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Primary school sun protection policies and practices 4 years after baseline—a follow-up study

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Abstract

Before the 2005 launch of the New Zealand SunSmart Schools Accreditation Programme (SSAP), 242 randomly sampled primary schools completed a mail survey about sun protection policies, practices, curriculum and environment. A 2009 follow-up included 189 (78%) and their mean Total Accreditation Score (TAS = total SSAP requirements met, range 0–12), increased by 0.8 (95% CI 0.5–1.2, $P < 0.001$) from 7.8 (95% CI 7.4–8.1) to 8.6 (95% CI 8.3–8.9) with evidence changes differed between regions ($P = 0.024$). The 2009 mean TAS varied by region (range 7.9–9.4, unadjusted $P = 0.004$, adjusted $P = 0.013$) with no clear pattern, but likely resource allocation association. TAS of schools acknowledging input from Health Promoting Schools demonstrated a tendency towards being statistically significantly higher by 0.5 (95% CI −0.1 to 1.1, $P = 0.082$), but statistically significantly higher by 1.1 (95% CI 0.5–1.7, $P < 0.001$) for schools acknowledging Cancer Society input. Lowest attainment was for the clothing (43%), shade (52%) and curriculum (55%) criteria. Key perceived barriers were cost, particularly of shade and limited support by parents and others. Schools which had not applied for accreditation identified lack of programme awareness and 'other priorities' as barriers; further information, better resourcing and training assistance as key needs. Observed positive change justifies increased support to consolidate gains and achieve sustainable universality.

Introduction

Skin cancer is a public health concern in many countries, but especially in New Zealand (NZ) where cutaneous malignant melanoma (melanoma) incidence rates are among the world's highest, being 43.0 and 37.4 per 100 000 (age standardized to WHO world population) for men and women, respectively, in 2008 [1]. It has been estimated that, for every death from skin cancer in NZ, an average 15.5 potential years of life are lost (PYLL) [2], comparable with a US estimate of 18.6 in a study which identified skin cancer as one of the more costly cancers in terms of PYLL [3]. Skin cancers place a substantial burden on direct health system costs, estimated at $NZ57.1 M per year, with total annual economic costs of $NZ123 M [2].

However, many skin cancers are potentially preventable because excessive solar ultraviolet radiation (UVR) exposure plays a key role in their development [4]. It has been estimated that UVR causes as much as 65% of melanoma worldwide (95% in high exposure contexts like Australia) and 99% of basal cell and squamous cell carcinomas [5]. Summer UVR levels in NZ are ~40% higher than those measured at similar latitudes during northern hemisphere summers [6], and are experienced by a largely European, 'displaced' population susceptible to the negative effects of high UVR.

Evidence from case–control and migrant studies indicates that excessive childhood UVR exposure increases the risk of melanoma [7] and other skin

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cancers [8]. Given that 'sun exposure in the first 10 years of life determines to a substantial degree the lifetime potential for skin cancer', this provides 'a very strong case on epidemiological grounds for giving priority to the control of early life sun exposure' [5]. The primary prevention objective of the New Zealand Cancer Control Strategy to 'reduce the number of people developing skin cancer due to UV radiation exposure' [9], identifies school settings as a priority [10]. Students can spend considerable time outdoors during school hours, in both organized and discretionary activities, so a supportive school environment has the potential to moderate UVR exposure and subsequent skin cancer risk. A systematic review concluded that there was 'sufficient' evidence that education and policy approaches can be effective for increasing sun protective behaviours in primary school settings [11]. That conclusion is supported by an economic evaluation of the US EPA 'SunWise' programme, a school-based skin cancer prevention program similar to the SSAP, which concluded that for every $1 invested, between ~$2 and $4 in medical care costs and productivity losses were saved [12].

The WHO recommends a comprehensive approach to school sun protection policy and practices including classroom teaching, the education of parents and caregivers and an award system to acknowledge effort [13], similar to the Australian SunSmart Schools Accreditation Program (SSAP) [14]. In Australia, accredited schools have higher levels of policy and practice than non-accredited schools and, consistent with findings for Massachusetts childcare centres [15], the inclusion of specific aspects of sun protection in written policy was linked to corresponding practice in all programme areas except shade adequacy [16]. SunSmart policies and practices are widespread throughout Australian primary schools, with a 2005 evaluation of the national SSAP reporting that 52% of schools had SunSmart status, with 85% of students wearing protective hats [17]. In NZ in 2005, no schools fully met NZ SSAP criteria [18].

The drafting of a sun protection policy acknowledges the ubiquitous nature of sun protection and the need to address it comprehensively, indicates a degree of commitment to finding solutions and provides a yardstick against which progress can be assessed. The implementation process can be facilitated through promotion of a basic template for a generic SSAP policy, which schools can adapt as required. 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.

In NZ, a nationwide SSAP, modelled on the Australian programme, was launched in October 2005. Schools must meet 12 criteria to achieve accreditation (Table I, columns 1–3). Cross-sectional findings for school surveys in 2005 and 2009 are reported elsewhere. [18, 19] For the 189 schools assessed both before the 2005 national launch of the SSAP and again in 2009, the present study investigates, first, changes since baseline levels and second, statistical predictors of mean Total Accreditation Scores (TAS) in 2009. Finally, some perceived barriers and facilitators to achieving sun protection at school, investigated only in 2009, are reported.

Methods

The NZ SSAP requires schools to meet 12 criteria for accreditation (Table I), as described in full elsewhere [18]. In summary, these criteria relate to the need to: have a sun protection policy for Terms 1 and 4 that is reviewed every 3 years; provide information about that policy to parents, students and staff; require students to either wear a hat when outdoors or play in the shade; encourage the wearing of other sun protective clothing; encourage sunscreen use and make it available at school; encourage role modeling by staff; include sun protection education in the curriculum; include sun protection planning for all outdoor events; try and reschedule outdoor activities outside peak UVR periods; provide, or work towards providing, adequate environmental shade. The total number of these 12 criteria met by a school constitutes the Total Accreditation Score (TAS) of that school. Support for programme implementation is provided by regional and national

Table I. *Minimum criteria for SSAP accreditation, and percentages of 189 schools attaining each criterion, based on survey responses, 2005 and 2009, ranked by percentage change*

Abbreviated name	Minimum criteria	Requirement to meet[a]	2005 (%)	2009 (%)	Change (%)
1. Play in shade	Students not wearing a hat are required to play in allocated shade areas	(1) Hat wearing enforced (2) Consequences for students not wearing hats	75.8	90.1	+14.3
2. Sunscreen	The use of SPF 30+ broad spectrum sunscreen is encouraged.	(1) Students 'actively encouraged' to wear sunscreen (2) SPF 30+ sunscreen available at school	65.8	79.7	+13.9
3. Hats	All students wear a broad brimmed (min. 7.5 cm brim), legionnaire or bucket hat (min. 6 cm brim, deep crown) when outside.	(1) Hat wearing enforced (2) Broad-brimmed, legionnaires or bucket hats 'only' used at school	60.6	74.0	+13.4
4. Clothing	The use of sun protective clothing is encouraged (e.g. sleeves and collars).	(1) Students encouraged to wear shirts with collars and longer sleeves (2) One of the following is true: (a) uniform schools had sun protective options (b) non-uniform schools require midriff covered and ban singlets/spaghetti strap tops	32.0	43.3	+11.3
5. Shade	The school has sufficient shade or is working towards increasing the number of trees and shade structures, so as to provide adequate shade in the school grounds.	(1) One of the following is true: (a) substantial shade for active and passive activities (b) definite plans to increase shade in next 12 months.	41.4	51.5	+10.1
6. Policy	The sun protection policy is implemented during Terms 1 and 4, when UVR levels are most intense.	(1) Either a sun protection policy or a sun protection section in the Health and Safety Policy is in place (2) Copy of policy returned with survey	56.5	61.0	+4.5
7. Review	The Board of Trustees and Principal review the sun protection policy regularly, including making suggestions or improvements at least once every 3 years.	(1) Sun protection policy or section of policy is in place (2) Copy of policy returned with survey (1) Reviewed at least every 3 years	56.5	61.0	+4.5
8. Information	All staff, students and parents/care-givers are to be informed of the skin protection policy and its intended practices.	(1) Some information given to parents/care-givers at enrolment (2) At least three methods used to convey general sun protection messages at school	82.8	87.2	+4.4
9. Curriculum	SunSmart education programmes are included in	(1) Extended teaching on sun protection taught at all levels every year	52.5	55.4	+2.9

(continued)

Table I. *Continued*

Abbreviated name	Minimum criteria	Requirement to meet[a]	2005 (%)	2009 (%)	Change (%)
	the curriculum at all levels every year.				
10. Rescheduling	Outdoor activities are rescheduled, whenever possible, to minimize time outdoors between 11 am and 4 pm.	(1) At least two of these eight are true: (a) assemblies held indoors, under shade or before 11 am (b) lunch is eaten in shaded areas or indoors (c) teachers asked to use shade for outdoor classes after 11 am (d) PE classes held before 11 am (e) outdoor excursions scheduled early in the day where possible (f) children can stay indoors on fine days for breaks (g) sports days before 11 am or after school (h) extended morning tea break/ short lunch break	89.1	90.7	+1.6
11. Planning	The sun protection policy is reflected in the planning of all outdoor events (e.g. camps, excursions, sporting events).	(1) One of the following is true: (a) sunscreen is available for student use on specific occasions (b) sports days are held before 11 am or after school hours (c) outdoor excursions are scheduled early where possible	73.7	74.7	+1.0
12. Role modelling	Staff are encouraged to act as role models by practising SunSmart behaviours.	(1) Staff encouraged to wear broad-brimmed, bucket or legionnaire hat	90.2	90.0	−0.2

[a]Schools to meet each point listed, with some subpoints, as outlined.

Cancer Society of New Zealand (CSNZ) health promotion staff, including a comprehensive national website.

Sampling

At baseline, a 10% random sample (200 of 1999 eligible, non-private schools—i.e. 'state' or 'state integrated' schools that represent 99% of the NZ primary school population catering for primary-age children) was randomly selected, within geographical regions corresponding to CSNZ Divisions and Centres, from the Ministry of Education schools database (March 2005) [18]. To replace non-responders, 72 schools (randomly selected within region) were added to the 227 initially selected at random to participate. Additional schools ($n = 27$) were randomly selected to raise the number within each of the 11 CSNZ centres at that time to a minimum of 16, producing 242 participants, overall. This allowed the percentage of schools which reported following any particular criterion to be estimated using 95% confidence intervals (95% CI) ± 25% within centres and ±7% overall. Subsequent CSNZ re-organization grouped all

centres into six Divisions (Table I), and the analyses reported here were adjusted accordingly. Three institution types were represented: Full Primary (Years 1–8; age 5–13 years), Contributing (Years 1–6; age 5–11 years) and Composite/Area (Years 1–13; age 5–18 years) schools (Table I).

Instrument

The mail survey instrument to assess school sun protection policy, practices, curriculum and environment was adapted from Australian precedents [20], in consultation with the CSNZ staff developing SSAP application forms. Minimum requirements to meet SSAP criteria (Table II) were directly related to the application form. 'No weighting was proposed by the CSNZ for the components of their programme and, since non-subjective weighting was considered to be difficult both to achieve and justify, each criterion was treated as of equal weight. The CSNZ proposed that although all criteria would need to be met in order to achieve accreditation, no arbitrary level of compliance was required for entry at baseline—the goal being to facilitate participation, avoid erecting barriers and measure progress towards meeting the SSAP criteria' [18]. Additional questions unrelated to accreditation scores, investigated obstacles to sun protection.

At baseline, no survey question dealt directly with regular review of policy documents. Initial assessment of this criterion simply reflected the provision of a sun protection policy, because schools are generally required to demonstrate to the Education Review Office (ERO) that health- and safety-related policies follow 3-yearly review cycles. However, in 2009, a specific survey question was asked: 'Do your Board of Trustees and Principal review the sun protection policy or guidelines at least every 3 years?'

Procedures

As in 2005 [18], the 2009 survey was mailed (2 September) directly to principals. A Freepost pre-addressed envelope was enclosed and respondents were requested to return completed questionnaires and copies of school sun protection policies or related documentation. Scheduled follow-ups were by email (23 September) and post (23 October—which included an extra questionnaire in case the original was misplaced). Further email and telephone reminders followed, as required. Where possible, the principal was contacted directly and urged to complete the survey in order to facilitate a representative summary of the primary school situation.

All participants were asked to respond to the questions in relation to their primary students (Y1–6) and practices in Term 1 (early February to mid-April) and 4 (early October to late December)—when ambient solar UVR can reach 'very high' or 'extreme'

Table II. *Characteristics of all eligible schools with primary age children in 2009, and schools in 2009 which participated in both the 2005 and 2009 surveys*

School characteristic	All eligible schools, 2009 ($n = 1972$)	Survey schools, 2009 ($n = 189$)	
Integration status	%	%	*n*
State	87		167
State-integrated	13	12	22
Socioeconomic decile			
1–3 (low)	31	29	54
4–7 (medium)	38	42	79
8–10 (high)	31	30	56
School type			
Full primary	55	54	103
Contributing	40	42	80
Composite	5	3	6
School size			
<50	19	20	37
51–100	14	14	27
101–200	25	30	57
201–400	26	22	41
>401	16	14	27
CSNZ Divisions[a]			
Auckland/Northland	24	23	43
Waikato/Bay of Plenty	19	17	33
Central Districts	20	21	40
Wellington/Tasman	13	17	32
Canterbury/W Coast	14	13	24
Otago/Southland	10	9	17

[a]The listed regions are presented from North to South, and correspond with the current structure of the CSNZ, incorporating the merger of smaller centres under Divisions.

levels [21] and sun protection is recommended. Ethical approvals were obtained following University of Otago guidelines.

Analysis

Most survey measures used fixed response options, but for some (mainly those about perceptions of barriers and facilitators) an 'other' option was provided, allowing alternative responses to be recorded, collated into 'themes' and coded as discrete responses. Responses to survey questions determined the attainment of each criterion, the abbreviated name of which (Table I, column 1) is used hereafter. A TAS between 0 and 12, represented how many SSAP criteria (Table I, column 2) were attained. As the mean TAS was of primary interest, statistical testing was not performed on the components of the score. In line with it being dropped from CSNZ SSAP assessments, our analyses did not include the 2005 requirement for there to be '≥90% students wearing hats outdoors in Terms 1 and 4'. When comparison was made with the 2009 findings, the previously reported 2005 results [18] were adjusted to take this into account.

A general linear model was used to estimate the effects of school factors (roll, socioeconomic decile and type), and geographic region on the TAS, with sampling and post-stratification weights to compensate for oversampling within some regions and differential response rates between regions, using the number of schools per region in 2009. These weights were also used in estimating mean scores, percentages providing particular responses, and percentages achieving each criterion. In order to explore the potential effects of schools being lost to follow-up between 2005 and 2009, sensitivity analyses were conducted for all models with TAS as an outcome where the 53 schools not followed up in 2009 had their 2009 TAS estimated as their 2005 score plus a Normally distributed random variable with a mean of zero and the same standard deviation as the change in TAS between 2005 and 2009 for the other 189 schools, that is, on average with no change to the score between 2005 and 2009. For such schools, their 2009 characteristics (institution type, school size and school decile) were assumed to be the same as for 2005. Stata 11.2 was used for analysis and all tests were performed at the two-sided 0.05 level. *P*-values between 0.05 and 0.10 are noted as tendencies where this is considered appropriate in highlighting areas for further study.

Results

In 2009, 189 of the 242 schools which participated at baseline agreed to be followed up. There was no evidence of differences between those 53 schools from 2005 lost to follow-up and those retained in terms of baseline TAS score ($P = 0.160$), region ($P = 0.519$), school type ($P = 0.054$), school decile ($P = 0.720$), or school size ($P = 0.434$). The 189 schools followed up were similar to all NZ schools with primary age children (Table II). Because of the 'boosting' to minimum numbers in each of the smaller centres, the geographical distribution of participating schools was somewhat different to the national distribution, with higher participation from Divisions which contained smaller centres in the original sampling. Overall, participating schools' responses are likely to have provided a representative and comprehensive picture of sun protection practices in NZ primary schools.

Changes in percentages of schools meeting criteria

Compared with 2005, increase in the percentages of schools meeting each of the 12 accreditation criteria were observed in 2009, except role modeling which dropped slightly to become the second most frequently attained criterion, marginally below play in the shade (Table I). The greatest increase was found for play in the shade, sunscreen and hats, followed by other clothing and environmental shade. The smallest increase was found for planning, followed by rescheduling and curriculum. The clothing component remained the least frequently attained SSAP criterion, followed by shade, then curriculum.

Mean TAS: change over time and its association with region and school factors

The percentages of the 189 schools attaining one or more of the 12 SSAP criteria in each of the two surveys are presented in Table III. Overall, mean TAS statistically significantly increased from 2005 to 2009 (Table IV). All mean regional scores increased between the survey years, although some increases were not statistically significant, with the Waikato/Bay of Plenty TAS increasing the most. The sensitivity analysis using data from all 242 schools showed a slightly smaller, but still statistically significant, increase of 0.7 in mean TAS (95% CI 0.4–1.0, $P < 0.001$).

Statistical modelling of mean TAS was undertaken with potential predictor variables including geographic region (six CSNZ Divisions), school roll (five categories), institution type (three categories) and socioeconomic decile rating (three categories). In both 2005 and 2009, among the 189 schools followed up, institution type was not a statistically significant predictor ($P = 0.133$ and $P = 0.660$), after controlling for differences in roll, region and decile. Neither school decile rating in either year ($P = 0.397$ and $P = 0.260$) nor size in 2005 ($P = 0.431$) were associated with TAS. Size was statistically significantly associated with TAS in 2009 ($P = 0.036$) with higher scores in schools with rolls 51–100 (1.2 higher, 95% CI 0.2–2.1, $P = 0.014$) and 101–200 (1.4 higher, 95% CI 0.5–2.3, $P = 0.003$) than <50, but no evidence of higher scores in larger schools (201–400: 0.7 higher, 95% CI −0.3 to 1.7, $P = 0.192$ and 400+: 0.8 higher, 95% CI −0.2 to 1.9, $P = 0.129$). TAS varied significantly by region in 2005 ($P = 0.014$) and in 2009 ($P = 0.013$) There was no clear pattern of scores differing either between urban and rural regions or the North and South Islands. Differences in mean TAS between categories of schools for both 2005 and 2009 had sufficiently wide confidence intervals (all included at least a difference of 1 and some extended beyond 3 in 2005) that important practical differences between school types could not be ruled out (data not shown). The sensitivity analysis showed comparable results for mean TAS based on school characteristics to those reported above using data from all 242 schools.

The results of an investigation of school characteristics (type, size and socioeconomic decile) as potential predictors of change in mean TAS are reported in Table V. A number of characteristics reached statistical significance for within-group changes, but there was evidence of between-group differences in 2009 scores after adjusting for 2005 scores for school size only, producing an n-shaped distribution with greater change observed in schools with medium size rolls, and not for school type or school decile.

Table III. *Percentages of 189 schools achieving TAS by survey year*

Total accreditation score	2005 amended (%)	2009 (%)
12	0.9	4.2
11	9.5	15.5
10	13.6	19.4
9	14.8	15.6
8	21.7	16.1
7	12.8	12.3
6	8.5	9.3
5	10.5	3.4
4	4.6	3.1
3	2.0	1.2
2	0.6	0.0
1	0.6	0.0

Sun protection barriers and facilitators

For each of these questions a free response option was provided and multiple responses permitted. All 189 respondents were asked 'What obstacles (if any) has your school encountered in addressing sun protection at school'. From a list of nine options the 'cost of shade development' was most frequently reported (57%), followed by 'cost of sunscreen' (31%), 'limited support by parents' (13%) and limited student cooperation (11%). Other respondents identified that sun protection was 'not a priority for the Board of Trustees' (3%), and that 'limited support' by staff (3%) and the principal (1%) were barriers.

Table IV. *Number of eligible schools 2009, and mean TAS of 189 surveyed schools by region/year*

Cancer Society Divisions —North to South	Eligible schools 2009 *n*	Mean TAS 2005	Mean TAS 2009	Change 2005–09[a]	95% CI	*P*-value
1. Auckland (including Northland)	478	7.3	7.9	+0.6	(−0.2 to 1.4)	0.158
2. Waikato/Bay of Plenty (including Rotorua and Tauranga)	379	7.9	9.4	+1.5	(0.8 to 2.1)	<0.001
3. Central districts (including Gisborne, Hawke's Bay, Manawatu, Wanganui and Taranaki)	395	7.7	8.3	+0.7	(−0.1 to 1.4)	0.106
4. Wellington (including Kapiti, Wairarapa, Nelson and Marlborough)	252	7.9	8.7	+0.8	(0.0 to 1.5)	0.041
5. Canterbury (including West Coast)	272	8.6	9.3	+0.7	(−0.1 to 1.5)	0.096
6. Otago and Southland	196	7.3	8.1	+0.8	(−0.5 to 2.0)	0.224
Combined	1,972	7.8	8.6	+0.8	(0.5 to 1.2)	<0.001

[a]Test for differences between regions in 2009 scores adjusting for 2005 scores is statistically significant ($P = 0.024$).

Table V. *Number of schools in 2009, mean TAS of 189 surveyed schools by institution type, roll size, socioeconomic decile/year and change from 2005 to 2009 with 95% CI and P-values*

School characteristic	*n*	Mean TAS 2005	Mean TAS 2009	Change 2005–09[a]	95% CI	*P*-value
Institution type						
Composite	6	6.8	8.5	+1.7	(0.7 to 2.8)	0.001
Contributing	80	8.0	8.5	+0.4[b]	(−0.1 to 0.9)	0.119
Full primary	103	7.6	8.7	+1.1	(0.6 to 1.5)	<0.001
Roll size						
<50	37	7.4	7.9	+0.5	(−0.4 to 1.3)	0.290
51–100	27	7.5	8.8	+1.3	(0.5 to 2.2)	0.001
101–200	57	7.9	9.2	+1.3	(0.7 to 1.8)	<0.001
201–400	41	7.6	8.3	+0.7	(0.0 to 1.4)	0.043
>401	27	8.4	8.4	+0.1[b]	(−0.8 to 0.9)	0.890
Socioeconomic decile						
1–3 (low)	54	7.1	8.2	+1.1	(0.5 to 1.7)	0.001
4–7 (medium)	79	8.0	8.9	+0.8[b]	(0.3 to 1.4)	0.004
8–10 (high)	56	8.0	8.6	+0.6	(0.0 to 1.2)	0.055

[a]Test for differences in 2009 scores adjusting for 2005 scores was statistically significant for differences in school sizes ($P = 0.032$), but neither types ($P = 0.179$) or decile ratings ($P = 0.548$).
[b]Rounding effect.

However, when respondents for the 133 schools which had not yet applied for accreditation were asked 'What has prevented your school from applying for SunSmart Schools accreditation', responses to a list of nine options indicated that the school was 'not aware of the programme' (39%), accreditation was 'not a priority for the school community at this time' (32%), the school had 'just not got around to it' (22%), staff 'don't know what's involved' (24%), 'don't know how to apply' (20%), 'lack of time' (21%), 'don't see any advantages in applying' (9%), 'too difficult to comply with the requirements of the programme' (6%) and a 'lack of resources' (3%).

When this same group of schools responded to the question 'What would encourage your school to apply for SunSmart Schools accreditation', the following were identified from eight options: 'more information about the programme' (61%), better resourcing for schools (30%), greater assistance with policy development (14%), 'more advantages for schools that apply to the programme' (13%) and training workshops for staff or Board of Trustees members (6%).

For only 9% of schools was it reported that, in the last 12 months, issues had been raised at school regarding 'information about vitamin D levels and sun exposure', but 47% of these respondents indicated that it 'had an impact' on school sun protection policy or practices. Overall, most respondents (77%) agreed that 'further information about the role of Vitamin D in health would be useful' at school.

All respondents were provided with a list of four options and asked 'from which of the following has your school had input regarding sun protection policy and/or procedures at your school'. The most frequent response was the CSNZ (51%), followed by Health Promoting Schools (50%), public health nurses (34%) and the Fruit in Schools Programme (17%)—a programme for low decile schools with a sun protection component. The mean TAS of schools acknowledging receipt of health promotion input from the Health Promoting Schools programme tended to be non-statistically significantly higher by 0.5 (95% CI −0.1 to 1.1, $P = 0.082$) and was statistically significantly higher by 1.1 (95% CI 0.5–1.7, $P < 0.001$) for schools acknowledging receipt of health promotion input from the Cancer Society. Similar results were obtained following the sensitivity analysis for Health Promoting Schools (mean TAS 0.5 higher, 95% CI −0.1 to 1.1, $P = 0.084$) with a smaller, but still statistically significant effect from the Cancer Society (0.6 higher, 95% CI 0.1–1.2, $P = 0.023$).

Discussion

In 2009, although most of the 189 participating schools followed up still only partially addressed sun protection, many had increased the number of ways in which they did this since baseline. However, relatively low levels of attainment were observed for some SSAP components, in particular, clothing (43.3%), shade (51.5%) and curriculum (54.4%). Despite an 11.3% increase, the clothing criterion remained the least frequently attained, but was not identified among reported obstacles to addressing sun protection at school. However, clothing issues were not specifically listed among the fixed response options provided, developed from 2005 survey free responses, thereby not cueing such a response. Nevertheless, a free response option was available. As reported elsewhere, schools with uniforms tended to have more protective clothing expectations than non-uniform schools—where singlet wearing, uncovered midriffs and lack of a shirt for outdoor activities were much more common [19]. However, some uniformed schools required less protective summer options to be worn, for example, shorts and skirts which fell above the knee. Overall, the SSAP clothing requirements presented challenges, lacked a high profile among respondents and need greater attention. Possible reluctance by some school administrators to more actively encourage the wearing of sun protective clothing may relate to anticipated resistance from some students and parents, which could require effort to overcome. In order to achieve significant improvement, advocacy may be required for manufacturers to produce, and distributors to promote, more attractive and affordable sun protective clothing options. To some extent, this has already been achieved with respect to hats, and the wearing of protective hats was more often attained. Although substantially better than levels reported in the northern hemisphere [22, 23], the 74% of NZ primary schools that met SSAP hat requirements compares less favourably with the 85% attainment of schools in Australia [17]. A sponsorship programme for hats in low decile NZ schools has recently been initiated, so further progress is anticipated.

For shade, although there was a 10.1% increase, still only 51.5% met SSAP requirements. The 'cost of shade development' was a fixed response option provided in the questionnaire and also the most

commonly mentioned obstacle to addressing sun protection at school (57%), thereby providing a clear message that environmental shade requires greater resourcing. The cost of shade has to be met through a school's operational budget, which is influenced by school roll size and socioeconomic decile. An indication that this funding is often not sufficient to cover even basic education costs, is provided by the fact that schools often request 'contributions' from parents, despite a nominally 'free' public education system. In our qualitative report based on 22 on-site visits, we concluded that 'financing shade was a recurring problem across most of the schools visited' [24]. In some cases, specific fund raising efforts were made to help meet the cost of installing environmental shade. Some schools mentioned that the provision of verandas in school building plans had been removed, at higher administrative levels, for cost reasons. Failing the routine provision of adequate shade, sponsorship is a possibility, although it would be relatively more costly than recent hat sponsorship and may exacerbate social inequalities. Furthermore, as stated elsewhere, 'The provision of adequate shade can be costly and requires professional guidance to achieve optimal placement at the required time' and 'considerable improvement would probably be achieved if shade was required to be considered in all building plans' [18, 19]. Although a very thorough NZ published shade manual is available [25], the cost of implementation and maintenance is likely to remain a barrier in the absence of stronger incentives and sufficient funding options from health and/or education authorities.

The curriculum criterion was met by only 55.4% of schools and only a 2.9% improvement was observed over a period of 4 years. Even assuming an (unlikely) equivalent annual increase, it would require many years to reach full curriculum criteria compliance. As with clothing, curriculum issues were not itemized as an obstacle among fixed response options, but neither were they identified in free responses. A variety of age appropriate curriculum resources are available through the SunSmart Schools' website and elsewhere, but further promotion and efforts to increase motivation to integrate resources into the curriculum would seem to be required. Integration may be hindered by the need to go through review and approval processes, and hesitation in initiating these related to fears of disrupting school personnel and students.

Vitamin D issues were reported by ~9% as having had 'an impact' on sun protection policies and practices. This finding could be interpreted as indicating that extensive media coverage, often critical of sun protection, had little impact on implementation of the SSAP. Nevertheless, it will remain important to be prepared to address such potential challenges by taking a comprehensive health promotion perspective to ensure that sun protective practices do not create unnecessary barriers against other health goals, such as the need for children to be physically active and maintain vitamin D sufficiency. The aim with respect to UVR exposure is that 'there should be no need to accept an increased risk of diseases of excessive exposure, in order to achieve minimal risk of diseases of underexposure' [4].

Among the 133 schools that had not yet applied for accreditation, the most commonly mentioned obstacle was not being 'aware of the programme' (39%) and the most commonly mentioned facilitator was 'more information about the programme' (61%). Closely related to these two factors were reports that staff did not know what was involved or how to apply, and schools were reported as lacking time and resources. Nevertheless, there was also some suggestion of inertia on the part of schools that had 'just not got around to it', and some indication of perceptions of limited advantages in applying. Assistance with policy development and training were identified as potential facilitators. Clearly, there was a widespread perceived need for greater SSAP promotion. Since survey completion, a number of initiatives should have helped to facilitate programme uptake, these include the appointment of a full-time, permanent SSAP national coordinator, development of a national electronic SSAP database for health promoters' use, upgrading of the SSAP website, training of volunteers to support schools and a hat sponsorship programme for low socioeconomic decile schools.

Multivariable analysis of factors associated with the TAS identified that region and two sources of health promotion input were independent predictors. Direct input from these programmes had a measurable, positive impact on SunSmart policy and practices at school. This is a commendation, but the greatest challenge will be to achieve comprehensive protection in all remaining schools, once the easier gains have been consolidated. There are similarities here with the Smokefree Schools programme, an initiative to prohibit smoking throughout school buildings and grounds which was originally also promoted by NGO's, but which eventually required regulatory intervention in order to achieve universality and sustainability [26]. In the meantime, the positive association between TAS and acknowledgement of CSNZ health promotion activity suggests that national programme coordination reinforced by regionally integrated health promoters with local knowledge and networks is a useful model. Looking ahead, the CSNZ probably has two key roles, first, to continue to promote and consolidate the SSAP, including through local school 'clusters' and, second, to advocate for its greater integration into routine health and safety practice, but without compromising the well-established programme profile.

The observed pattern of regional association was not related to urban or rural status, or differences between the North and South Islands. Although not possible to quantify, it is plausible that differences in attainment are related to the resources applied in different regions. Resource allocation to specific programmes, such as the SSAP, varies across regions according to Divisional management decisions. The Auckland region is challenged by having the greatest number of schools, a widely distributed and ethnically diverse population, so is likely to require equivalently greater resources to achieve parity with other regions. This regional challenge is reflected in internal CSNZ documentation which indicates that, nationally, Auckland currently has the third lowest level of accreditation. Unfortunately, comparable regional resource data are not available. Furthermore, some CSNZ appointments involve flexible working in more than a single role/topic area, making it difficult to quantify staff time allocated to promotion of the SSAP. More explicit and regionally proportional resource commitment to the SSAP should help to reduce regional differences.

Although significant changes in mean TAS from 2005 to 2009 were observed across some but not all categories of institution type, school socioeconomic decile rating and roll size, only the latter was statistically significant when 2009 scores were adjusted for those in 2005. The observed n-shaped distribution is difficult to interpret, although it is possible that schools of modest size are better placed to implement SSAP policies, with less competition from the 'other priorities' that tend to be associated with large size and better resourcing than the smallest institutions.

Study limitations

The present study was based on reports from school staff, which may overestimate positive practices. All principals participate in school board of trustees meetings and so should be aware whether or not their school has a sun protection policy. However, particularly if recently appointed, a principal may not be fully aware of some details in the policy, for example, how it is applied to specific contexts, how physical activity may be rescheduled or how particular outdoor areas are utilized. This may be a limitation with respect to self-reported policy details. However, complementing this study, on-site visits were conducted to 22 schools, and there was broad agreement between practices reported as survey data and qualitative observations [24].

The measures included in the survey instrument were based on Australian precedent and not specifically tested for validity or reliability within the NZ context, but were similar to the SSAP application form in use for >5 years. The study used a one-group pre- post-design so observed changes cannot be attributed to any specific factor. As many of the school-level effects on mean TAS had wide confidence intervals including values that could be considered of practical importance, despite the statistical non-significance of these effects, we

are unable to rule out associations that could have important public health significance. It would have been valuable to be able to discuss study results in relation to promotional efforts undertaken for the SSAP, for example, whether some policy components were promoted more actively than others or whether policy promotion differed among the CSNZ Divisions and between Health Promoting schools, public health nurses, the Cancer Society and the Fruit in Schools Program. Unfortunately, there was no systematic, national documentation of such issues by these agencies which would make this possible. However, subsequent to the follow-up period, there has been documentation of a CSNZ promotion of hat wearing through a Telecom sponsorsed partnership programme for low socioeconomic decile schools.

Conclusions

Although there has been progress towards making NZ primary schools safer for students with respect to sun protection, there remains much room for improvement, particularly in comparison with Australia [16]. Lowest attainment was reported in the areas of clothing protection, curriculum delivery, shade provision and policy. There is a need to assist schools in strengthening their sun protection policies and practices, overall, but especially regarding clothing, shade and better utilization of available curricular materials.

Observed regional variability in TAS is open to interpretation, but additional resources to implement and sustain the SSAP could be anticipated to help increase attainment. The positive association found between receipt of health promotion input and total SSAP scores in multivariable analysis provides evidence of the positive impact of health promotion efforts in helping to establish the programme. However, the resources likely to be required in order to achieve universality and sustainability of sun protection suggest the need for regulatory authorities to accept responsibility to address this issue through those institutions, public schools, for which they have responsibilities. Sun protection is an acknowledged health and safety strategy, arguably little different from other injury prevention measures, or the provision of hygienic facilities. Therefore, it seems anomalous that it should remain largely the responsibility of NGO health promoters and a charity to not only develop, implement and evaluate the SSAP, but also to continue to resource it in the absence of appropriate commitment at public service level. The Ministries of Health and Education could make collaborative efforts to help ensure the universal implementation and sustainability of this well established and positively evaluated programme through its integration into broader health and safety practice.

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Conflict of interest statement

None declared.

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