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Knowledge, attitudes and self-care practices related to sun protection among secondary students in Australia

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Abstract

The aim of this research was to ascertain changes in sun-related knowledge, attitudes and self-care practices among Australian secondary school students between 1993 and 1996. Two cross-sectional surveys of sun-related attitudes, beliefs and behavior of young people aged 12–17 years of age, were conducted in 1993 and 1996. Over 80% of adolescents at both time periods knew about the issues related to skin cancer prevention, frequency of burning and burning on cloudy days. Adolescent attitudes had shifted positively in the areas of staying inside in 1996 [relative risk (RR): 1.13; 95% confidence interval (CI): 1.09–1.17] and staying under shade in 1996 (RR: 1.16; 95% CI: 1.13–1.18). Desire for a moderate or dark tan was lower in 1996 (45%) than in 1993 (50%). Respondents reported that they were less likely to wear brief clothing to get a suntan in 1996 (RR: 0.81; 95% CI: 0.78–0.84) and were significantly more likely to stay in the shade in 1996 (RR: 1.19; 95% CI: 1.16–1.23). We conclude that there has been a shift in attitudes towards use of shade and avoidance of unnecessary exposure, and away from use of sunscreens and sunglasses. The results suggest that adolescents may be more ready to accept structural changes that move desired activities out of the sun.

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Introduction

Skin cancer is the most commonly diagnosed cancer in Australia, and causes significant mortality and morbidity (Giles *et al*., 1988; Marks *et al*., 1993), with an estimated 155 000 new cases (Carter *et al*., 1998) and over 1000 deaths each year; melanoma contributes to 80% of cases (Jelfs *et al*., 1996). Incidence rates of non-melanocytic skin cancer continue to rise in Australia (Staples *et al*., 1998), but evidence of a reduction in basal-cell carcinoma has been shown in younger age groups (Staples *et al*., 1998). Both melanoma and non-melanocytic skin cancer cost the Australian community an estimated A$297.5 million in direct health system costs (1993/4) (Mathers *et al*., 1998). A reduction in skin cancer incidence would have direct health system cost savings to the government (Mathers *et al*., 1998).

Epidemiological evidence has implicated childhood exposure to ultraviolet radiation as an important cause of skin cancer (Coombs *et al*., 1992; Harrison *et al*., 1994). Exposure in adult life appears to be less important (National Health and Medical Research Council, 1996). Adolescence is a period of greatest susceptibility to skin cancer, as the target cells are still immature (Hurwitz, 1988; Hill *et al*., 1992). However, during this time, there is a rapid decline among adolescents in using skin protection due to fashion trends and peer pressure (National Health and Medical Research Council, 1996; Lower *et al*., 1998), despite this group possessing knowledge about the implications of sun exposure (Arthey and Clarke, 1995), and compares with attitudes towards sun protection which are generally positive in primary school

(Dixon *et al*., 1999). Adolescence is an important developmental period to target strategies aimed at reducing sun exposure. This holds great potential to reduce the incidence of skin cancer (Marks and Hill, 1988).

In Australia, mass-media campaigns about skin cancer, which have incorporated comprehensive, behavioral-based (Green and Kreuter, 1991; Borland, 1992) health promotion strategies (Hill *et al*., 1993a), have been promoted since the early 1980s. These strategies have been adopted by the member organizations of the Australian Cancer Society. Although the activities varied across States, the focus was on the promotion of hats, appropriate clothing, application of sunscreen, use of sunglasses, seeking shade or remaining indoors (particularly within 2 h each side of the solar noon) to improve sun protective behaviors among young children and teenagers (Hill *et al*., 1992).

The National Health and Medical Research Program (1996) identified the need for school health programs to focus on curriculum, school environment, and partnerships between schools, community, parents and private or government organizations. In Victoria, the 'SunSmart' skin cancer control school's program, which was launched in 1988 (Sinclair *et al*., 1994; Peiper, 1999), provides training and curriculum resources to educators, to enable implementation of the SunSmart programs in institutions from pre-school to university. Schools are encouraged to practice SunSmart activities in three broad areas, i.e. provide structural change to reduce sun exposure among students, provide skin cancer lessons in the curriculum, and encourage sun protection behavior among staff and students. In 1996, the South Australian and Tasmanian cancer organizations introduced their own SunSmart school programs. By 1998, most States embraced an amalgamated national schools program.

Similarly, programs such as the National Skin Cancer Awareness Week, which have been promoted by the Australian Cancer Societies since 1984, have focused on how school children play outside using sun protection and how they learn about sun protection. The Australian Cancer Societies have attempted to extend existing primary school programs into the secondary school system with limited success. The National Skin Cancer Awareness Week promotion targeted adolescents for the first time in 1988. Although adolescents have high levels of knowledge about the risk of skin cancer, this knowledge often does not translate into behavior (Cockburn *et al*., 1989). In addition, their perceptions of the negative consequences of sun exposure are considered too far into the distant future to warrant immediate behavioral change (Svenson, 1984). However, specific programs, such as 'Me No Fry' which commenced in New South Wales in 1990/91 and Western Australia in 1994/5, have been directed at adolescents, and deliberately attempted to fit into the preferred fashions and assumptions of the Australian youth culture. These campaigns have proven successful by introducing favorable sun-safe attitudes and behaviors among young people aged 11–16 years (Baade *et al*., 1996).

The first national survey of school children was in 1993 (Lowe *et al*., 2000), several years after the introduction of the comprehensive programs. The study showed that many adolescents still preferred a tan and that many were not engaging in sun protection activities such as staying in the shade or covering up.

Given the widespread campaigns aimed to improve sun protection that have developed over the last decade, one would expect increasing levels of knowledge, positive attitudes and improved behavior among adolescents that was supportive of sun protection over time. The aim of this study was to examine changes in sun exposure habits, knowledge and attitudes among a representative sample of secondary school students between 1993 and 1996.

Methods

The investigation of sun-related knowledge, attitudes and self-care practices formed part of a larger survey which included questions on tobacco and alcohol use (Hill *et al*., 1993b). The methods applied in the studies conducted in 1993 and 1996

were identical, and therefore the results from both the two studies were comparable. Schools in all Australian States and the Northern Territory formed the target population of schools.

A stratified two-stage sampling design was utilized. In the first stage, a random sample of secondary schools was drawn to represent the range of schools in each state. Schools from each education system were represented in the studies.

A total of 332 (80%) randomly selected schools in 1993 and 434 (80%) in 1996, representing 15% of secondary schools participated in the studies. Students in year levels 7–12 were surveyed and were mainly aged between 12 and 17 years although some students aged 11, 18 and 19 were also included in these year levels.

In both 1993 and 1996, members of the research team administered the pencil and paper questionnaire to groups of up to 20 students on the school premises. Students from different year levels were surveyed together. Students answered the questionnaire anonymously and completed the questionnaire under test conditions. Any questions students had were answered individually by the administrator. After the survey was completed and collected, students were given more information about the survey and any questions students had regarding the use of the information were answered.

The questionnaire was a 22-page, self-completed booklet with questions on sun behavior and attitudes as well as the use of tobacco, alcohol, illicit and prescription drugs. The development and validation of the sun-protection section of the questionnaire comprised four stages of sampling, which included an elicitation survey and group discussion, a pilot of two question formats, and a pilot of the full questionnaire. Test–re-test reliability was good (Broadstock *et al*., 1996). A subset of questions was asked on reported sunburn history, knowledge about sun protection and skin cancer, sun protection lessons in school, attitudes towards sun-protective behavior, beliefs on sun protection and skin cancer, and usual reported behavior. Age, gender and skin type were also recorded. To ascertain the overall level of knowledge among adolescents over time, knowledge was assessed using true/false categories. The variables were, 'skin cancer can be easily cured if detected early', 'you can get sunburnt on a cloudy day' and 'you only get cancer if you get burnt often'.

Adolescents' attitudes towards sun protection behavior were assessed by six items rated on the same five-point scale ranging from dislike a lot to like a lot. The items included: how much do you like or dislike: 'wearing a hat outside'; 'staying under shade'; 'covering up with clothes'; 'keeping out of the sun between 11 a.m. and 3 p.m.'; 'staying inside'; and 'wearing sunglasses'. The distribution on the variables was skewed so they were dichotomized. The variables were divided into the categories of desired responses indicating sun smart attitudes and behaviors. The items were collapsed into like or like a lot and dislike or dislike a lot. Self-care practices or behaviors were assessed through five multiple response items measured on a five-point scale, with response options ranging from never to always. The items were: thinking about sunny days in summer, when you are in the sun for an hour or more between 11 a.m. and 3 p.m., how often would you wear: 'a hat'; 'clothes covering most of your body (inc. arms and legs)'; 'deliberately less or briefer clothing so as to get some sun on your skin'; 'maximum protection sunscreen (SPF15 or 15+)'; 'stay inside'; 'stay mainly in the shade'; and 'wear sunglasses'. The items were collapsed into 'usually or always' and 'sometimes, rarely or never'.

Statistical analyses

The analyses covered students aged between 12 and 17 years. Students younger and older than the age ranges were surveyed but their numbers were too few to enable reliable estimates to be calculated. The number of students in each age group ranged from 2577 to 5704. Using 95% confidence intervals (CI), the prevalence estimates reported here were within 2.3% or better of population values.

To ensure that the disproportionate sampling of any state, school type, age or sex group did not bias the estimates, data were weighted to bring the sample into line with the population distribution (according to state, education system, age and

Table I. *Distribution of age and gender of students who participated in the survey by year*

Characteristic	1993 (n = 19 523) (%)	1996 (n = 29 850) (%)
Male	50	49
Age		
12	15	14
13	19	19
14	18	19
15	18	19
16	17	17
17	13	12

gender). The prevalence estimates were based on the weighted data. Data collected from the surveys were analysed using Stata©. Statistical methods included the use of the theory of generalized linear models to analyse the data. In particular, a Log_e link with the Binomial family was used. This enabled estimates to be expressed as relative risks (RR) and 95% CI. The independent factors measured were year (1993, 1996). Confounding variables such as gender (male, female), age (12–17 years), Australian state and school type (government, independent, Catholic) were controlled. The results of the analyses were considered statistically significant when $P < 0.05$.

Results

A total of 19 592 students aged 12–17 years in year levels 7–12 were surveyed from schools across Australia in 1993 and 29 853 students in 1996. A sample of 49 373 students with complete data remained (Table I).

In 1993, of the 358 secondary schools selected to participate in the survey, 55 refused, giving an initial response rate of 85%. A further 55 schools were approached of which 29 replacement schools (in the same geographical location) agreed to take part in the study. Thus, a total of 332 (80%) secondary schools from a total of 413 schools participated in the study. Similarly, in 1996, 464 secondary schools were selected to participate in the survey and 106 refused, giving an initial response rate of 77%. From a sample of 106 replacement schools drawn at the same time as the original sample, 77 replacement schools agreed to take part in the study. A total of 434 (76%) secondary schools participated in the study.

Knowledge

Over 80% of adolescents at both time periods knew about the issues related to skin cancer prevention, frequency of burning and burning on cloudy days. When the confounding variables were adjusted for, the risk of adolescents knowing that skin cancer is easily cured if detected early, decreased by 3% over time (RR: 0.97; 95% CI: 0.96–0.97). However, the risk of adolescents knowing that one can get sunburnt on cloudy days was 4% greater over time (RR: 1.04; 95% CI: 1.03–1.04) (Table II). There was no change in the proportion of adolescent students who knew that one could get skin cancer without getting burnt often.

Attitudes

Adolescent attitudes towards many sun-protection behaviors changed significantly over time (Table III). When the confounding variables were adjusted for, adolescent attitudes had shifted positively in the areas of staying inside in 1996 (RR: 1.13; 95% CI: 1.09–1.17), staying under shade in 1996 (RR: 1.16; 95% CI: 1.13–1.18) and covering up with clothes (RR: 1.04; 95% CI: 1.00–1.08). Positive attitudes towards staying inside and staying under shade decreased with age ($P < 0.001$, adjusted for year of survey) reaching a nadir at the 14- and 15-year-old age groups, and then either leveled off (staying inside) or steadily increased positively (stay under shade).

By contrast, students were less positive about the use of sunglasses over time (RR: 0.94; 95% CI: 0.92–0.95) and keeping out of the sun between 11 a.m. and 3 p.m. (RR: 0.95; 95% CI: 0.91–0.98). At both time periods, females liked wearing sunglasses (1993:74%; 1996:67%; $P < 0.001$) more than males (1993:55%; 1996:53%; $P < 0.001$) but the differential reduced ($P = 0.002$). A significant linear relationship for age ($P < 0.001$, adjusted for year of survey) was

Table II. *The association between adolescent knowledge of skin cancer by year, 1993–1996*

Variable	Year	*n*	True (%)	Crude		Adjusted[a]	
				RR	95% CI	RR	95% CI
Skin cancer is easily cured if detected early	1993	19 341	85.56	1		1	
	1996	27 225	83.43	0.98	0.97 → 0.98	0.97	0.96 → 0.97
You can get burnt on cloudy days	1993	19 425	89.21	1			–[b]
	1996	27 398	92.53	1.04	1.03 → 1.04		
You only get skin cancer if you get burnt often	1993	19 360	18.75	1			–[b]
	1996	27 269	18.74	1.00	0.96 → 1.04		

[a]Adjusted for age, gender, state and school type.
[b]Model unable to be attained.

Table III. *The association between adolescent self-report attitudes towards sun protection by year, 1993–1996*

Variable	Year	*n*	Like/like a lot (%)	Crude		Adjusted[a]	
				RR	95% CI	RR	95% CI
Wear sunglasses	1993	19 186	64.67	1		1	
	1996	27 123	60.25	0.93	0.92 → 0.95	0.94	0.92 → 0.95
Stay inside	1993	19 188	18.78	1		1	
	1996	27 084	21.29	1.13	1.09 → 1.18	1.13	1.09 → 1.17
Stay under shade	1993	19 183	47.41	1		1	
	1996	27 115	56.15	1.18	1.16 → 1.21	1.16	1.13 → 1.18
Cover up with clothes	1993	19 191	20.63	1		1	
	1996	27 027	21.72	1.05	1.02 → 1.09	1.04	1.00 → 1.08
Keep out of the sun between 11 a.m. and 3 p.m.	1993	19 187	23.90	1		1	
	1996	27 091	23.21	0.97	0.94 → 1.00	0.95	0.91 → 0.98
Wear a hat outside	1993	19 223	54.42	1		1	
	1996	27 189	53.78	0.99	0.97 → 1.01	0.98	0.96 → 0.99

[a]Adjusted for age, gender, state and school type.

found, with older students more likely to have positive attitudes towards use of sunglasses compared to younger people. Females were more likely than males to stay out of the sun between 11 a.m. and 3 p.m. at both time periods (1993: $P < 0.0001$; 1996: $P < 0.001$), and again 15 year olds were the least likely to stay out of the sun ($P < 0.0001$, adjusted for year of survey). There were no differences over time with adolescent attitudes with reference to wearing a hat; however, males were more likely to like wearing a hat at both time periods (1993: $P < 0.001$; 1996: $P < 0.001$) compared to females and hat use decreased with age ($P < 0.0001$, adjusted for year).

Suntan preference

Adolescents at both time periods preferred to get a moderate or dark tan, but this reduced over time (1993: 50%; 1996: 46%; $P < 0.0001$). Females preferred to get a moderate or dark tan (1993: 53%; 1996: 50%; $P < 0.0001$) compared to males (1993: 47%; 1996: 40%; $P < 0.0001$) at both time periods. For age, there was a significant quadratic effect, preference for a moderate or dark tan

Table IV. *Association between adolescent behavior and sun protection by time, 1993–1996*

Variable	Year	*n*	Usually/ always (%)	Crude		Adjusted[a]	
				RR	95% CI	RR	95% CI
Deliberately wear less/briefer clothing	1993	22 493	22.18	1		1	
	1996	27 097	18.10	0.82	0.79 → 0.85	0.81	0.78 → 0.84
Wear sunglasses	1993	22 508	43.89	1		1	
	1996	27 187	37.54	0.86	0.84 → 0.87	0.87	0.85 → 0.89
Wear SPF15	1993	22 498	65.12	1		1	
	1996	27 142	61.46	0.94	0.93 → 0.96	0.96	0.95 → 0.97
Stay inside	1993	22 533	18.77	1		1	
	1996	27 208	19.38	1.03	1.00 → 1.07	1.03	1.00 → 1.07
Stay mainly in the shade	1993	22 530	25.88	1		1	
	1996	27 261	31.05	1.20	1.17 → 1.23	1.19	1.16 → 1.23
Wear clothing covering most of your	1993	22 545	24.70	1		1	
body	1996	27 001	24.24	0.98	0.95 → 1.01	1.00	0.97 → 1.03
Wear a hat	1993	22 567	50.37	1		1	
	1996	27 213	50.41	1.00	0.98 → 1.02	1.01	0.99 → 1.02

[a]Adjusted for age, gender, state and school type.

increased with age, peaked at 15 years and leveled out thereafter.

Self-care practices

Respondents reported that they were less likely to wear briefer clothing to get a suntan in 1996 (RR: 0.81; 95% CI: 0.78–0.84) (Table IV). Significantly more adolescents reported staying in the shade in 1996 (31%) compared with 1993 (26%) (RR: 1.19; 95% CI: 1.16–1.23). Reported shade use decreased with age until age 15 ($P < 0.0001$, adjusted for year of study) where the trend reversed and increased positively among the 16- and 17-year-old age groups (Table V).

By contrast, there was a decline in reported sunscreen use (RR: 0.96; 95% CI: 0.95–0.97) and sunglasses use (RR: 0.87; 95% CI: 0.85–0.89) over time (Table IV). Sunscreen use decreased with age ($P < 0.0001$) and females were more likely to wear sunscreen rather than males ($P < 0.0001$) (Table V). A significant linear relationship was found with age ($P < 0.0001$), with sunglasses use more prevalent among the older age groups (Table V). Females were more likely to wear sunglasses compared with males at both time periods ($P < 0.0001$, for both 1993 and 1996).

Discussion

This report builds on previous research (Baade *et al*., 1996) designed to ascertain the level of knowledge, attitudes and behaviors associated with sun protection among secondary school students across Australia, and provides the first evidence of how these are changing over time.

In discussing these results, it is important to recognize the limitations of the data. First, the sample excluded students aged less than 12 years and over 17 years of age, and those who had left school at the time of the data collection. Adolescents no longer within the school system might have different attitudes and self-care practices compared to the school population. Second, adolescents' self-reported behavior may be an overestimation of actual behavior. However, as it is practically impossible to observe actual behavior over extended periods in all outdoor contexts, it is difficult to accurately determine whether this is so. Younger people have been found to exaggerate their actual behavior (Bennetts *et al*., 1992). Third, respondents were asked to report on their usual behavior over the previous summer, which was

Table V. *Adolescent self-care practices: how often do you usually or always engage in practice, by age, gender and year*

Age	Wear briefer clothing (%)		Wear SPF15 (%)		Wear sunglasses (%)		Stay inside (%)		Stay under shade (%)		Cover up clothes (%)		Wear hat outside (%)	
	1993	1996	1993	1996	1993	1996	1993	1996	1993	1996	1993	1996	1993	1996
12	13	11	72	68	35	27	22	23	31	34	30	28	64	65
13	17	14	67	65	36	31	20	20	27	32	27	26	55	56
14	21	18	64	60	41	34	18	18	25	30	25	24	49	49
15	24	21	62	59	45	40	17	18	23	28	23	23	46	46
16	28	21	62	60	51	46	18	19	25	31	22	23	45	44
17	31	24	64	60	57	51	17	18	24	32	23	23	43	43
Male	18	13	56	51	32	29	19	19	23	28	27	28	63	64
Female	26	22	75	72	55	45	19	19	29	34	22	21	38	38

some months prior to the survey. Data were collected during a period of little need for ongoing protection, particularly in the southern states of Australia. As a result, reports of usual behavior may sometimes be based on assessments of whether it is appropriate rather than whenever outside. This may add an extra bias to estimates of frequency of behavior. Finally, it is important to note that relatively small percentage changes were statistically significant and therefore the findings should not be over-interpreted. This was a by-product of the large sample size. Overall, adolescent students had high levels of knowledge of the dangers of skin cancer. Knowledge that skin cancer is easily cured if detected early decreased slightly over time. As skin cancer is extremely rare in adolescents, this may not be of concern, it may reflect the focus on prevention issues in most programs. By contrast, knowledge that you can get burnt on cloudy days improved. As this is key information for ensuing adequate protection, this change is welcome.

Adolescent attitudes changed unsystematically. Liking to stay inside and under shade increased over time, and preference for a tan declined. By contrast, liking of sunglasses decreased. Consistent with the attitudinal shifts, students reported staying in the shade more often and wearing sunglasses less often. In addition, adolescents reported less use of sunscreen, but reported deliberately wearing less or briefer clothing less often.

These patterns indicate a change in adolescent approach to sun protection towards an increased focus on natural strategies for protection and away from sunscreen and sunglasses usage. The reduced levels of desire for a tan also decreased one major factor encouraging prolonged sun exposure. From the results, it is not clear whether this has led to any change in overall exposure. Given the unchanged levels of reported hat wearing, eye protection may have decreased, although it is possible that the extra use of shade compensated for the decrease.

Wearing SPF15 was the most common form of sun protection at both time periods even though its use declined over time. This downward trend may be attributable to the fact that fewer adolescents were wearing briefer clothing outside and increasingly more adolescents were staying in the shade.

The results suggest some move by adolescents towards a preference for natural protection over use of sunscreen. This is consistent with the messages disseminated by cancer societies. Whether this shift reflects a reduced desire to go out in the sun or increased availability of desirable activities in the shade is unclear. However, it is apparent that a desire to be out in the sun is no longer as large an obstacle to encouraging sun protection as it was in the past.

Previous research (Hill *et al*., 1993b; Arthey and Clarke, 1995; Baade *et al*., 1996) also found that young people in their mid-teens have attitudes and behaviors that were the least conducive to sun protection. In Broadstock *et al*.'s study (Broadstock *et al*., 1996), there was a consistent pattern that many of the attitudes and behaviors decline from ages 12 to 15 years. This trend reversed at 16 and 17 years with a stabilizing or in some cases a level of recovery. By contrast, older students demonstrated more knowledge about issues related to skin cancer prevention than younger students. This would suggest that other factors influence the 14- and 15-year-old groups despite their knowledge of the risks of skin cancer. Peer pressure and body image may outweigh the perceived benefits of using sun protection and to disregard their knowledge of the risk of skin cancer to undertake risk behavior associated with sunburn (Arthey and Clarke, 1995). Further research is required to identify opportunities to intervene at this vulnerable time. This could include linking up with fashion magazines and other sources of media information to focus on improving the perception of clothing and hats to increase their use as sun protection measures.

Structural change is also critical to improve levels of sun protection among adolescents. Creating sun-safe environments, which adolescents prefer to being out in the sun, is likely to be effective now that the value of sun seeking has declined. Provision of shade-cloth over school play-grounds, pre-school play areas and outdoor recreation centres can reinforce society's responsibility in the

provision of opportunities for adolescent outdoor activities without compromising sun protection.

In some states, the Australian Cancer Societies are encouraging community action by making available grants for local initiatives such as shade-cloths to local communities such as kindergartens, schools and sporting clubs. We are optimistic for more change in the future. In 1996, a national SunSmart school program was launched and renewed effort has been put into institutionalizing sun protection in all environments frequented by young people.

To be successful in the long term, a whole population approach is required to sensible sun protection habits. It is unlikely that adolescents will continue to protect themselves or do it more often unless they perceive the shift in sun protection as normative adult behavior or as acceptable to peers. To achieve this may involve changing basic concepts such as the belief regarding the attractiveness of a tan. In addition, the focus can also be shifted to treat activities directed at adolescents as part of community-wide programs to help everybody reduce their sun exposure.

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