.51, 0.23		−1.18	−2.06, −0.30	
Otago/Southland	−0.16	−1.15, 0.83		−0.91	−1.91, 0.08	
Population density status (main urban)			0.003			0.740
Minor urban	0.15	−0.55, 0.85		−0.19	−0.95, 0.58	
Secondary urban	−0.31	−1.20, 0.57		−0.33	−1.21, 0.55	
Rural	1.56	0.69, 2.43		0.25	−0.86, 1.36	

^a For overall group differences.

professional educationalists familiar with curriculum structure and the needs of teachers and students. Exemplary secondary level resources may need to be commissioned by an NGO as a first step, as was the case at the primary level in NZ. (Cancer Society of New Zealand Inc) Those resources have proved to be attractive and are available on-line through official education internet links. Resources that fit the curriculum are popular with teachers. In a US survey, 79% of metropolitan secondary schools reported being “interested in obtaining” “A sun protection curriculum designed specifically for secondary school grades.” (Buller et al., 2006).

4.5. International comparison of TSPS components

The limited information reported for secondary schools (in contrast to that available for primary schools) and use of diverse criteria (as well as different risk levels), make valid international comparisons difficult. This is illustrated from a UK study of a 10% national sample of secondary schools where 46% reported recommending that students “wear sunscreen at school when appropriate”, (Horsley et al., 2000) compared with 63% of schools in the present study reporting that they encouraged students to “wear at least SPF30 + broad spectrum sunscreen when outdoors at school” — the current, more specific NZ recommendations. A UK regional survey reported that 38% of participating secondary schools encouraged students to wear “wide brimmed or legionnaire-style hats when outside.” (Hoque et al., 2007) This is only marginally less than the 44% reported in the present study, but we defined sun protective hat wearing more specifically as including “Only broad-brimmed (min. 7.5 cm brim), bucket (min. 6 cm brim, deep crown) or legionnaire hats” (Table 1). It would assist the ability to make valid international comparisons if researchers used common, clearly defined measures, perhaps building on the initiative for establishing standard outcome

measures of sun exposure and sun protection practices in behavioural and epidemiologic research. (Glanz et al., 2008) Finally, a major US survey reported that 30% of secondary schools had “a policy that prohibits students from wearing hats” (Buller et al., 2006) — a very different situation to that which exists in NZ.

4.6. Predictors of TSPS

In a multivariable context, being a secondary school without links to primary and intermediate student classes predicted a statistically significantly lower TSPS in both unadjusted and adjusted models. This is plausible, given that many primary and intermediate schools are SunSmart accredited, likely to provide support for continuity in practice and, potentially, exert a sustained positive influence. A possible intervention for secondary schools lacking such links may be to encourage routine development of relationships with neighbouring SunSmart primary schools. The relatively few other significant socio-demographic predictors of TSPS indicates that a standard programme could be promoted to secondary schools, irrespective of socioeconomic decile, roll size, gender status or regional population density.

Having a school sun protection policy was statistically positively associated with a higher TSPS. To aim to significantly increase the number of secondary schools with a sun protection policy which follows a minimal template should, therefore, be a key goal.

Yet only 50% of secondary schools reported having a sun protection policy, so there remains considerable room for improvement in commitment to comprehensive sun protection. Nevertheless, among a random sample of US secondary schools only 10% reported having a sun protection policy, (Buller et al., 2006), so in this respect NZ compares favourably.

There are practical reasons for prioritising the development of a generic policy, rather than the creation of separate policies for each specific area

where sun protection may arise. First, this approach acknowledges the ubiquitous nature of sun protection and facilitates the process of identifying implications for the full range of school activities. Second, it helps foster consistency between schools through national promotion of a comprehensive policy template. Third, the process of policy development can help focus efforts on setting realistic goals and time frames for achieving incremental change, while also providing opportunities for staff, parent and student input. Fourth, as we noted with respect to primary schools, “once a policy is in place it can become a point of scrutiny for interested parties to enquire about, and require, some evidence of action and progress.” (Reeder et al., 2012) Finally, there is evidence from primary school and early childhood centre research that having a policy is associated with better sun protection practices. (Dono et al., 2014; Jones et al., 2008; Ettridge et al., 2011).

That integrated school status was a statistically significant predictor of lower TSPS in the multivariable model suggests that, controlling for other factors in the model, state schools may have a somewhat more ingrained culture of health and safety practice than schools which were previously private, and often church affiliated, institutions. This requires further investigation, but in the meantime it may be appropriate to pay attention to integration status when prioritising sun protection programme promotion.

Although region, overall, was not a statistically significant predictor, post hoc comparisons suggested that Canterbury/West Coast region schools had lower TSPS than other regions. This region includes Christchurch, the largest South Island city recently experienced severe earthquake damage. A low TSPS would be consistent with the prioritisation of issues other than sun protection. However, the rebuilding of schools within this area provides unique opportunities for advocacy in support of the routine inclusion of built shade.

4.7. Study limitations and strengths

Study findings are based on self-reports and 47% participation so they may be subject to social desirability and participation biases. However, in an earlier small study, (Jopson & Reeder, 2004) where we were able to compare self-reports with on-site observations for 31 schools, there was no clear generic, positive bias. Although there is the risk that schools which participated in the present study may differ significantly in one or more characteristics from those that did not, we were able to compare both groups according to sociodemographic characteristics recorded in the Ministry of Education database and found the two groups broadly comparable. Although the observed demographic differences between responding and non-responding schools were not substantial, there was evidence that participating schools were somewhat under-representative of low socioeconomic decile schools and those with the smallest roll size. The regression models are likely to be robust against any non-representativeness as it is difficult to consider how associations could differ between responding and non-responding schools, and there was a full range of schools in the sample with respect to decile and roll. If either variable were associated with the TSPS, there is the potential that the results may not be generalizable to the New Zealand population i.e. estimates of the mean and proportions could be biased. The multiple regression analyses, however, showed that decile and roll were not associated with the TSPS. This provides some degree of confidence for the validity of the study findings.

5. Conclusions

There is a need to promote the development of sun protection policies in secondary schools. Areas of practice, such as shade provision, sun protective clothing expectations, student breaks and outdoor event planning will require particular efforts. However, among those primary schools which participated in a similar baseline survey and were followed up 4 years after the implementation of the national SSAP, we found significant positive changes occurred. With similar efforts, it should

also be possible to achieve positive change at the secondary level. Given the very high risk of skin cancer among the NZ population, (International Agency for Research on Cancer, 2013) and our knowledge that excessive UVR exposure early in life is a risk factor, (Levine et al., 2013; Whiteman et al., 2001) such efforts need to be strengthened if significant reductions in both the high rates of disease and high treatment costs are to be achieved.

Funding

This work was supported by a Cancer Society of New Zealand Inc. (10085804PNF) programme grant [to A.I.R.]; and the University of Otago.

Transparency document

The [Transparency document](#) associated with this article can be found, in online version.

Acknowledgements

We thank Anne-Cathrine Lund Petersen for her help with survey administration, and Cancer Society health promotion staffs for reviewing the questionnaire instrument. We especially thank the school staff who gave up their valuable time to respond to the survey.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.pmedr.2016.03.001>.

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